COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

Kochi – 682 022, KERALA

ENVIRONMENTAL AUDIT REPORT

(2020 – 2021)

Executive Summary

An environmental audit is of paramount importance in the context of effective environmental governance. The thrust of this audit report is to highlight the adequacy and effectiveness of interventions and approaches made by the University to tackle some important environmental issues in the campus. The findings and recommendations made in this audit report will enable the administration to take corrective measures and to frame policies in order to improve the environmental efficiency and governance.

The objective of this report is to evaluate the activities being carried in the campus and provide the suggestions and recommendations for incorporation of environmental concerns in university policies and planning. This audit report provides baseline data regarding the environmental issues prevailing in the campus, like energy consumption, green belts, solid waste management, waste water generation etc.

This report is based on the surveys and the records maintained by the administration of the university and different departments. A questionnaire was framed and employed in collection of information and data regarding electricity consumption, energy consumption, water consumption, fuelwood, solid waste management etc. The perusal of the data revealed that university has a good green cover with respect other land uses that provides the cleaner work environment. The energy utilisation depends mostly on electricity obtained from the state grid. In addition, solar power partially meets the energy demand of the campus. The water consumption in the university is about 150 litres per person per day. This much of water is used for residential, irrigation and laboratory practices etc. The waste water generated is disposed in underground sewage pits and treated in sewage treatment plants. The university generates about 1200 kg of solid waste per day most of which is contributed by hostels followed by residential areas. About 80% of the waste is biodegradable. A part of the waste is converted to compost / biogas and the disposal of the remaining portion is carried out by the local body. In view of the observations the report recommends various measures to modify the existing system to make the campus safe and environment friendly.

1. Introduction

1.1 Introduction to environmental audit

EPA defines environmental audit as, "A systematic, documented, periodic and objective review by regulating entities of facility operations and practices related to meeting environmental requirements". It is a tool to assess general practices implemented by organization in term of its impact on environment". It shows strength and weakness of organization towards conservation of environment and function in a manner to minimize its harmful environmental impact.

1.2 Objectives of environmental audit

1. To undertake baseline survey regarding implementation of green practices in the university campus.

2. To identify and analyse significant environmental issues in campus.

3. To generate awareness among masses regarding various environmental issues.

4. To examine the current practices which can have impact on the environment such as resource utilization, waste management, energy conservation, etc.

5. To provide alternative eco-friendly practices to meet the needs of the campus without affecting the environment of the campus.

6. To improve resource use through reduction in material use, to minimize wastes and to identify recycling opportunities.

7. To prepare environmental audit report and listing the green practices followed by university.

2. Methodology

The present study is based on survey by questionnaire and the records maintained by the administration of the university and different departments. The survey was carried out by using a set of questionnaires about electricity consumption, water consumption, fuel, waste water, solid waste collection, and transport.

2.1 Survey by Questionnaire

The data regarding various practices that are carried out in the campus was collected using a questionnaire survey. A set of questionnaires were prepared regarding solid waste, energy, fuel, water, hazardous waste, and e-waste, etc. With the help of questionnaires some data related to environmental audit was collected from students, employees by interaction with them.

2.2 Evaluation of the data

A considerable amount of data and information was gathered during the audit procedure. It consists of the audit protocol, documentation supplied by the administration of the University, the auditor's own notes and observations, results of sampling and monitoring, photographs, records, plans, maps, audit findings and reviewing documentation against standards, policies and action plans and gathering evidence to support the answers to the questions.

2.3 Analysis and reporting

The tabulated data from questionnaires was used for further analysis. For better understanding of the results and to avoid complications, averages and percentages of the tables were calculated. The data obtained was assessed by the faculty members of the School of Environmental Studies and School of Engineering.

3.0 Data Analysis

3.1. Land Use

Cochin University of Science and Technology has a diverse land use pattern for providing all the facilities required to function smoothly. The university occupies an area about 86 ha of land. An assessment of the land use pattern in the campus showed that green spaces constitute about 60% of the land use followed by build-up (20%), playgrounds (10%) and roads (10%).

3.2. Energy Consumption pattern

Energy is utilized in the campus for transportation, lighting, space heating and cooling, running of lab instruments, appliances, water heating, ground water pumping, cooking, etc. The university utilises renewable as well as non-renewable energy sources to meet its energy needs. In terms of monetary value, about 25 % of monetary resources spent on meeting energy needs. Most of the energy utilized for lighting, pumping, and running of instruments is obtained from the state electricity grid. A small percent of the energy needs are met by solar panels. In addition to the above, diesel generators are installed as backup power in case of power failures. Transportation is an important part of any institution that rely on energy consumption. The University provides transport facility to the both students and staff. CUSAT owns 10 operational vehicles of different capacities which are used for pick and drop services to distant areas, field surveys and other purposes. The number of personal vehicles of university staff and students is unassessed. In its eco-friendly approach, the university promotes the use of cycles in the campus.

3.3. Water audit

Water audit refers to conducting periodic exercises to determine the water supplied into the distribution system as well as water lost and/or used within the distribution system. Water audit is aimed to establish the water consumption pattern in the individual sections, bench-mark the consumption levels with respect to best international practices, explore various pollution prevention and wastewater minimization opportunities. Water audits also provide platform to establish the performance of the existing water distribution systems as well as wastewater collection and treatment facilities and explore various wastewater recycling programs. The water

is supplied to the university by Kerala Water Authority. Ground water is also used for meeting the water demands. The per capita water utilisation of the university is 150 litres per capita per day. The utilisation of such a huge resource of water include usage for drinking, cleaning, laboratory usage and also leakages and overflows etc. The waste water generated is disposed off into the underground sewage tanks and the treatment plants.

3.4. Solid waste audit

Solid waste audit is an inventory of the amount and type of solid waste that is produced at a specific location. The solid waste audit is responsible for maintaining the cleanliness and healthful condition by providing an efficient, safe, and regulated management of solid waste and related materials. A waste audit can help your organization reduce waste, which helps the environment and cuts down on your organization's waste disposal bill.

Once an organization understands how it is wasting resources, it can begin conserving, recycling, or reusing them instead of tossing them in the trash. Studies have been carried to assess the composition of the waste generated in the campus. The data revealed that total generation of the waste in the campus is 1200 kg per day among which biodegradable waste is about 970 kg. The collected waste is presently disposed by an arrangement with the local municipality.

3.5. Air and Noise Audit

The study on air and noise quality was carried by the Chemical Engineering Division of School of Engineering.

Air quality data is depicted in Table 1. The noise quality in the campus varied from 50 db to 60 db during daytime and 42 to 51 db during night time. The prominent sources of air pollution and noise are vehicles, instruments and machinery present in the university.

Table 1. Seasonal variation in air pollutants inside the University campus (µg/m3).

Season	$PM_{2.5}$	PM_{10}	SO_2	NO_2
Monsoon	14	89	6	5
Summer	21	140	8	9

3.6. Plantation Audit

Cochin University of Science and Technology is one of the one of the green campuses in Kerala. The University has a good plantation cover in its campus. Besides parks, road sides are also flanked with large vegetations. The vegetation types are found to be quite diverse. It comprises of vegetation like shrubs, herbs, fruit trees etc. which are meant for beautification of the campus as well as for the environmental benefits. The fruit trees provide the habitat for faunal species to enhance the ecological efficiency of the campus.

4. Summary and Recommendations

4.1. Summary

- This audit report is one of the first attempts made by the university towards the eco-friendly approach to carry on its activities as per environmental norms.

- Major part of the land is under green spaces and parks. The university possesses sufficient manpower for beautification of the campus. The various land uses are green spaces, parks, roads and build up etc.

- University caters to a large number of people during day time and accommodates a good number of students and scholars in its various hostels. Besides university also provides residential facilities to its teaching faculty and non-teaching staff.

- The activities in the institute requires a huge amount of energy, a large proportion of which is fulfilled by the power obtained from the state grid.

- University generates a considerable amount of solid waste, a large portion of which is biodegradable. The solid waste is collected and disposed through an arrangement with the local municipality.

- In a single day university consumes a large quantity of water for various purposes in the campus. The water is stored in large as well as small tanks. Per capita water usage is about 150 litres per day. This huge quantity of water used results in generation of a large amount of waste water which is mostly disposed directly into the underground septic system and treatment plants.

➢ The university possesses a green campus. It comprises of vegetation like shrubs, herbs, fruit trees etc. which are meant for beautification of the campus as well as for the environmental benefits. The fruit trees provide the habitat for faunal species to enhance the ecological efficiency of the campus.

4.2. Recommendations

4.2.1. Build up

University should go for vertical development instead of acquiring more land for construction of its facilities especially the structures required for new departments and residential purposes. This would preserve the green spaces and enhance recharging of the water table. The new constructions will also require land for road construction that would further reduce the available green space. Going for vertical development will reduce all these impacts and can fulfill the needs of the university for newer structures.

4.2.2. Energy

The burden on state electricity grid should be reduced by installing more solar power plants in addition to the already installed plants. The power generated by installation of solar plants might be used in lightening, IT and Security. In addition, the lights, fans, gadgets and instruments must be turned off when not in use. To develop such attitude among the stakeholders strict policies must be implemented to reduce the overall energy utilization. Changing to solar powered gadgets will also reduce the considerable amount of monetary resources as well as pollution levels. Besides the green building concept should be introduced in construction of new structures in order to save the energy.
The university may also promote the use of electric vehicles in the campus. It is also necessary to implement certain restrictions on the use of vehicles inside the campus to preserve the quality of air.

4.2.3. Water Use

The university utilizes a large quantity of water on daily basis. The water utilization can be minimized by preventing the leakages and over flows by proper maintenance. Further, improved

taps with reduced water flow or taps having motion sensors should be installed. Besides the grey water can be utilized for irrigation purpose and flushing of the toilets etc.

4.2.4 Solid Waste

Generation of solid waste in the university campus is about 1200 kg per day. Since major composition (about 80-90%) of the solid waste is biodegradable, university is converting a portion of it to compost and biogas. This proportion should be increased. The university should enforce the segregation of waste at source and provide facility for proper disposal of these wastes as per the Solid Waste Management Rules, 2016. Besides colour coded bins should be allotted to each department for segregation of different types of wastes for proper disposal. Polythene must be banned inside the campus to further reduce the non-biodegradable portion of the solid waste. The recyclable wastes like paper, cardboard, glass, plastics and metal should be collected separately and transferred to certified recyclers or rag pickers.

4.2.5. Air and Noise

Air and noise pollution problem prevails due to excessive traffic in the campus. University should develop bicycle paths for promoting the use of bicycles in order to reduce the traffic in-flow in the campus to cope up the pollution problems in the campus. The campus should also be proposed as no horn zone by the university.

4.2.6. Plantation

University possesses a good number of trees to enhance its beauty as well as to provide a cleaner environment inside the campus. The university should promote plantation of indigenous and endemic shrubs, herbs and trees wherever space is available in order to preserve the endemic flora

and at the same time providing ecological services inside the campus. Bare spaces should be covered with grasses to reduce soil erosion and dust generation

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