

CERTIFICATE OF COMPLETION

This is to certify that

NRI INSTITUTE OF TECHNOLOGY

has successfully completed

GREEN LAND SCAPE AUDIT

The study was completed by Rekhapalli Environmental Solutions & Technologies Pvt Ltd



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Green Landscape Audit

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Acknowledgements

REST Pvt Ltd



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22 August 2022

Green Landscape Audit

The REST Pvt Ltd acknowledges with thanks the cooperation extended to our team for completing the study at NRI Institute of Technology (NRIIT).

The interactions and deliberations with NRIIT team were exemplary and the whole exercise was thoroughly a rewarding experience for us. We deeply appreciate the interest, enthusiasm, and commitment of NRIIT team towards environmental sustainability.

We are sure that the recommendations presented in this report will be implemented and the NRIIT team will be further improve their environmental performance.

Kind regards

Your sincerely

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REST Pvt Ltd

Executive Summary

The growth of countries across the world is leading to increased consumption of natural resources. There is an urgent need to establish environmental sustainability in every activity we do. In a modern academy, environmental sustainability will play a critical role in the very existence of an organization.

An educational institution is no different. Built environment, especially an educational institution, has a considerable foot print on the environment. Impact on the environment due to energy consumption, water usage and waste generation in an educational institution is prominent. Therefore, there is an imminent need to reduce the overall environmental footprint of the institution.

As an institution of higher learning, NRI Institute of Technology (NRIIT) firmly believes that there is an urgent need to address the environmental challenges and improve their environmental footprint.

True to its belief, NRIIT maintain an excellent landscaping in its campus. The whole campus is lush green, and trees are seen everywhere around the campus. REST congratulates the NRIIT for their efforts to create a truly green campus.

Based on the data submitted by NRIIT team, following improvement opportunities have been identified in the campus in terms of landscaping.

- Implement ecosystem restoration by development of theme gardens in used areas of the campus
- Develop green corridors between existing areas in the campus
- Develop natural areas to encourage bird roosting and nesting in built-up areas
- Increase tree density and canopy cover in the built-up areas by planting more fruit yielding trees.
- Conduct regular flora surveys for improving the existing data
- Develop strategies for regular monitoring prevention of invasive plant species.

By addressing the improvement opportunities, the campus would be able to achieve the following benefits:

- Identifying & implementation of proper measure for conservation of endangered floral species in the campus
- Reduce the microclimate temperature of the campus by 1-2°C which is significant
- As many of the species have the capability to absorb contaminants in the air and therefore this would lead to better air quality in the campus
- This can evolve as an excellent educational campus for spreading awareness on biodiversity and benefit the nation at large.

Introduction

Urbanisation and its effect on loss of biodiversity

Urbanization causes biodiversity to decline. As cities grow vital habitat is destroyed or fragmented into patches not big enough to support complex ecological communities. In the city, species may become endangered or even locally extinct as natural areas are swallowed up by the urban jungle.

Ironically, it is urban growth that is often responsible for the introduction of non-native species, either accidentally or deliberately, for food, pets or for aesthetic reasons.

Documentation of Flora

Knowledge on biodiversity of any geographical region is a paramount importance for sustainable management and conservation plans. The foremost task in the conservation process is to prepare an inventory of species. It is necessary to have full knowledge regarding the habit, habitat, distribution and phenology of various plants for their proper conservation.

The documentation of flora will help in identifying, documenting and promoting the conservation of native flora in India. This in turn will help in promoting native species for landscapes as they suit one growing interest in “Low maintenance” gardening and landscaping.

Many species are vigorous & hard and can survive winter, cold, and summer heat. These species once established, can flourish without irrigation or fertilization and are resistant to most pests & diseases.

Need for documentation of Flora

The knowledge building on significance and importance of various flora existing around us is the need of the hour. Loss of the biodiversity is likely to result in loss of various other taxonomic groups.

Serve as a ready reckoner:

Most of the campuses have huge landscape with diverse floral species. Nevertheless, the availability of information on these species is minimal. Hence, the documentation of the species would serve as an educational material on the details of species existing within the campus.

Public Visibility:

Despite having various biodiversity initiatives in place within the campus most of the campuses lack the visibility of the measures taken in conservation. The study will create awareness & visibility of the campus on various conservation measures implemented to the occupants as well as to the visitors.

Also, the organization will gain globally amongst its shareholders for the positive steps taken towards protecting biodiversity.

Conservation of Species:

Due to Urbanization most of the floral species are under tremendous pressure. The need of the hour is to conserve and protect these species. The study would help in identifying such species in the campus which need to be conserved.



NRIIT carbon sequestration through plantation

Carbon sequestration through plantation is one of the important steps towards achieving carbon neutrality. In carbon footprint calculation of NRIIT, carbon sequestration through plantation is considered and due credit has been given.

No. of trees considered for carbon footprint calculation	: 1815 trees
CO2 absorbed by a tree in one year	: 18 KG
Total CO2 sequestered	: 1815 x 18 KG of CO2/year
	: 32,670 KGS of CO2





Bougainvillea galbra (Paper flower)



Mangifera indica (Mango)



Ficus Variegata



Cocos nucifera (Coconut)



Lawsonia inermis (Henna plant)



Heterophylla (Norfolk Island pine)



Tagetes(marigold)



Nerium oleander (Ganneru)



Citrus Limon (Lemon)



Pterocarpus santalinus (Red sandal)



Cardyline fruticosa



Chlorophytum omosum (Spider plant)



Agave americana (Century plant)



Hibiscus



Annona reticulata (Custard apple)



Azadirachta indica (Neem)



Manilkara zapota (Sapodilla)



Phyllanthus emblica

Plantation & Maintenance techniques

Selection of species

- Native species like *Azadirachta indica* (Neem), *Pongamia pinnata* (Pongam tree), *Cassia fistula* (Indian shower tree), *Butea monosperma* (Flame of the forest) and also fruit bearing species like *Mangifera indica* (Mango), *Manilkara sapota* (Chikoo), *Syzygium cumini* (Jamun Tree), *Psidium guajva* (Guava), *Annona squamosa* (Custard apple), *Punica granatum* (Pomegranate), *Phyllanthus emblica* (Indian Gooseberry), *Citrus sinensis* (Sweet lime) and *Citrus limon* (Lime) to be selected for plantation.
- Saplings of 2-3 ft height to be considered for plantation in public areas
- Plantation can be taken up as avenues (roadside plantation) and green belts (thick plantation in one area)
- Fruit plantation can be taken up in protected areas, institutions with large areas. Special care to be taken in maintenance since these plants also generate revenue

Digging of pits

Pits to be dug about one month prior to the plantation date and it should be exposed to sunlight

This will help in killing of harmful disease-causing bacteria and virus.

1. In places of no availability of proper sunlight, dry trash to be filled in the pit and burnt.
2. Pit size should be normally 2ft or 3ft and in soils which are very hard 4ft³ or above to be dug.
3. Further to the digging of pit, the bottom of the pit should be loosened up to 6-9 inches.
4. While digging, we can observe different soil profiles. Topsoil will be soft and contains enough nutrients for nourishing the plant. The topsoil should be deposited on one end and hard soil on the other end. While filling the pit with soil, the topsoil only should be used. The topsoil from the non-plantation area around the pit to be collected and mixed with manure and used for filling of the pit.

Transportation

- Visit to the nurseries and enquire about plant species like availability, size, age and girth prior to the plantation. Also, the size of the packet in which the plant is existing to be enquired.
- Ensure that the material is available in the nursery and allotted to pick up
- The saplings to be watered one or two days prior to the movement of plants to plantation area
- The plants to be procured at least 15 days prior to plantation.
 - The saplings to be watered as soon as they reach the plantation area and regularly thereafter.
 - They should be kept in shade, non-windy & protected areas.

The above said steps to be followed for movement of plants near to the pits within the plantation area. Enough water to be stored for watering the plants after plantation. Also, tools and manpower to be kept in place to ensure proper plantation of saplings. If the sapling is bushy with many branches, then the branches are to be trimmed before plantation.

Plantation

- The poly bag around the root ball to be carefully cut with a knife / sickle / scissors without disturbing the roots
- Rope and stakes are to be kept ready to support the plant after plantation.
- Regular watering to be done to the plants followed by mulching (loosening of top 3-4 inches of soil)
- Mulching will help in conservation of moisture, aeration of roots and control of weeds.
- Note: At least 5% of extra plants to be procured for timely gap filling and to ensure 100% survival. Care to be taken for these plants like other plants.

Recommendations for Enhancing Flora in Campus

1. Implement Ecosystem Restoration

- Develop naturalised areas in the Open Area segments
 - Wastelands in the campus can be converted to a park
- 'Theme Gardens' can be developed in unused areas of the campus to increase proportion of natural area

2. Enhance Ecosystem Protection

- Protect and maintain the existing Open Area segments

3. Planting more fruit yielding trees

- Increase tree density and canopy cover in the built-up areas

4. Increase number of Native Plants in the Landscape area

- Increase native plants to boost native biodiversity
 - Bees, butterflies and other insects
- Healthy native plant growth will help in easy identification of invasive alien species

5. Introduce more native species in Open Areas

6. Preventing/ Decreasing Invasive Alien Species Spread

- Identify potential threatening species in advance and implement quarantine measures
- Mass Eradication techniques for larger spreads
- Commitment to complete eradication
- Manual Uprooting of small populations

7. Develop natural areas to encourage bird roosting and nesting in built-up areas

8. Introduce features to attract birds in the built-up areas

- Bird feeders
- Water troughs/ Bird baths
- Nesting material

9. Improve measures for rainwater harvesting in paved and un-paved areas

- Open fields, parks, pavement landscapes, etc.
- Develop outdoor parks in open areas

Conclusion

As seen in the carbon sequestration calculation, tree plantations lead to a tremendous reduction in net emissions of the campus. Therefore, NRIIT needs to develop a roadmap to include tree plantation as a strategy to reduce overall carbon emissions of the campus.