

BANGALORE METRO RAIL CORPORATION LTD.

**PROPOSED COMPENSATORY PLANATION PLAN FOR RAISING 2320 NUMBER
OF PLANTS BY BMRCL IN LIEU OF HONERABLE HIGH COURT OF
KARNATAKA ORDER DATED 13/09/2022 FOR WRIT PETITION NUMBER
17841/2018**



**(Ref: Honorable High Court Order Date 13/09/2022 For Writ Petition Number
17841/2018)**

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PROPOSED COMPENSATORY PLANATION PLAN FOR RAISING 2320 NUMBER OF PLANTS BY BMRCL IN LIEU OF HONERABLE HIGH COURT OF KARNATAKA ORDER DATED 13/09/2022 FOR WRIT PETITION NUMBER 17841/2018

1. Introduction

Bangalore Metro Rail Corporation Ltd is implementation of Metro Rail Project as a rapid public transit vehicle in Bengaluru urban limits.

Hearing the IA 10/2022 in lieu of WP No 17841/2018 Hon'ble High Court of Karnataka in its order dated 13/09/2022 as follows

“Bangalore Metro Rail Corporation Limited (hereinafter referred to as the 'BMRCL' for short) has filed an application on 16.08.2022 seeking permission of this Court to implement Official Memorandum. dated 26.07.2022 issued by Tree Officer and Deputy Conservator of Forests, BBMP, Bangalore, granting permission for removal of 382 trees and translocation of 29 trees which are situate on BMRCL Metro project area of Phase 2B, Package 2, between Kempapura Metro Station and Bagalur Cross (BBMP limits), Airport line.

The recommendations have been made by an expert body. In case the permission given by an expert body is not implemented, public Exchequer is being put at loss. The Metro Rail Project has been conceived in public interest and to reduce the pollution and traffic congestion. The aforesaid rail project is behind the schedule. In light of the recommendations made by expert body, we dispose of IA No. 10/2022 with the following Directions:

vi. Out of Translocated trees, 232 trees have been dried. Therefore, BMRCL is directed to plant 2320 tree and to submit a compliance report in this regard”.

Also Hon'ble High Court of Karnataka has directed BMRCL in its Daily Order WP 17841/2018 dated 25.03.2021 (**Annexure- II**) in vide Para 5 (i) to submit plan for raising compensatory planation to the Tree Officer.

In view of above, BMRCL has identified the locations as follows:

1. Park area 7, Aerospace Park at Hi-tech Defence and Aerospace Park, KIADB, Bengaluru.

Hereby propose to raise compensatory planation as per technique/scheme described here in this plan.

II. Location plan & Approval of land owner

Officials from BMRCL has approached KIADB (Karnataka Industrial Area and Development Board), Bengaluru for allotment of open space, Buffer zone & Park etc., for raising compensatory planation, accordingly KIADB Authorities has given their approval in letter NO. KIADB/EE-3/2022-23 dated 08.06.2022 (**Annexure-III**) for taking up Compensatory Plantation in Park area 7, Aerospace Park at Hi-tech Defence and Aerospace Park, KIADB, Bengaluru.

BMRCL has planned compensatory planation of total 2320 number of saplings of various species as per Forest Department Guide lines and Compensatory planation plan is also submitted to Trees Officer (**Annexure IV**).

Compensatory Planation Plan in lieu of removal of trees in ORR Phase 2A (Package-1)			
1	Total Land Available for Compensatory Planation	Acer	20.50
2	Total Sapling Planned by BMRCL	Nos	2320

III. Agency for compensatory planation

Bangalore Metro Rail Corporation will engage & take service of expert horticulture /planation agency for implementing the proposed compensatory planation including three years' comprehensive maintenance. An agreement will be entered with the approved agency for raising the planation as per the plan ensuring good survival rate.

IV. Scheme of Planation/Technique:

BMRCL has taken the responsibility of raising compensatory planation at the location suggested above as per standard practice & techniques through an expert agency in horticulture/ planation field.

Forest Department, Government of Karnataka has issued "General Guidelines for Species and Planation Technique Models" (**Annexure V**).

BMRCL has finalized a Scheme/ Technique for planation considering these guidelines relevant for Bangalore Urban Transitional Zone and institutional / office premises plantation model. The scheme is summarized as follows:

1. Planation work will be taken up within Park area 7, Aerospace Park at Hi-tech Defence and Aerospace Park, KIADB, Bengaluru.
2. Plantation work will be taken up through an expert horticulture/ planation agency recommend by forest department/BBMP forest division.
3. Water required during rainy season i.e. from May-June to Oct-Nov in Bangalore Urban area would be minimal/nil. During dry season from November to April watering will be regularly done as per the standard practice specified in above guidelines and as per requirement of planation species.
4. Aligning, marking of pits of size 1m x 1m x 1m shall be done at the identified location.
5. Excavation of pits of size 1m x 1m x 1m at 5m x 5m or 7m X 7m grid interval will be taken up as per the general guidelines given for City and Town Planting Model by the Karnataka Forest Department. (refer Annexure-V of Page No.25)
6. The pit will be vertically cut and straight in shape. All loose materials will be removed from pit.
7. Supply of saplings of min 12 months old of 7-8 feet height of species suitable for the zone as specified in the guidelines.
8. Supply of 10% Red earth required for refilling the pits after saplings.

9. Refilling of pit to 75% of the pit with excavated soil after breaking the clods and formation of saucer shaped mound. Conveyance of polythene bag seedlings to the planting location including watering polythene bagged seedlings at site.
10. Supply of 2.5 to 2m length wooden sticks for supporting saplings.
11. Planting seedlings including scooping the soil to required depth pressing the soil gently around the seedlings after planting.
12. Carrying out de-weeding around the plants for a radius of 0.6m.
13. Hoeing and soil working with pickaxe around the plant to a depth of 15cm and to a radius of 60cm.
14. Application of chemical fertilizers around the plant about 15cm away in furrow duly covering with soil as and when required.
15. Scraping of grass and weeds to radius of 0.5m around the plants.
16. Application of FYM (Farm Yard Manure), watering the plants using water tanker with available water inside the premises/ water from outside as required.

V. Up keep of planation & Maintenance

The agency entrusted with the compensatory plantation will be responsible for comprehensive maintenance also. The planation being done will be maintained for 3 years from date of plantation. During the maintenance period of 3 years, following activities will be carried out by the agency and shall be monitored by the BMRCL.

1. Maintenance activities for 1st year, 2nd year and 3rd year to be carried out by agency responsible for planation in order to ensure 100% success rate. In case of failure of any plant, immediate replacement will be done by agency.
2. In summer season i.e., From December to May watering will be done at regular intervals of once in a week. During Monsoon season i.e., from June to November watering required may be minimal/Nil. However, watering need to be done for any dry spell as and when required. During monsoon season whenever there is a scanty rainfall, agency shall do watering to make shortfall.
3. Removing weeds/grass surrounding plantation area as and when required.
4. Preparing reports on growth of plants with photographs/videography and submission to authorities on quarterly basis.
5. The entire compensatory plantation and maintenance to be done under supervision of BMRCL Environmental officer and under the direction of Tree officer.
6. Replacement of causality plants to ensure maintaining 100 % survival.

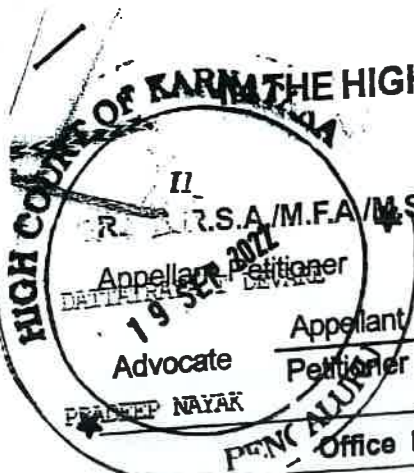
VI Conclusion

BMRCL has accepted to take over compensatory planation for 2320 Saplings at Park area 7, Aerospace Park at Hi-tech Defence and Aerospace Park, KIADB, Bengaluru. As Per Honorable High Court of Karnataka Order Dated 13/09/2022 For Writ Petition Number 17841/2018 as per the guidelines of Forest Department, GOK through an expert horticultural/forestry agency with aim to ensure good survival rate of planation with regular maintenance and adequate supervision.

Encl:

- 1) Annexure-I: Honorable High Court of Karnataka Order Dated 13/09/2022 For Writ Petition Number 17841/2018
- 2) Annexure II: High Court, Daily Order WP 17841/2018 date 25.03.2021
- 3) Annexure III: KIADB, Approval in letter NO. KIADB/EE-3/2022-23 dated 08.06.2022
- 4) Annexure-IV: Location plan for compensatory planation of KIADB Land, hi-tech Defence and Aerospace Park Phase -1 (adjacent to Kempegowda International Airport),
- 5) Annexure-V: Forest Department – GOK Guidelines on “Species and Planation Schemes/Technique Models”

Annexure-I
300813/22
H. E. Pradyumn



THE HIGH COURT OF KARNATAKA AT BENGALURU
ORDER SHEET PART - I

WP 17841/2018 (GM RES)
of 20
STATE OF KARNATAKA Respondent

Date of Filing: 23/04/2018
-vs- Advocate for Respondent

Office Notes

Orders of Court

Receipt No: 28891/2018 Court Fee : 500

THIS W.P. IS FILED PRAYING TO:-

DIRECT THE R-3 AND THE TREE OFFICERS UNDER THEIR JURISDICTION TO CARRY OUT THEIR FUNCTIONS AND DUTIES IN ACCORDANCE WITH THE PROVISIONS OF THE KARNATAKA PRESERVATION OF TREES ACT, 1976 AND THE KARNATAKA PRESERVATION OF TREE RULES 1977, AND THE GUIDELINES AND PRINCIPLES DETAILED BY THE HON'BLE BOMBAY HIGH COURT IN ITS JUDGMENT DTD. 20.09.2013 PASSED IN PIL 93 OF 2009, PRODUCED AT ANNEX-AV.

DIRECT THE R-3 TO HOLD REGULAR MEETINGS, AT LEAST ONCE IN EVERY THREE MONTHS, IN ACCORDANCE WITH SECTION 4 OF THE KARNATAKA PRESERVATION OF TREES ACT, 1976, AND MAKE PUBLICLY AVAILABLE THE MINUTES THEREOF.

DIRECT THE R-1 TO 3 TO ENSURE THAT THE R-3 CARRIES OUT A COMPLETE AND COMPREHENSIVE CENSUS OF TREES EVERY FIVE YEARS AND



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Ag.CJ & SVSJ:

13.09.2022

(VIDEO CONFERENCING / PHYSICAL HEARING)

ORDER

Heard on I.A. No.10/2022.

Bangalore Metro Rail Corporation Limited (hereinafter referred to as the 'BMRCL' for short) has filed an application on 16.08.2022 seeking permission of this Court to implement ~~Official Memorandum dated 26.07.2022 issued by Tree Officer and Deputy Conservator of Forests, BBMP, Bangalore,~~ granting permission for removal of 382 trees and translocation of 29 trees which are situate on BMRCL Metro project area of Phase 2B, Package 2, between Kempapura Metro Station and Bagalur Cross (BBMP limits), Airport line.

Learned Senior Counsel for BMRCL submitted that the Metro Rail project has been conceived in public interest. It is further submitted that, implementation of Metro Rail project would reduce the pollution caused due to vehicular movement. It is further submitted that, on implementation of Metro Phase-2, private vehicles plying on the roads would be reduced by 2,23,821. It is also pointed out that implementation of Phase-2 project would result in reduction of emission of carbon dioxide level by 249 tons and carbon dioxide sequestration daily capacity would be reduced by 0.18 tons.



It is also contended that, BMRCL seeks removal of the trees only when the same is absolutely necessary. It is further submitted that, the requirement to fell the trees has been processed by the Tree Officer and approved by the Committee.

Learned counsel for BBMP and State Government has apprised this Court with regard to the implementation of previous directions with regard to afforestation and has pointed that BMRCL as on today has planted 4020 trees and was required to plant 53210 trees. It has however planted only 25,410 trees. It is also pointed out by learned counsel for BBMP that, out of 753 trees, 660 trees have been translocated, out of which, 44 trees have dried and Additional Government Advocate has pointed out that out of 233 trees, 205 trees have been translocated and out of which, 172 translocated trees have completely dried, whereas 16 trees have partially dried.

It is contended by learned counsel for the petitioners that previous directions with regard to plantation of the trees and the translocation of the trees have not been complied with by BMRCL and therefore, BMRCL be directed to comply with the directions contained in the previous order and thereafter, their prayer for implementation of Official Memorandum dated 26.07.2022 be considered.

In response, learned senior counsel for BMRCL submits that, under the Official Memorandum, the BMRCL has time of six months to carry out the afforestation which is being



carried under the supervision of Tree Officer of BBMP and the Deputy Conservator of Forests. It is submitted that directions issued by this Court shall be complied with letter and spirit. It is also pointed that on account of delay in implementation of the metro rail project, the BMRCL is suffering a loss of Rs.2.00 crores per day.

We have considered the submissions made on both sides. The need for development and protection of environment have to go hand in hand. An undertaking has been furnished by learned Senior Counsel for BMRCL that previous directions issued by this Court shall be complied in letter and spirit. The metro rail project has been conceived in public interest. The need for cutting of the trees and its translocation as well as the retention of the site is being supervised under orders of this Court dated 25.03.2021 and 29.06.2021 by an Expert Committee and Tree Officer. The aforesaid Committee and the Tree Officer has examined the need for cutting as well as translocation and retention of the trees and has issued an Official Memorandum dated 26.07.2022 permitting BMRCL for removal of 382 trees and translocation of 29 trees which are standing in BMRCL metro project area, subject to the conditions mentioned therein.

The recommendations have been made by an expert body. In case the permission given by an expert body is not implemented, public Exchequer is being put at loss. The Metro Rail Project has been conceived in public interest and to reduce the pollution and traffic congestion. The aforesaid



- vi. Out of the translocated trees, 232 trees have dried. Therefore, BMRCL is directed to plant 2320 trees and to submit a compliance report in this regard.
- vii. The BMRCL shall take necessary steps to provide tree guards to protect the saplings planted by them.

The Tree Officer of BBMP is directed to inspect the remaining tree saplings planted by BMRCL if not already inspected. The BBMP is further directed to file a quarterly report for the quarters, i.e., July 2021 to September 2021, October 2021 to December 2021 and April 2022 to June 2022. The BBMP is further directed to upload all the quarterly reports on its websites.

Accordingly, I.A. No.10/2022 is disposed of.

Sd/-
Acting Chief Justice

JUDGE

TRUE COPY
20/9/22
Section Officer
High Court of Karnataka
Bangalore - 560 001



- a) The date on which the application was made..... 6/9/22
- b) The date on which charges and addl. charges, if any, are called for.....
- c) The date on which the charges and addl. charges, if any, are deposits.....
- d) The date on which the copy is ready..... 19/9/22
- e) The date of notifying that the copy is ready for delivery..... 19/9/22
- f) The date on which copy is delivered to the application..... 21/9/22

rail project is already behind the schedule. In the light of the recommendations made by the expert body, we dispose of I.A. No.10/2022 with the following directions:

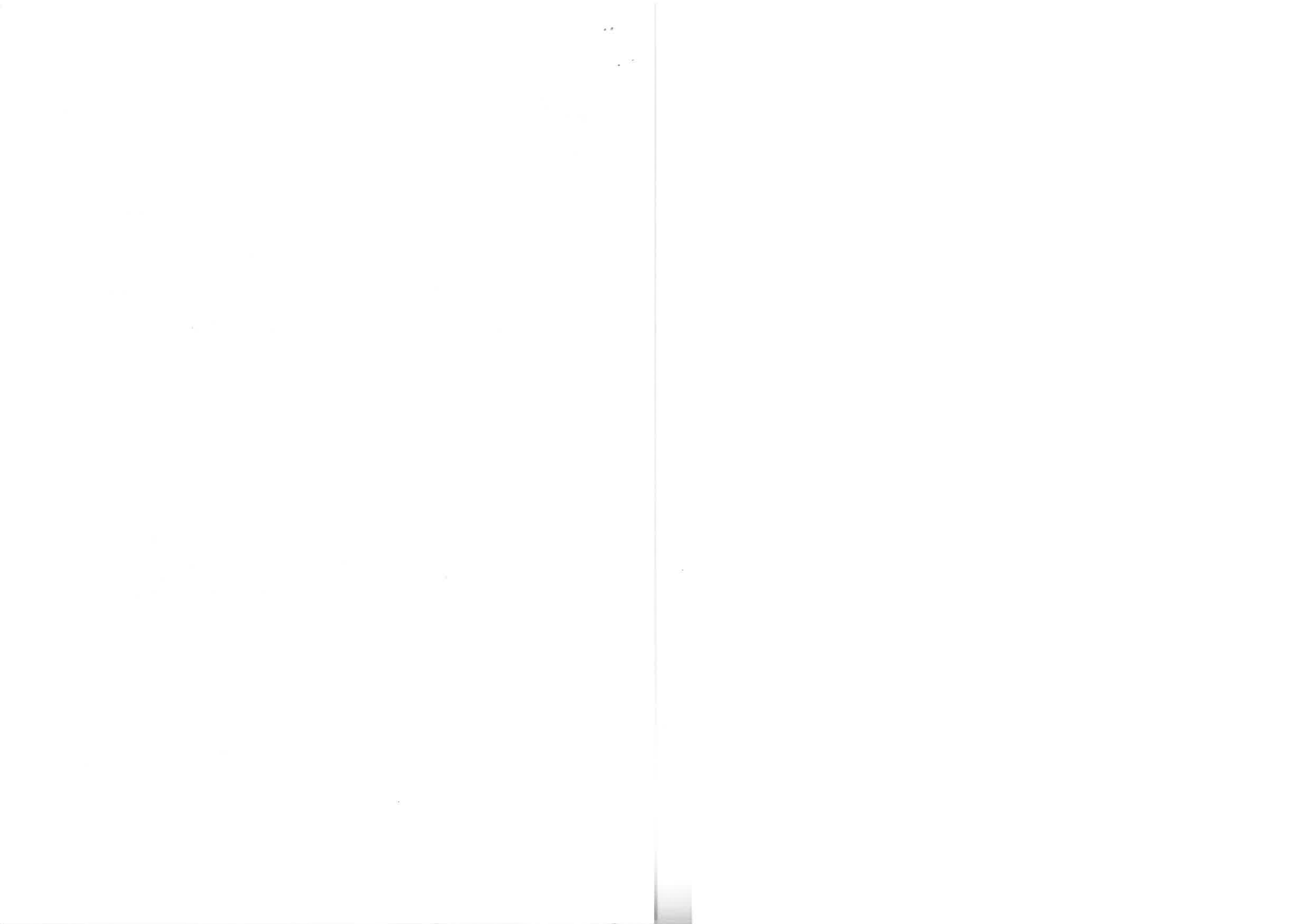
- i. The BMRCL is directed to implement the directions issued by this Court on previous occasion and to implement the same in letter and spirit. The BMRCL shall ensure that 27,800 trees are planted in terms of previous orders issued by this Court as well as Official Memorandums issued by Tree Officer.
- ii. The BMRCL is permitted to cut 382 trees and to translocate 29 trees which are standing in BMRCL Metro Project area of Phase 2B, Package 2, between Kempapura Metro Station and Bagalur Cross (BBMP limits) Airport Line.
- iii. The BMRCL shall comply with the conditions incorporated in the Official Memorandum dated 26.07.2022.
- iv. The BMRCL shall submit a compliance report with regard to plantation of 27,800 trees as well as status report with regard to plantation of trees as contained in the Official Memorandum dated 26.07.2022.
- v. The aforesaid afforestation shall take place under the supervision of Tree Officer.



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Daily Orders for Case WP 17841/2018

Sl. No	Judge(s) Name	Date of Order	Daily Order
57	CHIEF JUSTICE AND SACHIN SHANKAR MAGADUM	23/12/2021	<p>ORDER ON I.A.NOS.10, 11 & 12 OF 2021 Heard Shri Pradeep Nayak, learned counsel for the petitioners, Shri Udaya Holla, learned Senior Counsel for respondent No.5, Shri Dhyan Chinnappa, learned Senior Counsel for respondent No.7, Shri N.K.Ramesh, learned counsel for respondent No.4 as well as learned Additional Government Advocate for respondent Nos.1 and 2. 2. Learned counsel for the petitioners informs that he has filed three applications i.e., I.A.Nos.10/2021, 11/2021 and 12/2021. At the very outset, he made a statement that he does not want to press I.A.No.12/2021. As such, I.A.No.12/2021 is rejected as not pressed. 3. Learned counsel for the petitioners submits that I.A.No.10 is with respect to 27 heritage trees which are coming in the way of laying of road by the respondent No.7/Karnataka Road Development Corporation Limited (KRDCL). It is submitted that this Court had appointed an expert committee i.e., the University of Agricultural Sciences, GKVK, Bengaluru, which has submitted its report and the said report has been approved by the Court. However, the petitioners had approached the Hon'ble Apex Court challenging the order of this Court dated 20.09.2021 and the SLP preferred by the petitioners was disposed of with liberty to the petitioners to raise the concern which they have raised in the SLP before the Division Bench of the High Court and the High Court was requested to consider the submissions of the petitioners and pass appropriate orders. The submission is that the KRDCL shall be directed to change the alignment of the road in order to save these trees as the importance of these trees is very high and there is severe environmental impact due to cutting of these trees. 4. Learned counsel for the respondent No.7, on the other hand, submits that the alignment of the road cannot be changed as it will have devastating effect. Moreover, in case alignment of the road is changed, then again fresh assessment with respect to the affected trees would have to be made and it also involves fresh acquisition of land as well as the redoing of the entire exercise before starting of the road construction projects. It is submitted that the University of Agricultural Sciences, GKVK, who is the expert body has assessed the impact of these trees and has suggested that out of the 27 trees, 9 can be translocated and only 18 trees shall be cut. Accordingly, they are ready to translocate the 9 suggested trees and also ready to plant any number of trees in place of cutting of 18 trees which may be suggested by the expert body. It is submitted that because of the pendency of the litigation of the instant writ petition, the project has been delayed and no work has been carried out. The cost has been escalated and the petitioners shall be asked to bear the escalation of cost. 5. We have considered the submissions made by the learned counsel for the parties and gone through the records. 6. It is only because of these 27 trees which have come in the way of laying down of road by the respondent No.7 that the entire project has now been held up. As per the report submitted by the expert body, out of these 27 trees, 9 trees can be translocated for which the respondent No.7 is ready to translocate those 9 trees which have been identified by the expert body/ University of Agricultural Sciences, GKVK. Those 9 trees as such may be saved by translocation and therefore, we do not find any difficulty in directing the respondent No.7 to translocate those 9 trees at a suitable place and make all possible efforts to save those 9 trees. 7. So far as cutting of remaining 18 trees is concerned, we are of the considered view that we are not the expert body to give any opinion as to whether these trees shall be cut or not. The expert body appointed by the Court i.e., University of Agricultural Sciences, GKVK, has already given its opinion that it is necessary to cut these 18 trees which are coming in the way of laying of the road. As such, we feel that the respondent No.7 shall be allowed to cut those 18 trees and start the project at once and complete it in a time bound manner so that no further delay is caused. We direct accordingly. 8. However, so far as these 18 trees are concerned, the respondents shall plant excess number of trees at suitable places as may be suggested by the expert body i.e., University of Agricultural Sciences, GKVK, which may assess the environmental impact of cutting of those 18 trees and submit its report to the respondent No.7. The respondent No.7 shall, therefore, start the project and complete the laying of the roads, etc., at the earliest and submit its status report to this Court on the next date. 9. Learned counsel for the petitioners</p>





KARNATAKA INDUSTRIAL AREAS DEVELOPMENT BOARD

(A Government of Karnataka Undertaking)

Maharshi Aravinda Bhavan, 14/3, 1st Floor Nrupathunga Road, Bengaluru -560 001

Phone No. : 080-22223029/ 41511412

website : www.kiadb.in email id : do3@kiadb.in

Date: 08-06-2022

No. KIADB/EE-3/ /2022-23

To,
The General Manager (SEMU),
Bangalore Metro Rail Corporation Ltd.,
Regd. Office: BMTCL Complex,
3rd Floor, K H Road, Shantinagar,
Bengaluru - 560 027.

Sir,

Sub: Approval for taking up of compensatory plantation in Hi-Tech, Defence & Aerospace Park, Phase-1 (adjacent to Kempegowda International Airport) belonging to Karnataka Industrial Areas Development Board (KIADB).

Ref: 1. Your letter No. BMRCL/ED-3/KIADB/Compensatory Plantation/2021/246
Dated: 06-04-2021.
2. Head Officer letter No. 604 Dated: 15-04-2021.
3. Your letter No. BMRCL/GM-SEMUKIADB/CP/2022/3000 Dated:
30-05-2022.

In continuation of Head Office letter cited under reference (2), as per the request vide reference, the Board is pleased to give consent to take up compensatory plantation in Hi-Tech, Defence and Aerospace Park, Phase-1 (adjacent to Kempegowda International Airport) developed by KIADB in the location cited under reference (2).

Now as requested by your goodself, the Board has given consent in reference (2), to take up compensatory plantation in Hi-Tech, Defence and Aerospace Park, Phase-1 developed by KIADB in the balance locations as detailed below:

Sl. No.	Description	Extent (in Acres)
Aerospace Sector		
1	Park Area - 2	3.12
2	Park Area - 3	2.59
3	Park Area - 4-P1	1.06
4	Park Area - 4-P2-A	1.38
5	Park Area - 4-P2-B	0.54
6	Park Area - 6	8.65
7	Park Area - 7	20.50
Aerospace SEZ		
1	Park Area - 1	23.50
2	Park Area - 2	1.70

IT Sector		
1	Park Area - 1	8.88
2	Park Area - 2	4.03
3	Park Area - 3	1.90
4	Park Area - 4	11.13
5	Park Area - 5	26.73
6	Park Area - 7	7.52
Hardware Sector		
1	Park Area - 2	5.60
2	Park Area - 4	9.84
3	Park Area - 5	3.30

Once again, it is requested to take up the work in presence of KIADB Engineer incharge in order to avoid any damages, during execution. Kindly acknowledge the receipt of the same.

Yours faithfully.
Sd/-
Executive Engineer - 3

Copy to:

1. The Chief Executive Officer & Executive Member, KIADB Head Office, Race Course Road, Bengaluru - for kind perusal and further needful.
2. Office Copy.


Executive Engineer - 3

List of Tree species for Compensatory Plantation

Location :KIADB

Order NO; Hon'ble High Court of Karnataka Order Dated: 13.09.2022 for Writ Petition No: 17841/2018

Number of Saplings -2320 Nos

SI NO	Tree Species Name	Category	No Of Saplings Proposed for Plantation
1	Tamarind	Fruit	116
2	Jackfruit	Fruit	116
3	Indian Almond	Fruit	116
4	Indian Fig Tree	Fruit	116
5	Gooseberry Tree (Phyllanthuscidus)	Fruit	116
6	Hole dasavala	Flower	116
7	Hole matti	Wood	116
8	Kadamba mara	Flower & Wood	116
9	Mahogany	Wood	116
10	champaka mara	Flower	116
11	Ala	Wood & Fruit	116
12	Arali mara	Wood & Fruit	116
13	Atti mara	Wood & Fruit	116
14	Basari mara	Wood	116
15	Narale mara	Fruit	116
16	Neem	Wood	116
17	Honge	Wood	116
18	Tare	Wood	116
19	Red Tamarind	wood	116
20	Wild Mango	Fruit	116
21	Sihi Hunase	wood	116
Total			2320

SPECIES AND PLANTING TECHNIQUE MODELS General Guidelines

A. INTRODUCTION:

- 1) Karnataka Forest Department is afforesting around 80000 to 100000 ha. annually under various plan and non-plan programmes. Afforestation is also taken up under various models of planting. Assisted Natural Regeneration (ANR) and Artificial Regeneration (AR) accounts for large share of hectare being afforested. The department has gained lot of experience by way of feed back and evaluation of the planting programmes. Many successful planting techniques have been established and followed in the field. However there is no compilation of such successful planting techniques evolved and of collective experience of the department. Afforestation and Reforestation is one of the core activities of the department and there is an urgent need to codify successful practices, so that it serves as manual for all the field officers who are engaged in the task of afforestation. In addition uniform cost norms and model estimates for various types of afforestation works help in standardizing planting techniques across various schemes.
- 2) An effort in this regard began in a meeting of few field officers and senior officers on 3-11-2010. A concept paper was prepared and sent to all circles with a request to submit circle wise write up on important best practices. Based on the circle wise reports "A species and Planting Technique models for Karnataka" was prepared by a Core Committee comprising of Addl. Principal Chief Conservator of Forests (Development), Addl. Principal Chief Conservator of Forests (Projects), Conservator of Forests (Development) and Conservator of Forests (Projects).
- 3) The report was again circulated among field officers through circle Conservators of Forests / Chief Conservator of Forests during April 2011.
- 4) A series of workshops were held at Davanagere (Bellary circle), Shimoga (Shimoga, Chikmagalur and Mangalore circles), Dharwad (Dharwad, Belgaum and Kanara circles), Bangalore (Bangalore and Chamarajanagar circles), Mysore (Mysore, Kodagu and Hassan circles) and Gulbarga (Gulbarga circle) during May-June 2012. In these workshops all Chief Conservators of Forests, Deputy Conservators of Forests (Territorial) and (Social Forest), Assistant Conservators of Forests (Territorial) and (Social Forest) and selected Range Forest Officers participated. The report was also discussed in the meeting of Chief Conservators of Forests and senior officers of the department on 20-06-2012 and 17-12-2012. Based on the deliberations and inputs of senior officers and field officers the final report is prepared.

B. METHODOLOGY

- 1) The Approach: The state is divided in to 4 Silvi (Agro) climatic zones for the purpose of report. The Talukas / Districts in each zone are as per the agro-

climatic zones recognized by the State Agriculture Department. The details of areas falling in various agro-climatic zones is provided in Annexure-I. Karnataka state land use board has classified state in to 10 zones. These zones are further regrouped as follows for the purpose of this report.

1.	Dry Zone	:	North Eastern Dry Zone, Northern Dry Zone, Central Dry Zone, Eastern dry zone, Southern dry zone.
2.	Transitional zone	:	Southern transition zone, Northern transition zone, North Eastern transition zone.
3.	Malnad & Western Ghat zone	:	Corresponding to Hilly zone of Karnataka land use board classification.
4.	Coastal zone	:	Coastal zone.

2) Within Silvi (Agro) climatic zones and specially for the purpose of Artificial Regeneration Model two site qualities have been distinguished.

1. Poor site quality : Sites of low fertility having little (<30cm) or no top soil. Rocky in nature.
2. Moderate to High fertility site quality : Sites with >30 cm. soil depth. Can sustain growth of native species and production forestry.

3) Three canopy densities are also distinguished for deciding allotment of areas under ANR or AR model and working out specific treatments.

1. Open areas and areas with less than 10% canopy.
2. Areas with 10 to 25% canopy.
3. Areas with 25 to 40% canopy.

4) Following various models and topics have been considered for detailing out planting techniques and best practices.

1. Assisted Natural Regeneration (ANR)
2. Artificial Regeneration (AR)
3. NTFP plantation
4. Sandal Regeneration
5. Road side plantations.
6. School and Institutional planting.
7. City and Urban areas planting.
8. Canal Bank plantations.
9. Farm Forestry.
10. Nursery Practices.

5) The species and planting technique models for the states provide the following details.

- (1) **Brief description** of the area relevant to the Model. For actual geographical applicability and Taluks, districts in each zone Annexure-1 may be referred.
- (2) **List of core species:** The species which constitute core of nursery and planting for the given zone and model are listed based on the past experience.
- (3) **Planting Technique:** The details like site preparation, planting density per ha, size of polythene bags for raising seedlings, land preparation (pitting, T.M, Ripping etc.,) type of protection to be provided, watering, number of years a plantation to be maintained are indicated.

However to avoid repetition only the specific and important details of each model are only noted. Rest of the specifications are detailed out in Model Estimates relevant for each model of planting.

- (4) It is strongly recommended that the afforestation areas are delineated on water shed basis. A land scape of about 5-10 thousand ha. in each range including the areas outside forests may be taken as a unit of treatment of both arable and non-arable land. Such land scapes may be prioritised based on a composite index with proper weightage for extent of forest degradation, availability of waste lands, scope for Farm Forestry and Socio-economic backwardness of the areas etc.,
- 6) All resources available for afforestation including promotion of farm forestry may be allotted to such delineated land scapes based on its prioratisation so that the limited resources at the disposal of the department are spent on most needy areas.
- 7) The report also recommends the following common prescriptions.
 1. All block plantation sites are provided protection with Cattle Proof Trenches or Barbed Wire Fencing.
 2. SMC in terms of Gully checks and **SMC Trenches of 5X1X1 M dimension with outlets / spill ways and one or two nala bunds depending upon site requirement are provided in all block plantation.** A sum equal to 20% (a sum equal to 15% of the total cost of planting up to full maintenance is provided for SMC works in plain and gentle sloppy lands and 25% of the total cost of planting upto to full maintenance is provided in SMC works in sloppy and steep sloppy areas. This has to be certified by the officers at the rank of ACF / DCF after site visit.
 3. CPT is excavated to cover entire Micro Water Shed and plantings raised within the area for 5 years.
 4. Sowing of seeds, planting of cuttings and Agave shall be taken up on CPT mounds and SMC trenches.

5. Ripping is recommended as preferred in mode of site preparation in Dry and Transitional zones under AR Model.
6. Planting will be done in ripped furrows and mound formation taken up later. So no sowing of seeds on mounds is normally recommended. But in case where two seedlings are planted per trench, sowing of seeds of local species like Muttuga, Honge, Hale, Ode, Kamara etc. can be done in the trenches.
7. Watering of seedling is provided 5 times in the 1st year 3 times in 2nd year under Greening Urban Areas. Road side, NTFP, Canal Bank and Sandal Estate Models. However in Institutional Planting model watering will be done by individual institutions.
8. F.Y.M application @1CM/40 plants is recommended under Greening Urban Areas / Road side / NTFP models.
9. a) 500 T.M. of 4M length and 1500 plants/Ha is recommended for the area which do not have root stocks and do not likely to get root suckers after ripping / pitting.
b) However, in the locations where good number of root stocks are found and root suckers are likely to come up after ripping 1000 plants per hectare is recommended. Then the number of seedlings in each trench will be two per trench.
10. Plantation maintenance is kept at planting plus 2 year for Artificial Regeneration models which are planted with fast going species and 4 years for the models which are planted with slow going species. ANR Model, Greening Urban Areas, Road side, NTFP models where the plantations will be maintained up to 5 years.
11. Any major deviation based on site specific requirement shall be done only with the written approval of Deputy Conservator of Forests detailing out the reasons.
12. Detailed model estimates are provided for each model of planting.

C. SPECIES AND PLANTING TECHNIQUES MODELS

I. Assisted Natural Regeneration (ANR) Model is further sub divided in to

IA. Eco-Restoration Model

IB. Supplemental Planting Model

I(A) ECO- RESTORATION MODEL:

1. **Area Description:** Sites in all 4 zones which contain canopy density between 25 – 40% and are under various stages of degradation but can rejuvenate given proper protection and soil moisture conservation treatment are treated under this model, so that the already present root stock and regeneration is helped to establish and grow.
2. **Core Species:** No planting is proposed in this model. Only dibbling of seeds of native species will be taken up.
3. **Planting Technique:**
 - 1) Protection through excavation of cattle proof trenches @ 72 RMT/ 90 CMT per ha.
 - 2) Sowing of seeds of Glyrecidia, Planting of Agave suckers on the CPT mounds in open area and Duranta cuttings on the CPT mounds in partially shaded area in high forest locations.
 - 3) Watch and Ward for every 50 ha.
 - 4) Dibbling of seeds of Sandal, Neem, Seetaphal, Honge and other native species.
 - 5) Clearing unwanted growth, Climber cutting, Tending, cutting back of half cut stumps / stools to get good coppice growth and singling of coppice growth @ 400 plants/ha. The training of local community/ VFC members and sharing of biomass and its documentation shall be made in this operation.
 - 6) Other details as per model estimate Model -01

I(B) SUPPLEMENTAL PLANTING MODEL:

1. **Area Description:** Sites in all 4 zones which have a canopy density between 10 – 25% which are deficient in regeneration and are under higher degree of degradation and with large open gaps are selected under this model. The presence of appreciable root stock of native species which can be nursed / nurtured to better health and supplemental planting with high value native species is main objective of this model.

Species Proposed:

Dry Deciduous Forests:

- | | | |
|-----|-----------|------------------------------|
| 1. | Bevu | Azadiracta indica |
| 2. | Tapasi | Holoptelia integrifolia |
| 3. | Seetaphal | Annona Squamosa |
| 4. | Honge | Pongamia pinnata |
| 5. | Kamara | Hardwickia binata |
| 6. | Bage | Albezzia lebbek |
| 7. | Ficus | Ficus bengalensis |
| 8. | Sisso | Dalbargia Sisso |
| 9. | Ailanthus | Ailanthus excelsa |
| 10. | Hale | Writia tinctoria |
| 11. | Ude | Steriospermum
chelanoides |
| 12. | Dhupa | Boswellia
Serrata |
| 13. | Nelli | Emblica officinalis |
| 14. | Honne | Pterocarpus marsupium |

Moist Deciduous Forests

1.	Teak	Tectona grandis
2.	Nandi	Legarstroemia lanceolata
3.	Honne	Pterocarpus marsupium
4.	Mathi	Terminalia alata
5.	Shivane	Gmelina arboria
6.	Kindal	T.paniculata
7.	Beete	Dalbargia latifolia
8.	Tare	T.belericica
9.	Bamboo	Bambusa arundinasia
10.	Muthuga	Butea monosperma
11.	Hippe	Madhuca latifolia
12.	Sandal	Santalum album
13.	Nelli	Emblica officinalis
14.	Neral	Sizyzium cumini
15.	Dhaman	Grevia tilifolia
16.	Kaval	Careya arborea
17.	Harada	Terminatia chebula

Semi Evergreen and Evergreen Forests:

1. Honne	Pterocarpus marsupium
2. Beete	Dalbargia latifolia
3. Dhoopa	Vateria indica
4. Tare	T.belerica
5. Hole mathi	T.arjuna
6. Kindal	T.paniculata
7. Bamboo	a) B.arundinasia b) D. Strictus
8. Bharanigi	Vitex ultissima
9. Bobbi	Lophopetalum whitianum
10. Canes	Calamus species
11. Gulmavu	Machilus macranta
12. Saldhoopa	Vateria indica
13. Nerale	Syzgium Cumini
14. Hebbalasu	Artocarpus heterophyllus
15. Halmaddi	Ailanthus malabaricum
16. Mango	Mangifera indica
17. Murugal	Garcinia indica
18. Uppage	Garcinia gummigatta
19. White cedar	Dysoxylon Malabaricum

3. Planting Technique:

1. Identified area is demarcated and surveyed and area will be closed with CPT / barbed wire fence.
2. The SMC works are taken up from ridge to valley concept. SMC trenches of 5X1X1 mts. across rills with spill ways and nala bunds are created.
3. The young regeneration is protected, the coppice growth is promoted by cutting back of stumps, singling of multiple shoots. Training of local community / VFC members for singling, pruning, cutting back, sharing of biomass and its documentation is done. This to be done by watch and ward persons.
4. Advance work is done by digging upto 200 pits of 75cm³ in dry zones, upto 400 pits of 60cm³ in other zones avoiding pitting near the existing root stock / regeneration.
5. Sowing of seeds of Prosopis, Glyrecidia in dry areas only. Planting of Agave suckers on the CPT mounds in open area and Duranta cuttings on the CPT mounds in partially shaded area in high forest locations.
6. At least 12 month old seedling in 10" X 16" polythene bags in dry zones and 10 months old 8" X 12" / 6" X 9" (for teak) polythene bags in other zones are used for planting.

7. Planting with Agave, Suckers/ bulbils and sowing of seeds of Bamboo, Sandal, Glyrecedia, Cassia, honge etc., on Mounds of SMC trenches and on Cattle Proof Trenches is done.
8. If necessary, further tending of root suckers, cutting back stumps, singling of coppice growth and soil working up to 400 plants/ha. is done during 3rd year involving local community / VFC members with documentation.
9. Engaging watch and ward for every 25 ha.
10. Other operations as per Model estimate Model- 02 and 03.

II. ARTIFICIAL REGENERATION MODELS (AR)

1. Artificial regeneration is taken up on barren, open areas, waste lands, blanks and laterate patches and forest areas where the canopy density or root stock is less than 10%. The site preparation is normally done by ripping by D-80 / D-120 dozers in dry and transitional zones and pitting is also done in the patches where ripping can not be taken up in rocky patches, rugged nalas up to 100 pits per hectare with pit size 75 cm³.
2. Pitting is done in Malnad and coastal zones. The model by far constitutes very high extent of afforestation works in the state. Considering this fact the species choice and planting pattern is prescribed for all zones and two site qualities separately.

II(A) AR MODEL FOR LOW FERTILITY, ERODED AND ROCKY AREAS IN DRY ZONES.

1. **Area Description:** These are rocky eroded areas with very little or no top soil (less than 30 cm). The rainfall is scanty and ill distributed with high mean annual temperatures. The strategy for such areas is primarily to check the further degradation of sites and create a green cover using pioneer, colonizing species like Glyrecedia, C.Siamia, Agave etc., with a suitable mixture of hardy local species. The fast growing species like Glyrecedia cover up the site in 2-3 years and it is seen to compliment and facilitate the growth of inter planted local hardy species in course of time.

2. Core Species and Planting Pattern:

- a) In the locations where there is no chance of getting roots sucker and regeneration after ripping, the planting density is as follows:

1.	Glyrecedia, C.Siamia, Agave	1400 plants / ha.
2.	Honge, Seetaphal, Tapasi, Ficus	100 plants / ha.

- b) In the locations where there are chances of sufficient roots sucker and natural regeneration after ripping, the following core species planting pattern shall be followed.

c)

1.	Glyrecedia, C.Siamia, Agave	800 plants / ha.
2.	Honge, Seetaphal, Tapasi, Ficus	200 plants / ha.

II(B) AR MODEL FOR MODERATE TO HIGH FERTILITY AREAS IN DRY ZONE.

Planting Pattern – I

1. **Area Description:** Two distinct areas can be identified for the purpose of species selection. The taluks falling in Northern and North eastern dry zones (Annexure-I) especially districts like Bijapur, Gokak division of Belgaum district, Yadgir, Raichur, Gulbarga, Koppal and Gadag districts the following planting pattern is recommended.

2. **Core Species:**

1.	Glyrecedia, C.Siamia, Sisso	1300 plants / ha.
2.	Seetaphal, Honge, Ficus, Tapasi, Nelli, Bevu, Nerale	200 plants / ha.

b) In the locations where there are chances of sufficient roots sucker and natural regeneration after ripping, the following core species planting pattern shall be followed.

1.	Glyrecedia, C.Siamia, Agave	800 plants / ha.
2.	Honge, Seetaphal, Tapasi, Ficus	200 plants / ha.

3. **Planting Pattern – II :**

Area Description : The second distinct area comprises of Central, Eastern and Southern dry zones (Annexure-I) comprising of districts of Bagalkot, Bellary, Davanagere, Chitradurga, Tumkur, Kolar, Chikkaballapur, Bangalore Rural, Ramanagara etc.,

4. **Core Species:**

1.	Kamara, C.Siamia, Sisso, Stereospermum chelenoides, Soymida, Boswellia serrata	1300 plants / ha.
2.	Seetaphal, Honge, Tapasi, Ficus, Nelli, Cashew, Seemaruba, Bevu, Nerale, Mango	200 plants / ha.

b) In the locations where there are chances of sufficient roots sucker and natural regeneration after ripping, the following core species planting pattern shall be followed.

1.	Kamara, C.Siamia, Sisso, Stereospermum Chelenoides, Soymida, Boswellia serrata	800 plants / ha.
2.	Seetaphal, Honge, Tapasi, Ficus, Nelli, Cashew, Seemaruba, Bevu, Nerale, Mango	200 plants / ha.

II(C) AR MODEL FOR POORER SITES IN TRANSITIONAL ZONE:

1. **Area Description:** These areas also have little or no top soil, eroded, rocky and of low fertility. However the sites are located in better rainfall and moderate temperature and weather conditions.

2. **Core Species:**

1.	Auriculiformis in >1000 mm rainfall areas and in JFPM areas	1500 plants / ha.
2a.	C.Siamia, Sisso, Sterospermum, Seemaruba, Kamara	1300 plants / ha.
	Honge, Tapasi, Ficus, Nelli, Cashew, Bevu.	200 plants / ha.
2b.	In the locations where there are chances of sufficient roots sucker and regeneration after ripping the following core species planting pattern shall be followed.	
	C.Siamia, Sisso, Sterospermum, Seemaruba, Kamara	800 plants / ha
	Honge, Tapasi, Ficus, Nelli, Cashew, Bevu	200 plants / ha.

II(D) AR MODEL FOR MODERATE TO HIGH FERTILE AREAS IN TRANSITIONAL ZONE.

1. Area Description: The sites are having better soil depth (30-60 cms) and are situated in better rainfall and moderate weather conditions, conducive for raising productive plantations of fuel and small timber. Very fertile areas in this zone are put under NTFP / Fruit Orchard Model.

2. Core Species:

1.	A.auriculiformis in better rainfall areas and JFPM areas.	1500 plants / ha.
2a	C.Siamia, Sisso, Sterospermum, Seemaruba, Kamara	1100 plants / ha.
	Bamboo, Shivani, Nelli, Mango, Nerale, Cashew, Bage, Honge, Tapasi, Ficus	400 plants / ha.
2b.	In the locations where there are chances of sufficient roots suckers and regeneration after ripping the following core species planting pattern shall be followed.	
	C.Siamia, Sisso, Sterospermum, Seemaruba, Kamara	800 plants / ha
	Bamboo, Shivani, Nelli, Mango, Nerale, Cashew, Bage, Honge, Tapasi, Ficus	200 plants / ha.

3. Planting Pattern : Fast growing species like Kamara, C.Siamia, Sisso etc., in single species rows and species like Mango, Nerale, Nelli, Cashew at 10M spacing but in the ripped line only, without resorting to excavation of separate pits.

II(E) PLANTING OF EUCALYPTUS IN TRANSITIONAL ZONES

1. Moderate to high fertile areas in transitional zone as well as areas under JFPM in transitional zone are also suitable for raising Clonal and seed origin of better provinces Eucalyptus plantations. These plantations can yield appreciable biomass at the end of rotation period of 8 years. This will also improve supply of fuel wood, poles, small timber to meet local needs. It can also generate income to Village Forest Committees. In this model Eucalyptus preferably clonal planting material is planted 100% @ 1500 plants per hectare without mixing with any other species.

However adopting this planting model is subject to overall policy of growing of eucalyptus by Government.

II(F) AR MODEL FOR FORESHORE AREAS IN DRY AND TRANSITIONAL ZONE.

1. **Area Description** : These areas are situated in foreshores of Tanks and Reservoirs in dry and transitional zones. The sites are fertile due to accumulation of salt, but have high degree of salinity and water logging.
2. **Core Species:**

1.	A.Nilotica / A.auriculiformis	550 plants / ha.
2.	Honge, T.arjuna, Nerale, Sisso and Bamboo	550 plants / ha.

3. **Planting Technique:** Only pitting is done for foreshore planting. A.nilotica is raised in 5"X8" polythene bags and miscellaneous species raised in 8"X12" polythene bags. While planting care should be taken to scrape the salt entrusted surface soil away. While doing soil working, raised mounds are formed so that the salt is leached down during rains. The planting should be done beyond HFL of Tank.

Planting Technique for AR model for Dry and Transitional Zone:

- 1) Site preparation is done by using D-80 / D-120 dozers in dry zones and by D-8 dozers in transitional zones.
- 2) 500 Trenches of 4M length are formed per ha. Pitting is also done in patches where ripping can not be taken up in rocky patches, rugged nalas etc up to 100 trenches of 4X11M or 100 pits per hectare with pit size 75cm³.
- 3) No refilling and formation of mounds is done before planting. This operation will be done after planting.

- 4) Fast growing species like Glyrecedia, C.Siamia, Kamara etc., are raised in 5"X8" polythene bags and miscellaneous species like Honge, Bevu, Ficus, Seetaphal etc., raised in 8"X12" polythene bags.
- 5) The planting proportion of fast growing species and miscellaneous shall be as indicated.
- 6) No separate pitting will be excavated for planting miscellaneous species, but are planted in the ripped line only.
- 7) Fast growing species like C.Siamia, Glyrecedia, Kamara etc., are planted. Single species in a row and the miscellaneous species mixed in each line at appropriate spacing.
- 8) SMC works are carried out by Gully checks and SMC trenches of size 5X1X1m across the rills with spill way and nala bunding wherever required only.
- 9) Other details as per Model estimate – Model 04, 05, 06 and 07.

II(G) AR MODEL FOR MALNAD AND WESTERN GHAT ZONE AND COASTAL ZONE.

**1. Core species and Planting Pattern:
Planting Pattern-I**

Open degraded areas with <10% canopy cover. Areas assigned to JFPM, Harvested areas, Encroachment evicted areas in Malnad and Coastal zones including the area having lateritic stones and outcrops. In all types of forest areas viz., Moist deciduous, SEG or EG areas.	Acacia auriculiformis 1500 plants / ha.
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Planting Pattern-II

Moist deciduous forest types areas with bigger gaps and deficient regeneration. Moderate to high fertile areas.	Teak: 550 plants / ha.
	Honne, Matti, Kindal or Hunal, Heddi, Kalam, Nandi, Bamboo, Cashew, Mango, Nerale, Antawala, Shivani, Albezia 550 plants / ha.

Planting Pattern-III

Semi Evergreen, Evergreen areas with gaps and deficient regeneration. Moderate to high fertility in Malnad and Coastal zones	Acacia auriculiformis Hopea Whitiana 550 plants / ha.
	Hopea Parviflora, T.arjuna, Mango, Nerale, Cashew, Lophopetalumwhitianum, Hebbalasu, Saldhupa, Kaidhupa (Canarium strictum), Murugal, Uppage. 550 plants / ha.

Planting Technique :

- 1) Acacia auriculiformis is planted in pits of 45cm³ and planted 100% without mixing with any other species.
- 2) Teak in planting pattern II and Hopea whitiana is planting pattern-III are planted at 3X3M spacing (1100/ha) in 45cm³ pits in open areas.
- 3) Miscellaneous species are planted @400/ha in 5X5 M spacing.

- 4) Acacia is raised in 5"X8" polythene bags. Teak and Hopea are raised in 6"X9" polythene bags. Other miscellaneous species raised in 8"X12" polythene bags.
- 5) Protection is provided by Cattle Proof Trenches.
- 6) Sowing of seeds of Prosopis, Glyrecidia, Planting of Agave suckers on the CPT mounds in open area and Duranta cuttings on the CPT mounds in partially shaded area in high forest locations. SMC works provided by Gully checks are SMC trenches of 5X1X1 Mts size across the rills with spill ways and nala bunding wherever required only.
- 7) Other details as per Model estimate No.06 and 07.

NOTE ON PLANTING ACACIA IN AR MODEL:

1. Acacia is a gregarious, highly productive species which can attain high productivity in 8 years. It also gives highly valued timber after 20 years.
2. It is suitable for barren lateritic areas.
3. It can be planted in degraded forests, open areas with <10% canopy in Malnad and Coastal zones.
4. It can be grown as a pioneer species in Western ghats to build up fertility of the area and make it suitable for planting native species later.
5. It can be planted on Encroachment prone / evicted sites for quick site recovery and coverage.
6. It can be planted on Degraded forests and JFPM areas identified in JFPM management plan in Transitional, Malnad and Coastal zones.
7. Replanting after harvesting of JFPM areas as per VFC management plan.
8. Acacia should not be planted in ANR model as under planting.
9. Acacia should not be planted in dry zones.

II(H) AR MODEL SPECIAL AREAS IN COASTAL ZONES

1. **Area Description:** The sites in coastal area fall in 3 categories.
 1. Lateritic soils.
 2. Mangrooves.
 3. Sand dune stabilization

DEGRADED / LATERITIC SOILS:

Open degraded lateritic soils	Acacia auriculiformis 550 plants / ha. A.catachu 550 plants / ha.
Very hard lateritic patches	Ficus, A.catachu, T.belerica, Callophyllum oenophyllum, Cashew, Jummanakai (Fagara budrunga) planted 100 plants / ha.

Planting Technique:

1. Acacia auriculiform is raised in 5"X8" polythene bags and Acacia catachu in 8"X12" polythene bags planted in pits of 45cm³ and 60cm³ respectively.
2. Protection is provided by Cattle Proof Trenches / Barbed wire fence/ Laterite block rubble wall.
3. Standard SMC works with Gully checks and SMC trenches across the rills with spill ways and nala bunding wherever required only provided.
4. Other planting details as per Model estimate No.07.

MANGROVE PLANTING MODEL

1. **Area description:** Mangroove are typical areas in estuaries. They are both viviparous and saline tolerant in nature.
2. **Core species** : Avicennia marina, A.officinalis, Kandelia candel, Rhizophora apiculata, R.mucronata, Sonnaratia alba, S.Caseolaris, Exocaria agallocha, Aegiceras Corniculatum.
3. **Planting Pattern** : Seedlings of the species are collected and planted in estuaries in low sites at 1X1M spacing. Nursery seedlings can also be raised by wildling and planting can be done.

COASTAL SAND DUNE PLANTING:

Coastal sand dune belts are planted in Shelter belt fashion. Vegetative barrier created by shelter belt can be very effective in halting erosion of sand dunes.

- Species : Spinifix littorate (Ravanana meese), Ipomea species, Pandanus species, Morinda citrifolia, Callophyllum inophyllum, Anacardium occedentale, Cauarina equisitifolia
- Planting Technique : These species listed above are planted from sea shore towards inlands in the listed order. Smaller plants can be planted at 2X2M spacing with callophyllum, Cashew can be planted at 4X4 M spacing.

SUMMARY OF SPECIES, PLANTING PATTERN AND TECHNIQUE UNDER ARTIFICIAL REGENERATION MODELS

Sl. No.	Site specification	No. of plants / Ha	Core species	Planting Pattern			Model Code
				No. of Plants	Bag size	Site Preparation	
1.	Poorer sites in Dry zones all over state.	1500	Glyrecedia, C.Siamia, Agave	1400	5"X8"	Ripping / pitting (upto 100) in area where ripping can not be done	IIA
			Honge, Tapasi, Sitaphal, Ficus	100	8"X12"		
2.	Moderate-High Fertile areas in Northern and North Eastern dry zone	1500	Glyrecedia, C.Siamia, Sisso	1300	5"X8"	Ripping / pitting (upto 100) in area where ripping can not be done	IIB
			Seetaphal, Honge, Ficus, Tapasi, Nelli, Bevu, Nerale	200	8"X12"		
3.	Moderate - High fertile areas in Central, Eastern and Southern Dry zone.	1500	Kamara, C.Siamia, Sisso, Sterospermum, Seemaruba.	1300	5"X8"	Ripping / pitting (upto 100) in area where ripping can not be done	IIB
			Seetaphal, Honge, Saymeda, Tapasi, Ficus, Nelli, Cashew, Bevu, Nerale.	200	8"X12"		
4.	Poorer sites in Transitional zone	1500	Acacia auriculiformis in JFPM areas and areas receiving >1000 mm	1500	5"X8"	Ripping / pitting (upto 100) in area where ripping can not be done	IIC
			C.Siamia, Sisso, Stereospermum, Seemaruba,	1300	5"X8"		
			Kamara, Honge, Tapasi, Ficus, Nelli, Cashew, Bevu	200	8"X12"		

Sl. No.	Site specification	No. of plants / Ha	Core species	Planting Pattern			Model Code
				No. of Plants	Bag size	Site Preparation	
5.	Moderate to fertile sites in Transitional zones	1500	Acacia auriculiformis in JFPM areas and areas receiving >1000 mm rainfall	1500	5"X8"	Ripping / pitting (upto 100) in area where ripping can not be done	II D
			C.Siamia, Sisso, Stereosperum, Seemaruba, Kamara	1100	5"X8"		
			Bamboo, Shivani, Nelli, Mango, Nerale, Cashew, Bage, Honge, Tapasi, Ficus.	400	8"X12"		
			Eucalyptus	1500	5"X8"		II E
6.	Dry zone, Transitional zone where there are chances of sufficient root suckers and natural regeneration after Ripping.	1000	As recommended for respective sites.	800	5"X8"	Ripping	IIA/IIB/ IIC / IID
				200	8"X12"		
7.	Foreshore areas of Tanks and Reservoirs.	1500	A.Nilotica	750	5"X8"	45cm ³	II F
			Honge, T.arjuna, Nerale, Sisso	750	8"X12"	60cm ³	

Sl. No.	Site specification	No. of plants / Ha	Core species	Planting Pattern			Model Code
				No. of Plants	Bag size	Site Preparation	
8.	Degraded, Open areas, JFPM areas, Harvested areas, Encroachment evicted areas in Transition, Malnad, Coastal zones.	1500	Acacia auriculiformis	1500	5"X8"	Ripping or 45cm ³ pits	II G
9.	Open areas in Moist deciduous areas, Moderate to high fertility areas	1500	Teak	550	6"X9"	45cm ³ pits	II G
			Honne, Matti, Nandi, Bamboo, Cashew, Mango, Nerale, Antawala, Shivani, Alberia	550	8"X12"	60cm ³ pits	
10.	Semi evergreen and evergreen forest types in Malnad, Coastal zones. Deficient in regeneration, Moderate to high fertility		Hopea Whitiana	550	6"X9"	45cm ³ pits	II G
			Hopea Parriflones, T.arjuna, Mango, Nerale, Cashew, Lophopetalum Whitannum, Hebbalasu.	550	8"X12"	60cm ³ pits	
11.	Degraded Lateritic sites	1500	Acacia auriculiformis	750	5"X8"	45cm ³	II H
			A.Catachu	750	8"X12"	60cm ³ pits	
12.	Very Hard Lateritic Patches	100	Ficus, A.Catachu, T.Belerica, Callophyllan inofillum	100	10"X16"	1M ³ pits	

III. N.T.F.P. PLANTING MODEL

Area Description : Non Timber Forest produce plantations may be raised in sites of high fertility. Even while taking up ANR or AR Model, NTFP plantations may be raised on small portion of the plantation areas, which has high fertility.

2. Core Species:

- Dry zone : Hunse, Mango, Neral, Nelli, Hippe, Bevu, Honge, Seetaphal, Kadgeru, Bucnania, Cashew, Feronia, Seemaruba and other local NTFP Species. Halsu may also be taken up in better sites in Districts like Kolar, Tumkur, Bangalore.
- Transitional zone : Sandal, Bamboo, Antwala, Nelli, Hippe, Mango, Nerale, Muttuga, Kadgeru, Bucnania, Harada, Cashew, Hunse, Halasu, Seege and other local NTFP Species.
- Malnad & Western Ghats : Antawala, Murugal, Uppage, Dalchinni, Wate, Cashew, Halmaddi, Kaidhoopa, Harada, Nelli, Mango, Halsu, Sandal, Xanthoxylum ritsa, Bamboo, Canes and other local NTFP Species.
- Coastal zone : Murugal, Vate, Jummanakai, Myristica, Uppage, Cashew, Suragi, Urhonne, Antawala, Halsu, Mango and other local NTFP Species.

3. Planting Technique:

1. Atleast 12 months old, 7-8 feet tall seedlings raised in 10"X16" polythene bags to be planted.
2. 0.75m³ pits excavated for planting. 275 plants per ha. planted at spacing of 6X6 mts and 1m³ pits excavated for planting Hunse, Mango, Halsu at 10x10m spacing raised in 14"X20" bags.
3. Protection to be provided by Barbed wire fencing.
4. Sowing of seeds of Prosopis, Glyrencia, Planting of Agave suckers on the CPT mounds in open area and Duranta cuttings on the CPT mounds in partially shaded area in high forest locations.
5. F.Y.M. application 1 cm / 40 plants for first 2 years. D.A.P. fertilizer applied for 2 years.
6. Watering to be provided 5 times during 1st year and 3 times during 2nd year.
7. Maintenance up to 5 years. S.M.C. works from ridge to valley provided wherever necessary by standard SMC works with Gully checks and SMC trenches across the rills with spill ways and nala bunding wherever required only provided.
8. Other details as per Model estimate Model-08.

IV. MODEL FOR CREATION OF SANDAL ESTATES:

1. **Area Description:** Sandal was once very widely distributed in the Malnad and transition zone of the state. There is need to protect sandal regeneration areas as well as to create sandal on an estate management basis. Sandal can be planted in Malnad and transition zone extensively. The sites selected must be prepared by uprooting stumps and dozing with a dozer prepare like farm land for establishing estates.
2. **Species :** Sandal with planting of Teak / Bamboo along the boundaries.
3. **Planting Technique:**
 - A. **Protection of Sandal Regeneration Model**
 - 1) A minimum of 200 ha area where the sandal regenerate profusely identified and the seedlings have attained 5-10 cms girth has to be selected with 200 plants/ha. minimum density.
 - 2) The area is fenced with chain link mesh which is embedded in concrete foundation. For each such unit, 6 number of watch and ward are employed on 24/7 basis.
 - 3) Requisite ration is provided to the watchers.
 - 4) A temporary residential accommodation is constructed within the area.
 - 5) Dibbling of sandal seeds and planting in open areas taken up.
 - 6) Other details as per Model estimate. Model-09.
 - B. **Creation of Sandal Estates with chain link mesh**
 - 1) The site selected shall be moderate to high fertility area in Transition and Malnad zone.
 - 2) Preferably an old harvested Acacia / Eucalyptus plantation or encroachment evicted area is suitable.
 - 3) Site preparation is done by uprooting the stumps and dozing the area, ripping done 5M apart.
 - 4) Standard SMC works with Gully checks and SMC trenches across the rills with spill ways and nala bunding wherever required only provided.
 - 5) Well grown sandal seedlings raised in 8"X12" polythene bags planted at 5X5M spacing.

- 6) The treated sandal seed should be shown on mounds of SMC, in the trenches.
- 7) For sustainable management of sandal estate, people participation should be encouraged by forming VFC or strengthening existing VFC. Sufficient seed money and corpus fund shall be made available to VFC.
- 8) In order to ensure sustainable financial resources for maintenance of the chain link mess, providing watch and ward and protection of sandalwood trees beyond 5th year fast growing species like Teak, Marihal bamboo, Burma bamboo, Shivane, Hebbevu, Hale, Acacia auriculiformis, Eucalyptus species including clones shall be planted all along the boundary inside the outer inspection path and also all along internal inspection paths and fire lines @ 200 plants per hectare. The revenue out of thinned material from fast growing species and also from sale of sandal seeds would be made available by VFC for keeping watch and ward and also to maintain a dog squad of local breeds.
- 9) Area is fenced by chain link mess fixed on steel anglers and maintained regularly.
- 10) Watering and FYM application cultural operations as per Model estimate. Model-10.
- 11) Where sufficient funds are available, construction of compound wall as protection measure can be taken up.

V. INSTITUTION AND SCHOOL PLANTING MODEL.

1. Area description : Vacant lands and the boundaries of Institutions, Government offices, Schools and Colleges.

2. Core Species :

Dry zone : Bevu, Honge, Kadbadam, Nerale, Mango, Seethaphal, Ala, Nelli, Mellingtonia, Seehunse, Singapur Cherry, Chakra Nelli, Arali, Bela and other suitable fruit & ornamental plants.

Transitional zone : Mango, Halsu, Nelli, Hunse, Nerale, Singapur Cherry, Chakra Nelli, Kadbadam, Sampige, Mahagony, Tabubia, Spathodia, Bela, Antuwala, Ala, Arali and other local native species.

Malnad and Western Ghats : Sampige, Mavu, Halsu, Nelli, Nerale, Ranjal, Kadbadam, Cashew, Murugal, Saldhoopa, Uruhonne Saludhupa and other local species.

3. Planting Technique.

- (1) At least 12 months old 7-8 feet tall plants raised in 10"X16" bags to be planted.
- (2) Block planting or Boundary planting at 5X5 m or 7X7m spacing, as the case may be. On an average 200 pits/ha.
- (3) If the area is not fenced or does not have a compound wall, staking and thorn fencing to be done, as provided for Road side planting.
- (4) Application of F.Y.M., watering, watch and ward as provided in Model Estimate-11.
- (5) Protection of such plantations shall also be the responsibility of concerned institutions.

VI. CITY AND TOWN PLANTING MODEL.

1. Area Description: Planting can be taken up along the roads within the city. Vacant lands meant for parks can also be taken up for planting. Care has to be taken to avoid electricity lines and telephone lines during alignment.

2. Core Species :

Dry zone : Bevu, Kadbadam, Arli, Bahaunia, Honge, Mellingtonia, Nelli, Thespesia, Peltophorum, Sissoo.

Transitional zone : Bevu, Arli, Sisso, Bahaunia, Kadbadam, Sampige, Tabubia, Mango, Halsu, Nerale, Spathodia, Peltophorum, Holedasawal, Mahagony, Honge.

Malnad & Western Ghat zone : Sampige, Mavu, Halsu, Nelli, Mango, Nerale, Saldhoopa, Mahagony, Kadamba Ranjal and other ornamental species.

Coastal zone : Sampige, Mango, Mahagony, Bahaunia, Uruhonne, Halsu, Spathodia, Ranjal, Tabubia.

Suitable ornamental species which provide flowers round the year may also be planted.

3. Planting Technique:

1. At least 12 months old 7 to 8 feet tall seedlings raised in 10" X 16" bags to be planted.
2. 75 cm³ pits excavated at a spacing of 10 mts along roads and 5X5 m or 7X7 mts for block planting.
3. Staking, Protection, application of F.Y.M. watering provided as per Model estimate. Model-12
4. Pretreated stakes are used for enhancing life of stakes.

VII. ROADSIDE PLANTING MODEL:

1. Area description : The Road margins available along NH, SH, MDR's and Village roads throughout the state. These margins are often encroached. The species along roadsides are required to be planted with species which should be compatible with agricultural crops, to avoid hostility from adjoining cultivators.

2. Core Species :

1. Dry Zone : Bevu, Ala, Arali, Basri, Goni, Honge, Tapasi, Hunse, Sisso, Bage, Mango, Nerale, Seehunse and other suitable local species.
2. Transition zone : Bevu, Ala, Arali, Basri, Hunse, Sisso, Bage, Honge, Mango, Nerale, Hippe, Tapsi and other suitable local species.
3. Malnad and Western Ghats : Mango, Halsu, Nerale, Mahagony, Sampige, Veteria, Hippe Hole dasval and other suitable local species.
4. Coastal Zone : Sampige, Holedasavala, Tare, Mahagony, Vateria, Mango, Halsu, Uruhonne and other suitable local species.

Other suitable local species shall be personally decided by concerned Deputy Conservator of Forests, after proper assessment with regard to the site, climatic and other local conditions.

3. Planting Technique:

1. At least 14-18 months old minimum 7-8 feet tall seedlings raised in 14"X20" bags to be planted.
2. Pits of 1X1X1 Mts at a spacing of 10 Mts on either side of the road, 200 plants/km
3. Application of F.Y.M. 1 cum / 40 plants during 1st year.
4. Protection with staking and tying of thorns every year for 3 years. Proper treatment of stakes for long life.
5. Watch & Ward for minimum of 5 years; the watcher will do replacements and maintain thorn fencing.
6. Watering in Dry zones and Transitional zones 5 times in first year and 3 times in the second year.
7. Other Cultural operations like weeding, Saucer Bharav, Fire tracing etc., as per model estimate. Model-13

XIII. CANAL BANK MODEL

1. **Area Description** : Planting can be taken up along canals of irrigation projects. Since water is available for part of the year these sites are suitable for raising fruit yielding and NTFP species. If the site along Canals is very poor due to dumped soil, the pits can be filled with imported soil.

2. Core Species :

Dry zone : Bevu, Honge, Mango, Nerale, Seemaruba, Sissoo, Bage, and other suitable local species. Cassia siamea and Glyricidia in poorer sites

Transitional zone : Bevu, Honge, Sissoo, Cashew, Seemaruba, Mango, Hippe, Hunse, Halasu, Nerale, Nelli and other suitable local species.

3. Planting Technique :

1. Atleast 12 months old 7-8 feet tall seedlings raised in 10" X 16" bags to be planted at 10 m apart in pits of 0.75 m³.
2. C.siamea, Sissoo, Glyricidia are raised in 5"X8" Polythene Bags and planted in trenches of 4X0.5X0.5 mts in poorer sites.
3. Seed sowing is taken up on mounds with C.siamea and Glyricidia.
4. Miscellaneous plants provided with staking, protection, F.Y.M. application, watering on par with Road side plantations.
5. Barbed wire fencing may be taken up, if sufficient width strip is available.
6. Watch and ward provided for 5 years.
7. Other details as per Road side planting model estimate, Model-13.

FARM FORESTRY

Karnataka Forest Department has realized that the task of bringing 33% of geographical area cannot be achieved without facilitating voluntary tree planting by people outside the forest areas. Various schemes, especially the externally aided projects have tried to implement ambitious Farm Forestry components in the past.

The present status of farm forestry envisages that the seedlings raised for farm forestry in departmental nurseries and priced at subsidized rates will be purchased by interested farmers and they will take care of such assets.

However in view of the magnitude of the programme and the shortage of staff, lack of extension expertise, lack of mechanism to ascertain species preference of people, lack of proper distribution network, it is suggested that a comprehensive policy for farm forestry with following components be put in place.

- 1) The species preference of farmers is mandatorily assessed by a systematic demand survey, well in advance of nursery season.
- 2) The seedlings raised for farm forestry should be from known, superior seed source.
- 3) Wherever feasible clonal / grafted seedlings to be made available to farmers.
- 4) A stable policy on pricing of seedling supplied to farmers for planting, to be put in place after wider consultations. This is pertinent in view of pricing of seedling in plan schemes, where as the seedlings are not only given free but the planting costs are also paid under National Rural Employment Guarantee Scheme.
- 5) Krishi Aranya Protsaha Yojane, A scheme to incentivize for farmers @ Rs.10, 15, and 20 at the end of 1st, 2nd and 3rd year for each surviving seedling is a good initiative in encouraging Farm Forestry.
- 6) Well organized network of distribution centre using the existing infrastructure like the Forest Department offices, Panchayat Office premises, Temples, Schools etc., where the required number of seedlings are stocked and replenished as and when the seedlings are lifted by the public. Any person interested in buying seedling should be able to pay and carry the required number of seedlings from the centers. The cost involved in creating distribution centers should be budgeted and made available to field officers.
- 7) About 5000 Village Forest Committees and around 6000 self help groups, created under various programmes and NGOs may be involved in demand survey, raising of seedlings and establishing and running distribution centers. Suitable remuneration and incentives may be paid to those organizations and persons for this purpose.

- 8) Tree felling and transportation rules have to be made farmers friendly to facilitate farm forestry on large scale.

Species proposed: The species list is only indicative. The assessment may be done by a systematic demand survey.

Dry zone: Teak, Silver oak, Sandal, Neem, Tamarind, Mango, Nelli, Bamboo, Feronia, Drumstick, Karibevu, Kadbadam, Honge, Seemaruba, Hebbevu, Ailanthus excelsa, Sissoo etc.

Transitional zone: Teak, Silver oak, Hebbevu, Sandal, Cashew, Nelli, Mango, Halsu, Marihal, Bamboo, Neem, Tamarind, Drumstick, Karibevu, Red sanders, Honge, Seemaruba, Shivani, Sissoo etc.

Malnad, Western Ghats and Coastal zone: Teak, Sandal, Beete, Silver oak, Hebbevu, Cashew, Mango, Halasu, Nelli, Acacia auriculiformis, Casurina equisitifolia, Murugal, Uppage, Wate, Antawala, Dalchinni, Shivani, Ber Halsu, Marihal Bamboo and Burma Bamboo etc.

Eucalyptus has been traditionally preferred species in southern dry and transitional zones of the state, because of its fast growing, high yielding, coppicing and non-browsing qualities. There is a perception about not encouraging the planting of Eucalyptus. There is no conclusive evidence substantiating labelling of Eucalyptus as an ecological disaster. Similarly Acacia auriculiformis and Casurina are also in high demand in Malnad and Coastal areas. At present Eucalyptus, Acacia, Casurina are not covered under Krishi Aranya Protsaha Yojane. However **Government may take a final view on promoting these species based on wider consultations.**

NURSERY PRACTICES

Raising of successful plantation has 3 critical components (1) Selection of right species for the site (2) Raising right planting material (3) Following right planting technique and practices.

Nursery practices should aim at raising right planting material. The seed for raising planting material should come from known superior quality source. The seedling should be of the right age, sturdiness, attain critical height, so that within the period of normal plantation maintenance (3-5 years), the plantation is established beyond damaging factors. This is all the more important when native, slow growing species form the core of our planting programme. These species not only need to be raised in bigger containers, they need to be nursed for sufficient period in nursery, so that they attain status of right planting material. This is the most important critical factor that has direct bearing on raising successful native species plantations.

The following points are very important to streamline the nursery practices:

- 1) A list of core species have to be prepared for various models at planting in the department and Farm Forestry to assess the species wise seedling targets, seed requirement etc.,
- 2) All the seed source for planting programme should come from identified seed source only, either from plus trees, seed stands, clonal orchards and facilities for seed processing and certification upgraded to achieve this target in next 3-5 years.
- 3) To begin with all seedlings for distribution to public should come from known sources. In case of fruit yielding species like Mango, Hunsu, Nelli, Nerale, and Halsu etc grafted seedlings can also be supplied to public.
- 4) For raising quality and healthy seedlings, the seeds should not be directly shown in to the bags and they should be first shown in the mother seed beds. In order to ensure genetically superior quality of seedling , it is essential to sow the genuine quality seeds in the beds at least 3 times the number of required of seed beds. The seeds can be sown in staggered period of 3 days each – 1/3rd number of seed beds are sown at the beginning, another 1/3rd number of seed beds are sown after three days and remaining 1/3rd number of seed beds are sown after six days. The sprouts of seeds as soon as they are germinated from first, 1/3rd set of seed beds shall be transplanted to polythene bags at first stage (1/3rd) , the sprouts of second 1/3rd set of seed beds shall be transplanted in to another set of polythene bags(1/3rd) and the sprouts of germinated seeds from third, 1/3rd set of seed beds can be transplanted to 3rd set of polythene bags (1/3rd). Seedlings which sprout within 3 days of emergence of first sprouts only have to be transplanted and sprouts which emerge after 3 days should be discarded. To enhance further quality of seedlings, rigorous culling of weak seedlings in the polythene bags should be done within one month by pulling out such seedlings The empty

bags should be separated and shall be used for transplanting earliest germinated quality sprouts as explained above. This method shall be followed meticulously for most of the species which do not exhibit 'root shock' after transplanting of sprouts. For species which exhibit 'root shock', the seeds can be shown smaller polythene bags as in case of raising tall seedlings as explained below.

For raising tall seedlings, sufficient number of seedlings should be raised to take care of rigorous culling at early stage. For re-bagging, seedlings in 4"x6" should be raised in large number, at least thrice the number of required number of seedlings for the species which are difficult to survive after transplanting of spout seedlings or which do not with stand root shock or which can not be transplanted due to unfavorable weather conditions like continuous rainy season. After germination in the 4"x6" polythene bags, the earliest germinated vigorous seedlings should be retained and late germinated weak seedling should be mercilessly pulled out from the polythene bags and the empty bags can be used subsequently for other species or for next round of sowing. The culling out shall be done within one month. The selected seedlings in polythene bags shall be maintained and they shall be transplanted to bigger bag within two to three months before root coiling. For bigger seed species like mango, vateria etc. 5"x8" polythene bags can be used by following above explained procedure.

The cost of raising such seedlings for transplanting has to be provided for. At the time of re-bagging the selected and retained seedlings should be at least 2 months old.

- 5) Good quality, vigorous seedlings of Teak, Bamboo and sandal can be raised by proper precautions detailed below:
 - I. For teak seeds from known source should be used for sowing. From standard seed bed, stumps of thumb thickness, maximum 400 per bed only should be used. Rest of the stumps which are thinner in size and come up later should not be used and they should be discarded.
 - II. **Bamboo** : Bamboo seeds must be sown in seed beds first. Then 4-6 week old bamboo seedlings should be transplanted in to ridges and furrows Transplant beds. The seedlings should be allowed to grow in transplant beds for about 10-12 months. The seedlings which have well developed rhizome only should be transplanted in to 10"x16" bags and maintained for about 6 months. Thus raising proper bamboo seedlings will have 3 stages and require about 18 months of planning prior to planting.
 - III. **Sandal** : Sandal seeds have large proportion of immature seeds, which produce weak seedlings and they die after transplanting in to Polythene Bags or remain yellowish and weak throughout. It is very important to segregate well matured seeds and select only vigorous / dormant seedlings from seed beds. Seedlings which sprout within 3 days of the emergence of first

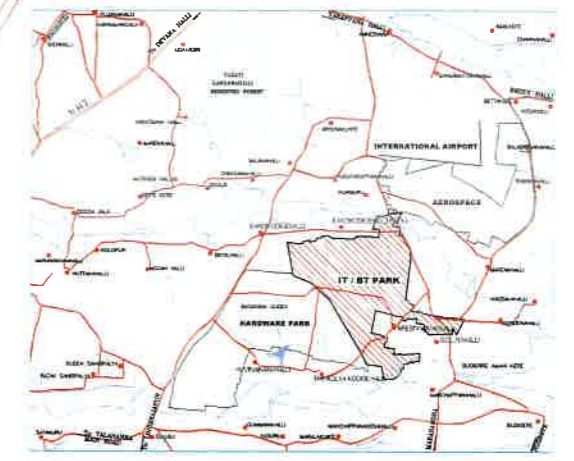
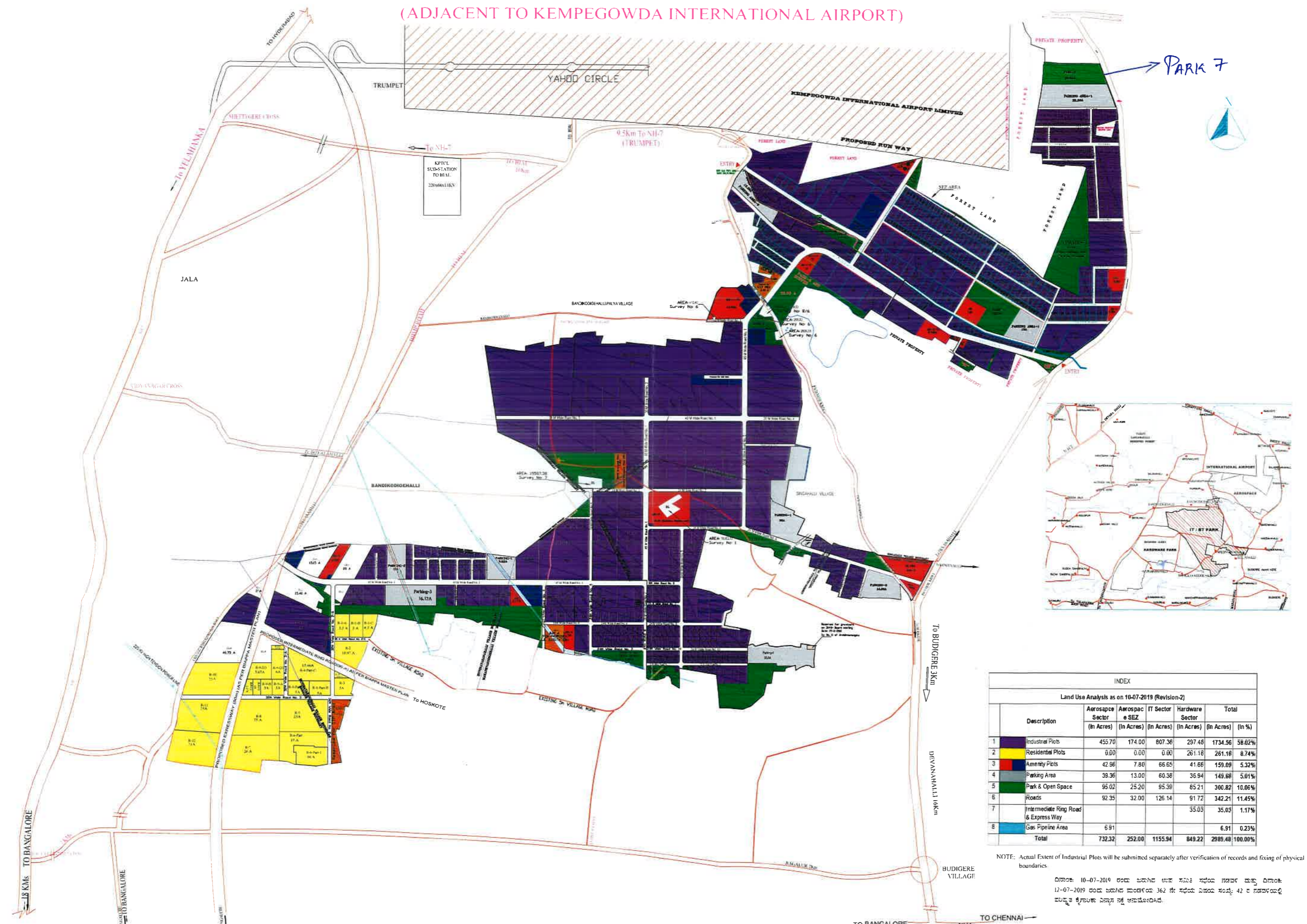
sprouting only should be used. Seeds should be treated with G.A (Gibberillic Acid) 500 PPM for 16 hours for better germination and periodic, regular plant protection should be done using DithaneM-45 (0.25%) and Ekalnx (0.02%) sprayed at monthly intervals.

- 6) The **nursery calendar** for raising right planting material is tabled below:

Sl. No.	Size of Polythene Bags/HDP E Bags.	Right age for planting	Month of sowing or Re-bagging	Month of raising 4"X6" , 5"X8" , seed beds for Re-bagging / transplanting
1.	5"X8"	Not less than 6 months	Before end of November	TPs from seed bed / Direct Sowing in the thrice the number of bags.
2.	6"X9"	Not less than 8 months	Before end of October	Direct sowing from teak beds.
3.	8"X12"	Not less than 10 months	Before end of July	Before end of April.
4.	10"X16"	Not less than 12 months	Before end of May	Before end of February
5.	14"X20"	Not less than 12 months	Before end of April	Before end of January

- 7) There should be a strict mechanism to monitor collection of seed and the timely raising of seedlings. The nursery infrastructure has to be suitably developed. This has to be personally monitored / ensured by Deputy Conservators of Forests / Chief Conservators of Forests of the circle.
- 8) Quality seeds should be procured from research and seed units of the department. Only if the requirement exceeds their capacity, that such seeds should be procured from elsewhere under proper certification about area of collection, viability, germination percentage and other relevant information.
- 9) The quality of ingredients viz., sand, good quality FYM and red earth should be ensured. Stringent action including disallowance of expenditure should be done for using poor quality ingredients.
- 10) All Nurseries should have proper records, Registers, display boards, name boards and proper layout, water tanks and pipelines for watering and sanitation to be maintained.

LAYOUT MAP OF HI-TECH, DEFENCE AND AEROSPACE PARK INDUSTRIAL AREA
(ADJACENT TO KEMPEGOWDA INTERNATIONAL AIRPORT)



INDEX						
Land Use Analysis as on 10-07-2019 (Revision-2)						
Description	Aerospace Sector (In Acres)	Aerospace SEZ (In Acres)	IT Sector (In Acres)	Hardware Sector (In Acres)	Total (In Acres)	Total (%)
1 Industrial Plots	455.70	174.00	807.36	297.48	1734.56	58.02%
2 Residential Plots	0.00	0.00	0.00	261.18	261.18	8.74%
3 Amenity Plots	42.98	7.80	66.65	41.66	159.09	5.32%
4 Parking Area	39.36	13.00	60.38	36.94	149.68	5.01%
5 Park & Open Space	95.02	25.20	95.38	85.21	300.82	10.06%
6 Roads	92.35	32.00	126.14	91.72	342.21	11.45%
7 Intermediate Ring Road & Express Way				35.03	35.03	1.17%
8 Gas Pipeline Area	6.91				6.91	0.23%
Total	732.32	252.00	1155.94	849.22	2989.48	100.00%

NOTE: Actual Extent of Industrial Plots will be submitted separately after verification of records and fixing of physical boundaries.

ದಿವಾಂಕ: 10-07-2019 ರಂದು ಜಾರಿಗೊಂಡ ಉಚಿತ ಸಮೀಕ್ಷೆ ವರದಿಯು ಸರಿಯಾದ ವಿಷಯವನ್ನು ಒದಗಿಸುತ್ತದೆ. 12-07-2019 ರಂದು ಜಾರಿಗೊಂಡ ಮಾರ್ಚ್ 362 ನೇ ಸಂವಿಧಾನದ ಅಡಿಯಲ್ಲಿ 42 ರ ನಡವಳಿಯನ್ನು ಮೂಲಕ ಕೈಗೊಂಡ ವಿವರಣೆ ನಕ್ಷೆ ಅನುಮೋದಿಸಿದೆ.

Prepared by:	Project Engineer (Civil) & Assistant Executive Engineer	Checked by:	Senior Engineer (Civil) & Executive Engineer	Approved by:	Chief Engineer - I	Executive Member
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