



DOON (P.G.) COLLEGE OF AGRICULTURE SCIENCE & TECHNOLOGY

CAMP ROAD SELAQUI, DEHRADUN-248011 (UTTARAKHAND)

(Under the Management of Maharani Laxmi Bai Memorial Educational Society)

AFFILIATED TO HEMVATI NANDAN BAHUGUNA GARHWAL UNIVERSITY

(--A CENTRAL UNIVERISTY--)

ISO 9001:2008 Certified

Green Audit / Environment Audit

- **Institution Policy Document**
- **Green Audit**
- **Environment Audit**
- **Certificate of Appreciation**



CERTIFICATE

This is to certify that Doon (PG) College of Agriculture Science and Technology, Selaqui, Dehradun has conducted Green Audit on their campus and has submitted necessary data in addition, credentials for scrutiny. The activities and measures carried out by the university have been verified based on the report submitted and was found to be acceptable. The efforts taken by the Doon (PG) college of Agriculture Science & Technology Management, Faculties & Students towards Green Building, environment and sustainability is high appreciated and commendable.

Certified Energy Auditor (CEA-32073)

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Green and Environmental Audit Report

Doon (PG) College of Agriculture
Science & Technology,
Dehradun

AUDIT REPORT



Energy and Environmental Audit report for Doon (PG) College of Agriculture Science & Technology, Dehradun

This report is developed for the Doon (PG) College of Agriculture Science & Technology in Dehradun. It identifies energy, water and resource conservation measures (ECMs). It also contains information about the ways to implement the identified measures in order to make the campus environment-friendly and safe for occupants.

Submitted To:

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Disclaimer

This report has been produced for Doon (PG) College of Agriculture Science & Technology, Dehradun. The information in the report are prepared based on the information obtained from various sources, the data available to us, parameters observed at the site, and discussions held with the relevant officials at the campus.

The detailed Information and analysis presented in this report are valid as on the date of visit and period of study at the site. The work presented represents our best efforts and judgments based on the information available at the time this report was prepared. GreenTree makes no assurances as to the accuracy of any such information or any conclusions based thereon.

The observations made in this report are only an indication of the performance of the facility based on our assessment and should not be considered as the comment on the functioning of the facility. The observation is purely based on the data recorded at that point of time.

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Executive Summary

A nation's growth starts from its educational institutions, where the ecology is thought as a prime factor of development associated with the environment. A clean and healthy environment aids effective learning and provides a conducive learning environment. Educational institutions nowadays are becoming more sensitive to environmental factors as more concepts are being introduced to make them eco-friendly. To preserve the environment within the campus, various viewpoints are applied by the several educational institutes to solve their environmental problems, such as promotion of energy savings measures, usage of recycled water, water-use reduction, rainwater harvesting etc. The activities pursued by colleges and universities can create a variety of adverse environmental impacts.

The aim of the report is to identify scope for improvement and recommend implementable and economically viable solutions in achieving the most optimized utilization of energy and water in the campus. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Therefore, it is imperative that the college evaluate its own contributions toward a sustainable future.

In Doon (PG) College of Agriculture Science & Technology-Dehradun the audit process involved initial interviews of management to clarify policies, activities, records and the cooperation of staff and students in the implementation of mitigation measures.

This was followed by staff interviews, 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 Doon (PG) College of Agriculture Science & Technology will be a useful tool for campus greening, resource management, planning of future projects, and a document for implementation of sustainable development of the university. Existing data will allow the university to compare its programs and operations with those of peer institutions, identify areas in need of improvement and prioritize the implementation of future projects. We expect that the management will be committed to implement the green audit recommendations.

Recommendation for establishment of "Core Management Team" on campus

In order to ensure that the provisions as suggested and advised in the audit report are actualized or their potential is realized thoroughly, we further suggest constituting a CORE MANAGEMENT TEAM on campus, comprising of senior administrative officers, staff members, teachers and student ambassadors. The team will be responsible for overseeing the implementation of the identified measures, which will imperative to its success on ground.

Proposed core team members will include:

- University owner and members from the management
- Staff members responsible for university facilities
- Student ambassadors as support team

The team will, thus, be responsible for:

- Identifying specific objectives
- Developing a GREEN CAMPUS ACTION PLAN
- Communicating the plan to other student bodies
- Implement conservation measures
- Motivate partner or sister university campuses

Abbreviation

LED	Light Emitting Diode
PV	Photo Voltaic
ODP	Ozone Depleting Potential
GWP	Global Warming Potential
CFL	Compact Fluorescent Lamp
CPCB	Central Pollution Control Board
STP	Sewage Treatment Plant
DG	Diesel Generator
NBC	National Building Code
EPI	Energy Performance Indicator

Contents

DISCLAIMER	- 2 -
EXECUTIVE SUMMARY	- 3 -
ABBREVIATION	- 5 -
CONTENTS	- 6 -
LIST OF TABLES	- 8 -
LIST OF FIGURES	- 9 -
1 ABOUT DOON (PG) COLLEGE OF AGRICULTURE SCIENCE & TECHNOLOGY	- 10 -
2 PROJECT BACKGROUND	- 11 -
2.1 BACKGROUND	- 11 -
3 APPROACH & METHODOLOGY	- 13 -
4 INTRODUCTION	- 15 -
5 ENVIRONMENTAL AND GREEN POLICY STATEMENT	- 16 -
6 TARGET AREAS OF GREEN AUDITING	- 18 -
7 WATER AUDIT	- 19 -
8 WASTE MANAGEMENT AUDIT	- 26 -
8.1 GENERAL WASTE AND HAZARDOUS WASTE:	- 26 -
9 ENERGY MANAGEMENT AUDIT	- 27 -
10 GREEN CAMPUS MANAGEMENT AUDIT	- 29 -
10.1 TYPES OF WASTE GENERATED ON CAMPUS	- 29 -
11 INDOOR COMFORT TEMPERATURE AND HUMIDITY PROFILE	- 30 -
12 WEATHER MONITORING SYSTEM	- 31 -
13 BIO-GAS PLANT	- 32 -
14 VERMI-COMPOST UNIT	- 33 -
15 RAIN WATER HARVESTING SYSTEM	- 34 -
16 FIRE ALARM SYSTEM	- 35 -
17 NOISE POLLUTION	- 36 -
18 HEALTH AUDIT	- 37 -
19 CUSTODIAL CHEMICAL USE	- 38 -
20 TRANSPORTATION	- 39 -
21 PROCUREMENT PROCESS	- 40 -
22 CPCB GUIDELINES	- 41 -
23 PAPER USE AND PRINTING GOALS	- 42 -
23.1 PAPER USE AND PRINTING GOALS	- 42 -
23.2 E-LIBRARY	- 43 -

24	TRAINING AND AWARENESS.....	- 44 -
25	GOVERNANCE.....	- 45 -
26	PLANTATION POLICY OF DOON (PG) COLLEGE OF AGRICULTURE SCIENCE & TECHNOLOGY	- 46 -
27	DISPOSAL OF FLUORESCENT TUBES	- 48 -
28	REFRIGERANT USED IN AIR CONDITIONERS	- 50 -
29	ECO FRIENDLY HOUSE KEEPING MATERIALS	- 51 -
30	GENERAL PURPOSE CLEANERS.....	- 52 -
31	FIRE SAFETY	- 53 -
32	CANTEEN WASTE-HANDLING PRACTICE	- 54 -
33	SUSTAINABLE DEVELOPMENT.....	- 55 -
33.1	WATER AND WASTE MANAGEMENT DURING CONSTRUCTION	- 56 -
33.2	RECYCLING	- 56 -
33.3	USE OF NATURAL RESOURCES AND REPLACEMENT OF CHEMICALS AS MUCH AS POSSIBLE	- 56 -
33.4	ENCOURAGE USE OF LOCAL MATERIALS	- 56 -
33.5	LOW VOC (VOLATILE ORGANIC COMPOUND) %	- 57 -
33.6	USE OF LOW IMPACT MATERIAL AND ZERO ODP MATERIAL	- 61 -
34	PHOTOGRAPHS OF THE ON-SITE AUDIT	- 62 -
35	AUDIT COORDINATOR	- 68 -

List of Tables

TABLE 1: GENERAL INFORMATION OF DOON (PG) COLLEGE OF AGRICULTURE SCIENCE & TECHNOLOGY	- 15 -
TABLE 20: ENERGY PERFORMANCE INDEX	- 27 -
TABLE 37: PHOTOGRAPHIC OBSERVATIONS	- 62 -

List of Figures

FIGURE 1: DOON (PG) COLLEGE OF AGRICULTURE SCIENCE & TECHNOLOGY, DEHRADUN	- 15 -
FIGURE 2: LOCATION MAP OF DOON (PG) COLLEGE OF AGRICULTURE SCIENCE & TECHNOLOGY	- 15 -
FIGURE 31: MINIMUM VENTILATION RATES	- 58 -
FIGURE 42: MINIMUM VENTILATION RATES	- 59 -

1 About Doon (PG) College of Agriculture Science & Technology

Doon (PG) College of Agriculture Science & Technology is one of the best agriculture science colleges in Dehradun India, Doon (P.G) College of Agriculture Science and Technology (DCAST), an institution known as agricultural science college, provides various learning opportunities in the agricultural field along with multiple career options.

The college programs impart structured management skills to the new generation of students, making us one of the best agriculture science colleges in India.

Our Colleges-Doon (P.G.) Paramedical College and Hospital (DPMC&H); Doon (P.G.) College of Agriculture Science and Technology (DCAST); Doon (P.G.) College of Agriculture and Allied Sciences (DCAAS) and Doon Valley College of Education (DVCE), , are being run under two societies, namely Ch. Charan Singh Memorial Educational Society and Maharani Lakshmi Bai Memorial Educational Society.

Ch. Charan Singh Memorial Educational Society, named in the honour of stalwarts Ch. Charan Singh, was established in 1987 with objective to provide education, research and training to aspiring youth of Uttarakhand and the country in order to increase their employability. The inspiration drawn from untiring and ceaseless endeavor of Ch. Charan Singh's work gave our societies a dynamic thrust.

- Department of Agriculture
- Department of Horticulture
- Department of Forestry
- Department of Management
- Department of Hotel Management
- Department of Computer Application
- Department of Chemistry
- Department of Botany
- Departmental of Environmental Science
- Department of Zoology
- Department of Library Science
- Department of Education
- Department of Mass Communication

2 Project Background

2.1 Background

Buildings in the education sector contribute to over 230 million tons of CO₂ emissions per annum approximately in India. The need for water, land and resources are growing enormously as more educational and institutional developments are underway to accommodate the ever-burgeoning population of India. There is growing interest in many up and coming universities today, to frame practical strategies for resource savings, conservation and waste reduction to make centers of learning deliver excellence in terms of sustainable green campuses and sustainable communities, at large.

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. Green Audit is the most efficient and ecological way to manage environmental problems. It is a kind of professional care which is the responsibility of each individual who are the part of economic, financial, social and environmental factor. It is necessary to conduct green audit in college campuses because students become aware of the green audit, its advantages to save the planet and they become good citizens of our country. Thus, green auditing becomes necessary at the college level.

As a first step, Doon (PG) College of Agriculture Science & Technology is undertaking a comprehensive Green and Environmental Auditing of campus to understand the energy and water use patterns and identify opportunities for improvement. The main objective of this appraisal report, supported by technical experts from GreenTree, is to provide a technical assessment of energy, water and resource conservation opportunities and their projected savings.

Going forward, the report will identify opportunities for water efficiency measures and also ascertain suitable retrofits and technology for these measures. Ultimately, the audit report should ensure that the agreed-upon conservation measures, when implemented, would enable the campus to minimize energy, water and resource consumption and adhere to statute requirements such as the National Building Code 2016.

Green and Environmental Auditing is **NOT a fault-finding exercise**, but an approach to identify energy, water and resource saving opportunities and scope for performance improvement.

Before initiating Green and Environmental Auditing process, it is necessary to understand the scope of the audit and amount of efforts required to complete the desired activity. The type of energy audit mainly depends on the category of building, the depth to which final audit is needed, and the potential and magnitude of cost reduction desired. The objective of this study was to find answers to the following questions:

- What is the benchmark for water consumption?
- Is water use monitored and recorded?
- How are water leaks checked?
- Is there a management team constituted for the university?
- Identifying water conservation opportunities
- How much energy is used?
- Identify obvious sources of energy waste or inefficiency
- Identify areas for further, more rigorous study
- Identify the scope of improvement based on measurement
- What is the technical and economic potential?
- What are the risks involved in execution?

It is worth mentioning that auditing is not a means to an end. It is a technique to identify opportunities for energy, water and resource savings. The campus management team must act on the findings of the audit report and implement the identified opportunities in order to realize savings.

3 Approach & Methodology

During the study, the entire building was visited and studied in detail. The audit involved carrying out various measurements and analysis covering all major energy, water and resource consuming sections, to realistically assess losses and potential for savings. The study focussed **on improving energy, water and resource use efficiency** and identifying saving opportunities. A very simple indigenized system has been devised to monitor the environmental performance of Doon (PG) College of Agriculture Science & Technology. It comes with a series of questions to be answered on a regular basis. This innovative scheme is user friendly and completely voluntary. The aim of this auditing report is to help the institution set environmental examples for the community and to educate the young learners.

A pre-audit meeting provided an opportunity to reinforce the scope and objectives of the audit and discussions were held on the practicalities associated with the audit. This meeting was an important prerequisite for the green audit because it was the first opportunity to meet the university concerned personnel for audit and deal with any concerns.

The major areas of study are broadly categorised into:

- Electrical Systems
- Air conditioners, Lighting and Fan
- Solar PV installation
- Water consumption
- Waste generating indicators
- Health indicators
- Transportation
- Training & awareness

The methodology adopted for the audit study is as follows:

Data Collection: This includes details like:

- Water use patterns and demand study
- Inventory of toilets, wash basins and urinals
- Energy performance indexing
- Waste management and type of waste generated
- Sound- based polluters for health auditing
- Food procurement and disposal
- Custodial chemical use
- Transportation
- Paper use, etc.

The data is collected includes maximum demand, units consumed, litres consumed and conserved, etc.

During the audit, there was continuous interaction among the audit team, GT Team and local officials, to ensure that the suggestions made are realistic, practical and implementable to allow for possible concurrent implementation.

4 Introduction

Doon (P.G) College of Agriculture Science and Technology is one of the best agriculture science colleges in dehradun India, Doon (P.G) College of Agriculture Science and Technology (DCAST), an institution known as agricultural science college, provides various learning opportunities in the agricultural field along with multiple career options.

Figure 1: Doon (PG) College of Agriculture Science & Technology, Dehradun



Figure 2: Location Map of Doon (PG) College of Agriculture Science & Technology



Table 1: General information of Doon (PG) College of Agriculture Science & Technology

Building Category	Educational
Name of the Building	Doon (PG) College of Agriculture Science & Technology, Dehradun
Building Occupancy	4500 ppl approx

5 Environmental and Green Policy Statement

The Doon (PG) College of Agriculture Science & Technology, Dehradun is committed to managing its estates in accordance with responsibilities to the environment. These responsibilities shall be demonstrated within the following areas as a minimum. The policy shall be reviewed annually or as per requirement.

1. **Tobacco Free premises:** The university administration pledges to make the premises totally tobacco free. No tobacco products shall be allowed to inside the University campus.
2. **Purchasing:** In purchasing its services, materials, equipment and consumable items, the university will, where possible, purchase items produced in ways which do least environmental harm, which are not supplied with excessive packaging; which are benign or at least harmless in their effect on the environment. Where possible, preference will be given to local or regional suppliers to maximize the university input to the local community as well as reduction of environmental impact due to transportation.
3. **Cleaning:** The University shall use cleaning products based on environmental considerations as well as cost and suitability. It will monitor its working practices with a view to administering dosages so as to reduce the risk of over concentration and excess residue of unused cleaning mixtures finding their way into piped waste disposal systems.
4. **Waste Disposal and Recycling:** The University will seek to minimize its generation of waste by reduction of purchased materials where this does not compromise its primary functions, or by re-use of materials within or outside the university campus. Where reduction or re-use is not feasible, materials will be recycled wherever possible.
5. **Energy:** The University is environmentally responsible for its use of energy and will therefore consider the sources, type, origin and destination of energy input and output throughout the university. This will require careful monitoring of consumption, the elimination of excessive or unnecessary use, and an ongoing program of energy conservation. Renewable energy solar PV plants shall be installed and in future also efforts shall be made to use renewable energy to the extent possible for mitigation of impact of energy use by university on environment.
6. **New Build and Building Refurbishment:** The University will ensure that whenever new construction or refurbishment, work is planned and executed in a manner which reflects environmentally-responsible approaches defined by the National Building Code-2016.
7. **Green Travel Plan:** The University actively promotes the use of public transport, walking and cycling. The university owns vehicles and requires staff where possible to use public transport when on University assignments. This plan is regularly reviewed. The travel of students shall also be encouraged through public transport for those who are not using shared university buses for commuting to and from university.
8. **Food Policy:** The university will ensure that decisions pertaining to the purchase of food, together with the use and disposal of plastic crockery/cutlery, should at all times include environmental implications as well as such factors as cost and nutritional value.

9. **Environmental Rules and Guidelines:** The University is committed to ensuring compliance to extant pollution control and other applicable environmental guidelines.
10. **Water Use:** The University intends to promote optimization of water use by avoidance of wastage, treatment and re-use of black water for other possible uses.
11. The university also commits for **Plastic free environment** in university premises.

6 Target Areas of Green Auditing

Green audit forms part of a resource management process. Although they are individual events, the real value of green audits is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient use of energy and water; Minimize waste generation or pollution and also economic efficiency.

All these indicators are assessed in process of “Green Auditing of educational institutes”. Eco-campus focuses on the reduction of contribution to emissions, procure a cost effective and secure supply of energy, encourage and enhance energy use conservation, promotes personal action, reduce the institute’s energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts. Target areas included in this green auditing are **water, energy, waste, green campus and carbon footprint**.

7 Water Audit

The Water Audit in the Site Campus has still to be finished and conducted so that the real potential as well as the Total Consumption along with the Savings the Campus can give can be highlighted.

The Campus is rigorous to implement services for saving and reducing its water needs as well as installing new techniques to achieve it which are as follows:

1. Installed a Sewage Treatment Plant to reduce the intake of Municipal Water.
2. Planting Local Trees and Shrubs to reduce Landscape Water Demand
3. Will Install Water Efficient Urinals and Sinks to reduce the flow and consumption.

OBSERVATIONS

Table 2: Observations and Recommendations

S.No.	Observation/Parameters	Yes/No	Recommendations
1	Is there any bench mark for water use	No	The bench mark should be got prepared for improvement on the basis of NBC-2016 and fixing targets for improvement. The consumption of water should be adjusted as per variation in occupancy whenever there is any change in occupancy is envisaged.
2	Is consumption of water as per NBC-2016 standard for use of water as applicable	DNA	Further reduction targets should be fixed for reduction
3	Is the water use monitored and recorded?	No	Establish procedures so that a staff member is responsible for reading your meter daily, analysing water use and knows what to do if water use changes unexpectedly. Record the data.
4	Is the water conservation opportunities identified	No	The water audit recommendations should be followed for exploring opportunities.
5	Are there any signs, posters or stickers in college premises to encourage water efficiency and remind students to report leaks?	Partial	Suitable water conservation stickers and bills should be displayed conspicuously for creating awareness
6	Is there any system in place where leaks are specifically checked during special drives for any leaking /damaged pipes, taps or cisterns etc.	No	There should be a written periodical program for addressing any type of leaks in water lines.
7	Is there any water management team to review water use?	No	Establish a water management team and meet regularly to review use and identify water saving opportunities. Consider involving students, teachers, administrative staff and even parents, visitors and volunteers.
8	Have you developed a water management plan?	No	Use the results of this checklist and your water audit to develop a water action

			plan, set goals for water savings and promote this throughout the university.
9	Have you installed sub-meters in high water using areas?	Yes	The Site has installed water meters for several sub metering locations to better monitor the water consumption and usage. The Site has been also been informed to establish a record book for better management of water.

S.No.	Observation/Parameters	Yes/No	Recommendations
Amenities			
1	Are water efficient showers installed in toilets?	No	install flow regulators to reduce flow to at least 9L/min Also consider shower timers by restricting the time of shower used by students through awareness and displaying stickers and bills and regular briefing through concerned members of staff.
2	Are the taps in hand basins are water efficient?	No	Install flow regulators to reduce flow to at least 4.5L/min: If taps are used only for hand washing, consider a flow rate as low as 1.7L/min for super efficiency.
3	Do cleaners hose down amenity areas?	No	If you must use a hose ensure it has a water efficient trigger nozzle.
4	Does your College have single flush toilets?	Yes	consider replacing single flush toilets with 6/3L or 4.5/3 L dual flush models, specially being a girls college there is always a huge saving potential because through awareness students can be encouraged to use low quantity flushing only in case of using WC as urinal as is the case most time of use of toilet.
5	Does your College have dual flush toilets?	Partial	Same as point No.4 above.
6	Do you have a single tank on the wall or urinal flush rate system?	yes	Ask maintenance staff to check the flow rate and flush timing. Over time wear will cause excessive flush volumes. Insert flow regulators into valve bodies to reduce flow.
7	Does your College have any cyclic flushing urinals?	No	Still considering replacement with manually flushing urinals, automatic sensor units or ultra-low-flow or waterless urinals for Gents toilet.

S.No.	Observation/Parameters	Yes/No	Recommendations
Canteen, Mess, Hand Wash Area			
1	Are taps in kitchens water efficient?	No	If No, install 7.5L/min flow restrictors on kitchen/art room sinks. Tip: Pre-rinse spray nozzles in kitchens can use less than 6L/minute and make it easier to rinse and clean dishes.
2	Do Kitchens have water efficient dishwashers?	No	Consider using water efficient model dishwasher. You will save money through water and energy savings.

3	Do staff leave taps running while they are cooking and cleaning?	No	Still, install stickers to remind staff to turn off taps. Consider installing sensor taps.
DNA: Data not available			
Outdoor areas			
1	Has appropriate staff completed the Water Conservation training	Partial	Staff had participated in one day workshop on Water Conservation but a training would be a better method to incorporate the idea.
2	Do campus sub-meter irrigation water supply?	Yes	Water meter has been installed to monitor the Consumption of Irrigation Usage.
3	Are you watering on your allocated watering days?	Yes	The Watering is done on early mornings with time slot allocated for the management to implement.
4	Do you improve your soils? Y	Yes	The Soil Management Techniques are implemented to improve the quality of the soil and life of plants.
5	Do you use an alternate water source to irrigate your landscape?	yes	STP (Sewage Treatment Plant) has been installed to conserve and treat Grey water and been used for irrigation watering purposes.
6	Do you have Water wise /Water efficient Plants in your garden?	Yes	A lot of native species have been planted there by reducing water requirement.
7	Is your irrigation system Water wise?	Yes	Only staff is to be educated that they should be careful to ensure that water is not falling on hard scape.
8	Do you have mulch on your garden beds?	Partial	Use water wise mulch to reduce evaporation and save water.
9	Do you have under-utilised areas of lawn in your landscape?	No	The Site has considered lawn in these areas with water wise gardens to reduce water use.

S.No.	Observation/Parameters	Yes/No	Recommendations
Training and Awareness			
1	Whether staff in general are aware about importance and need of water conservation	Yes	The awareness should be created more amongst all maintenance and operation staff for better quality of knowledge on Water Conservation.
2	Whether there are training modules/sessions for training of staff on topic of importance of water conservation.	No	Regular training should be conducted
3	Whether there is a program for sensitizing students through workshop/seminars to educate them regarding scarcity of water and its conservation	Partial	There should be some program to create awareness amongst students through training

4	Whether there is a program in place to involve students in water conservation targets.	No	There should be active involvement of students, they being helpful in college as well as it shall be useful for them during their life time in future.
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Bench Marking as per NBC-2016

Table 3: Benchmarking as per NBC-2016

S. No.	Type of Use	Per Capita -Litres per Day-As per NBC-2005	Total Daily requirement- Litres-Best Practice	Total Daily requirement-Litres-Typical use
1.	Day Time use	45	To be decided by Management	
2.	Hostel Stay	135	To be decided by Management	
3.	Visitors	15	To be decided by Management	

The water flow has been reduced from 8-10 litres per minute to 4 to 6 litres per minute by closing of valves which may not be a permanent solution. It is recommended that all taps should be got changed with low flow taps as and when these are due for change and there should be an annual plan to replace 10 to 20 % of taps commencing from high use toilets.

Inventory of Toilets- Doon (PG) College of Agriculture Science & Technology

Table 4: Inventory of Toilets

S.No.	Details of Toilet	HE-Toilet	She-Toilet	Differently Abled Toilets	VIP attached with office
1	Admin Building	1	0	0	2
2	Library	2	2	0	2
3	Main Block – 1	4	4	0	1
4	Main Block - 2	14	12	0	0
5	Girls Hostel-A	0	10	0	0
6	Boys Hostel	10	0	0	0
7	Auditorium	4	4	0	2
8	Mess	2	2	0	0
9	Food Court	2	1	0	0
	Total	39	35	0	7

Details of Wash Basins and Urinals

Table 5: Details of Wash Basins and Urinals

S.No.	Description	WB in each toilet	Total Wash basin	Urinal	Total Urinal
1	Gents	3	9	4	12
2	Girls Toilet	3	9	0	0
3	VIP/Attached Toilet	2	2	0	0
	Total	8	20	4	12

RECOMMENDATIONS TO OBSERVATIONS

Table 7: Action Steps

ACTION STEPS – Design and Construction	
A	Reduce water consumption through efficient fixtures and plumbing design.
1	Efficient plumbing design. Two stack system design
2	Sub metering of water for separate uses.-Bore well, Landscaping, Labs
3	Efficient fixtures such as low flow taps, shower heads and toilets and Water less urinals as per applicability in Gents Toilet.
4	Efficient appliances for catering and other uses with specified water efficiency standards.
5	Recycle water using Grey Water systems. Being done –recycled water data be maintained
6	Rain water is stored in multiple storage tanks and is used inside premises as per requirement.
7	Landscaping and site layout should avoid run-off by creation of Sustainable Urban Drainage Systems. Design documentation is required for establishing zero run off from premises during rain based on rain fall pattern.
8	Automatic shut off of Pump should be installed so that there is no wastage of water and Energy.
9	Log Book for running of Pump to be maintained
10	Check Leakage through internal audits-Weekly
OPERATION & MAINTENANCE	
	Once the building is operational, further reductions in water use can still be made depending on how efficiently the building is run.
1	Efficient fixtures and fittings reduce the amount of flow of water; however, it is equally important that water use is periodically assessed or audited to detect wastage caused either by the users or due to leakage. This will also help the building management in devising appropriate strategies for water conservation.
2	Campus do not have actual metered data to know exactly how much water is being consumed by them. Such organizations hence normally end up spending more on energy on bore well water as in this case and pose a threat to sustainability through wastage of water. The record of extraction/consumption/STP be prepared.
3	Such existing and even new buildings of campuses can reduce their water consumption simply and inexpensively by auditing water use and identifying appropriate water-saving measures
4	Install push button type individual manual urinal flushing system
5	Repair, replace leaking taps

Table 8: Plant factor for various species

APPENDIX 5B: LANDSCAPE WATER DEMAND REDUCTION

Table 1 Plant factor for various species

Plant species	Plant factor
Lawns	1
Native grass	0.45
Existing native trees	0
Newly planted native shrubs	0.3
Newly planted exotic shrubs	0.9
Newly planted native trees	0.15
Newly planted exotic trees	1.65

Table 9: Plant factor and irrigation system efficiency

Plant species	Plant factor
Vertical gardens	0.35
Newly planted native shrubs on podium	1.3
Newly planted exotic shrubs on podium	1.9
Newly planted native trees on podium	1.15
Newly planted exotic trees on podium	2.65

Note: For potted plants, calculate the water requirement as volume of pot and divide it by 4.

Table 2 Irrigation system efficiency

Type of Irrigation system	Efficiency (%)
Flood	65
Furrow	80
Sprinkler	85
Drip	90

RECOMMENDATIONS FOR PLANNING SUCCESSFUL WATER MANAGEMENT

1. Water management plans must be part of an integrated approach that examines how changes in water use will impact all other areas of operation.
2. Water conservation involves two distinct areas: technical and human. The technical side includes collecting data from water audits and installing water- efficient fixtures and procedures. The human side involves changing behaviours and expectations about water usage and “the way things should be done.” Both areas must be addressed for a water conservation program to succeed.
3. A water conservation plan depends upon accurate data. Before water saving measures are implemented, a thorough water audit should be conducted to determine where water is being used. Then, water use can be monitored to track conservation progress.
4. A successful water conservation plan follows a logical sequence of events. Implementation should be conducted in phases, starting with the most obvious and lowest-cost options.

5. An effective plan examines not just how much water is being used, but how it is used and by whom. When analysing a water audit, ask the next question: "Can this process be done as well or better using less water?"
6. The quality of water needed should be matched with the application. Many commercial, institutional, and industrial applications do not require the use of potable water. Whenever possible, substitute recycled water used in one process for use in another.
7. The true cost of water must be considered when conducting a cost analysis. The true cost of water is the amount on the energy PLUS the expense to heat, cool, treat, pump, and dispose of/discharge the water.
8. Life-cycle costing is the key to evaluating water conservation options. Don't just calculate the initial investment. Many conservation retrofits that appear to be prohibitively expensive are actually very cost-effective when amortized over the life of the equipment.

8 Waste Management Audit

Pollution from waste is aesthetically displeasing and results in large amounts of litter in our communities which can cause health problems. Plastic bags and discarded ropes and strings can be very dangerous to birds and other animals.

This indicator addresses waste production and disposal, plastic waste, paper waste, food waste, and recycling. Solid waste can be divided into two categories:

8.1 General waste and Hazardous waste:

General wastes include what is usually thrown away in homes and schools such as garbage, paper, tins and glass bottles. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals and petrol. Unscientific landfills may contain harmful contaminants that leach into soil and water supplies, and produce greenhouse gases contributing to global climate change.

Furthermore, solid waste often includes wasted material resources that could otherwise be channelled into better service through recycling, repair, and reuse. Thus, the minimization of solid waste is essential to a sustainable campus. The auditor diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems. It is therefore essential that any environmentally responsible institution examine its waste processing practices.

E-Waste: The old computers are sold back to vendor which is again put to beneficial use by repairing and it is good sustainable practice.

Key Boards and mouse: Computer paraphernalia which become un-serviceable are also disposed off. It is required to be ensured that vendor dealing with E-waste is authorised to collect E-waste.

Hazardous Waste: Lead Acid Cell Batteries are returned to Vendors for re-cycling of lead and other constituents.

Fluorescent tubes: Fluorescent tubes are handed over to Junk dealer who in turn should send them to local re-cycling units. Storage of fluorescent tubes in college should be as per recommended practice.

Waste Mobil oil: Waste oil is stored and used for lubricating door hinges and oiling of shuttering material.

9 Energy Management Audit

Energy cannot be seen, but we know it is there because we can see its effects in the forms of heat, light and power. This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, and vehicles. Energy use is clearly an important aspect of campus sustainability and thus, requires no explanation for its inclusion in the assessment. An old incandescent bulb uses approximately 60W to 100W while an energy efficient light emitting diode (LED) uses only less than 10 W. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is, therefore, essential that any environmentally responsible institution examines its energy use practices. LED use also has a peculiar advantage towards environment that LEDs do not use any mercury as is the case of CFLs or Fluorescent tubes.

Table 20: Energy Performance Index

Year	Month	Units Consumed	Unit Rate	total Amount
2020	January	NA	5.6	0
	February	NA	5.6	0
	March	NA	5.6	0
	April	NA	5.6	0
	May	NA	5.6	0
	June	NA	5.6	0
	July	NA	5.6	0
	August	NA	5.6	0
	September	7280	5.6	40768
	October	6040	5.6	33824
	November	7920	5.6	44352
	December	NA	5.6	0
2021	January	11640	5.6	65184
	February	NA	5.6	0
	March	NA	5.6	0
	April	7628	5.6	42716.8
	May	7516	5.6	42089.6
	June	8336	5.6	46681.6
	July	11072	5.6	62003.2
	August	13232	5.6	74099.2
	September	11820	5.6	66192
	October	10112	5.6	56627.2
	November	NA	5.6	0
	December	13200	5.6	73920
2022	January	10212	5.6	57187.2
	February	14756	5.6	82633.6
	March	NA	5.6	0
	April	20276	5.6	113545.6
	May	21952	5.6	122931.2
	June	21536	5.6	120601.6
	July	NA	5.6	0
	August	NA	5.6	0
	September	NA	5.6	0
	October	NA	5.6	0
	November	NA	5.6	0
	December	NA	5.6	0

The Total Consumption from the Bills collected is coming to be 204528 units and the Total Amount as per the Unit Rate of 5.6 Rupees / unit sums to be = 1145356.8 Rupees.

The Energy Consumption of the Campus is still in very Controlled rate but in order to set an benchmark well reduce the Total Annual Consumption with the help of solar PV and Solar Hot water systems. This will incorporate higher energy savings resulting in better yield and return for the investment done.

Also, the campus has been recommended to use energy Efficient Lights Fans and Motors pumps as well for further reduction of Energy Consumption.

The Campus has installed a 10 kWp of Solar PV System 5 kW each for the one campus also 5 kW for the other campus and the site has also installed a 4 KLD of Solar Hot Water to cater the Hot water requirements.

RESULTS

 Print Results

14,918 kWh/Year*

Month	Solar Radiation (kWh / m ² / day)	AC Energy (kWh)
January	4.44	1,075
February	5.22	1,124
March	6.21	1,440
April	6.93	1,505
May	6.73	1,490
June	5.83	1,255
July	4.57	1,044
August	4.55	1,045
September	5.60	1,236
October	6.15	1,417
November	5.20	1,183
December	4.61	1,103
Annual	5.50	14,917

Figure 3: Solar PV Generation as per 10 kW System

10 Green Campus Management Audit

Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities. In one year, a single mature tree absorbs up to 48 pounds of carbon dioxide from the atmosphere and releases it as oxygen. The amount of oxygen that a single tree produces is enough to provide one day's supply of oxygen for people. Trees on campus impact our mental health as well; studies have shown that trees greatly reduce stress, which a huge deal is considering many students are under some amount of stress.

10.1 Types of waste generated on campus

For safe handling and management of hazardous waste in an environmentally sound manner, Govt. of India has notified the Hazardous Waste (Management & Handling) Rules, 1989, under the Environment (Protection) Act, 1986. However, these Rules were suppressed with re notification of the Hazardous Wastes (Management, Handling and Tran's boundary Movement) Rules, 2008. Under the said Rules, hazardous waste has been defined as those wastes which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or substances, and shall include wastes as specified in Schedules of the Rules.

1. Solid waste- Extra waste is removed weekly through truck and disposed in municipal waste collection points
2. Dry leaves - Used in college for making manure/compost
3. Canteen waste - Used for Compost in college
4. Liquid waste - Preserved and used in college
5. Glass
6. Unused equipment - Returned to vendors through sale
7. Napkins - Handling not established
8. Plastic waste - Segregated and removed

Methods of managing waste generated on campus

1. Composting
2. Recycling
3. Reusing

11 Indoor Comfort Temperature and Humidity Profile

As the Climate is a Colder Climate in the City of Dehradun. The RH levels are profound to be in satisfactory level which meets the Criterion highlighted and also the Required Levels of RH is been enclosed in the Table below.

Relative humidity Spaces	Required %
Campus	40 - 70
Classroom	25 - 40
Library	15 - 30
Staff room	15 - 30
Mess	30 - 50
Canteen	40 - 70

Table 6: Required Levels of Relative Humidity (%)

12 Weather monitoring system

The WMS uses high accuracy sensors for the measurement of radiation, albedo, wind speed, wind direction, air temperature, humidity, module temperature, soiling, and other parameters.



13 Bio-gas plant

Biogas or gobar gas is a clean, unpolluted and cheap source of energy in rural areas. It consists of 55–70% methane which is inflammable. Biogas is produced from cattle dung in a biogas plant commonly known as gobar gas plant through a process called digestion.



14 Vermi-compost unit

Vermicompost (vermi-compost) is the product of the decomposition process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a mixture of decomposing vegetable or food waste, bedding materials, and vermicast. This process is called vermicomposting, while the rearing of worms for this purpose is called vermiculture. Vermicast (also called worm castings, worm humus, worm manure, or worm faeces) is the end-product of the breakdown of organic matter by earthworms. These excreta have been shown to contain reduced levels of contaminants and a higher saturation of nutrients than the organic materials before vermicomposting. Vermicompost contains water-soluble nutrients and is an excellent, nutrient-rich organic fertilizer and soil conditioner. It is used in gardening and sustainable, organic farming. Vermicomposting can also be applied for treatment of sewage.[citation needed] A variation of the process is vermifiltration (or vermidigestion) which is used to remove organic matter, pathogens, and oxygen demand from wastewater or directly from blackwater of flush toilets.



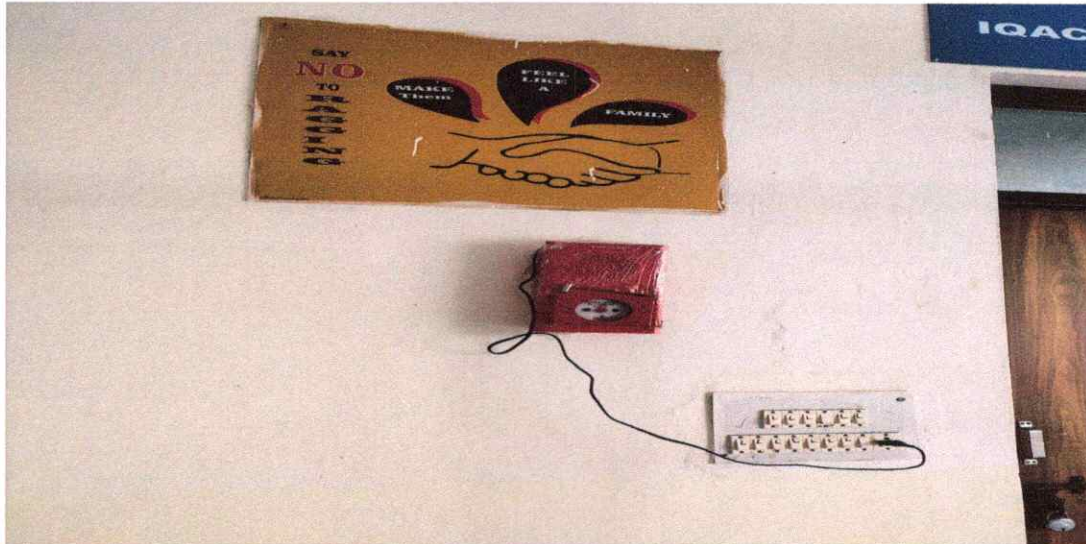
15 Rain water harvesting system

Rainwater harvesting (RWH) is the collection and storage of rain, rather than allowing it to run off. Rainwater is collected from a roof-like surface and redirected to a tank, cistern, deep pit (well, shaft, or borehole), aquifer, or a reservoir with percolation, so that it seeps down and restores the ground water. Dew and fog can also be collected with nets or other tools. Rainwater harvesting differs from stormwater harvesting as the runoff is typically collected from roofs and other surfaces for storage and subsequent reuse. Its uses include watering gardens, livestock, irrigation, domestic use with proper treatment, and domestic heating. The harvested water can also be committed to longer-term storage or groundwater recharge.



16 Fire alarm system

A **fire alarm system** warns people when smoke, fire, carbon monoxide or other fire-related or general notification emergency emergencies are detected. These alarms may be activated automatically from smoke detectors and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points or pull stations. Alarms can be either motorized bells or wall mountable sounders or horns. They can also be speaker strobes which sound an alarm, followed by a voice evacuation message which warns people inside the building not to use the elevators.



17 Noise Pollution

1. **Sounds of Normal Conversations:**
 - a. Sound Intensity: 40-60 dB
 - b. Health Hazard: Sound less than 80 dB is safe for the ear.
2. **Sounds emanating from Tape recorders or an Orchestra:**
 - a. Sound Intensity: 70 dB
 - b. Health Hazard: It is safe for ear.
3. **Sounds of Heavy Traffic:**
 - a. Sound Intensity: 90 dB
 - b. Health Hazard: Constant exposure to sound greater than 80 dB causes temporary hearing loss and if they are not treated immediately, causes permanent impairment.

18 Health Audit

There are no health issues experienced by staff and students by virtue of their presence in campus.

19 Custodial Chemical Use

Chemicals for one-year requirement are used in labs and stored in a separate store. The store requires to be ventilated and hazard analysis should be done through Material Specification Data Sheet and record should be maintained. Proper ventilation with hoods should be designed.

20 Transportation

Most of students are using shared transport which is sustainable. Students are using Buses, Shared auto. There are no buses owned by the college. The consumption of HSD by buses is monitored for optimised consumption.

Teaching and Non-Teaching faculty is also sensitized for using pooled transportation for working towards sustainability and reducing resource use and encouragement of resource conservation.

21 Procurement Process

Procurement team is required to be made aware regarding procurement of good and services that are sustainable. The sensitization is required for all purchases in a way that optimized utilisation of natural resources is possible.

1. Paper with recycled content
2. AC's with Zero ODP Refrigerant
3. Environment-friendly housekeeping chemicals
4. Paints, adhesives, sealants with recommended percentage of volatile organic compound.

22 CPCB GUIDELINES

Exhaust of DG Sets are required to be raised as per CPCB requirement.

23 PAPER USE AND PRINTING GOALS

1. There are efforts already directed through use of E-Books for reducing the use of paper.
2. There are instructions to staff and student to resort to printing only if it is absolutely unavoidable.
3. Papers with recycled content should be purchased.

23.1 Paper use and Printing Goals

1. Distribute memos, reports, purchase orders and brochures electronically. Research electronic Purchase Orders for small amounts of money and “electronic signatures” for larger Pos
2. Encourage re-use of scrap paper for printing and note taking. Larger printers should have one dedicated tray for the reuse of scrap paper.
3. Print on letterhead paper only as needed; use electronic letterhead whenever possible
4. Network all printing to shared copiers/printers and eliminate stand-alone printers where possible
5. Discourage reckless printing and copying by requiring use of an account/password
6. Promote a ‘Think before you Print’ culture
7. Desktop drafting and editing of documents
8. Reduce default margin settings
9. Use toner-saving fonts (eg. Eco Font) or smaller-sized fonts
10. Single-spaced formatting on all documents - Include the “think before you print” message in the “green” PR Campaign
11. Encourage increased use of Blackboard as a paper-free resource
12. Training and Adherence - Distribute (an) email(s) with detailed instructions, including “screen shots” on how to change settings on computers, copiers, faxes, printers
13. Establish duplex (two-sided) copying and printing as standard

14. Phase out meeting handouts and distribute/project them electronically (this needs to be better defined).
15. Digitize forms and administrative processes. Continue replacing paper-based processes and administration.
16. Widespread adoption of print management / print-saving software (eg. Green Print). Identify volunteers (including Sustainability Council and VP for Finance and Admin) to participate in a 30-day trial to explore the benefits (savings, functionality and ease of use) of Green Print Software. Find ways to test this in student labs & other high-volume print areas
17. Double-sided student assignments as standard (with electronic submission, grading & return)
18. Faxes: phase out fax machines, utilize computer faxing, end use of fax cover pages
19. Increase electronic archiving and record keeping (this needs to be better defined and targets identified; work with Purchasing, Personnel, Academic Department and/or Student Records to be determined)

23.2E-Library

Despite fewer in number, the e-books have advantage of being used by multiple students/ faculty simultaneously and thus create better impact on sustainability in contrary to hard copies that can be read by only one person at a time.

The following recommendations are made:

1. Use of E-books be promoted for students and faculty members especially in present COVID situation.
2. No. of E-books made available should be increased continuously.
3. Training on sustainability should be provided.
4. Adaption be promoted considering it to be a new normal.

24 Training and Awareness

The college is regularly conducting awareness program for students and faculty members.

25 Governance

Through enactment of Environmental and Green Policy and its circulation to all stake holders, sustainability can be achieved. The results are regularly required to be verified at annual intervals. These can be managed through internal or external audits.

26 Plantation Policy of Doon (PG) College of Agriculture Science & Technology

We at Doon (PG) College of Agriculture Science & Technology, are committed for continual improvement of Environment. As Trees planted contribute towards improvement of the environment, college has enacted the policy of plantation for the benefit of people and society.

Planting a tree has long been a suggestion to better the earth, whether it is outcry and warning of global warming, water crisis or something else. Trees offer many environmental as well as economic and social benefits.

The university, with strategic vision of top management and active participation of students, faculty members, non-teaching staff and other staff shall solemnly promise to always work and participate in betterment of environment through continual plantation programs.

There shall be regular awareness program and through face to face interaction all stake holders shall be apprised of the benefits of plantation

The students of Doon (PG) College of Agriculture Science & Technology very well understand the importance of trees in our life and have taken a pledge to contribute their bit in making the college, cities, nation and world a better place to live. They all pledged to plant more and more trees with the time and take care of the plants and to provide with basic needs as and when needed.

The university has a policy to celebrate Tree Plantation week in university premises twice annually and commits to set a target to add 1% to the existing plantation annually.

Through these plantations of trees, life shall improve and essential needs of mankind will also be easily managed. Besides absorption of Carbon Dioxide, trees also support life by providing habitat to different species such as squirrels, bees and birds. Trees cleanse the climate by absorbing carbon dioxide from the environment and releasing oxygen. The trees cool the environment and also effects of global warming are mitigated.

We at Doon (PG) College of Agriculture Science & Technology, once again vow to plant trees as per policy, assure survival of trees by adequate maintenance and watering practices and species selected for plantation shall be such that have very minimal water requirement. We also shall decide optimally to have turf (Grass area) as per barest requirement for reduction of water foot print for horticulture use in university premises.

Plantation Program

Uttaranchal University has regular plantation programs and given above is the plantation policy and Inventory of different type of plant and trees.

SL. NO	Type of Tree
1.	Araucaria
2.	Thevetis Peruvina
3.	Palm Tree
4.	Guava
5.	Thuja Orientals
6.	Gurhal
7.	harsingar
8.	Agathis robust
9.	Chandni
10.	Ashok
11.	Rubber Plant
12.	Hagerstone
13.	Hedge
14.	Vinca Rosea
15.	Areca Palm

27 Disposal of Fluorescent Tubes

Consumer Level:

As per the present observed practice at consumer level in the society at large, often, the used lamps are collected by the kabari from the households and collectively handed over to the glass recyclers for the recovery of glass material.

This is all operative in a highly unorganized sector. It has, also, been observed that, the used lamps are thrown in the garbage bins and finally into the municipal garbage dumpsites, contaminating air, water and soil. Most of the used lamps are broken either at transit solid waste bins (provided by local civic authority) or broken during the transport to the final disposal site. A portion of the mercury, in vapor form, is released into the air; whereas rest of the mercury is released onto the soil with further possibility of getting into the surface and/or ground water bodies through the leachate from soil.

CONSUMER LEVEL –

Handling of Used/Broken Fluorescent Lamps (FLs): The consumers may handle and dispose the used lamps as described below:

Domestic Consumers: The consumer must ensure that (s)he does not throw used lamps in the general trash bin but hands them over (in a properly packed form) to a kabari (an individual) or a collection agency identified by an authorized Lamp Recycling Unit for proper recycle / disposal of used FLs.

The used intact FLs may be stored either in the same boxes in which new lamps are brought or other boxes of similar size. They should be stored upright. The due precaution may be taken while packing more than one used lamp, so as not cause the possibility of breakage during the storage and transportation.

Even, the broken FLs, after due clean-up, may be handed over for safe recycling and disposal.

Here are some guidelines for cleaning up a broken CFL:

1. Open a window and leave the room (restrict access) for at least 15 minutes. If you have fans, place the fans in the windows and blow the air out of the room. Note: If the room has no windows, open all doors to the room and windows outside the room and use fans to move the air out of the room and to the open windows.
2. Remove all materials you can without using a vacuum cleaner
3. Wear disposable rubber gloves, if available (do not use your bare hands) • Carefully scoop up the fragments and powder with stiff paper or cardboard
4. Wipe the area clean with a damp paper towel or disposable wet wipe
5. Sticky tape (such as duct tape) can be used to pick up small pieces and powder
6. Place all cleanup materials in a plastic bag and seal it, and then place in a second sealed plastic bag, dispose it properly and wash your hands after disposing of the bags.
7. The first time you vacuum the area where the bulb was broken, remove the vacuum bag once done cleaning the area (or empty and wipe the canister) and put the bag and/or vacuum debris, as well as the cleaning materials, in two sealed plastic bags in the outdoor trash or protected outdoor location for normal disposal.

Consumer Awareness: All the consumers, individual domestic consumers and bulk consumers (offices, institutions, large residential complexes, etc.) should get fully aware about the potential health impact of mercury-bearing lamps, through audio-visual media and the product leaflets. The precautions, to be taken while cleaning up the broken FLs should, also, be known to the consumers. As a part of such awareness programs, the consumers, even at individual level, are expected to participate actively with constructive suggestions and provide the feedback, for the overall success of mercury management in fluorescent lamp

Collection: The collection of used lamps may be done mainly by two ways: (i) Collection of used lamp (FLs) from bulk consumers may either be arranged by the management of above set-up (institutions, etc.) for direct disposal to LRU or by the LRU which may arrange to pick up used lamps from such collection sites through an identified collection agency. (ii) Collection of used lamps (FLs) from individual domestic consumer may be arranged by the LRU, either through kabaris (individuals appointed for the purpose by LRU) or an identified collection agency for door to door pickup.

Transportation: (i) The Handler (e.g. Kabari or representative of LRU) of used FLs in transit should take care of selection of proper vehicle and carriage so as to minimize breakage of used FLs. (ii) There should not be any intermediate transfer of materials in the transit stage. The collected used FLs should be straight transported to the LRF for further processing. (iii) The Handler should be trained to take care of mercury spills, if any, that takes place enroute the journey to LRU.

28 Refrigerant used in Air Conditioners

Figure 8: Refrigerant Specifications

Refrigerant	Global Warming Poetential	Ozone Depletion Potential
R 22	1810	Medium
R 410A	2088	Nil
R 32	675	Nil
R 134A	1430	Nil
R 290	3	Nil
R 600A	3	Nil

Recommendations

1. It is observed that recently procured Air conditioners have been procured which have high global warming and ozone depletion potential (with R-22) refrigerant. In future, care should be taken to purchase Air conditioners with refrigerants for which GWP is low and ODP is nil.
2. Life cycle cost should be considered for making decision about purchase of Air Conditioners.
3. All AC's that were procured more than 8 years ago should be replaced with best in class energy efficient Air Conditioners after taking into consideration Life Cycle Cost.

Figure 9: Refrigerants used in building

Refrigerant used in ac are - R-32 & R22 → Make - Voltas, Blues & Daikin
 3 stor & 2 stor

29 ECO FRIENDLY HOUSE KEEPING MATERIALS

Eliminate exposure to prohibited substances that can lead to long term health effects either through respiration / direct contact.

Mandatory Requirement Manufacturer to provide Material Safety Data Sheet (MSDS) for the products.

The MSDS should have the following details:

1. Chemical Identify
2. Manufacturer's information
3. Hazardous ingredients / Identify information
4. Physical, Chemical characteristics
5. Fire and explosion hazard data
6. Reactivity data
7. Health hazard data
8. Precautions of safe handling and use
9. Control measures
10. Emergency and first aid procedures

30 General Purpose Cleaners

Presently there is no practice for procurement of eco-friendly chemicals.

Eco friendly housekeeping materials are recommended to be used for all cleaning applications. Green Pro or any similar Indian standard should be procured in future and records of such procurement should be documented for future references.

The cleaning material may be required for following applications and also may be some other in addition to these.

1. Glass Cleaners
2. Bathroom Cleaners
3. Disinfectants and Sanitizers
4. Cleaner/Degreasers
5. Carpet and Upholstery Cleaners
6. Floor Cleaners
7. Liquid Hand Soap
8. Furniture Polish

31 Fire Safety

No halon-based fire extinguishers have been used. It is recommended that if fire suppression system is to be used for any fire extinguishing system, only clean agents with minimum environmental impact should be installed.

32 Canteen Waste-Handling practice

There are no signs provided in Mess and Cafeteria for avoiding food wastage and take food as per requirement and there should not be any food wastage. These signage's are required to be provided in all area where food is served or consumed.

1. All Hostel Mess
2. Canteen
3. Cafeteria

33 Sustainable Development

Sustainable development should always be practiced in all activities of university.

For design of any new future construction the following points should be given consideration and weightage:

1. Siting, form and design of building
2. External Development and Landscape
3. Envelope optimization
4. Shading of Building
5. Cool Roof practices
6. Sustainable Material
7. Water and Waste management
8. Building Services Optimization

The following construction practices should be followed for future construction

The framework for sustainable construction practices includes the following issues:

1. Pre-construction pre-requisites;
2. Planning for sustainable construction; demolition.
3. Planning, monitoring and control of environmental descriptors;
4. Sustainable work execution procedures;
5. Effective use of water;
6. Construction waste management;
7. Post-construction closeout;
8. Alternative use, de-construction, dismantling
9. Procurement Policy
10. Contractual Obligations towards Sustainable Construction
11. Identification of Sustainability Issues During Construction
12. Construction methods review and impact on sustainability
13. Consideration to environmental impact assessment
14. Considerations to social impact assessment
15. Prevention and management of construction accidents
16. Establishing Energy Consumption Data
17. Collection, Analysis, Documentation System and
18. Creating Benchmarks
19. Monitoring of performance of management systems and
20. Location of Infrastructure for Laborer's
21. Providing fire and life safety measures during construction

33.1 Water and Waste Management during Construction

1. Water Use During Construction
2. Control and Use of De-Watering Output
3. Management of Waste Water

33.2 Recycling

Rate of R-cycling should be monitored and maximised to extent possible. Conservation and Restoration Activities should always be preferred.

33.3 Use of natural resources and replacement of chemicals as much as possible

As far as possible avoid use of Chemicals and use natural resources.

33.4 Encourage use of local materials

Always encourage use of locally available material. With this we will help local population and their Social Development Index will get a boost. Also low energy shall be expanded on transportation that will ultimately save fossil fuels and make decision of an organization more sustainable.

33.5 Low VOC (Volatile organic compound) %

The following material contains VOC

1. Paints
2. Adhesives
3. Sealants
4. Other materials

It should be ensured that while procurement or issuing PO's for work, only material with permitted percentage of VOC are procured are used. Special conditions, if any, in contract/specifications should be incorporated. Team responsible for PMC shall ensure that material brought to site and used in execution of work is in compliance to Green specifications.

Figure 10: VOC limits of materials

Annexure I

VOC limits of materials

Type of Material	VOC Limit (g/L less water)
Paints	
Non- Flat (Glossy) paint	150
Flat (Mat) paint	50
Anti- corrosive/ anti-rust paints	250
Varnish	350
Adhesives	
Glazing adhesives	100
Tiles adhesives	65
Wood adhesive	30
Wood flooring adhesive	100

Figure 31: Minimum Ventilation Rates

Annexure II
Minimum Ventilation Rates in Various Functional Zones*

Occupancy Category	People Outdoor Air Rate Cfm/person	Area Outdoor Air Rate Cfm/ sq.ft
Correctional Facilities		
Dayroom, Guard station	5	0.06
Booking/ waiting	7.5	0.06
Education Facilities		
Daycare (through age 4), daycare sickroom, Art Classroom, science laboratories, college laboratories, wood, metal shop	10	0.18
Classrooms (ages 5-8), (age 9+), computer lab, media centre	10	0.12
Lecture Room/ hall (fixed seating)	7.5	0.06
Music/ theater/ dance,	10	0.06
Multi use assembly	7.5	0.06
Food & Beverages Services		
Restaurant dining rooms/ cafeteria/ fast food dining/ Bars/ Cocktail Lounges	7.5	0.18
General		
Break Rooms, Coffee stations, conference/ meeting	5	0.06
Corridors	-	0.06
Storage Rooms	-	0.12
Hotels, Motels, Resorts, Dormitories		
Bedroom/ living room, barracks sleeping areas	5	0.06
laundry rooms	5	0.12
Lobbies/ prefunction	7.5	0.06
Multipurpose assembly	5	0.06

Figure 42: Minimum Ventilation Rates

Occupancy Category	People Outdoor Air Rate	Area Outdoor Air Rate
	Cfm/person	Cfm/ sq.ft
Office Building		
Office Spaces, Reception Areas, Telephone, data entry, Main entry Lobbies	5	0.06
Electrical Equipment rooms	-	0.06
Elevator machine rooms	-	0.12
Pharmacy (prep area)	5	0.18
Photo Studios	5	0.12
Shipping/ receiving	-	0.12
Telephone closets	-	0.00
Transportation waiting	7.5	0.06
Warehouses	-	0.06
Public Assembly Spaces		
Auditorium seating area, Place of religious worship, Courtrooms, Legislative Chambers, Lobbies	5	0.06
Libraries	5	0.12
Museums (children's)	7.5	0.06
Museum/ galleries	7.5	0.06
Retail		
Sales	7.5	0.12
Mall common Areas	7.5	0.06
Barber Shop	7.5	0.06
Beauty & nail salons	20	0.12
Pet Shops (animal areas)	7.5	0.18
Super Market, Coin operated Laundries	7.5	0.06

Figure 13: Minimum Ventilation Rates

Occupancy Category	People Outdoor Air Rate	Area Outdoor Air Rate
	Cfm/person	Cfm/ sq.ft
Sports & Entertainment		
Sports arena (Play Area), Gym, stadium (play area)	-	0.30
Spectator area	7.5	0.06
Swimming (pool & deck)	-	0.48
Disco/dance floor/ health club/ aerobics room/ weight rooms	20	0.06
Bowling alley (seating)	10	0.12
Gambling casinos/ game arcades	7.5	0.18
Stages, studios	10	0.06

* Total outdoor air flow in functional zone =

$$\left\{ \begin{array}{l} \text{Outdoor air flow rate required per} \\ \text{person as per the above table} \\ \times \\ \text{Zone population} \end{array} \right\} + \left\{ \begin{array}{l} \text{Outdoor air flow rate required per unit} \\ \text{area as per the above table} \\ \times \\ \text{Net occupiable zone area} \end{array} \right\}$$

33.6 Use of Low Impact material and Zero ODP material

Figure 14: Refrigerant Specifications

Refrigerant	Type	ODP	GWP	Atmospheric lifetime (years)
R12	CFC	0.9	8500	102
R22	HCFC	0.06	1700	13.3
R134a	HFC	0	1300	14
R407C	HFC blend	0	1610	36
R410A	HFC blend	0	1900	36
Ammonia (R717)	Natural compound	0	0	< 1
Propane (R290)	HC	0	3	< 1
R1234yf	HFC unsat.	0	6	Very low
R1234ze	HFC unsat.	0	6	Very low

Where ever relevant and applicable care should be taken to include in specifications use of low impact material and only zero ODP material shall be procured or used in execution of works by contractors/Vendors.

34 Photographs of the on-site Audit

Table 37: Photographic Observations

	<p>Water Meters are installed for multiple locations</p>
	<p>STP is installed and is in working condition to Recycle and reuse the Grey water back to reduce the Water Consumption.</p>



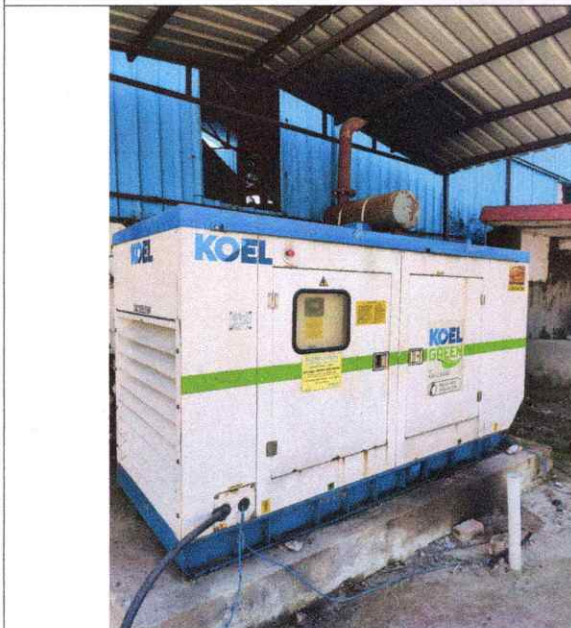
Energy Efficient Pumps and Motors are used.



Energy Efficient and HCFC Free Refrigerant based HVAC System



Dedicated Parking for Electrical vehicles is provided.



Stack Height of DG set exhaust is in contravention to CPCB guidelines.



20 kWp total Installed Capacity Solar PV System is been installed along with Solar Ho Water system to reduce the Energy Consumption of the site



Energy Efficient Lift System is been installed in the main block.



Water Urinals and Water taps were not found maintained and water efficient.



Smart TV are been installed to reduce the use of chalks and paper wastage.



Exhaust Fan is appropriately installed with gaps around Exhaust fan.

Efficient Fluorescent tubes installed with higher environmental impact due to more than double energy consumption than the efficient fixtures now available.



Halon Free Fire Suppression System is been installed. The locations are easily accessible and well placed throughout the Campus.

35 Audit Coordinator



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CERTIFICATE

This is to certify that Doon (PG) College of Agriculture Science and Technology, Selaqui, Dehradun has conducted Green Audit on their campus and has submitted necessary data in addition, credentials for scrutiny. The activities and measures carried out by the university have been verified based on the report submitted and was found to be acceptable.

The efforts taken by the Doon (PG) college of Agriculture Science & Technology Management, Faculties & Students towards Green Building, environment and sustainability is high appreciated and commendable.

Certified Energy Auditor (CEA-32073)

Name:- Mr Dhruv Jain

Organization:- GreenTree Global

Role in project: Energy Auditor



Signature: _____

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