

MANGALORE UNIVERSITY

ENVIRONMENTAL AUDIT REPORT



2019

Institutional self-inquiry is a natural, inevitable and necessary requirement of higher education institutions. The scope of the transformation of higher educational institutions have been a major debate however, transformation for constructing the healthy society and a Nation is undisputable issue. Environmental degradation and realization of values of environment are a major concern for not only the institutions but also the younger generations of this country. In its pursuit to improve environmental quality and to maintain a pristine environment for the future generation of students, Mangalore University has made a self-inquiry on environmental quality of the campus by constituting an expert committee for environment / green audit by involving the following members with vast experience and expertise in various aspects of the environment.

Prof. P.L. Dharma	Department of Political Sciences
Prof. T. N. Sreedhara	Department of Business Administration
Prof. K.S. Sreepada	Department of Applied Zoology
Prof. H. Gangadhara Bhat	Department of Marine Geology
Prof. K. Chandrakala Shenoy	Department of Biosciences
Prof. Y. Narayana	Department of Physics
Prof. Boja Poojary	Department of Chemistry
Prof. K.C. Raju	Department of Applied Botany
Dr. M.S. Mustak	Dept. of Applied Zoology
Shri. Prabhakar N	Deputy Registrar & Estate Officer (Revenue)
Shri.K. Purushotham Naik	Assistant Registrar, General Section
Shri. Lakshmana	Garden Supervisor
Shri. Bharath Patel	Engineering Division

The committee evolved its own method to prepare a report on environment / green audit similar to the models available elsewhere (ICC,1989). The report was prepared on the basis of the following objectives:

- To establish a baseline data and documentation of existing natural and physical environmental conditions
- To understand the current practices of sustainability with regard to the use of electricity, water; waste disposal; transportation etc


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- To promote environmental awareness through participatory auditing process; and
- To record good practices on environmental management system that provide future strategies and action plans towards building healthy environment.

In its endeavour to undertake constructive and progressive works, the University has initiated various programs to transform the University into a green campus. Though the campus is placed on the hard rocky, laterite area, through several programs, especially through the participative action saplings have been undertaken. In the recent past the focus has been shifted to make the campus eco-friendly through energy conservation through solarisation, water conservation by rain water harvesting, construction of check dams. Recharge of bore wells and open wells, solid waste management through vermi-composting; timely disposal of hazardous wastes (biomedical, e- wastes etc.). Greenery is being maintained around the campus by establishing gardens, lawns and through plantation programs. Further, various environmental and bio-resources programs are being undertaken by few departments to bring in awareness on environmental issues and steps to be taken in preventing damage.

a. Energy Management: 'Solar Power Plant' at the roof-top of the many buildings on the campus is capable of fulfilling significant electricity requirement in a year can act as a nonconventional source of energy. The solar power systems of Science block, Management block, Guest houses and S V P Kannada Department buildings can act as an alternate source of electric power for general illumination purposes. Solar lights are provided in all possible buildings and on the main street of the campus. Solar water heaters are installed in the guest houses, hostels and canteen.

As per the advice by the Environment experts, LED lights are also being used in the offices/corridors and laboratories. Energy efficient refrigerators are encouraged to use wherever necessary on the campus.

b. Water Management: The water requirements of the campus are met through a dedicated water supply system from Netravati river. There are two functioning bore wells and an open well at Kuntalguri botanical garden.


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Roof top rain water harvesting system was introduced on the campus. Rainwater collection and storage tank are maintained in Mangala auditorium building. The collected water is earmarked for the use in the Auditorium as well as in Administrative buildings. Similar system exists in the University hostel for Women. In addition to these, efforts are also being made to collect and preserve the rainwater from all the rooftops of other buildings on the campus.

Various steps in practice for water management are:

- *Recharging of bore wells and Open wells:* Rainwater running through the valley is filtered using coarse aggregates kept in the cement rings which is connected to the bore well situated near Men's hostel. In ladies hostel an open well is connected through the rainwater harvesting pipes having several filter elements. Two check dams that were constructed on the campus also support our water management practice.
- A reservoir with a capacity of 2000 liters has been constructed to store rain water for utilization on the campus.
- The university has a water storage tanks with a capacity of 16 lakh liters. The gardens/lawns are being maintained with either drip irrigation or water saving sprinkler systems.
- Extensive use of water efficient appliances such as auto stop taps, toilets with flush, urinals with flush, sprinklers and drip-irrigations in gardens, humidifiers in nurseries/ glass houses are being made in order to strengthen our water management program.
- **Water Quality:** Safe drinking water is supplied through the central water distribution system maintained by the University Engineering Section. All the buildings are provided with safe drinking water through RO filter water facilities. The facilities have both hot and cold potable water.

c. **Waste Management:** Land filling is the general waste management strategy adopted by the university and there is no systematic management plan for

managing inorganic waste, especially plastics. Liquid wastes from each departments, hostels are released openly and this needs to be avoided in order to manage the waste properly.

- The university has stopped using plastics and plastic based items in all the programs as a policy. All the departments have stopped using flex banners, plastic carry bags and cups for social functions and academic programmes. Every plastic item is replaced by equivalent eco-friendly substitute.
- The university has started implementing paperless administration policy in steps.
- Civil construction wastes, e-wastes, electrical appliances wastes etc. are being dumped at a place and are being managed effectively. Careless discarding of solid wastes (wooden furniture's, glass windows, e-wastes and electrical appliances) is to be controlled in a systematic way and immediate attention needs to be given.
- The used tube lights and its accessories are stored in engineering section and are managed through City Corporation based disposal system.
- Wastes are regularly collected within the campus and baskets are kept throughout the campus for the collection of wastes. Monthly Swachtha abhiyan program are being conducted by involving all the members of the campus. Biogas plants, for effectively managing organic wastes, are established in Women's hostel and it is being used for cooking purposes. Similarly, the organic waste produced from working women hostel, men's hotel and canteen can be used for bio gas production.
- Solid wastes including garden wastes are being converted through vermiculture methods and vermi-compost produced acts as bio-fertilizers in nursery gardens.
- Liquid waste from toilets, both rooms, kitchen and laboratories, are connected to the leach pits in the respective buildings. A new proposal has been submitted


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to manage the wastes with UGD system connected to sewage treatment plants. The treated effluents will be used there and then for greenery activities on the campus.

D. Landscape/Environment: The campus is already covered to the extent of about 60% by vegetation and the regular planting program is one of the best practices of the University. Horticulture division and a few departments are maintaining garden on the campus. The campus is greener with its biodiversity. Landscaping with green cover has been done in front of and around many buildings including Science faculty building, Library, Administrative building, Management block, S V P Kannada block (Near Health Centre), Yoga department quadrangle, University canteen, along double road, CARRER, Microtron Centre, Kaveri Guest house, Botany and Zoology department blocks, etc. Steps have been initiated for the establishment of landscaping in-front of all other buildings and centers.

- Plantation of fruit yielding plants(grafted) near quarters, playgrounds, Microtron Centre, and other areas is undertaken in association with the Forest Department have been undertaken.
- Nursery activities of mainly flowering and ornamental plants are regularly done. These pots are kept in the corridors of various buildings for esthetics requirements.

E. Built-up Environment: In general, the built-up environment is eco-friendly except in a few places. All the buildings are constructed in such a way that there is scope for natural ventilation and light. Classrooms/laboratories are painted with white color to increase the level of light availability during day time. All the building tops are covered with roof sheets for preventing water leakage and associated growth of algae. These structures are also provided with rainwater harvesting facilities. However, in the recently built lecture hall complex, lot more to do to avoid disturbances due to vehicle movements.

F. Transportation: Majority of the students rely on very well established public transport system of Mangalore City, which runs at regular frequency. Most the

faculty members either use four wheelers / two wheelers within the campus. Hence there is significant level of air pollution in the form of carbon emission from vehicles. Public vehicle movement in a few roads causes sound pollution also.

Zero Emission Vehicles (ZEV) policy on campus: A few battery operated vehicles are being used by staff members on the campus

Pedestrian path policy on campus: A pedestrian path with solar street lamp facilities for pedestrian in the night is available in almost every road on the campus; Ramps and human guidance are available in all buildings of the campus in order to help persons with physical disabilities.

G. Safety measures: Fire safety instruments are installed in every building on the campus. Fire alarms are installed in sophisticated laboratories in order to avoid occurrence of any unwanted incidents due to various means.

H. Biodiversity of the Campus: A detailed Biodiversity file is uploaded to the University website.

<https://mangaloreuniversity.ac.in/sites/default/files/BioDiversity%20Complete.pdf>

Students of the department of Applied Zoology along with others have taken part in annual bird counting of the campus since last four years. Nearly 106 species have been recorded and five rare species have been sighted on the campus. In addition, the reports on flora and fauna of the campus was prepared based on the research work and survey conducted by a team of students and faculty members.

Recommendations:

1. The departments of Life Sciences can undertake environmental related programs. Annual reports of the same have to be submitted to IQAC and University administration. Further, the committee constituted by the university for the purpose can carry out auditing.
2. Waste materials from construction activities should be disposed from the site and the area to be cleaned immediately after the completion of the work or once in


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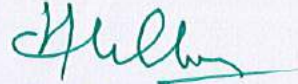
two months (whichever is earlier). University must have a well-planned 'blue print' for all construction activities with a better vision to bring over all aesthetic look to the campus.

3. Specific waste management plans should be adopted to manage solid waste on the campus, with the assistance of State Suchithwa Mission and use of plastic carry bags, thermocol cups/plates and flex boards should be banned inside the university. It should be strictly adopted by other departments and university functions.
 - Solid wastes (Wooden furniture's, glass windows, e-wastes, electrical appliances) are to be kept in one place and disposed once sufficient quantity of wastes is collected from the campus. Each department (buildings) should have data on waste generated and methods adopted for management.
 - Organic wastes can be used for biogas plants in hostels, canteens, guesthouses and staff quarters. The wastes generated can be used for promoting organic farming activities within the campus.
 - Propose a system for collection and disposal of waste sorted out as organic and others on a daily basis, managed by the campus administration. There should be a system for proper management of hazardous wastes. Organizing campus awareness programs to reduce the use of plastic/papers on the campus. Month end cleaning program also help the university to keep its surrounding clean. It should be made mandatory that the waste has to be managed by the concerned departments, including administrative office, shops, canteen etc. This should be monitored by the canteen/ hostel management committee.
4. Used water from each department (tap water and washroom water) can be recycled and made use for gardening and toilet flush. Wastewater can be drained to the pits dug surrounding the base of big trees filled with pebbles. These structures can act as wastewater filtering system.

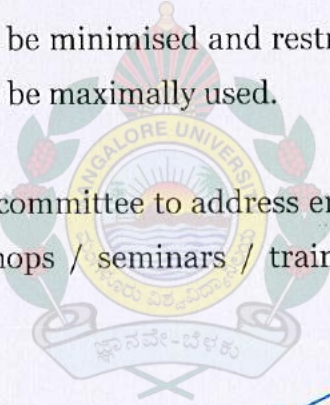


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5. Rain water harvesting structure should be the part of any construction and water saved can be used by the respective buildings for all activities including maintenance of the garden. Rainwater pits can be prepared at appropriate places identified with the assistance of the experts from the Department of Geology and restoration activities may be initiated to sustain the health of check dams and reservoirs on the campus. This can attract fauna and increase the overall biodiversity of the campus. Wastage of water must be stopped.
6. The public lights within the campus may be run with solar panels and the replacement of all the lights should be done with LED lamps. Solar lines can be given to grid after complete utilization by the university. Energy auditing should be done regularly by the Engineering Section.
7. All the buildings on the campus should develop a garden in front of them with a dedicated budget head for the purpose. The expenditure towards waste management also should be included to this budget head.
8. Green habitat concept should be adopted for all the building construction activities of the university in future, which may help a long way in reducing energy usage, increasing aesthetic appeal of the buildings and class rooms besides reducing carbon foot print.
9. Fire safety instruments to be installed in all the buildings and central facilities.
10. Public toilets/e-toilets may be established on the campus. Toilets are to be designed for the use of differently abled personnel.
11. Vehicle pooling should be encouraged among students and faculty members. Usage of bicycles should be emphasised wherever possible as a policy matter of the University. Vehicle parking in a specified area preferably near the gates (East/ West) is to be arranged on priority and complete ban on vehicular movement inside the campus needs to be made at the earliest. Only pollution-free battery operated transport facility should be entertained inside the campus during working hours.


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12. Environmental education and sustainable ecosystem' should be made part of the curriculum of all the postgraduate departments. An evaluation method can be devised on Swachhtha program being conducted by the students and a credit system may be introduced in order to make study on Environmental conservation/awareness activities compulsory.
13. The compound walls of the campus can be painted with environmental issues related slogans and paintings.
14. Strict measures to be taken on display of banners related to programs conducted by various departments. These banners are to be removed immediately after the respective programs and if not done, penalty should be levied to the concerned personnel (Estate officer to be made in-charge of this aspect).
15. Cell phone usage should be minimised and restricted on the campus. Existing IP phones and intercoms to be maximally used.
16. There can be a section / committee to address environment related aspects of the campus through workshops / seminars / training programs at least couple of times in a year.



(Prof P L Dharma)

Chairman

Environment Audit Committee

Dr. P.L. DHARMA

Professor of Political Science

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Carbon Footprint – Emission & Absorption

Total Carbon Footprint (CO₂ emission per year, in metric tons)

a) Electricity used per year
CO₂ emission from electricity

$$= (\text{electricity used per year in kWh} / 1000) \times 0.84$$

$$= \frac{2036667 \text{ kWh}}{1000} \times 0.84$$

$$= \mathbf{1710.80 \text{ ton}}$$

b) Transportation per year (Bus)
CO₂ emission from transportation (Bus) =

(Number of the shuttle bus in our University x total shuttle bus service each day x approximate distance travelled by the vehicle inside the campus in kilometres x 240 /100) x 0.01

$$= 10 \times 3 \times 4 \times 240 /100) \times 0.01$$

$$= \mathbf{2.88 \text{ ton}}$$

240 working days per year, 0.01 is the coefficient to calculate the emission in metric tons per 100

(c) Transportation per year (car)
CO₂ emission from transportation (car) =

(Number of cars entering University campus x 2 x approximate distance travelled by the vehicle inside the campus in kilometres x 240 /100) x 0.02

$$= (50 \times 2 \times 2 \times 240/100) \times 0.02$$

$$= \mathbf{9.60 \text{ ton}}$$

(d) Transportation per year (Motor cycle)
CO₂ emission from transportation (Motor cycle)

= (Number of motorcycles entering University campus x 2 x approximate distance travelled by the vehicle inside the campus in kilometres x 240 /100)

$$= 100 \times 2 \times 2 \times 240 /100) \times 0.01$$

$$= \mathbf{9.60 \text{ ton}}$$

Total emission per year

= Total emission from electricity usage + Transportation (bus + car + motorcycle)

$$= \mathbf{1710.80 + (2.88 + 9.6 + 9.6)}$$

$$\sim \mathbf{1781 \text{ ton}}$$


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Carbon absorption by flora in the institution

There are 25 varieties of big trees (with age around 10 years and more), 17 varieties of medium trees (with age around 5 years or less) on the campus of different species, varieties of shrubs, herbs (including potted plants and climbers on the campus spread over **353 acres**).

About 13000 full grown trees and 1600 semi grown trees, around 40,000 bushes / shrubs and lawn in a area of 80,000 sq ft.

- (i) Carbon absorption capacity of one full grown tree = 6.8 kg CO₂
Therefore Carbon absorption capacity of 13000 full-grown trees = $13000 \times 6.8 \text{ kg CO}_2 = 88400 \text{ kg} = \mathbf{88.4 \text{ tons of CO}_2}$
- (ii) The carbon absorption capacity of 1600 semi-grown trees is 50% of that of full-grown trees. Hence the carbon absorption = $1600 \times 3.4 \text{ kg of CO}_2 = 5440 \text{ kg of CO}_2 = \mathbf{5.44 \text{ tons of CO}_2}$
- (iii) There are approximately 90,000 bushes of various species being raised in the gardens and grown in the areas where no buildings are built.

Carbon absorption of bush plants varies widely with their species. Certain bushes absorb very high level of CO₂ where as some others absorb very low level of CO₂. In the absence of a detailed scientific study, 200g of CO₂ absorption is taken per bush (in consultation with Environmental Science specialists).

Based on this, total carbon absorption of bushes is
 $90,000 \times 200 \text{ g} = 18,00,000 \text{ g} = 18000 \text{ kg} = \mathbf{18 \text{ tons of CO}_2}$

- (iv) The lawns on the campus has buffalo grass, Mexican grass and indigenous grass species and covers a total area of ~ 80,000 sq.ft.

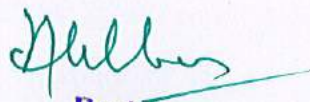
Carbon absorption capacity of a 10 sq.ft area of lawn is 1 g per day.

Therefore, carbon absorption by lawn area = $80,000 \times 0.1 \text{ g CO}_2 = 8000 \text{ g CO}_2 = 8 \text{ kg CO}_2$ per day.

Total carbon absorption per year is $8 \times 365 = 2920 \text{ kg of CO}_2 = \mathbf{2.92 \text{ tons of CO}_2}$

Grand total of carbon absorption capacity of the campus is = $88.4 + 5.44 + 18 + 2.92$
 $= 114.76 \sim \mathbf{115 \text{ Tons}}$

The University is making all the efforts to balance carbon emission to absorption components by increasing greenery wherever possible on the campus.


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