# SAKTHI COLLEGE OF ARTS AND SCIENCE FOR WOMEN

**ODDANCHATRAM – 624 619**

# ENVIRONMENT AUDIT REPORT

**2020 – 2021**

**PREPARED BY**

## DEPARTMENT OF ENVIRONMENTAL SCIENCES

**Bishop Heber College (Autonomous)**

Tiruchirappalli, Tamilnadu – 620 017

# CAMPUS ENVIRONMENT AUDIT

## CERTIFICATE

This is to certify that detailed **Environment Audit** of **Sakthi College of Arts and Science, Dindigul, Tamilnadu** has been successfully conducted. The activities and measures carried out by the College have been verified based on the reports submitted by the College and found to be satisfactory. The College has evolved policies on Environment and Green campus in line with the Sustainable Development Goals. The efforts taken by the members of the faculty, students, support staff and the Management towards creating a strategic change in attaining holistic environmental sustainability is highly appreciated and commended.

D.J.S. Anand Karunakaran
Asst. Professor
P.G & Research Department of Physics
Bishop Heber College, (Autonomous)
Tiruchirappalli - 620 017.

CAMPUS GREEN AUDIT
CGA
CERTIFIED
Bishop Heber College
DEPARTMENT OF ENVIRONMENTAL SCIENCES

Prof. A. ALAGAPPA MOSES
Associate Professor & Head
Department of Environmental Sciences
BISHOP HEBER COLLEGE (Autonomous)
Tiruchirappalli - 620 017

**Date: 23 October 2021**


**Dr. D.J. S. Anand Karunakaran**
**Energy Auditor**
Associate Professor
Department of Physics
Bishop Heber College (Autonomous)

Email: anandkkaruna@gmail.com
Mobile: +919865947332 / 6381773190

**Prof. A. Alagappa Moses**
**Functional Area Expert – Ecology & Biodiversity**
(Accredited by Quality Council of India - NABET)
Category A Projects *(vide AC MOM III, 2010 New Delhi)*
Associate Professor & Head,
Department of Environmental Sciences
Email: aalagappamoses@gmail.com
Mobile: +91 98424 90051


NABET QCI


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**NATIONAL ACCREDITATION BOARD FOR EDUCATION & TRAINING**
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QCI Office, 6th Floor, ITPI Building, Ring Road, I.P. Estate, New Delhi
**Category A** Projects
*(vide AC MOM III, 2010 New Delhi*
SA- 270th AC Meeting February 28 ,2020_Rev.01*)*

## PERSONNEL

**Prof. A. ALAGAPPA MOSES**
Principal Consultant
**Functional Area Expert (FAE)**
**Ecology and Biodiversity (EB)**
(Accredited by Quality Council of India - NABET)
**Category A** Projects
*(vide AC MOM III, 2010*
*New Delhi.*
SA- 270th AC Meeting February 28 ,2020_Rev.01*)*

**Vice Principal**
Associate Professor and Head
Department of Environmental Sciences
Bishop Heber College,

**Dr. D. J. S. ANAND KARUNAKARAN**
FAE - Land and Energy Audit

Associate Dean, IQAC
Associate Professor
Department of Physics
Bishop Heber College

**Dr. V. ANAND GIDEON**
FAE - Flora

Associate Professor and Head
Department of Botany
Dean – Extension Activities
Bishop Heber College

**Dr. R. TENESON**
FAE - Water Quality Assessment

Assistant Professor
Department of Environmental Sciences
Bishop Heber College

**Ms. T. AJAYLA KARTHIKA**
**FAE - Fauna**

Research Scholar
Department of Environmental Sciences,
Bishop Heber College

**Ms. A. ADELINE NICKIETA**
FAE - Waste Management

Research Scholar
Department of Environmental Sciences,
Bishop Heber College

**Mr. S. MAHALINGAM**
Laboratory Assistant

Department of Environmental Sciences,
Bishop Heber College

# PREFACE

An Environmental Audit is a tool comprising a systematic, documented, periodic and objective evaluation of how well a project, organization or equipment is performing with the aim of helping to safeguard the environment. The audit should facilitate management control of environmental practices and assess compliance with policy objectives and regulatory requirements.

A clean and healthy environment aids effective learning and provides a conducive learning environment.

Green audit is an official examination of the effects a college on the environment. It helps to improve the existing practices with the aim of reducing the adverse effects of these on the environment concerned.

Higher Educational Institutions are committed to preserve the environment within the campus through promotion of energy savings, recycling of waste, water use reduction, water harvesting etc.

Green audit visualizes the documentation of all such activities taking stock of the infrastructure of the college, their academic and managerial policies and future plans in the form of an environmental audit report.

Green audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of green impact on campus.

Green audit promotes financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. Thus, it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more relevant.

The audit process in Sakthi College of Arts and Science involved initial interviews with management to clarify policies, activities, records and the co-operation of staff and students in the implementation of mitigation measures. Staff and students were given training how to collect the data for the green audit process. This was followed by staff and student interviews, collection of data through the questionnaire-based survey, review of records, observation of practices and observable outcomes. In addition, the approach ensured that the management and staff are active participants in the green auditing process in the college.

The baseline data prepared for the College will be a useful tool for campus greening, resource management, planning of future projects, and a document for implementation of sustainable development of the college. Existing data will allow the college to compare its programs and operations with those of peer institutions, identify areas in need of improvement, and prioritize the implementation of future projects. The green audit reports assist in the process of attaining an eco-friendly approach to the sustainable development of the college.

The results presented in the green audit report will serve as a guide for educating the college community on the existing environment related practices and resource usage at the college as well as spawn new activities and innovative practices. The Green Audit team expects the management to express their commitment to implement the recommendations.



**Date:** 23 October 2021

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# CHAPTER I

## INTRODUCTION

***"Education is a liberating force, and in our age, it is also a democratizing force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances"*** *- so defined Padmabushan Arutchelvar Dr. N. Mahalingam, Chairman, Sakthi Groups.*

Following the great man's footsteps, Dr. K. Vembannan, M.B.B.S., M.S., the Managing Trustee of Sowdamman Charitable Trust is a staunch believer that "Education makes one more humane, independent and perfect. It is the most powerful weapon for upliftment of mankind."

Being a visionary, Dr. Vembannan founded Sakthi College of Arts and Science, Oddanchatram in the year 2009 as a temple of learning. The college functions with the noble aspiration of uplifting the moral and educational standards of the women of the rural area in and around Oddanchatram, Tamil Nadu, Palani. It has the vision of empowering women through value-based education, with special concern for the economically disadvantaged and the first generation learners. The mission of the college is actualized in the institutional goals, administrative policies, academic programmes, co-curricular and extra-curricular activities, staff enrichment initiatives and student support systems. The ethical and moral formation of staff and students is seamlessly woven into the fabric of campus life. Innovation, student-centred modes of teaching and learning, extensive use of technological aids and research-based activities enrich the intellectual life on the campus.

The Institution has been recognized under (2f) and (12b) of the UGC Act. It is affiliated to Mother Teresa Women's University, Kodaikanal. Having started functioning with 129 students in the academic year 2009, it has now reached the strength of 1100 students. The proof of its adherence to standard lies in the milestone achievement of having bloomed well with 11

Under-graduate, 10 Post-graduate and 07 Pre-doctoral (M.Phil.,) Programmes. The College offers innovative curricula, opportunities for holistic development and a highly disciplined and diversified environment for students to surpass in scholastic, non-scholastic and research pursuits. However, while keeping pace with the changes in higher education at the national and global level, the institution still retains its local flavour and continues to offer value-based education with a special focus on the underprivileged.

**The Emblem and Landmark Structures**


**Fig. 1: The College Emblem**


**Fig. 2: Magnificient College Entrance**

**Fig. 3: The Main Block**


**Fig 4 View of the Temple and Main Building**

**SAKTHI VISION**

INITIATE INNOVATE, INCULCATE

Sakthi Educational Institution pursues a philosophy of perpetual acquisition of knowledge. Apart from academic curriculum, equally important is our policy to provide value-based education and to bring out the hidden potentials within optimism.

**SAKTHI MISSION**

"To act as the nurturing ground for young professionals who seek to make their mark and to create a talent pool for various Educational Institutions so that there may be synergistic growth for both"

# CHAPTER II

# CAMPUS ENVIRONMENTAL AUDIT

## 2.1 Campus Environmental Audit

An Environmental Audit is a tool comprising a systematic, documented, periodic and objective evaluation of how well a project, organization or equipment is performing with the aim of helping to safeguard the environment. The audit should facilitate management control of environmental practices and assess compliance with policy objectives and regulatory requirements. (European Environment Agency, European Commission 1999, Brussels).

Environmental auditing is a systematic, documented, periodic and objective process in assessing an organization's activities and services in relation to:

- Assessing relevant statutory and internal requirements
- Facilitating understanding of good environmental practices
- Promoting good environmental management
- Maintaining credibility with the public/clients
- Raising staff awareness and commitment to departmental environmental policy
- Exploring improvement opportunities
- Establishing the performance baseline for developing good sustainable practices.

## 2.2 Green Audit towards Sustainable Development

Sustainable Development (SD) is one of the biggest challenges of the twenty-first century and there can be no sustainability where educational

institutions (Universities, Institutions of Higher Education, and Schools) promote un-sustainability. In modern society 'No institutions are better situated and more obliged to facilitate the transition to a sustainable future than schools, Colleges and Universities'.

**Sustainable Development Goals** (SDGs)

The 17 Sustainable Development Goals and 169 targets which has been proposed demonstrates the scale and ambition of this new universal agenda. They seek to build on the MDGs and complete has not been achieved. They seek to realize the human rights of all and to achieve gender equality and the empowerment of all women and Girls. They are integrated and in and indivisible and balance the three dimensions of Sustainable Development: the economic, social and environmental. The Goals and Targets will stimulate action over the next 15 years in areas of critical importance for humanity and the planet.


**Fig. 5: SUSTAINABLE DEVELOPMENT GOALS**

In spite of a number of SDGs and an ever increasing number of Universities / Institutions of Higher Educations and Schools becoming

engaged with the principles and concepts of SD, especially in the developed world, most of them to be traditional in India.

## 2.3 Environmental Audit

Environmental auditing has become a valuable tool in the management and monitoring of environmental and sustainable development programmes. The information generated from audit exercise provides important information to many different stakeholders.

Although seen primarily as a tool in commerce and industry, creative application of environmental auditing techniques can improve transparency and communication in many areas of society where there is a need for greater understanding of environmental and ecosystem interactions. The environmental audit is a systematic process that must be carefully planned, structured and organized. As it is part of a long term process of evaluation and checking, it needs to be a repeatable process which can be readily replicated and can reflect change in both a quantitative and qualitative manner.

Universities and Colleges are regarded as “Small Cities” due to their size, population and the multifarious activities, which have some serious direct and indirect impacts on the local environment.

## 2.4 Campus Green Audit

The campus environmental audit is a common tool that many colleges and universities have employed in recent years. A campus environmental audit is both a summary and a report card for a campus and a way to evaluate where and how resources are being used. An environmental audit is also the first step in being able to quantify whether or not current and/or future environmental efforts are actually making a difference. As such, an environmental audit is the beginning of the sustainability planning process. The results can be used to quantify what kinds of impacts the

campus community has on the environment and what steps the college can take to reduce these impacts.

## 2.5 Green Audit

Green Audit is defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The 'Green Audit' aims to analyse environmental practices within and outside the Institute, which will have an impact on the eco-friendly ambience and sustainable ecosystem. It is a useful tool that can be used to understand existing practices and resource use to highlight the prospects of introducing resource efficiency in the ecosystem. Green audit provides cognizance on scope for improvement of environment and ecosystem of the campus. Thus, it is imperative that Sakthi College evaluate its own status on environmental sustainability and contributes towards sustainable future.

## 2.6 Pre-Audit Stage

The process of Green Audit started with a pre-audit meeting that has provided an opportunity to reinforce the scope and objectives of the audit. The deliberations focused on the procedures to be followed in conducting the audit. This meeting is an important prerequisite for conducting green audit as it provides the first opportunity to meet and interact with the auditee and deal with any matters of concerns. The meeting was held at Sakthi College during October 2021. The audit protocol and audit plan were discussed in detail and a Green Audit team was constituted with a staff adviser and student members.

a) Preliminary literature review of concepts and methodologies related to green audit.

b) Discussion with the management staff on various systems installed in the campus.

c) Awareness creation and interaction with the staff and student on the

concept of green audit. Walk through the entire campus to understand the nature of water use, energy use and waste management systems in the campus.

## 2.7 Commitment of the College

The College has shown the commitment and keen interest towards conducting green audit and encourages green practices. The College is committed towards Education for sustainability and implementation of sustainable strategies, reducing carbon foot print and effective utilization of waste into wealth.

## 2.8 Goals and Objectives

The goal of Green audit is *"Ensuring Environmental Sustainability (EES) through reducing environmental foot print such as carbon, water, food, and land, management and conservation of the natural resource base, and the orientation of Education for Sustainable Development (ESD) by evolving Institutional policies on various environmental attributes in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations".*

## 2.9 Objectives:

- To evolve institutional policies on various environmental attributes such as water, waste and sanitation and to assess the patterns of consumption of energy and water
- To measure the quantum of generation of wastes and hazardous substances
- To evaluate the level of awareness among the students regarding environmental resources

- To inculcate the concepts of 5 R principle such as Reduce, Refuse, Recover, Recycle and Repurpose among the stakeholders, thus making the organization as a better steward,
- To implement environmental management strategies so as to reduce overall environmental foot print.

## 2.10 Benefits of the Green Auditing

| |
|---|
| • More efficient resource management |
| • To provide basis for improved sustainability |
| • To create a green campus |
| • To enable waste management through reduction of waste generation, solid- waste and water recycling |
| • To create plastic free campus and evolve health consciousness among the stakeholders |
| • Recognize the cost saving methods through waste minimizing and managing |
| • Point out the prevailing and forthcoming complications |
| • Authenticate conformity with the implemented laws |
| • Empower the organizations to frame a better environmental performance |
| • Enhance the alertness for environmental guidelines and duties |
| • Impart environmental education through systematic environmental management approach and Improving environmental standards |

| |
|---|
| • Benchmarking for environmental protection initiatives |
| • Financial savings through a reduction in resource use |
| • Development of ownership, personal and social responsibility for the College and its environment |
| • Enhancement of college profile |
| • Developing an environmental ethic and value systems in youngsters. |
| • Green auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs of the college. |

## 2.11 Modules Campus Green Audit

Campus Green Audit (CGA) is a process of resource management. They are individual modules carried out in a defined interval illustrating an overall improvement or change in the institution over a period of time. The concept of Eco-friendly campus mainly focuses on the efficient use of energy and water; minimize waste generation, economic efficiency and reduction in environmental foot print. All these indicators are assessed in the process of Campus Green Audit. The CGA promotes conservation energy, water and waste management. The audit stages are as follows:

**I. Pre-audit Stage**

**II. Audit Stage**

a. Audit for various environmental aspects

b. Checking of documents and evaluation

c. Review of Environmental Policy

d. Review of Programmes or Activities

**III. Post-audit Stage**

a. Land

b. Energy

c. Water

d. Waste

i. Wastewater

ii. Solid Waste

1. E Waste
2. Biomedical waste

e. Food

f. Campus hygiene

**IV. Processing of Data Collection as per the template**

a. Development of questionnaire format to identify all water/energy using fixtures/ equipment and examine water or energy use patterns for individual buildings in the campus.

b. Collection of secondary data from compilation of electricity bills, collecting records of pumps, generators, water quality analysis reports, civil and electrical etc.

c. Semi-structured interview with maintenance manager, technicians, plumber and housekeeping staff on current situation and the past trends in water consumption, electricity consumption, waste management, waste generation etc.

**V. Data Processing and analysis**

The existing trends and patterns in water usage, energy usage and waste generation and management is analyzed in this step from the data collected from the previous step.

## VI. Audit Recommendations and Reporting

Recommendation – On the basis of results of data analysis and observations, some steps for reducing power and water consumption were recommended. Proper treatments for waste were also suggested. Use of fossil fuels has to be reduced for the sake of community health.

# CHAPTER 3

# METHODOLOGY

## 3.1 Methods

The data pertaining to various aspects of the environment were collected from primary and secondary sources as per the work sheets given below:

## 3.2 Work sheets

### Work Sheet 1 - WATER AUDIT

**Table 1: Campus Water Profile**

| | | |
|---|---|---|
| No. of Municipal water connections | : | |
| No. of Sumps | : | |
| No. of Storage tanks | : | |
| No. of Bore wells | : | |
| Average annual rainfall | : | |
| No. of Rainwater Harvesting Structures | : | |

**Table 2: Storage Tanks in the College**

| S.No. | Location of the Tank | Dimension of the Tanks(M) | | | Capacity in $m^3$ | No Of tanks In each Location | Total Capacity in Litres |
|---|---|---|---|---|---|---|---|
| | | L | B | H | | | |
| 1. | | | | | | | |
| 2. | | | | | | | |

**Table 3: Number and Location of Bore Wells**

| Sl. No. | Location of the Bore well (Geo-coordinates) | Type of Pump Used (Hp) | Depth of the Borewell | Average depth of the water table |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |

**Table 4: Water consumption**

| Sl. No. | Unit | Population | Water Consumption (L) | Percapita consumption |
|---|---|---|---|---|
| 1 | Academics | | | |
| 2 | Hostels | | | |

**WORK SHEET 2: LAND AUDIT**

**Table 5: Land at a Glance (Area in Sq. M).**

| | | | |
|---|---|---|---|
| 1. | Total Land area of your College | : | |
| 2. | Open space | : | |
| 3. | Plantation / Green area | : | |
| 4. | Built-up / Constructed Area | : | |
| 5. | No. of Buildings in the campus | : | |
| 6. | Total No. of floors in buildings | : | |
| 7. | Roof Top area | : | |
| 8. | Terrain of the Campus | : | **Plain / Rocky / Undulating** |
| 9. | Ground area | : | |
| 10. | Parking Area | : | |

**Table 6: Classification Scheme for Land Use Analysis of Built Up Area**

| Level I | Level II |
|---|---|
| 1. Built-up Area | 1.1 Dense<br>1.2 Moderate<br>1.3 Sparse |

**Table 7: Land Use Data**

| **Categories of Land Use** | **Area in Sq. Metres** |
|---|---|
| Open space and Plantation | |
| Build up area | |
| **Total** | |

**Table 8: Total Green Cover**

| **S. No.** | **Block** | **Place** | **$m^2$** |
|---|---|---|---|
| 1 | A | Ground coverage area | $m^2$ |
| 2 | B1 | Green landscaped area on ground | $m^2$ |
| 3 | B2 | Play area that has grass on ground | $m^2$ |
| 4 | B | Green area on ground (B1 + B2) | $m^2$ |
| 5 | C | Play area that is paved/concrete on ground | $m^2$ |
| 6 | D | surface parking area | $m^2$ |
| 7 | E | Service area on Ground | $m^2$ |

Ideally the green area on the ground should be 33% of the total site area,, out of which 15 % should be from green landscape area on ground.

**Table 9: Built-Up Area of the Campus**

| S. No. | Block | Place | Area unit |
|---|---|---|---|
| 1 | A | Roof and terrace area | $m^2$ |
| 2 | B | Green cover on exposed roof and terrace | $m^2$ |
| 3 | C | Total built-up / constructed area | $m^2$ |
| 4 | D | total number of floors (excluding ground floor) | $m^2$ |

**WORK SHEET 3**

**Table 10: Wastewater Discharge from the campus**

| S. No. | Buildings | Quantity of Water Consumption | Quantity of Wastewater generated in Litres (80%) of water consumption |
|---|---|---|---|
| **1.** | **Academic** | | |
| | **A** | | |
| | **B** | | |
| | **C** | | |
| **2.** | **Hostels** | | |
| | **A** | | |
| | **B** | | |
| | **C** | | |

**WORK SHEET 4**

**Table 11: Waste Audit**

| **S. No.** | Does your College segregate solid waste? | | **Yes** | | **No** |
|---|---|---|---|---|---|
| | If yes, who segregates the waste at source? | ✓ | **x** | **No. of staff** | |
| **1.** | Students, Teachers and all the staff | | | | |
| **2.** | Housekeeping staff (Sweeper) | | | | |
| **3.** | Gardner | | | | |
| **4.** | Rag Pickers | | | | |
| **5.** | Other | | | | |
| **6.** | How many categories does your college segregate waste into? | **1** | **2** | **3** | > 3 |
| **7.** | If your college segregates waste into more than three categories, mention the categories:<br>Dry \| Wet \| Biodegradable /Non-Biodegradable \| E-Waste \| Glass \| Styrofoam | | | | |

**Table 12: Biodegradable /Wet waste**

| **S. No.** | **How much waste does your College generate?** | **Quantity of solid waste generated (monthly average in kg)** |
|---|---|---|
| 1. | Garden / horticulture waste | |
| 2. | Kitchen waste ---- Raw | |
| 3. | Kitchen waste ---- Cooked | |
| 4. | Wet waste from classroom etc. | |
| 5. | Total amount of waste | |
| 6. | Per capita waste generation | |

**Table 13: Dry / Recyclable waste**

| S. No. | How much waste does your College generate? | Quantity of solid waste generated (Monthly average in kg) |
|---|---|---|
| 1. | Plastic | |
| 2. | Paper | |
| 3. | Wood or classroom furniture | |
| 4. | Glass | |
| 5. | Metal | |
| 6. | Thermocol | |
| 7. | Tetra packs | |
| 8. | Total amount of waste | |
| 9. | Per capita waste generation | |

**Table 14: Domestic Hazardous Waste**

| S. No. | How much waste does your College generate? | Quantity of solid waste generated (monthly average in kg) |
|---|---|---|
| 1 | Hazardous and toxic waste (Paints, Lab waste, etc.) | |
| 2 | Oil from diesel generator sets | |
| 3 | Total amount of waste | |
| 4 | Per capita waste generation | |

**Table 15: Types of E-Waste**

| S. No. | Item | Total no. of Items | BEE Star Rating | Working condition | Non-Working condition |
|---|---|---|---|---|---|
| 1. | TVs | | | | |
| 2. | VCR or DVD players | | | | |
| 3. | Refrigerators and freezers | | | | |
| 4. | Washing machines | | | | |
| 5. | Air conditioners | | | | |
| 6. | Water/Room heaters | | | | |
| 7. | Microwaves /Ovens | | | | |
| 8. | Toasters | | | | |
| 9. | Electric kettles | | | | |
| 10. | Personal computers | | | | |
| 11. | Laptop computer | | | | |
| 12. | Notebook / Pad computes | | | | |
| 13. | Printers | | | | |
| 14. | Copying equipment (Xerox) | | | | |
| 15. | Projectors | | | | |
| 16. | Digital Whiteboards | | | | |
| 17. | Calculators/Fax/Telex | | | | |
| 18. | Telephones | | | | |
| 19. | Mobiles / Mobile Batteries | | | | |
| 20. | Induction cookers | | | | |
| 21. | Batteries condemned | | | | |
| 22. | Bulbs – tube lights and others | | | | |

**Table 16: Total Quantity of E-Waste**

| S. No. | How much waste does your College generate? | Quantity generated (monthly average in kg) |
|---|---|---|
| 1 | E-Waste | |

Please submit the following supporting documents:

- Certificate of disposing e-waste from authorized dealer/dismantler.

Who collects your e-waste, when not in working condition?

- Scrap dealer
- Taken back by manufacturer / vendor
- Authorized dealer
- Authorized dismantler

**How Does Your College Dispose of Waste?**

What is the final destination for waste that is disposed of externally from your college? (No points should be given here as dumping waste in landfills are not sustainable practices.)

- Open dumping
- Designated dumping site
- Landfill site

**Please upload the following supporting documents on GSP audit portal:**

- Picture of housekeeping staff disposing different types of solid wastes.
- Does your college burn waste? □ Yes □ No
- If yes,

a) Where does your College burn waste?

  - Inside the College / Outside the College

b) What kind of waste is burnt / incinerated?

- Horticultural / Plastic / Tyre / Paper

**Table 17: Biomedical Waste**

| S. No. | How much waste does your College generate? | Quantity of solid waste generated (monthly average in kg) |
|---|---|---|
| 1 | Biomedical waste such as Syringes, band aids, expired medicines etc. | |
| 2 | Per capita waste generation | |

**Table 18: Sanitary Waste**

| S. No. | How much waste does your College generate? | Quantity of solid waste generated (monthly average in kg) |
|---|---|---|
| 1 | Sanitary waste | |
| 2 | Per capita waste generation | |

**Table 19: C & D Waste**

| S. No. | How much waste does your College generate? | Quantity of solid waste generated (monthly average in kg) |
|---|---|---|
| 1 | Construction and Demolition waste | |
| 2 | Per capita waste generation | |

## WASTE COLLECTION

### Table 20: Waste Collection Points in your College

| Area | Total No. of Waste collection points | No. of waste collection points with no bin | No. of waste collection points with one bin (mixed waste) | No. of waste collection points with one bin (for only dry waste) | No. of waste collection points with two bins (wet &dry) | No. of waste collection points with three bins or more ) |
|---|---|---|---|---|---|---|
| Classrooms | | | | | | |
| Playgrounds | | | | | | |
| Common area (e.g. reception, corridors) | | | | | | |
| Staff room | | | | | | |
| Laboratory | | | | | | |
| Canteen | | | | | | |
| Clinic/sick room | | | | | | |
| Library | | | | | | |
| Toilets | | | | | | |
| Others | | | | | | |
| Total | | | | | | |

*Tool tip: collection points are the areas where dusting have been placed.*

**Table 21: Total Quantity of Waste Treated**

| S. NO. | Type of Waste | Quantity of waste recycled per month (in Kg, frequency may differ) |
|---|---|---|
| 1 | Garden waste/horticulture waste | |
| 2 | Kitchen waste – Raw | |
| 3 | Kitchen waste – Cooked | |
| 4 | Wet waste from classrooms etc. | |
| 5 | Plastic | |
| 6 | Paper | |
| 7 | Wood, class room furniture | |
| 8 | Glass | |
| 9 | Metal | |
| 10 | Thermocol | |
| 11 | Tetra packs | |
| 12 | Hazardous and toxic waste (paints, lab waste etc. | |
| 13 | Oil from diesel generator sets. | |
| 14 | E – waste | |
| 15 | Biomedical waste such as syringes, Band-Aids, expired medicines etc. | |
| 16 | Sanitary waste | |
| 17 | Construction and demolition (C&D) Waste | |
| 18 | Total (in Kilograms) | |

**Table 22: Waste Recycling Practices followed in College**

| S. No. | Category Waste | Local Scrap collector | Authorized dealer | Dumped at a designated community site | Internal Procedure |
|---|---|---|---|---|---|
| 1 | **Paper** (e.g. used notebooks, used examination papers, subscription newspaper and magazines) | | | | |
| 2 | Plastic (e.g. Broken, unusable) | | | | |
| 3 | Horticultural waste | | | | |
| 4 | E-Waste (e.g. broken, unusable computers) | | | | |
| 5 | Hazardous waste | | | | |
| 6 | Wood, glass, metal | | | | |
| 7 | Biomedical Waste (e.g. waste from nurse room in College such as Band-Aids, syringes..) | | | | |

# CHAPTER 4

# AUDIT STAGE

The Campus Environment Audit was carried out by the Post Graduate and Research Department of Environmental Sciences, Bishop Heber College (Autonomous), Tiruchirappalli, Tamilnadu. The audit team constituted by the management during the pre-audit has done extensive data collection covering all the modules of green audit. The Campus Green Audit team comprises of Co-ordinators, Staff in-charge for each module and student volunteers.

## 4.1 Campus Green Audit Team

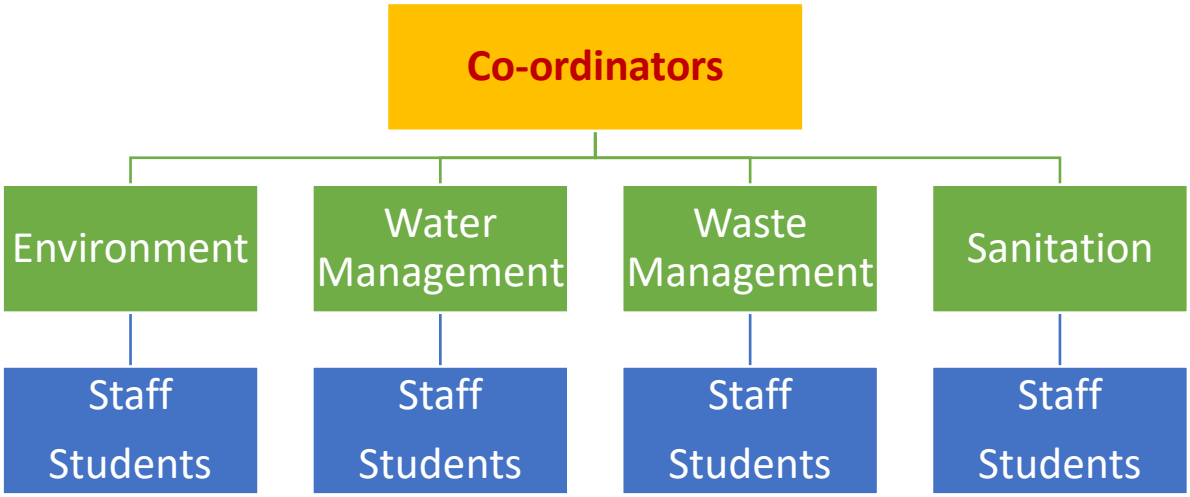



**Fig. 6: Campus Environment Audit Team**

# CHAPTER 5

# POST AUDIT STAGE

## 5.1 Post audit

The Campus Environment Audit relies upon findings supported by documents and information. The essence of green audit is to express the environmental policy, environmental organization, environmental management and environmental sustainability. The individual functioning of these components ensure a holistic environmental sustainability.

The Post Audit Stage of the Campus Green Audit comprises of the following environmental components, its baseline information, identification of impacts and strategies for environmental management:

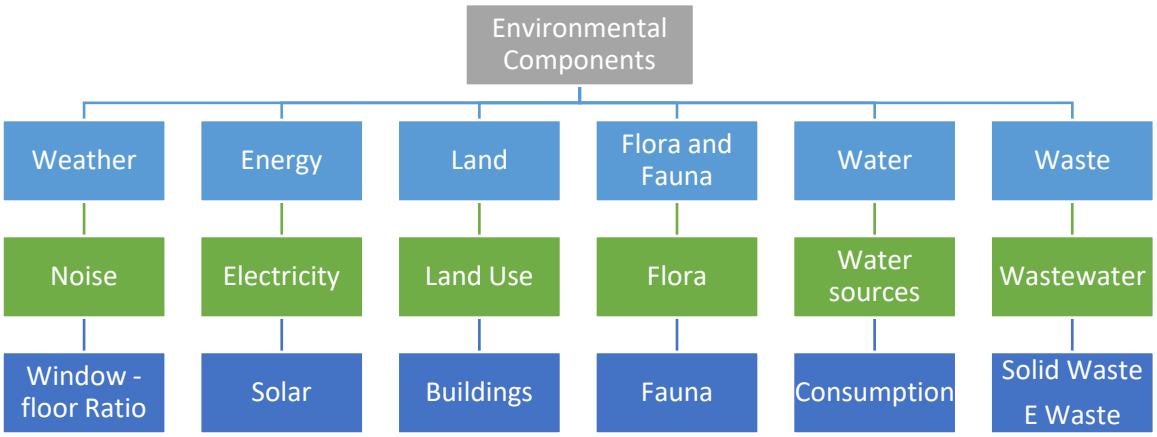



**Fig. 7: Environmental Components**

## 5.2 Climate

Reddiarchatram area falls under **tropical climate**. The period from April to June is generally hot and dry. The average temperature varies from 26 to 41° C. The humidity is relatively high in the mornings and varies between 65 and 85%.

The temperature in Reddiarchatram ranges from a maximum of 41 °C to a minimum of 26 °C during summer and a maximum of 26 °C to a

minimum of 20 °C during winter. Dindigul receives rainfall with an average of 812 mm (32.0 in) annually. The Southwest monsoon, with an onset in June and lasting up to August, brings scanty rainfall. Bulk of the rainfall is received during the North East monsoon in the months of October, November and December.

The area falls under tropical climate. The period from April to June is generally hot and dry. The average temperature varies from 26 to 41°C. The humidity is relatively high in the mornings and varies between65 and 85%. While in the afternoons it varies between 40 and 70%. Reddiarchatram Firkas receives rainfall from southwest monsoon (June – September), northeast monsoon (October –December) and non-monsoon periods (January –May). The area receives the major rainfall from northeast monsoon and the normal annual rainfall is 885.83mm

### 5.3 Ambient Noise Quality Monitoring

The word noise is defined as unwanted sound that creates annoyance and interferes in conversation disturbs sleep and teaching-learning process, reduce work efficiency, causing stress and challenge to public health and it is a silent killer problem growing day-by-day. Almost all the educational institutes are located near the busy places such as bus-stand, market area, highways/busy roads etc. Therefore, these educational institutes suffer from noises and hence disturbing in school activities like teaching, learning and discussion session.

The ambient noise levels recorded around the College is given in Table 23. The noise standards in educational institutes (maximum allowable noise) such as an area within 100 m from educational institute as prescribed by **TNPCB** are given below.

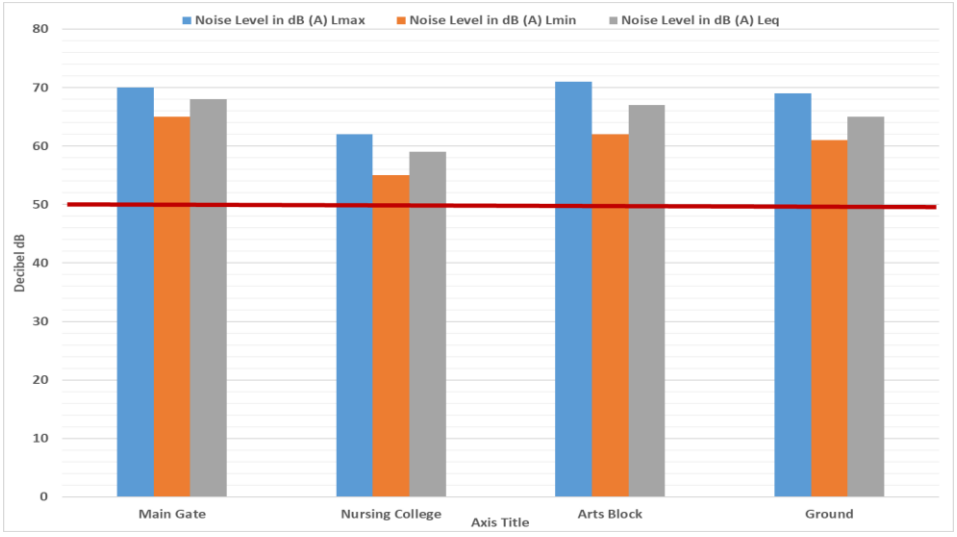
**Table 23: Ambient Noise Levels around the College**

| S. No. | Location | Noise Level in dB (A) | | Leq |
|---|---|---|---|---|
| | | $L_{max}$ | $L_{min}$ | |
| 1 | **Main Gate** | 70 | 65 | 68 |
| 2 | **Nursing College** | 62 | 55 | 59 |
| 3 | **Arts Block** | 71 | 62 | 67 |
| 4 | **Ground** | 69 | 61 | 65 |
| ***Noise Limits in Silence Zone 50 dB(A)*** | | | | |

(Permissible noise level: Outdoor-Below 55 dB (A) & Classroom-35-45 dB (A)

As per **Indian standards** the desirable **noise** pollution for **educational institutions** and hospitals during daytime is 50 dbA. **Noise levels** were measured with a **sound** level meter at 10 points 2 each in north, East, West and South (8– 10 am, 12–2 pm, and 3–5 pm) over two cycles of measurements. The noise levels in all the locations are above the desirable limits which is due to the vehicular movement.

**Fig. 8: Ambient Noise Levels**



## 5.4 Window – Floor Ratio

Building occupants can enjoy an aesthetically pleasing indoor environment with less lighting energy required if sufficient daylight is available. Effective use of daylight is essential in achieving a sustainable building design (Al-Tamimi *et al*, 2016).

The openings for natural light may range from 10%–100% of the floor area. A study by Al-Tamimi and Syed Fadzil, (2012) suggested an upper limit because in the tropical context, too much light may not be desirable because it can introduce heat and glare problems.

Windows and doors are an important aspect of any house design. They are required for physical and visual connections, but their interaction with heat gain/loss and natural ventilation make them and their design critical to a home's good passive design.

A window-to-floor ratio provides a rough rule of thumb for determining optimum areas of window in relation to the floor area of a room or house. As with all rules of thumb it should only be used as a starting point for a design and firmed up by a skilled designer and computer modeling. This helps in accounting for the complexity of the thermal interactions in a building.

In any house, window type, area, orientation and shading should be jointly considered in order to effectively control the heat gain and heat loss of a building. They will be dependent on the opportunities of the site and the climate it is located in, and should be shaped further by the construction method employed. In temperate climates, higher levels of exposed thermal mass will enable greater areas of windows.

As a general guide, the total **window** area should be less than 25 per cent of the total **floor** area of the house. Most of the **windows** should be located to the north where good solar access is easiest to manage, with minimal amounts on the east and west façade.

Internal environment quality (IEQ) research has understandably focused on the readily measurable aspects of: heat, light, sound and air quality, and although impressive individual sense impacts have been identified, Kim and de Dear, (2012) argue strongly that there is currently no consensus as to the relative importance of IEQ factors. (Fadzi, Tamimi, 2009; Carmody *et al*, 2004, Philips, 2013).

Window – to – Floor ratio of the Class rooms and other rooms have been calculated and are within the norms.

**Table 24: Percentage of Floor Area Ventilated**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 17.57 | 18.16 | 18.71 | 20.23 | 22.4 | 23.07 | 25.76 | 28.77 | 35.72 | | 38.87 |

## 5.5 Observation and Comments

1 Ventilation in rooms of different buildings is good and complies with the standards.
2 All the rooms receive optimum lighting.
3 Noise levels were above the desirable limits throughout the campus.
4 Green belt along the periphery of the campus should be established.

# CHAPTER 6

# WATER

Water use by individuals and institutions is not generally regulated, even though many parts of the country are experiencing droughts or water shortages. Regardless of the region's climate, it is important to conserve water, as groundwater supplies are increasingly depleted and polluted. By cutting back the volume of wastewater and runoff generated by the campus the pollutants entering the local waterways and regional body of water can be cut down.

## 6.1 Campus Population

A college campus contains administrative offices, libraries, class rooms, research rooms, laboratories, food services or cafeteria, guest rooms, recreational and sport facilities, halls, hostels, parking lots pavements, roads, wilderness areas. These are the units of the college campus that constitutes a college community. The units of a campus have been broadly grouped under academic facilities and accommodation facilities. The hostels and the guestrooms come under accommodation facilities, whereas the remaining units will form the academic facilities. The academic and accommodative facilities become functional only in the presence of the students and faculty. They are the backbones of a functional educational institution. All facts of the campus community are critical in facing environmental challenges.

**Table 25: Campus Population – Students, Research scholars and Staff**

| S. No. | Year | Students | Staff | | | Total |
|---|---|---|---|---|---|---|
| | | | Teaching | Non-Teaching | Others | |
| **1.** | 2020 - 21 | 1088 | 50 | 10 | 10 | 1158 |
| | **Total** | 1088 | 50 | 10 | 10 | 1158 |

Thus the students and faculty including non-teaching staff constitute the campus population. The average population in ICW campus is 2662 inclusive of students and staff.

## 6.2 Sources

The water source of the campus could be classified as local panchayat water supply and Ground water. The panchayat water is being used for potable purposes whereas the ground water is used for all other purposes.

## 6.3 Consumption of Water

The average percapita water consumption of water in academic unit is 75 lpcd with average consumption of 614925 litres.

**Table 26: Total Water Demand**

| | Description | Population/area m2 | Domestic Litres per Head per Day | | Flushing Litres per Head per Day | | Total Water Consumption LPCD | Total Water Requirement (KLD) | WW generation (KLD) |
|---|---|---|---|---|---|---|---|---|---|
| | | | Demand/Head/Day | Total | Demand/Head/Day | Total | | | |
| 1 | **Staff** | 60 | 25 | 1500 | 20 | 720 | 2220 | 22.20 | 1.89 |
| 2 | **Students** | 1088 | 25 | 27200 | 20 | 21760 | 48960 | 489.60 | 41.62 |
| 3 | **Hostel** | 10 | 90 | 900 | 45 | 450 | 1350 | 13.50 | 0.38 |
| | | **1158** | | **29600** | **-** | **22930** | **52530** | **525.30** | **43.89** |
| Total Water Demand say KLD | | | | **296.00** | **-** | **229.30** | **525.30** | **525.30** | **43.89** |

*Source: Central Ground Water Authority, India*

**Table 27: Water Consumption – Academics**

| S. No. | Year | Students | Staff/ Others | Total | Total Water consumption in Litres | Consumption of Water (lpcd) |
|---|---|---|---|---|---|---|
| 1. | 2020 - 21 | 1088 | 70 | 1158 | 93798 | 81.00 |

## 6.4 Sources of Water Supply

- The sources of water supply for the campus are from 3 bore wells.
- Water is used for drinking purpose, toilets and gardening.
- Total water requirement is 525.30 KLD.
- A total quantum of 93798 liters per day of water is consumed for various purposes after storage in 5 overhead storage tanks.
- The average depth of the bore wells are 1000 feet with available water table at 120 feet.
- The horse power of the motors used for pumping are 5 hp, 7.5 hp & 10 hp.
- Per capita consumption of water is 81 lpcd which slightly above the rural Indian average.

## 6.5 Water Quality Assessment

Safe drinking water is supplied to the students both in the academic buildings and hostels using water purifiers. In order to test the quality of the water samples potable water and ground water samples were collected and tested for selected parameters. The results shows that all the parameters are within the limits except total hardness and calcium which are higher than the permissible limits of BIS.

However, the results shows that the RO unit in the college and hostel are not in good condition and should be maintained properly. There is no reduction in hardness calcium, magnesium and other ions. Hence, either the RO unit should be attended immediately.

**Table 28: Results of Water Analysis**

| S. No. | Parameters | College Bore | RO | Hostel Bore | Hostel RO | BIS- Std (mg/L) |
|---|---|---|---|---|---|---|
| 1. | pH | 7.77 | 7.72 | 7.47 | 7.60 | **6.5-8.5** |
| 2. | EC (µ Mho) | 1196.00 | 1226.00 | 1168.00 | 1168.00 | |
| 3. | TDS (mg/L) | 598.00 | 563.00 | 584.00 | 584.00 | **500-2000** |
| 4. | Alkalinity (mg/L) | 50.00 | 50.00 | 60.00 | 60.00 | **250** |
| 5. | TH (mg/L) | 630.00 | 670.00 | 635.00 | 635.00 | **600** |
| 6. | Ca (mg/L) | 200.40 | 210.42 | 230.46 | 220.44 | **200** |
| 7. | Mg (mg/L) | 29.16 | 35.23 | 14.58 | 20.65 | **100** |
| 8. | Cl (mg/L) | 95.71 | 120.53 | 124.07 | 124.07 | **250-1000** |
| 9. | Fl (mg/L) | 0.42 | 0.06 | 0.32 | 0.43 | **1-1.5** |
| 10. | Phosphate(mg/L) | 0.04 | 0.03 | 0.02 | 0.04 | **0.1** |
| 11. | Nitrate (mg/L) | 1.20 | 1.30 | 2.30 | 2.10 | **200** |
| 12. | BOD (mg/L) | 3.24 | 1.64 | 3.24 | 3.24 | **30** |
| 13. | COD (mg/L) | 16.00 | 8.00 | 16.00 | 8.00 | **250** |
| 14. | DO (mg/L) | 7.30 | 7.69 | 7.70 | 6.40 | |

## 6.6 Rain Water Harvesting

Rainwater harvesting is an important environment friendly approach. It is a Green Practice having double benefit of keeping the groundwater level undisturbed and charging the aquifer. Rainwater and run-off water, stored in a planned way, can save the earth from soil erosion and flood and recharge the aquifers to increase the groundwater level.

The objectives are to increase recharge of groundwater by capturing and storing rainwater, by rainwater harvesting from rooftop run-offs and to store the water for gardening & washing purpose.

The College has a large rain water harvesting pit near the canteen, the entire campus has a good drainage pattern and the terrain is undulating, the campus rain water harvesting is practiced.

**Calculation**

The rain water collected in an area can be calculated as per the following formula:

| | | |
|---|---|---|
| Total rain water collected in litres | = | mean annual rainfall in mm x area in $m^2$ x runoff factor |
| Mean Annual rainfall in Reddiarchatram Firka | = | 886 mm |
| Runoff Coefficient | = | 0.8 |

**Ref:**
*Plan on Artificial Recharge to Groundwater and Water Conservation in Reddiarchatram Firka, Dindigul Taluk, Dindigul District, Tamil Nadu by Central Ground Water Board South Eastern Coastal Region Rajaji Bhawan, Besant Nagar Chennai 30 . 2009*
*cgwb.gov.in/AR/AR-PLans/Tamil%20Nadu/Dindigul%_final9.pdf*

**How much water can be harvested from rain ?**

| Type of Catchment | Coefficients |
|---|---|
| **Roof Catchments** | |
| - Tiles | 0.8- 0.9 |
| - Corrugated metal sheets | 0.7- 0.9 |
| **Ground surface coverings** | |
| - Concrete | 0.6- 0.8 |
| - Brick pavement | 0.5- 0.6 |
| **Untreated ground catchments** | |
| - Soil on slopes less than 10 per cent | 0.0 - 0.3 |
| - Rocky natural catchments | 0.2 - 0.5 |

**Harvesting potential = Rainfall (mm) x Area of catchment x Run-off coefficient**

So the larger the surface area, the more water can be caught.

66,000 litres of water can be caught from a house with 100 sq.mts in one year. Ground water recharged from this is sufficient for a normal family size of five members for a period of four months.

*A Guide to Techniques of Water conservation and Management, UNDP India 2008*

**Table 29: Rainwater collected in campus**

| S. No. | Building | Roof Top Area (Sq. M) | Runoff factor | Rain water in Litres | Rain water in cu.m |
|---|---|---|---|---|---|
| 1. | Academic | 2722.19 | 0.8 | 1929488.27 | 1929.49 |
| 2. | Hostel | 1500.00 | 0.8 | 1063200.00 | 1063.20 |
| 3. | Guest house | 611.00 | 0.8 | 433076.80 | 433.08 |
| 4. | Canteen | 112.00 | 0.8 | 79385.60 | 79.39 |
| | Total | 4945.19 | 0.8 | 3505150.67 | 350.51 |

Total rainwater collected through the roof top of the campus is 350.51 cu.m.

## 6.7 Observation and Comments

1. The percapita consumption of water is 81 lpcd in the academic buildings

    a. The Indian average per capita consumption of potable water for rural area is 70 – 80 lpcd and urban / semi urban area is 120 - 135 lpcd.

2. The per capita consumption is well within the Indian average.

3. The campus has 4 storage tanks which are spatially distributed in the campus and is adequate for the students in the campus.

4. The results of water quality assessment shows that the water quality parameters are within the standard limits prescribed by Bureau of Indian Standards (BIS) except Total hardness and calcium.

5. Both campus and building Rainwater harvesting is practiced.

6. Total quantity of rain water collected is 350.51 cu. m

# CHAPTER 7

# WASTE AUDIT

## 7.1 Waste

The sustainable development requires that the generation of waste is avoided, or where it cannot be avoided, that it is reduced, re-used, recycled or recovered and only as a last resort treated and safely disposed.

## 7.2 Wastewater

Water is an important element for all living organisms. Water is so essential that without water human cannot survive. Most of the reactions which occur in the living cells and the non-living environment involve the medium of water. Man uses water for various purposes; it includes drinking, cooking, bathing, washing, heating, air-conditioning, industrial processing, power generation and other recreational purposes. (Nandakumar, 1988).

Once the water is used, it becomes a waste because of the various impurities mixed with the water which changes the quality of water. In other words, water becomes waste water which may be defined as "combination of the liquid-or water-carried waste removed from residences, institutions, commercial and industrial establishments, together with such groundwater, surface water, and storm water as may be present" (Metcalf & Eddy, 1991). The components of the waste water depend on the community which may include the following:

1. **Domestic (also called sanitary) wastewater:** Waste water discharged from residences and from commercial, institutional, and similar facilities.

2. **Industrial waste water:** Waste water in which industrial wastes predominate.

3. **Infiltration /inflow:** Water that enters the sewer system through indirect and direct means. Infiltration is extraneous water that enters

the sewer through leaking joints, cracks and breaks, or porous walls. Inflow is the storm water that enters the sewer system from storm drain connections (catch basins), roof leaders, foundation and basement drains, or through manhole covers.

4. **Storm water:** Runoff resulting from rainfall.

The untreated waste water, if allowed to accumulate, leads to the production of large qualities of malodorous gases, and also cause diseases through the pathogenic microorganisms. It can stimulate the growth of aquatic plants and also contains toxic compounds. For these reasons, the immediate and nuisance-free removal of waste water from its sources of generation, followed by treatment and disposal is not desirable but also necessary.

## 7.3 Wastewater Generated from the Campus

The total quantum of wastewater generated from the campus is depicted in the Figure 7.1.

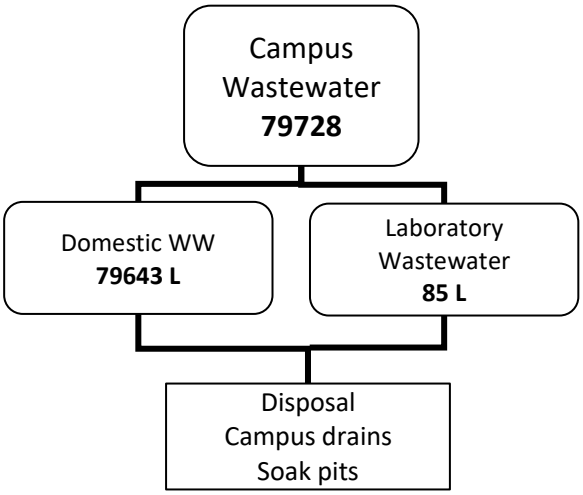



**Fig. 9: Quantity of Wastewater**

Wastewater generated in the campus are reused for gardening purposes.

## 7.4 Solid Waste

Solid waste substances are those materials which become waste after short period of their use as newspapers packing wrappers etc., different types of cans, bottles, broken glass wares plastic containers, polythene bags, ashes and domestic garbage. These discarded solid substances after their uses are variously called as Refuse, Garbage, Rubbish solid waste etc.

Solid waste, often called the third pollution after air and water pollution is that material which arises from various human activities and which is normally discarded materials from the urban community as well as the more homogenous accumulation of other wastes.

Waste is the raw material located at a wrong place. It can be converted into useful products by making use of appropriate processing technologies. Many of the waste are at presently reused in uneconomic manner or left completely unutilized causing great hazards to the human environment.

**Table 30: Biodegradable Waste**

| S. No | Type of Waste Generated in the Campus | Quantity of solid waste generated (Monthly average in kg.) |
|---|---|---|
| 1 | Garden/ horticulture waste | 95 Kg/ Mon |
| 2 | Kitchen waste – Raw | 60 Kg/ Mon |
| 3 | Kitchen waste – Cooked | 45 Kg/ Mon |
| 4 | Wet waste from Classroom etc., | 0.5 Kg/ Mon |
| 5 | Total amount of waste | 190.50 Kg/ Mon |

**Table 31: Dry / Recyclable waste**

| S. No | Type of Waste Generated in the Campus | Quantity of solid waste generated (Monthly average in kg.) |
|---|---|---|
| 1 | Plastic | 0.85 Kg/ Mon |
| 2 | Paper | 115 Kg/ Mon |
| 3 | Wood or Classroom Furniture | Reused for other purposes |
| 4 | Glass | NIL |
| 5 | Metal | 1.2 Kg/ Mon |
| 6 | Thermocol | NIL |
| 7 | Tetra packs | Not used in the campus |

**Table 32: Domestic Hazardous Waste**

| S. No | Type of Waste | Quantity of solid waste generated (Monthly average in kg.) |
|---|---|---|
| 1 | Hazardous and Toxic Waste (Paints, Lab waste etc., ) | Paints- taken away by contractors Lab wastes - incinerated |
| 2 | Oil from Diesel Generator sets | Negligible |
| 3 | Total amount of waste | NIL |

**Table 33: E-Waste**

| S. No | Type of waste | Quantity of solid waste generated (Monthly average in kg.) |
|---|---|---|
| 1 | E waste | 3 |

## 7.5 Biomedical Waste

Biomedical wastes generated from the departments of chemistry and zoology is discharged as per the schedule of Biomedical Waste (Handling and management) Rules, 2016. Handling of live specimens is stopped and

only virtual dissections are implemented in the department of zoology. Laboratory wastewater from the department of Chemistry and zoology are neutralized and discharged in to the common drainage systems of the campus.

**Table 34: Biomedical Waste**

| S. No | Type of Waste | Quantity of solid waste generated |
|---|---|---|
| 1. | Biomedical waste | Negligible |
| 2. | Sanitary Waste | 16 kg / Month |
| 3. | Construction Demolition waste | Reused |

**Table 35: Waste Recycling Practices followed in College**

| S. No | Category Waste | Dumped at a designated Community Site/ Internal Procedure |
|---|---|---|
| 1 | Paper | Collected in collection room & sold to vendors |
| 2 | Plastic | Local scrap dealer |
| 3 | Horticultural Waste | Vermicompost |
| 4 | E-Waste | Local scrap dealer |
| 5 | Hazardous waste | Laboratory wastes incinerated |
| 6 | Wood, Glass, Metal | Collected in collection room & sold to vendors |
| 7 | Biomedical Waste | Cotton & Incinerated |

## 7.6 Observation and Comments

1. The wastewater generated in the campus is 79645 litres which is normal

2. Biodegradable waste generated per month is negligible, dry waste 190.50 Kg/ Mon. Sanitary waste generation is 16 kg/month. The campus does not produce hazardous waste.

3. The quantity of solid wastes generation are within the limits as per the MSWM Rules, 2000.

# CHAPTER 8

# FOOD AUDIT

## 8.1 Eat good Food for good Health

Good food is all around us. For generations, Indians have incorporated biodiversity in their daily food-using millets instead of wheat or rice, eating vegetables sourced from forests rather than farms, eating local food, and changing their diet with changing seasons.

- India is one of the biodiversity-rich countries and home to nearly 12 per cent of the world's plant species. People in the biodiversity-rich areas have an immense understanding of the plants that grow around them. Each region of the country has its special cuisine based on the plants available in the area.

- Many bio-diverse foods have medicinal properties. They are rich in micronutrients, help people fight disease and keep them healthy in changing seasons. It was for food that people protected their environment. When crops were cultivated, they were grown naturally, without the use of agrochemicals. In rural areas, people often do not have to buy food and this provides nutrition security. There is some evidence that people living in places where food is available in traditional sources are healthier.

- Access to good food has decreased drastically. Most traditional food cannot be stored and it is difficult to market them. People no longer have access to forests and kitchen gardens are fast disappearing, particularly in urban areas. In many places, environmental damage has decimated the biodiversity.

## 8.2 Child Health and Food Policy

Food has been at the centre of policy debate in India for many years, as more than 20 per cent of the country's population suffers from under nourishment. India ranks 97$^{th}$ out of 118 countries in the 2016 Global Hunger Index and has further pushed to 102$^{nd}$ out of 117

qualifying countries in 2019 with a score of 30.3. India suffers from a level of hunger that is serious.

*https://www.globalhungerindex.org/results.html*

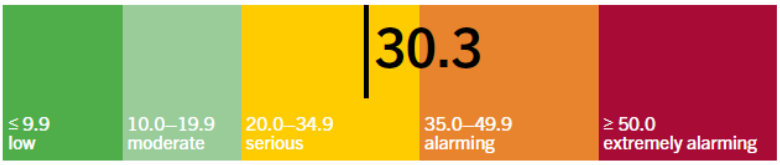



**Fig. 10: Global Hunger Index - India**

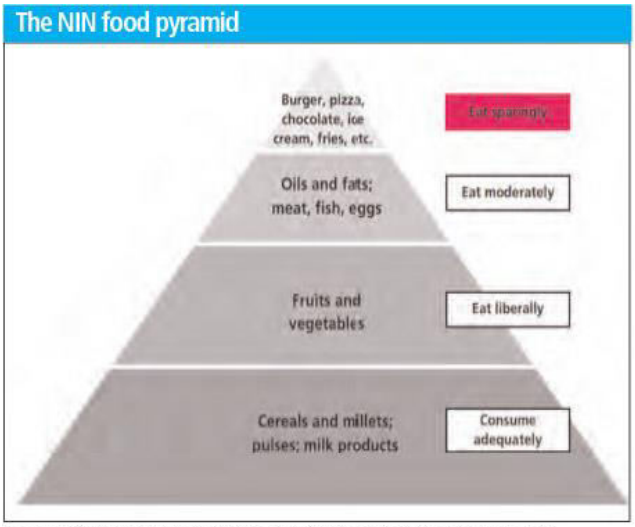
It ranks 120thamong 128 countries with data on under nutrition during 2009-13; 30.7 per cent of the country's children are underweight (an improvement from 43.5 per cent in 2005-06). Data from targeted studies show an alarming trend. The HUNGaMA (Hunger and Malnutrition) report covering 112 worst-performing districts in nine states tells us that 42 per cent children are underweight, 58 per cent are stunted and 11.4 are 'wasted' by the age of 24 months.

Meanwhile, childhood obesity is also alarmingly on the rise globally as well as in India. The International Obesity Task Force (IOTF) of WHO estimates that 10 per cent of children aged 5-17 years worldwide are overweight.

India therefore faces a peculiar crisis that spans both ends of the spectrum of nutritional disorders—while 30.7 per cent of the country's children are underweight, according to the International Association for the Study of Obesity's world map of obesity, overfeeding is evident as overweight and obesity has been recently on the rise and is present in 20.6 per cent boys and 18.3 per cent girls in India.

Given India's dubious distinction of carrying the twin burden of under nutrition and overfeeding, we need to be extra cautious. In a bid to beat hunger, we are losing out to the deadly parasite of ultra-processed

food, without realizing how harmful it actually is. Yes, craving for ultra-processed food is a global epidemic.




Source: Dietary Guidelines for Indians, 2011, National Institute of Nutrition (NIN)

**Recommended Daily Allowance (RDA) for a 10- to 12-year-old moderately active child**

| Nutrient/energy | RDA |
|---|---|
| Energy (E) | 2,100 kilocalorie* |
| Sugar | Up to 30 g |
| Total visible fat | 35 g [~15%E] |
| Saturated fatty acids (SFA) | Up to 8% E |
| Trans-fatty acids (TFA) | < 1% E |
| Salt | 5 g |
| Protein | 34g/day |
| Carbohydrates | 130g/day |

**kote:** *Average for calculation purpose [2,190 kcal for a boy weighing 34.3 kg and 2,010 kcal for a girl weighing 35 kg]; calorie calculation; 1 g of fat=9 kcal; 1g of protein = 4 kcal
**Source:** Dietary Guidelines for Indians, 2011, National Institute of Nutrition

**Fig. 11: Food Pyramid and Recommended Daily Allowance**

**Table 36: Food Categorization for College Canteen Policy**

| | | |
|---|---|---|
| **GREEN** | **Always on menu** | Vegetables and legumes, fruits, grain (cereal) foods; mostly whole grain and/or high in fibre, learn meat, egg, fish etc. |
| **YELLOW** | **Select carefully**<br>Approach should be greening, small portion size and reduced frequency. | Baked vegetable-based snacks, Ice creams, milk-based ices and dairy desserts etc. |
| **RED** | **Not on menu**<br>Banned from Colleges as they are high in fat, salt and sugar. | Energy drinks, carbonated and other sweetened beverages, fried packaged foods, chocolates, potato fries |

## 8.3 The fat of the matter:

The highest level of total fat was found in an Indian snack (Haldiram'saaloobhujia): 37.8 gm/100 gm of the sample (Centre for Science and Environment)

- Trans-fat content was the highest in french fries (8.1 per cent of the total fat), followed by instant noodles (4.6 percent of the total fat) and potato chips (4.5 per cent of the total fat).
- Salt content was the highest in instant noodles (3.7 gm/100 gm of sample). Eating a packet of instant noodles, therefore, will cover about half of the daily salt quota. The salt content is not declared by the companies on the label
- The highest level of carbohydrates was detected in Top Ramen noodles at 73.3 gm per 100 gm.

**Table 37: Food Items Served in the College**

| S. No. | Packaged Food Items | Flavours / variants available | Variants | No. of items sold /Day |
|---|---|---|---|---|
| 1 | Savoury snacks and similar packaged food like chips, and Haldirams. | 9 | Bourbon, Milk bikis, Marie gold, Good Day, Treat, Oreo, Cake, Little heart, 50-50 | 100 |
| 2 | Potato fries and burgers | Nil | | |
| 3 | Confectionery (Chocolates, Candies, gums) | 8 | Chocolaes, Dairy milk, Miky bar, Munch, Kitkat, 5 Star, Perk, Candies and Gums | 150 |
| 4 | Ice cream | 5 | Gulfi, Cone Cone, Orange, Grapes, Vennila | 10 |
| 5 | Carbonated beverages | Nil | | |
| 6 | Sugar sweetened non- | 2 | | 50 |

| | | | | |
|---|---|---|---|---|
| | carbonated beverages | | | |
| 7 | Packages / bottles Maza/lassi/flavoured milk | 5 | | 50 |
| 8 | Packaged / bottled energy drinks | Nil | | |

**Table 38: VARIETIES OF TRADITIONAL INDIAN FOOD ITEMS** (Especially Non-Packaged) Served in the College

| S. No. | Traditional Indian Snacks | Number of servings |
|---|---|---|
| 1 | Samosas | 65 |
| 2 | Idli/Dosa and Sambhar | 45 |
| 3 | Pavbhaji | Nil |
| 4 | Momos | 22 |
| 5 | Others/Chapathi | 25 |


**Fig. 12: Food Items Served in the College**

**Table 39: TRADITIONAL INDIAN BEVERAGE ITEMS**

| S. No. | Traditional Indian beverages | Number of plates |
|---|---|---|
| 1 | Lemon / Orange / Pomegranate Juice | 20 |
| 2 | Sweet lassi | 10 |
| 3 | Salted buttermilk | 15 |
| 4 | Tea | 55 |
| 5 | Coffee | 30 |

## 8.4 Balanced Diet

According to the 'Dietary Guidelines for Indians, 2011' of the National Institute of Nutrition (NIN), a balanced diet is one that provides all nutrients in required amounts and proper proportions. It should provide around 50-60 per cent of the total calories from carbohydrates, about 10-15 per cent from proteins and 20-30 per cent from both visible and invisible fat. In addition, it should provide other non-nutrients such as dietary fibre and antioxidants that bestow positive health benefits.

## 8.5 Observations and comments:

1. Food and beverage items served in the college canteen are traditional and prepared and served in hygienic manner.

# CHAPTER 9

# CONCLUSION AND RECOMMENDATIONS

## 9.1 Conclusion

Environment Audit is the most efficient way to identify the strength and weakness of environmentally sustainable practices and to find a way to solve problem. Green Audit is one kind of professional approach towards a responsible way in utilizing economic, financial, social and environmental resources. Green audits can “add value” to the management approaches being taken by the college and is a way of identifying, evaluating and managing environmental risks (known and unknown).

There is scope for further improvement, particularly in relation to waste, energy and water management. The college in recent years considers the environmental impacts of most of its actions and makes a concerted effort to act in an environmentally responsible manner. Even though the college does perform fairly well, the recommendations in this report highlight many ways in which the college can work to improve its actions and become a more sustainable institution.

## 9.2 Observations

Campus Green audit is a guide to assess environmental quality and creating strategies for change. Some of the very salient observations and important strategic changes to be implemented in the college are as follows:

1 Ventilation in rooms of different buildings is good and complies with the standards.
2 All the rooms receive optimum lighting.
3 Noise levels were above the desirable limits throughout the campus.
4 Green belt along the periphery of the campus should be established.
5 As per **Indian standards** the desirable **noise** pollution for **educational institutions** and hospitals during daytime is 50 dbA.

6 The percapita consumption of water is 81 lpcd in the academic buildings. The Indian average per capita consumption of potable water for rural area is 70 – 80 lpcd and urban / semi urban area is 120 - 135 lpcd.

7 The per capita consumption is well within the Indian average.

8 The campus has 4 storage tanks which are spatially distributed in the campus and is adequate for the students in the campus.

9 The results of water quality assessment shows that the water quality parameters are within the standard limits prescribed by Bureau of Indian Standards (BIS) except Total hardness and calcium.

10 Both campus and building Rainwater harvesting is practiced.

11 Total quantity of rain water collected is 350.51 cu. m

12 The wastewater generated in the campus is 79645 litres which is normal

13 Biodegradable waste generated per month is negligible, dry waste 190.50 Kg/ Mon. Sanitary waste generation is 16 kg/month. The campus does not produce hazardous waste.

14 The quantity of solid wastes generation is within the limits as per the MSWM Rules, 2000.

15 Food and beverage items served in the college canteen are traditional and prepared and served in hygienic manner.

**9.3 Recommendations**

1) The principles of Reduce, Reuse and Recycle can be encouraged among the students, teachers, non-teaching staff, support staff and all the stakeholders of the College.

2) For an effective recycling of wastepaper, a paper recycling unit may be established.

3) E waste and laboratory waste management plan should be developed and implemented.

4) Maintenance of water tanks and RO plants should be done regularly.

5) Butterfly garden may be developed to arouse appreciation towards floral and faunal diversity.

6) Trees and plants can be named with its common name and scientific name wherever possible. *(Avoid nailing name tags)*

7) Total Replacement of CFL with LED. Donate used Tube lights and CFL to educational institutions in need.

8) Conduct quarterly Campus Environmental Audit for water, energy and waste.

# CHPATER 10

# REFERENCES


**Agarwal.S.K,** Environmental Audit," Environmental Management New concept, Eco-informatics, APH publishing corporation.Vol.1, pp (135-165). 2002

**Alagappa Moses and Sheeja. K.M.** Campus Environmental Audit And Assessment for Water and Wastewater Management. Dissertation submitted to Bharathidasan University. 2005

**Alagappa Moses, A., Edwin Chandraskaran. G and JhonselySajitha, C.** Design and layout of waste water Treatment plant for a college community, Indian Journal of Environmental Protection, Vol:16(6),pp(401-405). 1995

**Al-TamimiNedhal, FadzilSharifahFairuz Syed.** Energy Efficient Envelope Design for High-Rise Residential Buildings in Malaysia. Architectural Science Review. 2012; 55(2):119-27.

**Al-TamimiNedhal, FadzilSharifahFairuz Syed and Abdullah Adel.**Relationship between Window-to-Floor Area Ratio and Single-Point Daylight Factor in Varied Residential Rooms in Malaysia. *ISSN (Print): 0974-6846: ISSN (Online) : 0974-5645.* **Indian Journal of Science and Technology,** *Vol 9(33), DOI: 10.17485/ijst/2016/v9i33/86216, September 2016*

**APHA American Public Health Association (APHA).** Standard methods for the examination of water and waste water,20th Edition. 1998

**April A. Smith.,'Campus Ecology.** A guide to assessing environmental quality and creating strategies for change'. April A. Smith and the student environmental action coalition. Copyright 1993 by April Smith and the tides foundation / student E.A.C., Published in the united

states by living planet in the united states by living planet press. Pg-foreword, 1993.

**Badrinath.S.D and Raman.N.S.** Environmental Audit-A Management Tool, Indian Journal of Environmental protection, vol:13 (12),pp(881-894), 1993

**Chandra Sekar K., Daniel R.J.R. and GadagkarR**.Animal species diversity in Western ghats. Technical report 5, centre for ecological sciences, Journal of the Indian institute of Science, Bangalore. 1984.

**Chandra Prakash Naga,Chandra Shekhar Sen, Shakti Singh Dagdi**. Energy audit in Govt. Polytechnic College, Ajmer campus. *Vol-3 Issue-3 2017. IJARIIE-ISSN(O)-2395-4396. www.ijariie.com*

**Clair N. Sawyer, Perry L. Mc Carty, Gene F. Perkin.** Chemistry for Environmental Engineering and Science, Mc. Graw Hill Series in Civil and Environmental Engineering. 2002

**Fadzi SF, Tamimi ANA**. The Impact of Varied Orientation & Wall Window Ratio (WWR) to Daylight Distribution in Residential Rooms. Malaysia: CIBW107 International Symposium. 2009; p. 478-86.

**Gary.V.K.,SimmiGoel and Renuka Gupta, 2001** Ground water Quality of an average Indian City : A case study of Haisar (Haryana), Journal of Indian Water Work Association,Vol:33(3), pp (237-242).

**IMA and FEMDAT (2001)** "Guidelines on Biomedical Waste Management" Why? What? How? When? For generators in Tamil Nadu. Prepared by Indian Medical Association, Tamil Nadu branch (IMA), and Federation of Medical and Dental Association of Tamil Nadu (FEMDAT). Chennai.

**Kim J, de Dear R**. Nonlinear relationships between individual IEQ factors and overall workspace satisfaction. Build Environ 2012;49:33 e44.

**Liz Farkaz, Chole Hartley, Matt McTavish, Jenny Theherge, Tony waterfall, 1991**, Investigation of a campus cyclical water system.

**Mathew K.M., 1995**. An excursion flora of central Tamil Nadu, India. Oxford and IBH publication, Co., New Delhi.

**Naba Kumar Patnaik, 2000**, Environmental Audit-A perspective of Environmental Management and Audit, Edited by: Sasibhushana Rao p, and MohanaRaoP, Chap:24.,pp(282-291).

**Nanda Kumar,1998** Waste Water treatment by using Wind Mill Savonious Rotor M.Sc., Dissertation submitted to Bharathildasan University, Tiruchirappalli.

**Olaniya,M.S., R.V.Bhoyor and A.D.Bhide(1998)** Effects of solid waste Disposal on land.Indian journal of environmental health.

**Phillips D**. Taylor & Francis: Lighting Modern Buildings. 2013 Jun 17.

**Ramanujam.R,2001,** water Conservation-Need of the day Method and techniques in Kerala context, Journal of Indian Water work Association, Vol:33(!),pp(5-13)

**Ramaswamy S.V. and Razi B.A., 1973** Flora of Bangalore dt., Prasaranga University of Mysore.

**Ravichandran and Manivanan.V,2004**, Environmental audit for BHC campus with reference to water &Energy.

**Rob Fetter and Alyssa Mudd, 1993**, The Brown, the Green, and the Grey: Auditing water Use at Brown University.

**Santra S.C., Chatterjee T.P. and Dos A.P., 2005**. College Botany practical vol I and II New central Book Agency privates Ltd., Kolkata.

**Shyuamal L., 1994.** The birds of Indian Institute of science campus-changes in Avifauna, Newsland 34(1), 7-9.

**Sivaramakrishnan K.G., Venkataraman K., Moorthy R.K., Subramanian K.A., and Utkarsh G., 2000**. Aquatic insect diversity and ubiquity of the Western Ghats, centre for Research in Aquatic Entomology, Department of Zoology, Madura college, Madurai.

**Srinivasa Reedy, 2001**, water for New millennium, journal of Indian Water Works Association, vol:33(2)(135-142).

**SurendraVarma., 1999**. Bird diversity on the campus of the Indian Institute of science, Asian Elephant Research and conservation centre, centre for ecological sciences, Indian institute of science (llSc) Bangalore.

**Suresh H.S and Harish R. Bhat ., 1998.** Flora of the Indian Institute of science campus, Centre for Ecological sciences, Journal of the Indian Institute of science, Bangalore.

**UmshMolani, 2000**,Environmental Audit, Environmental Management and Audit, Edited by:Sasibhuxhana Rao P and Mohana Rao P,Chap(28),pp(323-329).

**UNESCO**. Norms and Standards for Educational facilities. Training materials in educational planning and administration facilities. Division of Educational Policy and planning. EPP/TM.17. 1985.

**Venkatraman,G,1966,** A note on the occurrence of large scale fish mortality along the Chaliyar River near BeyPore.J.Mar.Biol.Ass.Indian vol:8.

**Web References**

*www.adm.uwater1/00.ca/infowast/watgreenprojects/water-conservation.html*

www.uwosh.edu/environmental audit/introduction.php dated 27.02.05

www.uwrf.edu/campus environmental audit/faq.html

www.tidco.com and http://www.tidco.com/tidcodosc/tn pp 9.

*www.globalhungerindex.org/results.html*

*https://www.accuweather.com/en/in/kodaikanal/195980/october-weather/195980?year=2019*

*https://www.accuweather.com/en/in/kodaikanal/195980/november-weather/195980?year=2019*

*https://www.accuweather.com/en/in/kodaikanal/195980/december-weather/195980?year=2019*

*https://www.accuweather.com/en/in/kodaikanal/195980/january-weather/195980?year=2020*

*https://www.accuweather.com/en/in/kodaikanal/195980/february-weather/195980?year=2020*

*https://www.accuweather.com/en/in/kodaikanal/195980/march-weather/195980?year=2020*