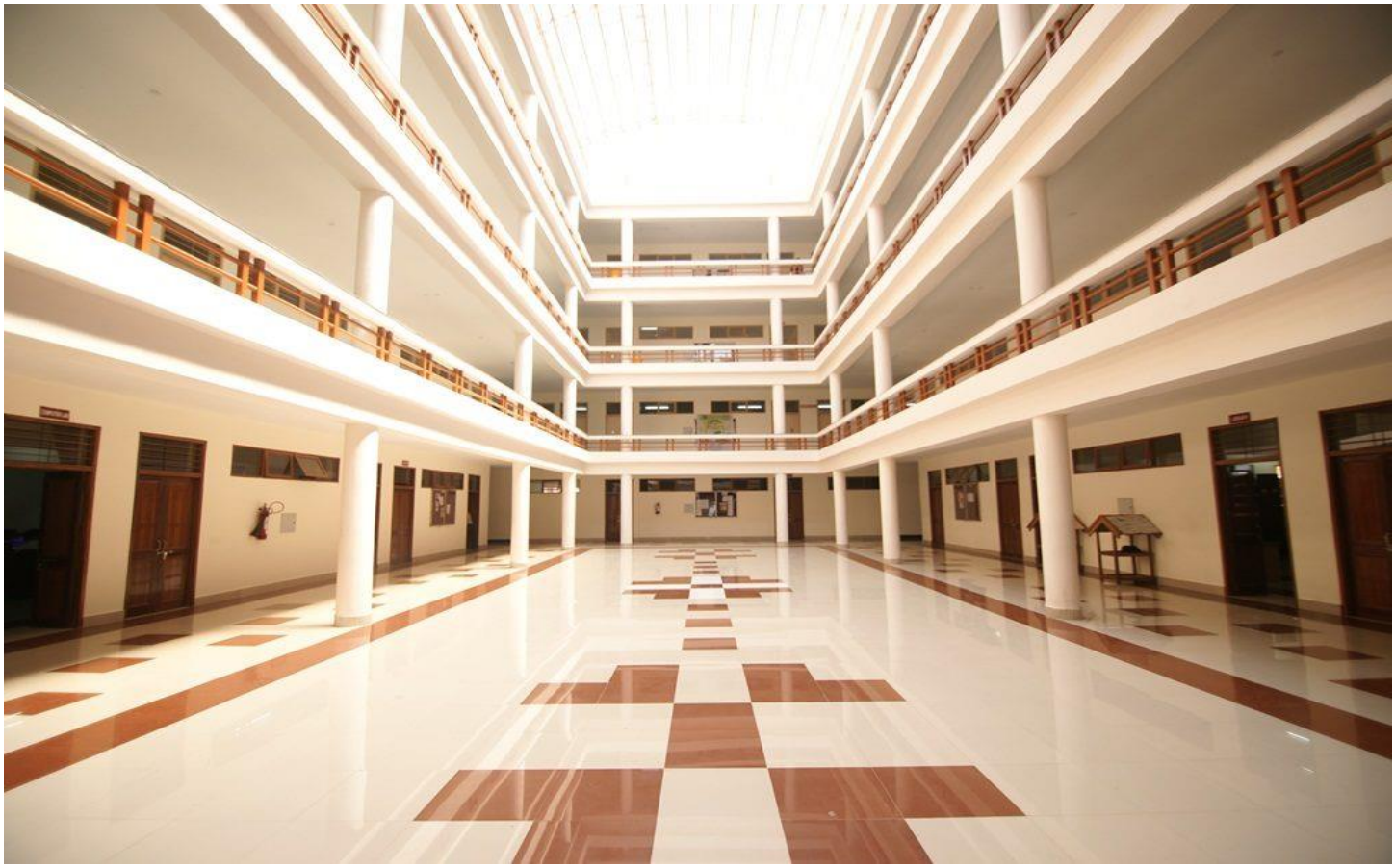
Green and Environmental Audit Report

Uttaranchal University, Dehradun

AUDIT REPORT



Energy and Environmental Audit report for Uttaranchal University, Dehradun

This report is developed for the Uttaranchal University 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.

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Disclaimer

This report has been produced for Uttaranchal University, 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.

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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 Uttaranchal University-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 Uttaranchal university 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 programmes 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 actualised or their potential is realised 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

List of Tables

List of Figures

1 About Uttaranchal University

Uttaranchal University is constituted with the merger of professional institutes of Sushila Devi Centre for Professional Studies & Research Society, namely Law College Dehradun, Uttaranchal Institute of Technology and Uttaranchal Institute of Management.

Uttaranchal University is one of the leading educational hubs of professional courses with innumerable students enrolled in different educational programs. It offers an array of multi–disciplinary courses making it a knowledge portal where excellence matters.

Uttaranchal University is located in a fascinating geological setting. It is flanked by NH-72 on one side and a beautiful broad slithering river on the other side. The pine trees surrounding the area lend a pristine and wholesome ambience to the campus.

The institute currently offers comprehensive facilities, cultural activities, wide range of academic courses and industry interface. Uttaranchal University offers multi-disciplinary study programs under its following institutes:

- Law College Dehradun (LCD) – Established in 2002
- Uttaranchal Institute of Technology (UIT) – Established in 2006
- Uttaranchal Institute of Management (UIM) – Established in 2006
- Uttaranchal Institute of Pharmaceutical Sciences (UIPS) – Established in 2016
- School of Applied & Life Sciences (SALS) – Established in 2016
- School of Agriculture (SOA) – Established in 2016
- University Polytechnic (UP) – Established in 2016
- School of Hospitality Management (SHM) – Established in 2018
- School of Media and Communication Studies (SMCS) – Established in 2018
- School of Liberal Arts (SLA) – Established in 2019

2 Project Background

2.1 Background

Buildings in the education sector contribute to over 230 million tons of CO_2 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, Uttaranchal University 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 Uttaranchal University. 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

Uttaranchal University is constituted with the merger of professional institutes of Sushila Devi Centre for Professional Studies & Research Society, namely Law College Dehradun, Uttaranchal Institute of Technology and Uttaranchal Institute of Management.

Uttaranchal University is one of the leading educational hubs of professional courses with innumerable students enrolled in different educational programs. It offers an array of multi–disciplinary courses making it a knowledge portal where excellence matters.

Figure 1: Uttaranchal University, Dehradun

Figure 2: Location Map of Uttaranchal University

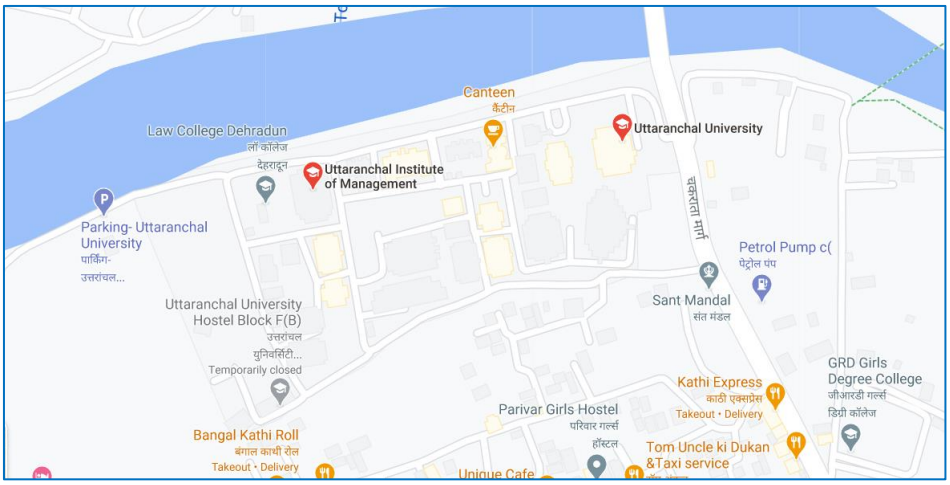


Table 1: General information of Uttaranchal University

Building Category	Educational
Name of the Building	Uttaranchal University, Dehradun
Total plot area as per site	84176.08 sq. mts.
Building Occupancy	6000 ppl approx

5 Environmental and Green Policy Statement

The Uttaranchal University, 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

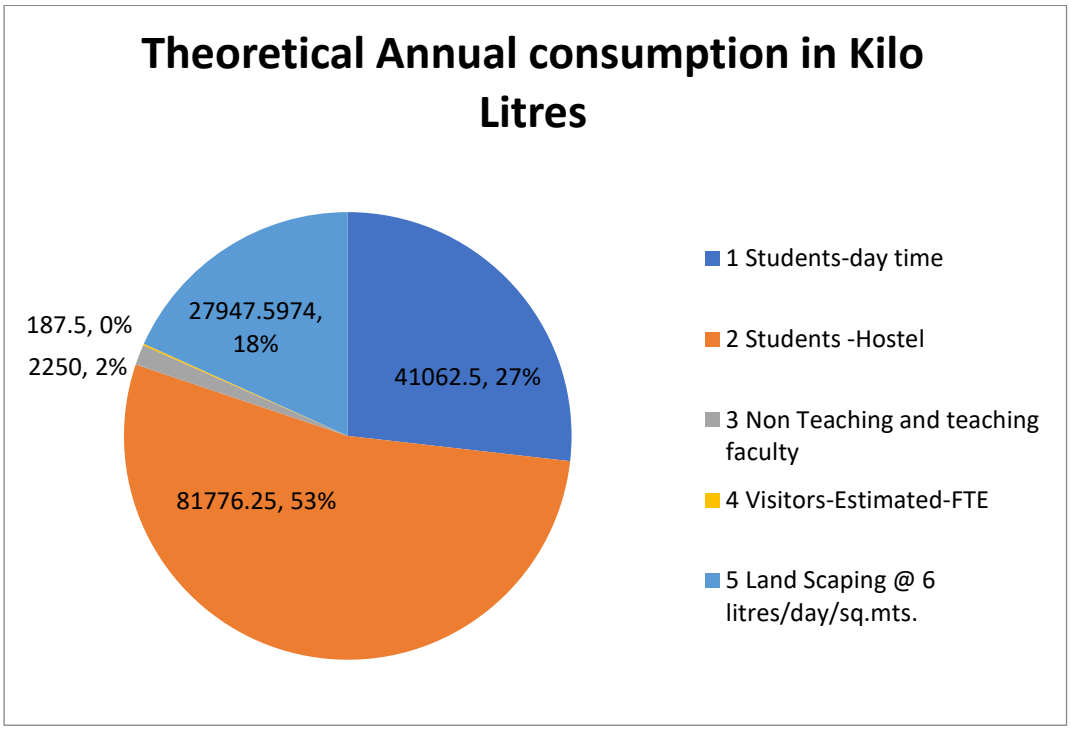
Green audit forms part of a resource management process. Although they are individual events, the real value of green audits is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient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

From Pie Chart it is observed that 53 % of total annual water consumption-Theoretical allowance is in Hostels due to 24-hour stay of students and it is followed by day time occupants like students and faculty members.

Figure 3: Overview of water consumption



The maximum conservation opportunities lie in these areas. Special attention should be given in Hostels and there should be regular water leak audits conducted and report should be documented. As presently data for extraction of water is not available, it is recommended that all input source of water should be metered and the consumption pattern should be reviewed daily/weekly and monthly and any significant deviation in consumption should be immediately addressed.

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 when ever there is any 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, analyzing 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?	No	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?	No	Consider installing sub-meters in high water using areas and monitor regularly to know accurately where water is used and identify any problems specially for external water use, individual hostels, kitchen/canteen such as leaks or other anomalies

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?	No	Same as point No.4 above.
6	Do you have a single tank on the wall or urinal flusherette 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 dish washer . 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	No	Ensure appropriate staff complete the Water conservation training.
2	Do campus sub-meter irrigation water supply?	No	consider installing sub-meters to determine water use and identify any leaks, and monitor regularly.
3	Are you watering on your allocated watering days?	No	If No, make sure you are watering on your allocated watering days. Make schedule of watering
4	Do you improve your soils? Y	No	Improving soil quality can improve plant growth and water retention.
5	Do you use an alternate water source to irrigate your landscape?	yes	Water rejected from RO is stored and used for irrigation purpose but not metered. Meters should be installed.STP treated water is also used for Horticulture application.
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?	No	Use water wise mulch to reduce evaporation and save water.
9	Do you have under-utilised areas of lawn in your landscape?	Yes	consider replacing 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	No	The awareness should be created amongst all maintenance and operation staff.
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	No	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.

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 liters per minute to 4 to 6 liters 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-Uttaranchal University

Table 4: Inventory of Toilets

S.No.	Details of Toilet	HE-Toilet	She-Toilet	Differently Abled Toilets	VIP attached with office
1	Main Building	3	3	0	7
2	Library	4	4	3	2
3	Pharma	4	4	4	1
4	Mechanical	2	2	0	0
5	Workshop	1	0	0	1
6	T & P	3	3	0	0
7	Poly	3	3	0	2
8	HM	3	3	0	2
9	UIM	4	4	0	1
10	Law	4	4	8	1
11	Agri	4	4	4	1
12	Civil	4	4	4	0

13	Girls Hostel-A	0	8	0	0
14	Girls Hostel-B	0	8	0	0
15	Girls Hostel-C	0	8	0	0
16	Girls Hostel-D	0	8	0	0
17	Girls Hostel-E	0	3	0	0
18	Girls Hostel-F	0	24	0	0
19	Boys Hostel-Old Block	12	0	0	0
20	Boys Hostel-A	8	0	0	0
21	Boys Hostel-B	9	0	0	0
22	Boys Hostel-C	8	0	0	0
23	Boys Hostel-D	16	0	0	0
24	Boys Hostel-E	4	0	0	0
25	Boys Hostel-F	7	0	0	1
26	Auditorium	4	4	2	1
27	Guest house	0	0	0	12
28	Food Court	2	1	0	0
	Total	**109**	**102**	**25**	**32**

Details of Wash Basins and Urinals

Table 5: Details of Wash Basins and Urinals

S.No.	Description	Qty. of Toilet	WB in each toilet	Total Wash basin	Urinal	Total Urinal
1	Gents	109	3	327	3	327
2	Girls Toilet	102	3	306	0	0
3	VIP/Attached Toilet	32	1	32		
	Total	**243**	**7**	**665**	**3**	**327**

Flow Rate of Fixtures Measured

Table 6: Flow rates of fixtures

S.No.	Details of Toilet	Random Flow data-Measured-Litres per Minute
1	Main Building	5
2	Library	6
3	Pharma	4
4	Mechanical	5.5
5	Workshop	5
6	T & P	6
7	Poly	4
8	HM	5.5
9	UIM	5
10	Law	6

11	Agri	5.5
12	Civil	4
13	Girls Hostel-A	5
14	Girls Hostel-B	6
15	Girls Hostel-C	4
16	Girls Hostel-D	5.5
17	Girls Hostel-E	5
18	Girls Hostel-F	6
19	Boys Hostel-Old Block	4
20	Boys Hostel-A	5.5
21	Boys Hostel-B	5
22	Boys Hostel-C	6
23	Boys Hostel-D	4
24	Boys Hostel-E	5.5
25	Boys Hostel-F	5
26	Auditorium	6
27	Guest house	5.5
28	Food Court	8

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	
1	Once the building is operational, further reductions in water use can still be made depending on how efficiently the building is run. 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 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 no use any mercury as is the case of CFLs or Fluorescent tubes.

Energy Performance Index

Table 20: Energy Performance Index

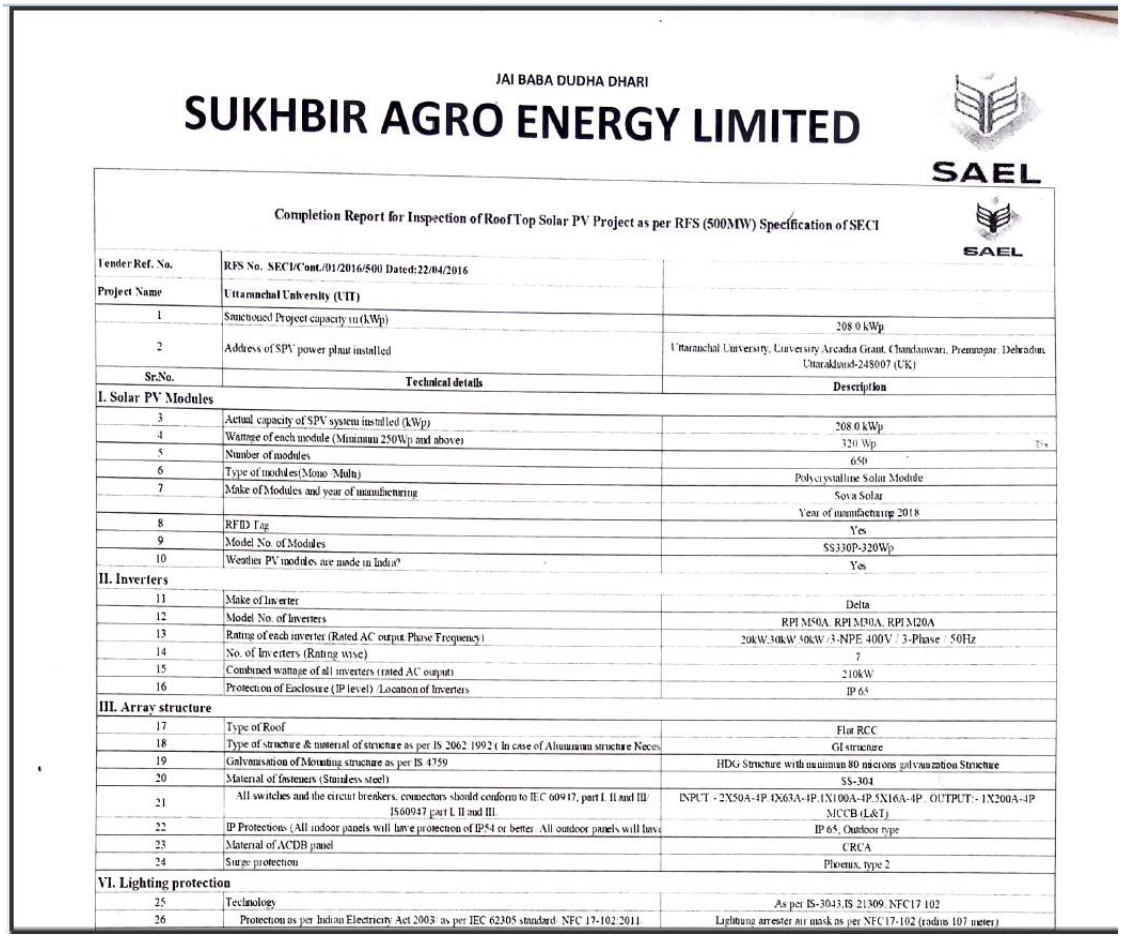
S.No.	Month	Qty. in Litters-DG Sets	Equivalent kWh-input	Electricity Consumption-kWh	Total Consumption -Equivalent kWh	Total Covered Area	EPI
1	Sep-19	3200	30362.79	157240	187602.79	82881.76	2.2634991
2	Oct-19	1000	9488.37	101672	111160.37	82881.76	1.3411922
3	Nov-19	800	7590.70	103372	110962.70	82881.76	1.3388072
4	Dec-19	1000	9488.37	164490	173978.37	82881.76	2.0991153
5	Jan-20	2600	24669.77	94038	118707.77	82881.76	1.4322544
6	Feb-20	1600	15181.40	101766	116947.40	82881.76	1.4110149
7	Mar-20	1400	13283.72	69312	82595.72	82881.76	0.9965488
8	Apr-20	0	0.00	25566	25566.00	82881.76	0.3084635
9	May-20	600	5693.02	32070	37763.02	82881.76	0.4556253
10	Jun-20	600	5693.02	34566	40259.02	82881.76	0.4857404
11	Jul-20	800	7590.70	43206	50796.70	82881.76	0.6128815
12	Aug-20	640	6072.56	44616	50688.56	82881.76	0.6115768
	Total/Annual EPI Per sq. mts.				**1107028.42**		13.356719

Annual EPI is 13.35 kWh per sq. mts. This could be low due to limited consumption due to Covid-19. If considered for average of pre-covid period, EPI is 18.85 kWh/sq. mts/annum

8.1 Renewable Energy

There is a plan to install 500 kWp Solar PV system and already an MOU has been signed. The system can generate energy on-site through Green Energy route. Only improvement that can be considered is utilising generated energy in case grid is not available. Depending upon requirement of load, through the use of PLC , the number of inverters can be made operational as per requirement of load at site.

Figure 4: Solar PV specifications



JAI BABA DUDHA DHARI

SUKHBIR AGRO ENERGY LIMITED

SAEL

Completion Report for Inspection of Roof Top Solar PV Project as per RFS (500MW) Specification of SECI

Tender Ref. No.	RfS No. SECI/Cont./01/2016/500 Dated:22/04/2016	
Project Name	Uttaranchal University (UIT)	
1	Sanctioned Project capacity in (kWp)	208.0 kWp
2	Address of SPV power plant installed	Uttaranchal University, University Arcadia Grant, Chandanwari, Premnagar, Dehradun, Uttarakhand-248007 (UK)
Sr.No.	Technical details	Description
I. Solar PV Modules		
3	Actual capacity of SPV system installed (kWp)	208.0 kWp
4	Wattage of each module (Minimum 250Wp and above)	320 Wp
5	Number of modules	650
6	Type of modules(Mono /Multi)	Polycrystalline Solar Module
7	Make of Modules and year of manufacturing	Sova Solar Year of manufacturing 2018
8	RFID Tag	Yes
9	Model No. of Modules	SS330P-320Wp
10	Weather PV modules are made in India?	Yes
II. Inverters		
11	Make of Inverter	Delta
12	Model No. of Inverters	RPI M50A, RPI M30A, RPI M20A
13	Rating of each inverter (Rated AC output Phase Frequency)	20kW,30kW 50kW /3-NPE 400V / 3-Phase / 50Hz
14	No. of Inverters (Rating wise)	7
15	Combined wattage of all inverters (rated AC output)	210kW
16	Protection of Enclosure (IP level) /Location of Inverters	IP 65
III. Array structure		
17	Type of Roof	Flat RCC
18	Type of structure & material of structure as per IS 2062:1992 (In case of Aluminum structure Neces	GI structure
19	Galvanisation of Mounting structure as per IS 4759	HDG Structure with minimum 80 microns galvanization Structure
20	Material of fasteners (Stainless steel)	SS-304
21	All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.	INPUT - 2X50A-4P,4X63A-4P,1X100A-4P,5X16A-4P . OUTPUT - 1X200A-4P MCCB (L&T)
22	IP Protections (All indoor panels will have protection of IP54 or better. All outdoor panels will have	IP 65, Outdoor type
23	Material of ACDB panel	CRCA
24	Surge protection	Phoenix, type 2
VI. Lighting protection		
25	Technology	As per IS-3043,IS 21309, NFC17 102
26	Protection as per Indian Electricity Act 2003/ as per IEC 62305 standard/ NFC 17-102:2011	Lightning arrester air mask as per NFC17-102 (radius 107 meter)

8.2 CO_2 reduction potential – Annual with installation of Solar PV System

Figure 5: Solar PV calculator

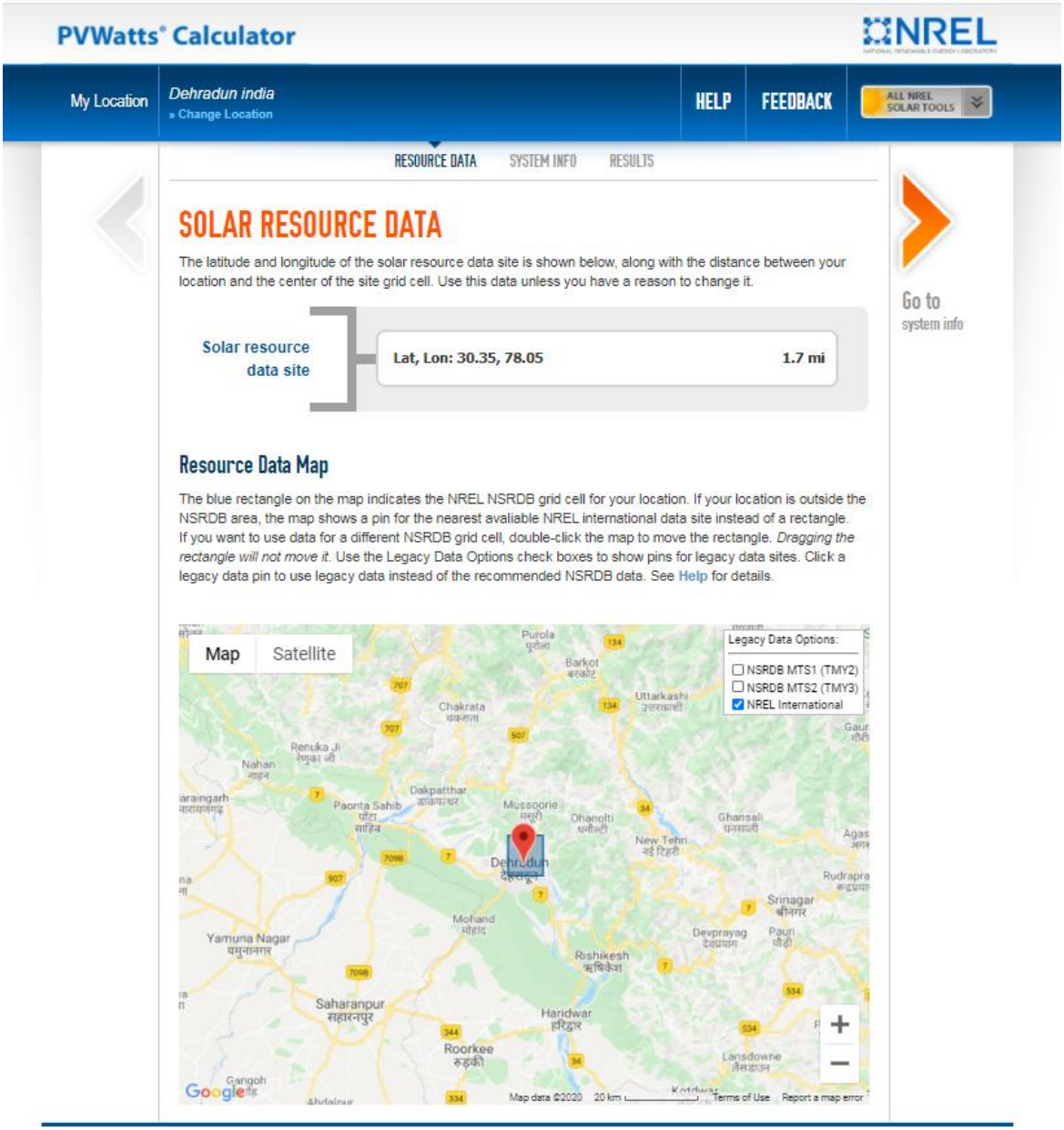
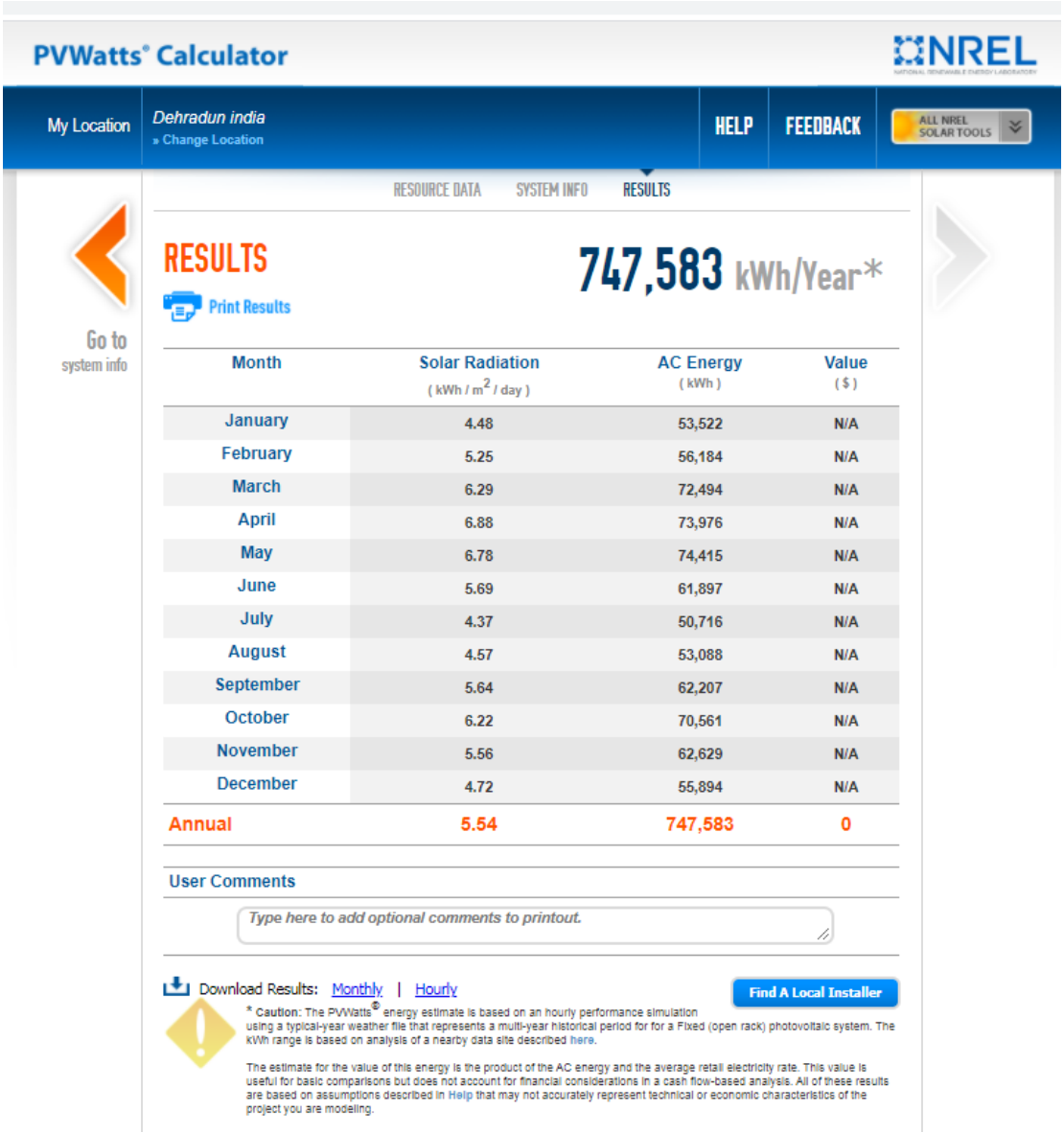


Figure 6: Solar PV Calculator



PVWatts® Calculator

NREL

My Location | Dehradun india » Change Location | HELP | FEEDBACK | ALL NREL SOLAR TOOLS

RESOURCE DATA | SYSTEM INFO | RESULTS

Go to system info

RESULTS

747,583 kWh/Year*

Print Results

Month	Solar Radiation (kWh / m² / day)	AC Energy (kWh)	Value ($)
January	4.48	53,522	N/A
February	5.25	56,184	N/A
March	6.29	72,494	N/A
April	6.88	73,976	N/A
May	6.78	74,415	N/A
June	5.69	61,897	N/A
July	4.37	50,716	N/A
August	4.57	53,088	N/A
September	5.64	62,207	N/A
October	6.22	70,561	N/A
November	5.56	62,629	N/A
December	4.72	55,894	N/A
Annual	5.54	747,583	0

User Comments

Type here to add optional comments to printout.

Download Results: Monthly | Hourly

Find A Local Installer

* Caution: The PVWatts® energy estimate is based on an hourly performance simulation using a typical-year weather file that represents a multi-year historical period for for a Fixed (open rack) photovoltaic system. The kWh range is based on analysis of a nearby data site described here.

The estimate for the value of this energy is the product of the AC energy and the average retail electricity rate. This value is useful for basic comparisons but does not account for financial considerations in a cash flow-based analysis. All of these results are based on assumptions described in Help that may not accurately represent technical or economic characteristics of the project you are modeling.

There is potential of CO_2 foot print reduction to the extent of 600 MT annually.

8.3 Solar Water Heating System

There are solar water heating systems installed for use in hostels. There is already 44 kLPD Solar Water heating system installed. It is recommended that during summer months or holidays time, an action may be initiated for utilisation of hot water for alternative use if possible.

9 Waste Management Audit

Pollution from waste is aesthetically unpleasing 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:

9.1 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.

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.

10.1Types 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 Trans 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/composte
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 Health Audit

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

12 Noise Pollution

1. **Sounds of Normal Conversations**: Sound Intensity: 40-60 dB
   Health Hazard: Sound less than 80 dB is safe for the ear.
2. **Sounds emanating from Tape recorders or an Orchestra**:
   Sound Intensity: 70 dB
   Health Hazard: It is safe for ear.
3. **Sounds of Heavy Traffic**:
   Sound Intensity: 90 dB
   Health Hazard: Constant exposure to sound greater than 80 dB causes temporary hearing loss and if they are not treated immediately, causes permanent impairment.
4. **Sounds of Pneumatic drills and other machines**:
   Sound Intensity: 100 dB
   Health Hazard: Constant exposure causes temporary hearing loss and if they are not treated immediately, causes permanent impairment.
5. **Sounds of Aircraft engine**:
   Sound Intensity: 100-200 dB
   Health Hazard: Higher noise level of 160 dB cause total deafness, rupturing eardrums, damaging inner ear. It also causes high blood pressure, ulcer in stomach, palpitation, nervous problems, irritation, anger, and affects pregnant women's embryo.
6. **Sounds of Rockets during take-off**:
   Sound Intensity: 200 dB
   Health Hazard: It is dangerously causing total deafness by rupturing the eardrums and damaging the inner ear. It also causes high blood pressure, ulcer in stomach, palpitation, nervous problems, irritation, anger, and affects pregnant women's embryo.

Table 31: Decibel Level Measurement

Decibel level measurement-Uttaranchal university			
S No.	**Location**	**Decible level - Measured**	**Remarks**
1	ADMIN BLOCK - FRONT SIDE	68	Satisfactory
2	ADMIN BLOCK - RIGHT SIDE BUS PARKING AREA	62	Satisfactory
3	RECEPTION	54	Satisfactory
4	GENTS TOILET RECEPTION	67	Satisfactory
5	ADMISSION INFORMATION CENTRE	62	Satisfactory
6	ADMIN. BLOCK - CONFERENCE HALL	41.7	Satisfactory
7	ADMIN BLOCK - FIRST FLOOR	42.8	Satisfactory
8	INSTITUTE OF TECHNOLOGY	61	Satisfactory
9	MESS - DINING HOSTEL	59	Satisfactory
10	CENTRAL WORK SHOP	58	Satisfactory
11	DEPTT. OF MECHANICAL ENGINEERING	56	Satisfactory
12	SCHOOL OF MEDIA & COMINICATION	52	Satisfactory
13	GUEST HOUSE	54	Satisfactory
14	UNIVERSITY POLITECHNIC	50	Satisfactory
15	SCHOOL OF HOSPITALITY MANAGEMENT	48	Satisfactory
16	UTTRANCHAL INSTITUTE OF MANAGEMENT	43	Satisfactory

17	LAW COLLEGE DEHRA DUN	42.5	Satisfactory
18	UNIVERSITY INSTITUTE OF PHARMACEEUTICAL SCIENCE (UIPS)	42.8	Satisfactory
19	SCHOOL OF APPLIED & LIVE SCIENCE	41.9	Satisfactory
20	AUDITORIUM	41.5	Satisfactory
21	SCHOOL OF AGRECULTURE	41.6	Satisfactory
22	UTTRANCHAL UNIVERSITY OF TECHNOLOGY	41	Satisfactory
23	DEPTT. OF CIVIL ENGINEERING	41.5	Satisfactory
24	DEPTT. OFPETROLIUM ENGINEERING	42.5	Satisfactory
25	S BHAGAT SINGH BOYS HOSTEL	46.1	Satisfactory
26	BOYS HOSTEL BLOCK - E	46.3	Satisfactory
27	BOYS HOSTEL BLOCK - F	45.4	Satisfactory
28	DINING HALL	42	Satisfactory
29	ANAPURNA GIRLS HOSTEL BLOCK	41.8	Satisfactory
30	LAXMIBAI GIRLS HOSTEL BLOCK - A	52.1	Satisfactory
31	DINING HALL	41.5	Satisfactory
32	KALPANA CHAWLA GIRLS HOSTEL BLOCK - B	73.2	Satisfactory
33	SAROJANI NAIDU GIRLS HOSTEL BLOCK - C	41.5	Satisfactory
34	KASTURBA GIRLS HOSTEL BLOCK - C	41.6	Satisfactory
35	DINING HALL	41.8	Satisfactory
36	STP	41.2	Satisfactory

Sound/Decibel level measured is satisfactory and there is no adverse impact of the same on occupants.

13 Food Procurement and Disposal

Food is prepared in Canteen/Mess and any food waste that is generated is filled in compost pits for preparation of natural manure.

14 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.

15 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.

16 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.

17 Rain water harvesting System

There are no rain water harvesting system installed but there is an arrangement for capturing rain water and storing them in underground tanks. The water is then re-used. The calculations for documenting no run off during peak rains is not established.

18 CPCB GUIDELINES

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

19 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 iif it is absolutely unavoidable.

3. Papers with recycled content should be purchased.

19.1 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. EcoFont) 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. GreenPrint). 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 GreenPrint 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)

19.2E-Library

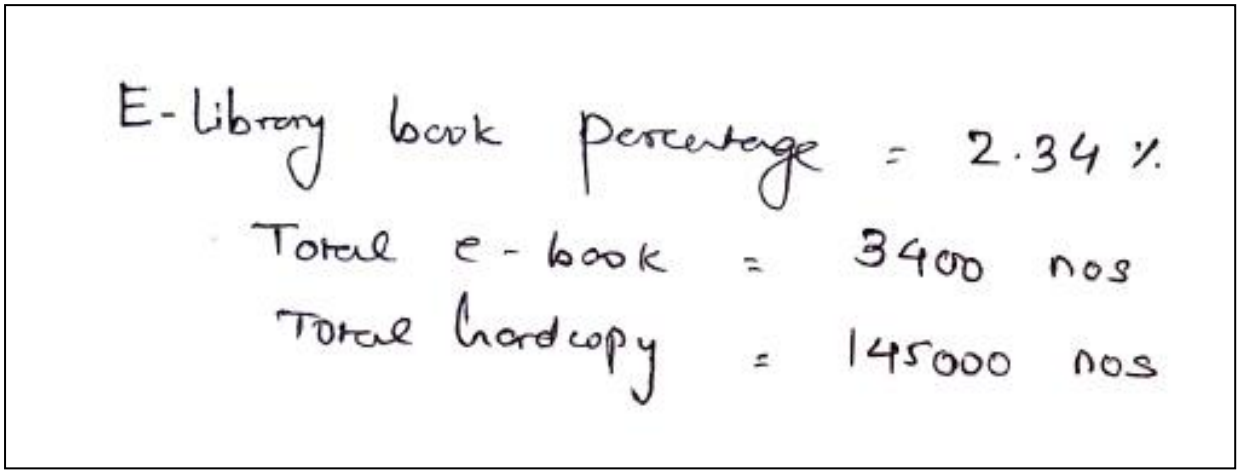
1. Present E-Library book percentage in numbers i1 2.34 %
2. Total e-Books: 3400 Nos
3. Total Hard Copy: 145000

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 specially 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.

Figure 7: E-book percentage in library



20 Training and Awareness

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

21 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.

22 Plantation Policy of Uttaranchal University

We at Uttaranchal University, 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 Uttaranchal University 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 Uttaranchal University, 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.

Top Management-Uttaranchal University

Plantation Inventory

Table 42: Plantation Inventory

Inventory of Trees and Plants at uttaranchal University						
S.No	**Trees**	**Qty.**	**Type**	**S.No**	**Show Plant**	**Qty.**
1	Kathal	10	Veg	37	Bottle palm	75
2	Jamun	4	Fruit	38	Ciprus Tapori	25
3	Amla	10	Medicinal	39	Bent (Cane) palm	10

4	Chakotra	2	Fruit	40	Juniprus Tapori	100
5	Guava	2	Fruit	41	Highcus Tapori	20
6	Mango	2	Fruit	42-a	Cicus (Two Varieties)	25
7	Lemon	1	Fruit	42-b	Cicus (Two Varieties)	25
8	Sheesham	5	Wood	43	Furkeria	15
9	Semal	1	Fruit	44	Motia haze	200
10	Aerokaria-Kanda	85	Show	45	Noleena	6
11	Banana	3	Fruit	46	Safed Duranta	100
12	Palm Tree	10	Show	47	More Phanki	50
13	Bargad	1	Medicinal	48	Arica palm	20
14	Peepal	1	Medicinal	49	Finish Palm	50
15	Kaner	1	Flower	50	Cheri haze	100
	Total -Trees	**138**		51	Mureni haze	500
	Medicinal Plant			52	Uphorbia haze	50
16	Harshingar	1		53	Durantia haze	300
17	Chandani	2		54	Badalia haze	50
18	Bela	2		55	Bori Chori haze	300
19	Lemon Grass	3		56	Ficus (Three varieties)	200
20	Gandh-Raj	2		57	Baans (bamboo)	500
21	Kamelia	2		58	Copper Bottle brush	1000
22	Ajelia	2		59	Golden Bottle Brush	10000
23	Gardenia	2			**Total-Show Plant**	**13721**
24	Rudraksha	5			**Flowers**	
25	Klorodrum-Seretum	5		60	Gulchiniya	15
26	Gulmohar	2		61	Roses (15 varieties)	150
27	Jakaranda	2		62	Badi Champa	4
28	Elephant Panda	4		63	Gudhal	300
29	Arjun	1			**Total Plants-Flower**	**469**
30	Gulcheeniya	10				
31	Sawani	12		**Abstract of Tree and Plants**		
32	Kanak-Champ (Electronia)	62		1	Total -Trees	138
33	Choti Champa	300		2	Total Medicinal Plant	449
34	Alovera	15		3	Total-Show Plant	13721
35	Tulsi (Basil)	10		4	Total-Flowers Plants	469
36	Kari Patta	5				
	Total Medicinal	**449**			**Total**	**14777**

Plantation Program

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

Total Trees and Plants presently existing in Uttaranchal university is as follows

Table 53: Plantation on Campus

S. No.	Description	Qty.
1	Total Trees	138
2	Total Medicinal Plants	449
3	Total Show Plants	13721
4	Total Flower Plants	469
	Grand Total	14777

23 The Need for Measurement & Verification (M&V)

There is no record of air quality testing. Generally, the dust level is found to be higher than normal and causes abnormal conditions.

Table 64: PM 2.5 & PM 10 measurement

S.no	Location	PM-2.5	PM-10	Particles	CO_2	nCHO-formaldehyde
1	ADMIN BLOCK - FRONT SIDE	59.7	89.9	6389	713	0.001
2	ADMIN BLOCK - RIGHT SIDE BUS PARKING AREA	62.3	95.3	6436	677	0.001
3	RECEPTION	68.7	103.4	7675	754	2.245
4	GENTS TOILET RECEPTION	58.5	92.5	6060	650	0.001
5	ADMISSION INFORMATION CENTRE	64.5	96.5	6565	643	0.001
6	ADMIN. BLOCK - CONFERENCE HALL	59.3	89.3	6350	711	2.245
7	ADMIN BLOCK - FIRST FLOOR	59.5	89.7	6359	716	2.238
8	INSTITUTE OF TECHNOLOGY	62.4	95.1	6434	671	0.001
9	MESS - DINING HOSTEL	61.8	94.9	6428	668	0.001
10	CENTRAL WORK SHOP	60.1	94.7	6235	661	0.001
11	DEPTT. OF MECHANICAL ENGINEERING	62.9	95.1	6423	656	0.001
12	SCHOOL OF MEDIA & COMINICATION	60.5	94.5	6428	659	0.001
13	GUEST HOUSE	62.7	94.3	6431	662	0.001
14	UNIVERSITY POLITECHNIC	61.8	95.8	6438	654	0.001
15	SCHOOL OF HOSPITALITY MANAGEMENT	61.3	95.2	6411	663	0.001
16	UTTRANCHAL INSTITUTE OF MANAGEMENT	62.4	95.4	6398	668	0.001
17	LAW COLLEGE DEHRA DUN	61.2	94.9	6382	661	0.001
18	UNIVERSITY INSTITUTE OF PHARMACEEUTICAL SCIENCE (UIPS)	61.1	94.3	6401	652	0.001
19	SCHOOL OF APPLIED & LIVE SCIENCE	60.5	94.7	6348	658	0.001
20	AUDITORIUM	61.3	95.3	6324	651	0.001
21	SCHOOL OF AGRECULTURE	62.4	95.6	6348	655	0.001
22	UTTRANCHAL UNIVERSITY OF TECHNOLOGY	62.8	95.4	6338	649	0.001
23	DEPTT. OF CIVIL ENGINEERING	62.7	95.1	6329	650	0.001
24	DEPTT. OFPETROLIUM ENGINEERING	62.9	95.7	6334	658	0.001
25	S BHAGAT SINGH BOYS HOSTEL	60.5	90.6	5753	674	0.001
26	BOYS HOSTEL BLOCK - E	60.1	90.4	5762	681	0.001

27	BOYS HOSTEL BLOCK - F	60.8	91.1	5758	671	0.001
28	DINING HALL	49.4	71.9	6242	602	0.001
29	ANAPURNA GIRLS HOSTEL BLOCK	50.6	75.4	5981	586	0.002
30	LAXMIBAI GIRLS HOSTEL BLOCK - A	50.4	76.1	5987	598	0.002
31	DINING HALL	48.8	70.7	6228	601	0.001
32	KALPANA CHAWLA GIRLS HOSTEL BLOCK - B	52.5	77.4	6443	630	0.002
33	SAROJANI NAIDU GIRLS HOSTEL BLOCK - C	50.3	74.9	5883	590	0.002
34	KASTURBA GIRLS HOSTEL BLOCK - C	49.7	73.9	5967	582	0.002
35	DINING HALL	48.6	70.9	6236	598	0.001
36	STP	55.7	83.6	5859	684	0.002

Generally, the values of air quality data are within permissible limits. Regular check on these parameters should be kept.

24 Indoor Comfort Temperature and Humidity Profile

Table 75: Indoor comfort temperature and humidity profile

S.No	Location	Dry Bulb Temp.	Wet Bulb Temp.	Humidity	Remarks
1	Admin block - front side	26	28	45	Satisfactory
2	Admin block - right side bus parking area	26	28	45	Satisfactory
3	Reception	26	28	45	Satisfactory
4	Gents toilet reception	26	28	45	Satisfactory
5	Admission information centre	26	28	45	Satisfactory
6	Admin. Block - conference hall	26	28	45	Satisfactory
7	Admin block - first floor	26	28	45	Satisfactory
8	Institute of technology	26	28	45	Satisfactory
9	Mess - dining hostel	26	28	45	Satisfactory
10	Central work shop	26	28	45	Satisfactory
11	Dept. Of mechanical engineering	26	28	45	Satisfactory
12	School of media & communication	26	28	45	Satisfactory
13	Guest house	26	28	45	Satisfactory
14	University polytechnic	26	28	45	Satisfactory
15	School of hospitality management	26	28	45	Satisfactory
16	Uttaranchal institute of management	26	28	45	Satisfactory
17	Law college Dehradun	26	28	45	Satisfactory
18	University institute of pharmaceutical science (uips)	26	28	45	Satisfactory
19	School of applied & live science	26	28	45	Satisfactory
20	Auditorium	26	28	45	Satisfactory
21	School of agriculture	26	28	45	Satisfactory
22	Uttaranchal university of technology	26	28	45	Satisfactory
23	Dept. of civil engineering	26	28	45	Satisfactory
24	Dept. of petroleum engineering	26	28	45	Satisfactory
25	S bhagat Singh Boys hostel	26	28	45	Satisfactory
26	Boys hostel block - E	26	28	45	Satisfactory
27	Boys hostel block - F	26	28	45	Satisfactory
28	Dining hall	26	28	45	Satisfactory
29	Anapurna girls hostel block	26	28	45	Satisfactory
30	Laxmibai girls hostel block - A	26	28	45	Satisfactory
31	Dining hall	26	28	45	Satisfactory
32	Kalpana chawla girls hostel block - B	26	28	45	Satisfactory
33	Sarojani naidu girls hostel block - C	26	28	45	Satisfactory
34	Kasturba girls hostel block - C	26	28	45	Satisfactory
35	Dining hall	26	28	45	Satisfactory
36	STP	26	28	45	Satisfactory

25 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.

26 Refrigerant used in Air Conditioners

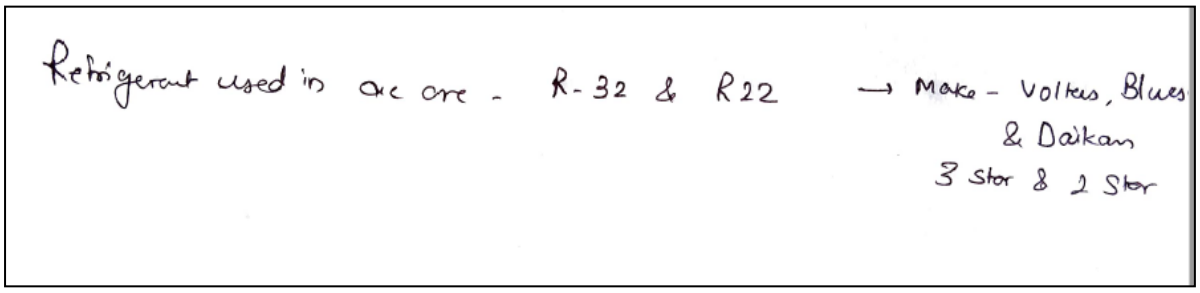
Figure 8: Refrigerant Specifications

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



27 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

28 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

29 Ventilation assessment

Table 86: Ventilation Assessment

S.No	Location	Length in Meters	Width in Meters	Total Area in sq. mts.	Area of Windows and Ventilators- sq.mts.	Percentage of openable area as floor area	Remarks
ACADEMIC BLOCK V (B) Ground Floor							
1	Gents Toilet	4.345	8.78	38.15	2.21	5.80	Satisfactory
2	Staff Meeting Room	7.2	11	79.20	6.06	7.65	Satisfactory
3	Court Room	15.43	11	169.73	22.38	13.19	Satisfactory
4	Ladies Toilet				1.44		Satisfactory
5	LLM C/R	7.2	11	79.20	6.72	8.48	Satisfactory
6	Computer Room	14.63	11	160.93	13.44	8.35	Satisfactory
7	Liabrary	22	11	242.00	24.00	9.92	Satisfactory
8	Room-1	7.2	11	79.20	13.44	16.97	Satisfactory
9	Administration	7.2	11	79.20	10.08	12.73	Satisfactory
10	VIP Room	4.567	3.5	15.98	3.36	21.02	Satisfactory
11	Store Room	2.818	3.2	9.02	3.36	37.26	Satisfactory
12	ROOM-3-Entrance Lobby	3.37	2.4	8.09	13.44	166.17	Satisfactory
13	Enterance Lobby	9	7.445	67.01	6.72	10.03	Satisfactory
First Floor							
14	Gents Toilet						Satisfactory
15	Class Room-1	7.2	11	79.20	7.14	9.02	Satisfactory
16	Class Room-2	9	11	99.00	16.32	16.48	Satisfactory
17	Class Room-3	7.2	11	79.20	7.14	9.02	Satisfactory
18	Class Room-4	7.2	11	79.20	8.64	10.91	Satisfactory
19	Class Room-5	7.2	11	79.20	8.64	10.91	Satisfactory
20	Class Room-6	7.2	11	79.20	8.64	10.91	Satisfactory
21	Class Room-7	7.2	11	79.20	8.64	10.91	Satisfactory
22	Class Room-8	7.2	11	79.20	8.64	10.91	Satisfactory
23	Class Room-9	7.2	11	79.20	8.64	10.91	Satisfactory
24	Class Room-10	7.2	11	79.20	13.44	16.97	Satisfactory
25	Class Room-11	7.2	11	79.20	6.72	8.48	Satisfactory
26	Class Room-12	7.2	11	79.20	6.72	8.48	Satisfactory
27	Class Room-13	7.2	11	79.20	13.44	16.97	Satisfactory
Second Floor							
28	Gents Toilet						Satisfactory
29	Class Room - 1	7.2	11	79.20	7.14	9.02	Satisfactory
30	Class Room - 2	9	11	99.00	17.28	17.45	Satisfactory
31	Class Room - 3	7.2	11	79.20	7.14	9.02	Satisfactory
32	Class Room - 4	7.2	11	79.20	8.64	10.91	Satisfactory

33	Class Room - 5	7.2	11	79.20	8.64	10.91	Satisfactory
34	Class Room - 6	7.2	11	79.20	8.64	10.91	Satisfactory
35	Class Room - 7	7.2	11	79.20	8.64	10.91	Satisfactory
36	Class Room - 8	7.2	11	79.20	8.64	10.91	Satisfactory
37	Class Room - 9	7.2	11	79.20	10.08	12.73	Satisfactory
38	Class Room - 10	7.2	11	79.20	8.64	10.91	Satisfactory
39	Class Room - 11	9	11	99.00	11.52	11.64	Satisfactory
40	Class Room - 12	7.2	11	79.20	6.96	8.79	Satisfactory
41	Class Room - 13	7.2	11	79.20	10.08	12.73	Satisfactory
Third Floor							
42	Gents Toilet						Satisfactory
43	Class Room - 1	7.2	11	79.20	7.14	9.02	Satisfactory
44	Class Room - 2	9	11	99.00	16.32	16.48	Satisfactory
45	Class Room - 3	7.2	11	79.20	7.14	9.02	Satisfactory
46	Class Room - 4	7.2	11	79.20	8.64	10.91	Satisfactory
47	Class Room - 5	7.2	11	79.20	8.64	10.91	Satisfactory
48	Class Room - 6	7.2	11	79.20	8.64	10.91	Satisfactory
49	Class Room - 7	7.2	11	79.20	8.64	10.91	Satisfactory
50	Class Room - 8	7.2	11	79.20	8.64	10.91	Satisfactory
51	Class Room - 9	7.2	11	79.20	8.64	10.91	Satisfactory
52	Class Room - 10	7.2	11	79.20	10.08	12.73	Satisfactory
53	Class Room - 11	7.2	11	79.20	6.96	8.79	Satisfactory
54	Class Room - 12	9	9	81.00	12.00	14.81	Satisfactory
55	Class Room - 13	7.2	11	79.20	6.96	8.79	Satisfactory
56	Class Room - 14	7.2	11	79.20	1.44	1.82	Not Satisfactory
Academic Block V (C) - Central Library & Computer Science							
Ground Floor							
57	Reading Room	46	14.77	679.42	55.44	8.16	Satisfactory
58	TBLS Library	5.77	9.768	56.36	5.04	8.94	Satisfactory
59	Gents Toilet	2.99	7.855	23.49	3.96	16.86	Satisfactory
60	Store Cum Manti	5.77	3.6	20.77	1.92	9.24	Satisfactory
61	Reprographic Section	5.77	4.77	27.52	0.00	0.00	Satisfactory
62	Processing Section	5.77	4.77	27.52	5.04	18.31	Satisfactory
63	Store	2.885	3.34	9.64	0.00	0.00	Satisfactory
64	Reading Room	9.77	14.77	144.30	5.76	3.99	Satisfactory
65	Periodical Section	5.77	9.77	56.37	5.76	10.22	Satisfactory
66	Reference Section	11.77	9.77	114.99	3.84	3.34	Not Satisfactory
67	Ladies Toilet	5.77	6.425	37.07	4.32	11.65	Satisfactory
68	Digital Library	11.17	4.71	52.61	10.08	19.16	Satisfactory
69	Property Centre	3	5.77	17.31	2.52	14.56	Satisfactory
70	Entrance Lobby	16	9.77	156.32	10.08	6.45	Satisfactory

71	Waiting Area	4.425	4.77	21.11	0.00	0.00	Satisfactory
72	Library security Room	3.23	3	9.69	2.52	26.01	Satisfactory
73	Librarian Room	5	4.77	23.85	10.08	42.26	Satisfactory
	First Floor						Satisfactory
74	Lab - 1	11.77	14.77	173.84	10.08	5.80	Satisfactory
75	Lab - 2	10	14.77	147.70	5.04	3.41	Satisfactory
76	Lab - 3	11.77	14.77	173.84	5.04	2.90	Satisfactory
77	Lab - 4	11.77	14.77	173.84	12.60	7.25	Satisfactory
78	Server Room & cabin	5.77	5.8	33.47	5.04	15.06	Satisfactory
79	Reprographic Section	5.77	3.853	22.23	2.52	11.34	Satisfactory
80	Lab - 5	11.77	18	211.86	12.60	5.95	Satisfactory
81	Lab - 6	10	19.77	197.70	7.56	3.82	Satisfactory
82	Lab - 7	11.77	19.77	232.69	7.56	3.25	Satisfactory
83	Lab - 8	11.77	14.77	173.84	15.12	8.70	Satisfactory
84	HOD CBE Office	5.77	3.455	19.94	2.52	12.64	Satisfactory
85	HOD CBE Office Toilet	1.2	2.4	2.88	1.44	50.00	Satisfactory
86	HOD CSE Office	4.455	4.77	21.25	2.52	11.86	Satisfactory
87	HOD CBE Office Toilet	1.2	2.4	2.88	1.44	50.00	Satisfactory
88	Gents Toilet	5.77	6.655	38.40	2.88	7.50	Satisfactory
89	Ladies Toilet	5.77	6.425	37.07	4.32	11.65	Satisfactory
	Second Floor						Satisfactory
90	HOD Room	5.77	14.77	85.22	5.04	5.91	Satisfactory
91	PA Cabin & Deptt. Office	5.77	14.77	85.22	7.56	8.87	Satisfactory
92	Basic Electronic Lab	5.77	14.77	85.22	2.52	2.96	Not Satisfactory
93	Electronic Lab	4	14.77	59.08	2.52	4.27	Not Satisfactory
94	Digital Electronic Lab	5.77	14.77	85.22	2.52	2.96	Not Satisfactory
95	Microprocessor Lab	5.77	14.77	85.22	2.52	2.96	Not Satisfactory
96	Microwave Lab	5.77	14.77	85.22	2.52	2.96	Not Satisfactory
97	Project & R & A Lab	5.77	14.77	85.22	2.52	2.96	Not Satisfactory
98	VLSI & LADA Electronics Ckt Lab	5.77	14.77	85.22	7.56	8.87	Satisfactory
99	Deptt. Library & Faculty	5.77	9.768	56.36	7.56	13.41	Satisfactory
100	Lab - 9	11.77	14.77	173.84	15.12	8.70	Satisfactory

101	Printed Circuit Board Lab	5.77	9.77	56.37	10.20	18.09	Satisfactory
102	Faculty Cabins	5.77	9.77	56.37	5.04	8.94	Satisfactory
103	Seminar Faculty	10	9.77	97.70	5.04	5.16	Not Satisfactory
104	Analog Lab	5.77	9.77	56.37	0.00	0.00	Not Satisfactory
105	Optical Fibre DSP & Matt Lab	5.77	1.8	10.39	2.52	24.26	Satisfactory
106	Analog comn. Lab	5.77	9.768	56.36	2.52	4.47	Not Satisfactory
107	Digital communication Lab	5.77	14.77	85.22	5.04	5.91	Satisfactory
108	Dark Room & Kitchen	5.77	18	103.86	2.52	2.43	Not Satisfactory
Academic Block V (D) - Uttaranchal Institute of Pharmaceutical Science (UIRS)							
Ground Floor							
109	Lab - 1			75.00	6.06	8.08	Satisfactory
110	Lab - 2			75.00	9.24	12.32	Satisfactory
111	Lab - 3			75.00	6.06	8.08	Satisfactory
112	Lab - 4			132.00	12.12	9.18	Satisfactory
113	Lab - 5			132.00	12.12	9.18	Satisfactory
114	Lab - 6			75.00	9.24	12.32	Satisfactory
115	Lab - 7			75.00	6.06	8.08	Satisfactory
116	Machine Room			101.00	10.68	10.57	Satisfactory
	First Floor						Satisfactory
117	Lab - 1			75.00	6.06	8.08	Satisfactory
118	Lab - 2			75.00	9.24	12.32	Satisfactory
119	Lab - 3			75.00	6.06	8.08	Satisfactory
120	Store Room			132.00	12.12	9.18	Satisfactory
121	Institution			132.00	12.12	9.18	Satisfactory
122	Class Room-1			75.00	9.24	12.32	Satisfactory
123	Class Room-2			75.00	6.06	8.08	Satisfactory
124	Class Room-3			75.00	6.06	8.08	Satisfactory
125	Class Room-4			75.00	9.24	12.32	Satisfactory
	Second Floor						Satisfactory
126	Faculty Room-1			68.00	6.06	8.91	Satisfactory
127	Faculty Room-2			68.00	6.06	8.91	Satisfactory
128	Class Room-1			90.00	9.24	10.27	Satisfactory
129	Boys Common Room			75.00	6.06	8.08	Satisfactory
130	Library			150.00	6.06	4.04	Not Satisfactory
131	Lab - 1			132.00	12.12	9.18	Satisfactory

132	Lab - 2			132.00	12.12	9.18	Satisfactory
133	Lab - 3			75.00	4.62	6.16	Satisfactory
134	Computer Room			75.00	9.24	12.32	Satisfactory
Hostel Block V (B) - Kalpana Chawla Girls Hostel							
	Ground Floor						Satisfactory
135	Room-1	3.3	5.93	19.57	4.62	23.61	Satisfactory
136	Room-2	3.97	3.38	13.42	4.62	34.43	Satisfactory
137	Room-3	3	4.215	12.65	5.88	46.47	Satisfactory
138	Room-4	2.715	4.93	13.38	2.31	17.26	Satisfactory
139	Room-5	2.45	2.815	6.90	2.31	33.49	Satisfactory
140	Room-6	2.715	4.93	13.38	4.62	34.52	Satisfactory
141	Room-7	2.6	4.93	12.82	4.62	36.04	Satisfactory
142	Room-8	3.97	3.38	13.42	4.62	34.43	Satisfactory
143	Room-9	3	4.215	12.65	2.31	18.27	Satisfactory
144	Room-10	2.715	4.93	13.38	5.67	42.33	Satisfactory
145	Room-11	2.45	2.815	6.90	2.31	33.49	Satisfactory
146	Room-12	2.715	4.93	13.38	4.62	34.52	Satisfactory
147	Room-13	2.6	4.93	12.82	4.62	36.04	Satisfactory
148	Dining Hall	27.039	11.53	311.76	27.36	8.78	Satisfactory
149	Room-14	3.97	3.3	13.10	4.62	35.26	Satisfactory
150	Room-15	2.715	4.93	13.38	4.62	34.52	Satisfactory
151	Room-16	2.715	4.93	13.38	4.62	34.52	Satisfactory
152	Room-17	2.45	2.815	6.90	2.31	33.49	Satisfactory
153	Room-18	2.715	4.93	13.38	5.67	42.33	Satisfactory
154	Room-19	3	4.215	12.65	2.52	19.93	Satisfactory
155	Room-20	3.97	3.38	13.42	4.62	34.43	Satisfactory
156	Room-21	3.3	5.93	19.57	4.62	23.61	Satisfactory
157	Toilet						Satisfactory
First Floor							
158	Room-1	3.3	5.93	19.57	4.62	23.61	Satisfactory
159	Room-2	3.97	3.38	13.42	4.62	34.43	Satisfactory
160	Room-3	3	4.215	12.65	5.88	46.47	Satisfactory
161	Room-4	2.715	4.93	13.38	2.31	17.26	Satisfactory
162	Room-5	2.45	2.815	6.90	2.31	33.49	Satisfactory
163	Room-6	2.715	4.93	13.38	4.62	34.52	Satisfactory
164	Room-7	2.6	4.93	12.82	4.62	36.04	Satisfactory
165	Room-8	2.45	2.815	6.90	2.31	33.49	Satisfactory
166	Room-9	2.45	2.815	6.90	2.31	33.49	Satisfactory
167	Room-10	2.715	4.93	13.38	5.67	42.33	Satisfactory
168	Room-11	2.715	4.93	13.38	5.67	42.33	Satisfactory
169	Room-12	2.715	4.93	13.38	5.67	42.33	Satisfactory
170	Room-13	2.715	4.93	13.38	5.67	42.33	Satisfactory
171	Room-14	2.715	4.93	13.38	5.67	42.33	Satisfactory
172	Room-15	2.45	2.815	6.90	2.31	33.49	Satisfactory

173	Room-16	2.45	2.815	6.90	2.31	33.49	Satisfactory
174	Room-17	2.45	2.815	6.90	2.31	33.49	Satisfactory
175	Room-18	2.715	4.93	13.38	5.67	42.33	Satisfactory
176	Room-19	2.715	4.93	13.38	5.67	42.33	Satisfactory
177	Room-20	2.715	4.93	13.38	5.67	42.33	Satisfactory
178	Room-21	3	4.215	12.65	5.88	46.47	Satisfactory
179	Room-22	3	4.215	12.65	5.88	46.47	Satisfactory
180	Room-23	3	4.215	12.65	5.88	46.47	Satisfactory
181	Room-24	3.97	3.38	13.42	4.62	34.43	Satisfactory
182	Room-25	3.97	3.38	13.42	4.62	34.43	Satisfactory
183	Room-26	3.97	3.38	13.42	4.62	34.43	Satisfactory
184	Room-27	2.6	4.93	12.82	4.62	36.04	Satisfactory
185	Room-28	3.3	5.93	19.57	4.62	23.61	Satisfactory
	Second Floor						Satisfactory
186	Room-1	3.057	5.615	17.17	3.36	19.57	Satisfactory
187	Room-2	3.057	5.615	17.17	3.36	19.57	Satisfactory
188	Room-3	3.057	5.615	17.17	3.36	19.57	Satisfactory
189	Room-4	2.815	5.615	15.81	3.36	21.26	Satisfactory
190	Room-5	2.815	5.615	15.81	3.36	21.26	Satisfactory
191	Room-6	2.815	5.615	15.81	3.36	21.26	Satisfactory
192	Room-7	2.818	5.615	15.82	2.52	15.93	Satisfactory
193	Room-8	2.818	5.615	15.82	2.52	15.93	Satisfactory
194	Room-9	2.818	5.615	15.82	2.52	15.93	Satisfactory
195	Room-10	2.755	5.615	15.47	3.36	21.72	Satisfactory
196	Room-11	2.755	5.615	15.47	3.36	21.72	Satisfactory
197	Room-12	2.812	5.615	15.79	2.52	15.96	Satisfactory
198	Room-13	2.812	5.615	15.79	2.52	15.96	Satisfactory
199	Room-14	2.76	5.615	15.50	3.36	21.68	Satisfactory
200	Room-15	3.115	5.615	17.49	2.52	14.41	Satisfactory
	First Floor						Satisfactory
201	Room - 1	3.615	4.2	15.18	3.36	22.13	Satisfactory
202	Toilet	2.15	1.65	3.55	1.44	40.59	Satisfactory
203	Room - 2	3.615	4.2	15.18	3.36	22.13	Satisfactory
204	Toilet	2.15	1.65	3.55	1.44	40.59	Satisfactory
205	Room - 3	3.615	4.2	15.18	3.36	22.13	Satisfactory
206	Toilet	2.15	1.65	3.55	1.44	40.59	Satisfactory
207	Room - 4	3.615	4.2	15.18	3.36	22.13	Satisfactory
208	Toilet	2.15	1.65	3.55	1.44	40.59	Satisfactory
209	Suit -1 Bed Room-1	3.685	5.05	18.61	5.67	30.47	Satisfactory
210	Suit-1 Bed Room-2	3.658	4.735	17.32	3.36	19.40	Satisfactory
211	Toilet	2.5	1.95	4.88	1.44	29.54	Satisfactory
212	Suit -2 Bed Room-1	3.658	5.43	19.86	5.67	28.55	Satisfactory

213	Suit-2 Bed Room-2	3.658	5.285	19.33	3.36	17.38	Satisfactory
214	Toilet	2.5	1.95	4.88	1.44	29.54	Satisfactory
215	Room - 1	3.615	4.2	15.18	3.36	22.13	Satisfactory
216	Toilet	2.15	1.65	3.55	1.44	40.59	Satisfactory
217	Room - 2	3.615	4.2	15.18	3.36	22.13	Satisfactory
218	Toilet	2.15	1.65	3.55	1.44	40.59	Satisfactory
219	Room - 3	3.615	4.2	15.18	3.36	22.13	Satisfactory
220	Toilet	2.15	1.65	3.55	1.44	40.59	Satisfactory
221	Room - 4	3.615	4.2	15.18	3.36	22.13	Satisfactory
222	Toilet	2.15	1.65	3.55	1.44	40.59	Satisfactory
223	Care Taker Room	3.5	4.2	14.70	3.36	22.86	Satisfactory
224	Pantry						Satisfactory
225	Dining Hall						Satisfactory
226	Suit -3 Bed Room-1	3.558	5	17.79	2.31	12.98	Satisfactory
227	Suit-3 Bed Room-2	3.557	4.75	16.90	3.36	19.89	Satisfactory
228	Toilet	2.5	1.95	4.88	1.44	29.54	Satisfactory
229	Suit -4 Bed Room-1	3.558	5	17.79	2.31	12.98	Satisfactory
230	Suit-4 Bed Room-2	3.557	4.75	16.90	3.36	19.89	Satisfactory
231	Toilet	2.5	1.95	4.88	1.44	29.54	Satisfactory
	Mechanical Block						Satisfactory
	Ground Floor						Satisfactory
232	Turning Lab - 1	10.105	15.165	153.24	15.12	9.87	Satisfactory
233	Turning Lab - 2	10.105	15.165	153.24	15.12	9.87	Satisfactory
234	Faculty	6.5	6.21	40.37	10.08	24.97	Satisfactory
235	HOD Room	3.5	4.097	14.34	2.52	17.57	Satisfactory
236	Lab	10.105	6.272	63.38	10.08	15.90	Satisfactory
	First Floor				0.00		Satisfactory
237	Cad Lab	10.195	9.705	98.94	33.60	33.96	Satisfactory
238	Camical Lab	10.195	9.73	99.20	16.80	16.94	Satisfactory
239	Lab	10.195	9.725	99.15	16.80	16.94	Satisfactory
	Second Floor						Satisfactory
240	Engineering Drawing Hall - 1	10.195	9.54	97.26	33.60	34.55	Satisfactory
241	Engineering Drawing Hall - 2	10.195	9.54	97.26	33.60	34.55	Satisfactory

30 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.

31 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 signages are required to be provided in all area where food is served or consumed.

1. All Hostel Mess
2. Canteen
3. Cafeteria

32 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 Labourers
21. Providing fire and life safety measures during construction

32.1 Water and Waste Management During Construction

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

3. Management of Waste Water

32.2Recycling

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

32.3Use of natural resources and replacement of chemicals as much as possible

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

32.4Encourage 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.

32.5Low 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 41: Minimum Ventilation Rates

Annexure II

Minimum Ventilation Rates in Various Functional Zones*

Occupancy Category	People Outdoor Air Rate	Area Outdoor Air Rate
	Cfm/person	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 52: 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 =*

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

32.6Use 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.

33 Photographs of the on-site Audit

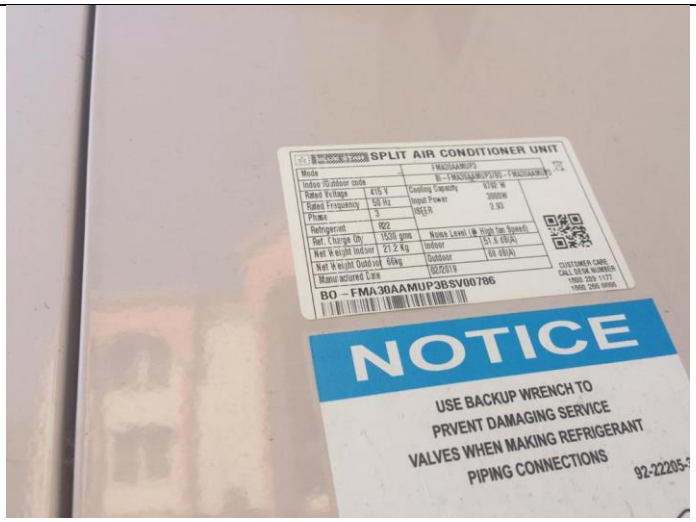
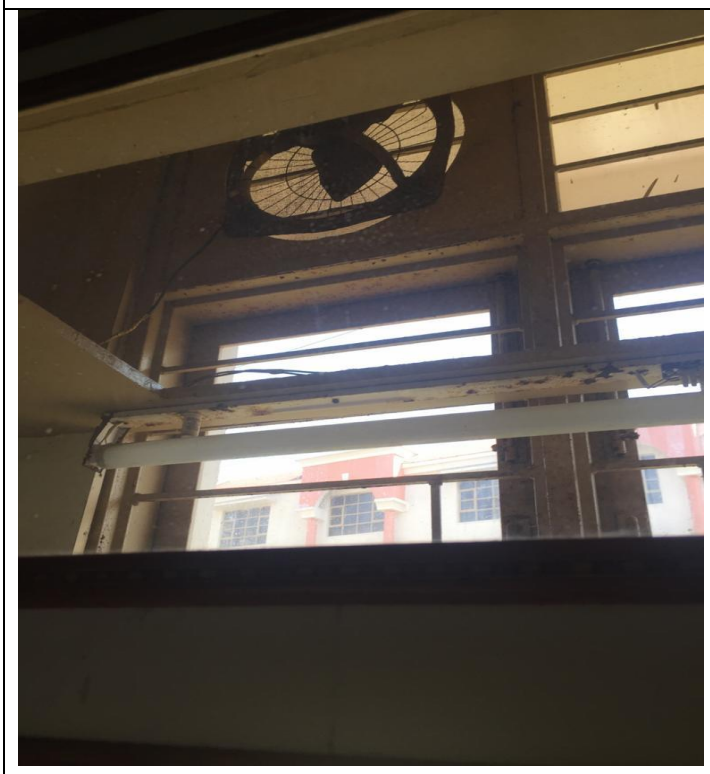
Table 97: Photographic Observations

	Single Bin is kept in Reception area of Campus. Segregation of waste at source is not possible
	Single Bin is kept in Campus. Segregation of waste at source is not possible

	Preferred bins
	COVID awareness precaution signage pasted

	Dedicated Parking for Electrical vehicles is provided.
	Stack Height of DG set exhaust is in contravention to CPCB guidelines.

	Stack Height of DG set exhaust is in contravention to CPCB guidelines.
	Water tank for capturing Rain water is provided.

	Split AC purchased in 2019 is with R-22 Refrigerant. All AC now purchased should be with Environment friendly Refrigerants.
	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.

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