

Title of the Project:- Sequestered carbon in roadside plantations: an assessment of potential contribution in climate mitigation in Jabalpur Smart City and Katni district.

Why this Project:-

This study suggests suitable strategies that can be helpful in reducing climate change impacts by mitigation techniques. The challenges of climate change can be efficiently overcome by the storage of carbon in terrestrial carbon sinks viz. plants, plant products and soils for longer periods. Adoption of carbon sequestration measures can considerably reduce the rise in atmospheric CO₂ level.

A project was taken up to highlight the potential of roadside trees and parks and gardens in climate change mitigation. The main objectives of the study were to find the total carbon sequestration in roadside plantations, parks and gardens, identification of suitable trees for roadside plantations and parks and gardens, find rates of variations of carbon sequestration with species and age and finally assessment of potential contribution of roadside plantations in climate change mitigation.

The study areas i.e. Jabalpur and Katni were selected to implement climate change mitigation strategies in perspective of Jabalpur being a smart city and Katni, which has industrial effluents.

Research Methodology: –

The methodology for assessment of total carbon sequestration by trees in parks and gardens in Jabalpur and Katni district was based on the following steps:-

1. Collection of secondary data on parks and gardens: Proforma used to obtain secondary information of parks.
2. **Selection of parks and garden** : Classification of parks and gardens in Jabalpur and Katni.

S.N.	Classification	Size/ Area in ha.	Sampling
1.	Large parks/gardens	05 to 09	100%
2.	Medium parks/gardens	02 to 04	50%
3.	Small parks/gardens	01 and less	25%

3. Selection of trees in parks and gardens
4. Stratification of trees on the basis of species and age
5. Sample design for large (05 ha and above) parks: A non-destructive sampling approach was adopted to estimate the above ground tree biomass in different trees. An attempt was made to select sample plots in all large gardens having size of more than 05 ha and more and in all density classes. Nested two stage sampling approach was adopted to sample trees. A super plot of 250m x 250m size, was laid in each of the several sites. Four sample plots, each of 31.62m x 31.62m (0.1 ha) size, were laid within each super plot. During the survey, it was found that there are 43 roadside plantations found mainly in city and colony roads of Jabalpur Smart City.

Study design:-

1. Selection of sample plants for measurement
2. Growth parameters measurements
3. Calculation of stem volume
4. Calculation of stem biomass
5. Calculation of sequestered carbon in different plant parts (above and below ground), leaf litter and soil.
6. Estimation of the total carbon sequestered
7. Estimation of total carbon sequestered in all the road side plantations in the districts.
8. Estimation of the total carbon sequestration potential

Objectives of Research:-

1. To estimate carbon sequestration by different species in roadside plantations and parks and gardens of in Jabalpur and Katni.

2. To study variations in rates of carbon sequestration with species and age.
3. To identify suitable tree species for roadside plantations and parks and gardens.
4. To assess the potential contribution of roadside plantations in climate change mitigation.

Activities Undertaken:-

1. Collection of secondary data on parks and gardens
 2. Selection of parks and garden
 3. Selection of trees in parks and gardens
 4. Stratification of trees on the basis of species and age
 5. Growth parameters measurements
 6. Calculation of stem volume and stem biomass
 7. Calculation of sequestered carbon in different plant parts (above and below ground), leaf litter and soil.
 8. Estimation of the total carbon sequestered.
 9. Estimation of the total carbon sequestration potential.
- 43 roadside plantations found mainly in city and colony roads of Jabalpur Smart City. A total of 629.658 tons of carbon were estimated by 2,755 trees of 19 different age groups. These 2,755 trees belonged to 58 different species.
 - In Katni city 32 roadside plantations were found mainly in city and colony roads. A total of 590.391 tons of carbon have been estimated of 2,498 trees of 15 different age groups. These 2,498 trees belonged to 46 different tree species.
 - Most common tree species on basis of number of occurrences found on the roadsides in Jabalpur and Katni are Gulmohar (*Delonix regia*), Peltophorum (*Peltophorum pterocarpum*), Kassod (*Cassia siamea*), Karanj (*Millettia pinnata*), Ashok (*Polyalthia longifolia*), Amaltas (*Cassia fistula*), Nandi Flame (*Spathodea campanulata*), Neem (*Azadirachta indica*) and Nilgiri (*Eucalyptus tereticornis*).
 - In Jabalpur, there are 200 parks and gardens out of which 43 parks and gardens of large, medium and small size were sampled. In sampled parks and gardens, a total of 584.834 tons of carbon was estimated by 3,815 different trees. On basis of sample selection a total of 1346.870 tons of carbon may be recorded by trees in parks and gardens of Jabalpur after averaging carbon content per park and garden.
 - In Katni, there are 62 parks and gardens out of which 27 parks and gardens of large, medium and small size were sampled. In sampled parks and gardens a total of 339.95 tons of carbon was sequestered by 1,538 different trees. On basis of sample selection, a total of 584.83 tons of carbon may be recorded by trees in parks and gardens of Katni after averaging carbon content per park and garden.
 - Most common tree species in parks and gardens on basis of number of maximum occurrences in Jabalpur and Katni were recorded as Ashok (*Polyalthia longifolia*), Bottle Palm (*Hyophorbe laginicaulis*), Fish-tail Palm (*Caryota urens*), Saptarni (*Alstonia scholaris*), Kaner (*Cascabela thevetia*), Gulmohar (*Delonix regia*) and Peltophorum (*Peltophorum pterocarpum*).

Cost of the Project:-16.0 Lakhs

Outcome of Research:-

Five criteria were identified for selection of species viz., aesthetic, environmental, utility, hardiness and air pollution for opting out suitable tree species for roadsides and parks and gardens. It was found that there are 12 species which have all qualities of above selected criteria. These species are fast growing, evergreen and also have good tolerance in extreme climate events and may play an important role in reducing air pollution level. The species of all values are as follows 1) Bargad (*Ficus benghalensis*), 2) Gulmohar (*Delonix regia*), 3) Karanj (*Millettia pinnata*), 4) Kassod (*Cassia siamea*), 5) Mahaneem (*Ailanthus excelsa*), 6) Neem (*Azadirachta indica*), 7) Omar (*Ficus racemosa*), 8) Pipal (*Ficus religiosa*), 9) Peltophorum (*Peltophorum pterocarpum*), 10) Safed Siris (*Albizzia procera*), 11) Shisham

(*Dalbergia sissoo*) and 12) Siris (*Albizzia lebbeck*). Species like Shisham, Siris and Gulmohar have also been reported as having showing good air pollution tolerant index by earlier studies. Apart from these species, other species like Saptparni (*Alstonia scholaris*), Kadamb (*Neolamarckia cadamba*), Bottle palm (*Hyophorbe laginicaulis*), Tecoma (*Tecoma stans*) and Ashok (*Polyalthia longifolia*) may also be preferred on basis of requirements of the plantations. These are well suited on roads, parks and gardens.



Verification of field data in Katni and Jabalpur