

# ***GREEN AUDIT REPORT***

***OF***

# ***DOGRA EDUCATIONAL TRUST***

Submitted by-



*V. O. Singh*  
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This report is based on the information provided from the facility & on-site observations on specific dates. We certify that this information and following analysis is correct to the best of our knowledge and ability. The validity of the recommendations is dependent on field measurement and historical data supplied to us. This report (including any enclosures and attachments) has been prepared for the exclusive use and benefit of the addressee(s) and solely for the purpose for which it is provided. Unless we provide express prior written consent, no part of this report should be reproduced, distributed or communicated to any third party. We do not accept any liability if this report is used for an alternative purpose from which it is intended, nor to any third party in respect of this report. The recommendations and findings are to be used by client at their own accord and Inventum Power Private Limited or its associates would not be responsible for any material or non-material losses (if any) occurring in any way due to their implementation.

  
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## ACKNOWLEDGEMENT

**INVENTUM POWER PVT LTD** expresses its sincere thanks to the site management of **DOGRA EDUCATIONAL TRUST, JAMMU** for giving us an opportunity to conduct Green Audit in their esteemed organisation for providing our findings/ Suggestions for overall improvement to them.

The audit was conducted in the month of May 2021.

Our sincere thanks to **Sh. Angrez Singh Bendral** for his keen interest and co-operation extended towards the conduct of the Energy Audit.

We are also thankful to all supporting staff of the campus for providing wholehearted support and guidance during the course of the study. Green Audit Report of Dogra Educational Trust, Jammu has been prepared on the basis of findings of internal green & Environmental/Energy audits conducted by Inventum Power and telephonic interviews of faculty, non-teaching staff & students.

The Green Audit Report also presents green initiatives followed and taken up by the College and provides suggestions and recommendations to improve environmental sustainability.

### **TEAM MEMBERS FROM INVENTUM POWER PVT LTD**

- ❖ **Mr. Ajay Jain** - **Certified Energy Manager**
- ❖ **Mr. Ashish Sharma** - **Executive Engineer**

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## **1. EXECUTIVE SUMMARY**

Green campus is a concept implemented in many educational institutions, all over the world to make them sustainable because of their mass resource utilization and waste discharge in to the environment. Waste minimization plans for the educational institute are now mandatory to maintain the cleanliness of the campus. To find out the environmental performance of the educational institutions and to analyse the possible solutions for converting the educational campus as eco-campus the conduction of Green Auditing of institution is essential. The green auditing of 'Dogra Educational Trust, enables to assess the life style, action and its impact on the environment. This is the first attempt to conduct green auditing of this college campus. This audit was mainly focused on greening indicators like consumption of energy in terms of electricity and fossil fuel, quality of soil and water, vegetation, waste management practices and carbon foot print of the campus etc. Initially a questionnaire survey was conducted to know about the existing resources of the campus and resource consumption pattern of the students and staffs in the college. In order to assess the quality of water and soil, water and soil samples were collected from different locations of the college campus and analysed for its parameters.

Collected data was grouped, tabulated and analysed. Finally, a report pertaining environmental management plan with strength, weakness and suggestion on the environmental issue of campus are documented.

  
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## **2. INTRODUCTION**

### **2.1 ABOUT DOGRA EDUCATIONAL TRUST**

Dedicated to the memory of immortal sons of the Duggar Land, who have been famous for their valour and patriotism. Dogra Educational Trust is committed to keep the beacon of light shining forever through the academic pursuits delivered by Dogra Law College, Dogra College of Education & Dogra Degree College.

All these three colleges constitute an upper rung of an educational endeavour undertaken by Dogra Educational Trust, to spread education in the region, True to the set motto, Knowledge for Liberation, both the colleges are striving to help spread legal literacy and build a knowledgeable citizenry befitting a free nation.

The fundamental aim of the college is to impart sound learning to young women under circumstances congenial to their all-round development. It encourages the students to aim at excellence not only in academic pursuits, but also in every aspect of human endeavour to achieve perfection. The students are prompted to strive for academic excellence so that in course of time they may take up suitable careers for the betterment of their lives and also of their families and society at large. The various co-curricular activities of the college especially the extension programmes provide them with a rare social consciousness that motivates them to reach out to their fellowmen particularly the needy and the marginalised.

Dogra Educational Trust stands as a landmark in the educational endeavours initiated, more than three decades back, by an energetic and zealous son of Dugger Desh, Th. Gulchain Singh Charak, Chairman of the Trust. His esteem for Dogra culture, valour and devotion is manifest in the adoption of appellation 'Dogra' for all the educational institutions established so far. His preference for saffron colour is reminiscent of the great sacrifice made by valiant Dogras defining the borders of India beyond the Himalayas. As the pioneer in the field of private education, he espoused the cause of private aided schools.


### **2.2 COURSES OFFERED BY THE COLLEGE**

#### **Dogra Degree College**

- BBA
- B. Com
- B.A

#### **Dogra Law College**

- LLB 5 Years
- LLB 3 Years

  
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## **Dogra College of Education**

- B. Ed

## **Physical Structure**

College has a total of 3 departments namely:

- **Dogra Law College**
- **Dogra College of Education**
- **Dogra Degree College**

All the buildings have rooms such as classrooms, offices, auditoriums, etc.

## **2.3 ABOUT INVENTUM POWER**

Inventum Power Private Limited is Care rated BEE Certified ESCO (Energy service Company) registered under Gov. of India the Ministry of Power, And ISO 9001: 2015 certified companies along with International collaboration with Elspec ISRAEL. Our technology simplifies the understanding of the quality of power itself, is highly compatible & helps our customers enhance electrical network power quality. Our innovations can be found in almost any sector, spanning from the industrial, commercial to the utility sectors.

## **2.4 ABOUT AUDIT TEAM MEMBERS**


We have dedicated and expert team for services. Your first point of contact with Inventum Power care will be with our dedicated customer services team. We are highly skilled, motivated and fully trained to assist you. Our services team includes our expert, highly experienced advisors for Energy saving systems, environmental health analysis and others Energy Conservation and Sustainability Experts who have over 40 years combined experience for the same. Each team member is dedicated to offering a high level of customer care and also strives for excellence to ensure that you receive the perfect service.

## **2.6 OBJECTIVE OF GREEN AUDIT**

Green audit is the key to a systematic approach for decision-making in the area of natural/environmental resource management and gives a positive orientation towards the sustainable use of resource. The primary objective of this green audit is to assess the environmental quality and the management strategies being implemented in College Campus.

The specific objectives are:

- To analyse the quality of the water and soil in the college campus.
- To suggest measures to improve biodiversity within the college campus.
- To determine the energy consumption pattern of the college.
- To quantify the liquid and solid waste generation and management plans in the campus.
- To assess the carbon foot print of the college.

  
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- To assess whether the measures implemented by College have helped to reduce the Carbon Footprint.
- To impart environment management plans to the college.
- To assess whether extracurricular activities of the Institution support the collection, recovery, reuse and recycling of solid wastes.
- To identify the gap areas and suggest recommendations to improve the Green Campus status of the College.

## **2.7 BENEFITS OF GREEN AUDIT TO EDUCATIONAL INSTITUTIONS**

There are many advantages of green audit to an Educational Institute:

- It would help to protect the environment in and around the campus.
- Recognize the cost saving methods through waste minimization and energy conservation.
- Empower the organization to frame a better environmental performance.
- It portrays good image of institution through its clean and green campus.

Finally, it will help to build positive impression for through green initiatives the upcoming NAAC visit.

## **2.8 TARGET AREAS OF GREEN AUDITING**

Green audit 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 etc.

Target areas included in this green auditing are water, energy, waste, green campus and carbon footprint.

### **Auditing for Water Management**

Water is a natural resource; all living organisms depend on it. While freely available in many natural environments, in human settlements potable (drinkable) water is less readily available. Since most of the water in the sea is saline and unfit for human consumption. Groundwater depletion and water contamination are making this even worse at an alarming rate. Hence it is essential to examine the quality and usage of water in the college. Water auditing is conducted for the evaluation of facilities of raw water intake and determining the facilities for water treatment and reuse. We have investigated the relevant method that can be adopted and implemented to balance the demand and supply of water.

### **Auditing for Energy Management**

Energy conservation is an important aspect of campus sustainability which is also linked with carbon foot print of the campus. Energy auditing deals with the energy conservation and methods to reduce its consumption, misuse and wastage. It is therefore essential that any environmentally responsible institution examines its energy use practices.

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### **Auditing for Waste Management**

Human activities create waste, and it is the way these wastes are handled, stored, collected and disposed of, which can pose risks to the environment and to public health. Solid waste can be divided into three categories: *Bio-Degradable, Non-Biodegradable and Hazardous waste*.

Bio-degradable wastes include food wastes, canteen waste, wastes from toilets etc. Non-biodegradable wastes include plastic, tins and glass bottles etc. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals, acids and petrol.

Unscientific management of these wastes such as dumping in pits or burning them may cause harmful discharge of contaminants into soil and water supplies, and produce green house gases contributing to global climate change respectively. Special attention should be given to the handling and management of hazardous waste generated in the college. Bio-degradable waste can be effectively utilized for energy generation purposes through anaerobic digestion or can be converted to fertilizer by composting technology. Non-biodegradable waste can be utilized through recycling and reuse. Thus the minimization of solid waste is essential to a sustainable campus.

### **Auditing for Green Campus Management**

Trees play an important ecological role within the campus environment, as well as support improved public health and provide aesthetic benefits to campus residents.

The amount of oxygen released by the trees of the campus is good for the people in the campus.

### **Auditing for Carbon Footprint**

Burning of fossil fuels in vehicles (such as petrol) has an impact on the environment through the emission of greenhouse gases into the atmosphere. Vehicular emission is the main source of carbon emission in the campus, hence to assess the method of transportation that is practiced in the college is important.

## **2.9 METHODOLOGY ADOPTED**

The methodology adopted to conduct the Green Audit of the Institution had the following components:

### **Onsite Visit:**

Four-day field visit was conducted by the Green Audit Team. The key focus of the visit was on assessing the status of the green cover of the Institution, their waste management practices and energy conservation strategies etc. The sample collection (water, soil) was carried out during the visits. The water samples from two open wells and two tap water sources were taken and soil samples from three different places of the campus was collected. The sample collection, preservation, and analysis were done in the scientific manner as prescribed by the standard procedures.

### **Focus Group Discussion**

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The Focus Group discussions were held with the nature club, club members, staff members and the management focusing various aspects of Green Audit. The discussion was focused on identifying the attitudes and awareness towards environmental issues at the institutional and local level.

### **Energy, waste management and Carbon foot print analysis Survey**

With the help of teachers and students, the audit team has assessed the energy consumption pattern and waste generation, disposal and treatment facilities of the college. The monitoring was conducted with a detailed questionnaire survey method.


## **2.10 SURVEY FORMS**

### **Electrical System:**

- Last 12 months' electricity bills with units consumed, power factor & net charge.
- Last 12 months' DG units generated, fuel consumed & net charge.
- Last 12 months' data of LPG/any other fuel consumption in campus for cooking etc.
- Complete details of AC's used in the campus such as: Total number, capacity, Power consumption, star ratings etc.
- Details of types of lights used inside the campus. Mention if all replaced with Led or not. '
- Details of Solar Power generation system such as: Total units' generated in last 12 months, amounts of electricity exported etc.
- Details of Solar water heater system such as capacity etc.
- Whether electricity conservation posters used in campus.
- Any Energy Saving methods employed by campus management.
- Whether installed occupancy sensors inside bathrooms, corridors, staircases, gallery etc.
- List of electrical & electronic equipments and Lab Equipment in college campus.

### **Building and campus details:**

- Total number of buildings in the campus.
- Total Area of the campus and total Build-up area.
- Details of buildings such as: Number and types of rooms, labs, auditoriums, library and Number of windows in a room and their size.
- Please provide pictures of class rooms, labs, library in day light without use of artificial lighting.
- Any Energy Saving methods employed by campus management.
- Total Air conditioned & Non-Air Conditioned area in buildings.
- Types & number of trees, plants etc. present inside the campus.
- Number of garden/Green Belts in the campus.
- Details of indoor plantation if present.
- Any natural or recycled material used for any construction inside the campus.
- Total number of Students, Teachers & non-teaching staff in campus.
- Year of construction of buildings.

  
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### **Water management System:**

- Details of water usage or if possible provide water bills of last 12 months.
- Give details of maximum water usage areas.
- Give details of water storage and distribution systems such as source of water supply, Number of storage tanks, storage tank capacity etc.
- If possible, provide water distribution system diagram.
- Details of Rain water harvesting system if present.
- Whether sprinkler/drip irrigation systems are being used in gardens for watering plants.
- Details of waste/sewage water treatment systems.
- Details of water purification/ RO systems for drinking.
- Sources of waste water generation.
- Whether Dishwasher used in Kitchens/Canteens?
- Approx. number of leaky taps or points present in campus.
- Whether water conservation posters used in campus.

### **Waste management System:**

- Steps taken by campus management to tackle E Waste.
- Steps taken by campus management to tackle Lab Waste.
- Steps taken by campus management to tackle Biodegradable/Kitchen/Food Waste.
- Steps taken by campus management to tackle Non-Biodegradable Waste.
- Any arrangements of Vermi-composting pits for waste utilization, If Yes give details.
- Whether waste segregation is practiced/ promoted inside the campus.
- Steps taken by campus management to regulate usage of single use plastic.

### **Miscellaneous:**

- Details of any type of nature club/ Eco Club present in college.
- Details of events organized & initiatives taken by campus to promote sustainability.
- Whether students are allowed to use to IC Engine vehicles inside the campus or not.
- Types of Display/monitors in Computer Labs, CRT or LCD or LED.


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## **AUDIT STAGE**

Green auditing in Dogra Educational Trust began with the assessment of the status of the green cover of the Institution followed by waste management practices and energy conservation strategies etc. The team monitored different facilities at the college, determined different types of appliances and utilities (lights, taps, toilets, fridges, etc.) as well as measuring the usage per item (Watts indicated on the appliance or measuring water from a tap) and identifying the relevant consumption patterns (such as how often an appliance is used) and their impacts. The staff and learners were interviewed to get details of usage, frequency or general characteristics of certain appliances.

Data collection was done in the sectors such as Energy, Waste, Greening, Carbon footprint and Water use. College records and documents were verified several times to clarify the data received through survey and discussions.

  
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## **3. GREEN AUDIT REPORT**

### **3.1 WATER ASSESSMENT**

All the water requirement of the campus is fulfilled by the ground water. The college has its own bore well in the campus itself. As informed by College's management team, daily water consumption for the entire campus when in full operation is around 14 KL.

Water samples from four different locations were collected and analysed for its quality parameters. The samples include main water source of the college campus which is used for canteen and drinking water cum cooler systems. The samples were collected and analysed for various physio-chemical parameters. The major parameters analysed include dissolved oxygen, acidity, alkalinity, chloride, hardness, pH, conductivity, total dissolved solids and salinity. The results came out to be satisfactory.

### **3.2 WASTEWATER MANAGEMENT**

Wastewater is mainly generated from washing, toilet flushing, canteen kitchen and cafeteria. Total 19 washrooms are provided in the whole campus.

Currently, all the sewage/sanitary wastewater generated is sent to municipal sewer line. Sewage treatment plant should be installed for the treatment and recycling of waste water.

### **3.3 SOLID WASTE MANAGEMENT**

Solid waste generated from campus includes mainly stationary waste, wet (food/ organic) waste and E-waste. Waste segregation can be employed to efficient waste management. Being a College with hostel/residential facility, the quantity of wet (food/ organic) waste generated in the premises is moderate. Biodegradable wet waste is mostly generated from the canteen and cafeteria. Organic waste generated is sent to municipal corporation for processing. College should initiate the process of installing a composting unit for the treatment of canteen waste and horticulture waste.

There is such as any big scope of E- waste in the campus. E- waste is broadly comprised of discarded computer monitors, motherboards, mobile phones and chargers, compact discs, headphones, Printed Circuit Boards (PCB), televisions etc. The campus doesn't generate any significant amount of e waste. Even if produced, its sent to the municipal corporation for processing. College strictly follows the guidelines regarding plastic usage and has prohibited the use of single use plastic e.g. carry-bags, glasses, spoons etc., in the campus.

### **Waste management Practices adopted by the college**

For the last few years, college is following zero organic waste protocol throughout the campus. The food waste generated by the students and staffs are taken by municipal corporation, so that, waste generated inside the campus is properly recycled.

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### 3.4 ELECTRICAL SYSTEM MANAGEMENT

College gets its electricity supply from two sources; first one being the grid and the second one being the solar PV system. Grid supply is coming from Jammu Power Distribution Corporation Limited (JPDCL). A total load of 10 kW is sanctioned to the college.

The Solar system is an On grid type i.e. it exports back the unutilised excess units generated to the grid. A total of three 5 kWp rated system has been installed.

The campus has also installed two diesel generator sets for its Power backup solution. Both the generator sets use diesel as a fuel. For cooking inside the cafeteria and the canteen, LPG cylinders are used.

#### **Air Conditioning System**

College has 16 air conditioners with star ratings. [Standards set by Bureau of Energy Efficiency (BEE)]. Below we have given the Types of ACs, their quantities, capacity as well as star ratings respectively.

Sl. No	Type of AC	Quantity	Capacity	Star Rating
1	Window AC	6	1.5 Ton	3 Star
2	Window AC	1	2 Ton	3 Star
3	Window Ac	1	0.8 Ton	3 Star
4	Split AC	3	2 Ton	3 Star
5	Split AC	5	1.5 Ton	3 Star

#### **Other Miscellaneous Systems**

LED tube lights, LED bulbs & fans are installed in classrooms, offices, library, etc. For efficient energy consumption and saving on electricity bills, college has already replaced incandescent bulbs and tube lights with LEDs. Most of the computers have LED/LCD screens. But any occupancy sensors haven't been installed in places like washrooms, staircases, etc. Below we have presented the list of other electrical equipments used inside the campus.

Sl. No	Equipment	Capacity	Quantity
1	Water Cooler	120 litres	2
2	Water Cooler	80 litres	1
3	Water Cooler	20 litres	1
4	Ceiling Fan	NA	230
5	Computers	NA	49
6	Printer	NA	10
7	Photostat Machine	NA	2
8	Water Purifier	NA	4
9	CCTV Cameras	NA	64
10	OHP Projectors	NA	9
11	Transformers	15 KVA	2



12	Transformers	10 KVA	1
13	SERVO	50 KVA	2

### 3.5 GREEN STEPS TAKEN BY THE COLEGE

College campus was audited with respect to Green Audit Checklist developed by Inventum Power Private Limited. Based on the data available for review, it is understood that college is actively taking initiatives in environment related activities. College has taken green initiatives by:

- Installing a renewable energy system, the Solar Photovoltaic system produces and even exports energy to the grid. This has dual benefits: Reduction in electricity bills & reduction of carbon emission due to extra energy generation from renewable sources.
- Buildings are well designed with wide windows and wide passages and big windows to utilise sunlight, and for ventilation.
- College library has e book facility which encourages less use for paper books and thus reduces stress on the environment.
- College has trees, shrubs and potted plants present in the campus.
- Understanding the importance of efficient energy use, college has already replaced all the conventional lighting sources with LEDs.
- In order to spread awareness among the students, college has installed awareness spreading poster regarding water saving & plastic ban inside the campus.

### 3.6 RECOMMENDED GREEN STEPS

Although college has already implemented some of the measures to encourage energy saving, we are suggesting some more ways which can be more helpful.

- College should think about implementing green initiatives such as rainwater harvesting, vermicomposting, etc. for sewage treatment which help in promoting sustainability.
- Solar water heating system should be implemented for the Hostels. The energy required for heating the water is gained from electricity. Use of solar heater will reduce the electricity consumption & Energy Bills.
- College should develop monitoring mechanism and generate & maintain the performance records of the green infrastructure.
- Water consumption can be reduced further through various conservation methods. Replacement of all old water faucets with water saving faucets such as pressmatic taps, aerator taps, jet sprays etc. can save water and help in minimising the water footprint.
- Treated sanitary wastewater can be recycled for toilet flushing and cleaning.
- College should test water quality at regular intervals, develop water demand/ balance diagram and a plan delineating water conservation practice.
- Records of pipe/ water taps leakage complaints should be maintained as a part of Standard Operating Procedures (SOPs).
- Control sensors can help to reduce consumption by automatically dimming lights when people are not around.

# THANK YOU



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**JULY. 2022**

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# **1. INTRODUCTION**

## **OBJECTIVE OF GREEN AUDIT**

Green audit is the key to a systematic approach for decision-making in the area of natural/environmental resource management and gives a positive orientation towards the sustainable use of resource. The primary objective of this green audit is to assess the environmental quality and the management strategies being implemented in College Campus.

The specific objectives are:

- To analyse the quality of the water and soil in the college campus.
- To suggest measures to improve biodiversity within the college campus.
- To determine the energy consumption pattern of the college.
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## **BENEFITS OF GREEN AUDIT TO EDUCATIONAL INSTITUTIONS**

There are many advantages of green audit to an Educational Institute:

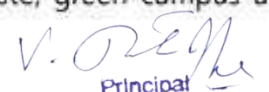
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## **TARGET AREAS OF GREEN AUDITING**

Green audit 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 etc.

Target areas included in this green auditing are water, energy, waste, green campus and carbon footprint.

  
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### **Auditing for Water Management**

Water is a natural resource; all living organisms depend on it. While freely available in many natural environments, in human settlements potable (drinkable) water is less readily available. Since most of the water in the sea is saline and unfit for human consumption. Groundwater depletion and water contamination are making this even worse at an alarming rate. Hence it is essential to examine the quality and usage of water in the college. Water auditing is conducted for the evaluation of facilities of raw water intake and determining the facilities for water treatment and reuse. We have investigated the relevant method that can be adopted and implemented to balance the demand and supply of water.

### **Auditing for Energy Management**

Energy conservation is an important aspect of campus sustainability which is also linked with carbon foot print of the campus. Energy auditing deals with the energy conservation and methods to reduce its consumption, misuse and wastage. It is therefore essential that any environmentally responsible institution examines its energy use practices.

### **Auditing for Waste Management**

Human activities create waste, and it is the way these wastes are handled, stored, collected and disposed of, which can pose risks to the environment and to public health. Solid waste can be divided into three categories: Bio-Degradable, Non-Biodegradable and Hazardous waste.

Bio-degradable wastes include food wastes, canteen waste, wastes from toilets etc. Non-biodegradable wastes include plastic, tins and glass bottles etc. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals, acids and petrol.

Unscientific management of these wastes such as dumping in pits or burning them may cause harmful discharge of contaminants into soil and water supplies, and produce greenhouse gases contributing to global climate change respectively. Special attention should be given to the handling and management of hazardous waste generated in the college. Bio-degradable waste can be effectively utilized for energy generation purposes through anaerobic digestion or can be converted to fertilizer by composting technology. Non-biodegradable waste can be utilized through recycling and reuse. Thus the minimization of solid waste is essential to a sustainable campus.

### **Auditing for Green Campus Management**

Trees play an important ecological role within the campus environment, as well as support improved public health and provide aesthetic benefits to campus residents.

The amount of oxygen released by the trees of the campus is good for the people in the campus.

### **Auditing for Carbon Footprint**

Burning of fossil fuels in vehicles (such as petrol) has an impact on the environment through the emission of greenhouse gases into the atmosphere. Vehicular emission is the main source of carbon emission in the campus, hence to assess the method of transportation that is practiced in the college is important.

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## **ABOUT DOGRA EDUCATIONAL TRUST**

Dedicated to the memory of immortal sons of the Duggar Land, who have been famous for their valour and patriotism. Dogra Educational Trust is committed to keep the beacon of light shining forever through the academic pursuits delivered by Dogra College of Education, Dogra Law College & Dogra Degree College

All the colleges constitute an upper rung of an educational endeavour undertaken by Dogra Educational Trust, to spread education in the region, True to the set motto, Knowledge for Liberation, all the colleges are striving to help spread legal literacy and build a knowledgeable citizenry befitting a free nation.


Dogra Educational Trust stands as a landmark in the educational endeavours initiated, more than three decades back, by an energetic and zealous son of Duggar Desh, Th. Gulchain Singh Charak, Chairman of the Trust. His esteem for Dogra culture, valour and devotion is manifest in the adoption of appellation 'Dogra' for all the educational institutions established so far. His preference for saffron colour is reminiscent of the great sacrifice made by valiant Dogras defining the borders of India beyond the Himalayas.

## **ABOUT INVENTUM POWER**

Inventum Power Private Limited is Care rated BEE Certified ESCO (Energy service Company) registered under Gov. of India the Ministry of Power, And ISO 9001: 2015 certified companies along with International collaboration with Elspec ISRAEL. Our technology simplifies the understanding of the quality of power itself, is highly compatible & helps our customers enhance electrical network power quality. Our innovations can be found in almost any sector, spanning from the industrial, commercial to the utility sectors.

## **ABOUT AUDIT TEAM MEMBERS**

We have dedicated and expert team for services. Your first point of contact with Inventum Power care will be with our dedicated customer services team. We are highly skilled, motivated and fully trained to assist you. Our services team includes our expert, highly experienced advisors for Energy saving systems, environmental health analysis and others Energy Conservation and Sustainability Experts who have over 40 years combined experience for the same. Each team member is dedicated to offering a high level of customer care and also strives for excellence to ensure that you receive the perfect service.

  
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## 2. THE CAMPUS

### ENVIRONMENTAL SETTING

The college is spread over an area of 25 Kanals & 11 Maralas. College is easily accessible by the Srinagar- Kanyakumari Highway and the nearest railway station is Bari Brahmana (the station just before the Jammu Tawi). Domestic Jammu Airport is 10 km away from the College.

The buildings of the college i.e. Dogra College of Education, Dogra Law College & Dogra Degree College were constructed in the year 1997, 2001 & 2003 respectively. A total of 1221 students, 44 teachers and 43 non teaching staffs are present in the college as of now. College building has three 5 kWp roof-top solar PV system,



### COLLEGE INFORMATION

The Dogra College of Education is a premier institution with work ethics, dedication and reputation of value based quality education. Dogra College of Education, baptized in the memory of Dogra heroes, is a living testimony to the commitment of Dogra Educational Trust, in the spread of education in the region. The Professionally competent and value oriented teachers are instrumental to the community and national development. Institution concerns about the welfare of the community and nation.

The college has a total of 6 number of buildings: The 3 colleges 3 storey each, Guest House, Hostel Warden Residency and Cafeteria of 2 storey each. Each building consists of classrooms, staffrooms, office, library, auditorium, seminar halls, etc. The rooms are well equipped with large windows of size approx. 6 feet \* 6 feet. It ensures entry of ample amount of natural sunlight and fresh air inside the rooms. Details of the buildings are given below:

College	Type of Room	No of Rooms	No of Windows
Dogra Law College	Classrooms	9	2 each, Size 6'x6'
	Staff Room	2	2 each, Size 6'x6'
	Office	3	1 each, Size 8'x8'
	Lib	2	2 each, Size 6'x6'
	Washroom	2	
	Auditorium	1	4, Size 6'x6'
	Seminar Hall	1	2, Size 6'x6'
	Moot Court Hall	1	2, Size 6'x6'
	Store Room	1	
	Girls Common Room	1	2, Size 6'x6'
Dogra Degree College	Classrooms	9	2 each, Size 6'x4.5'
	Staff Room	3	2 each, Size 6'x4.5'
	Office	2	3, Size 6'x4.5'
	Lib	1	2, Size 6'x4.5'
	Labs	1	2, Size 6'x4.5'
	Washroom	6	
	Sports Room	1	2, Size 6'x4.5'
	Boys Common Room	1	2, Size 6'x4.5'
	Girls Common Room	1	2, Size 6'x4.5'
	Dogra College of Education	Classrooms	9
Staff Room		1	2 each, Size 6'x4.5'
Office		4	2 each, Size 6'x4.5'
Lib		3	2 each, Size 6'x4.5'
Labs		3	2 each, Size 6'x4.5'
Washroom		7	
Sports Room		1	2, Size 6'x4.5'
Boys Common Room		1	2, Size 6'x4.5'
Girls Common Room		1	2, Size 6'x4.5'
Store Room		1	
Conference Hall	1	4, Size 6'x4.5'	



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Admin Block	Chairman Gallery	1	2, Size 6'x4.5'
	Offices	3	5, Size 6'x4.5'
	Reception Hall	1	1, Size 6'x4.5'
	Waiting Hall	1	1, Size 6'x4.5'
	Washroom	4	

College offers various courses listed below:

- BBA
- B. Com
- B.A.
- LLB 3 Years
- LLB 5 Years
- B.Ed.

**Dogra College of Education:**



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**Dogra Degree College:**



**Dogra Law College:**



*V. O. Singh*  
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Bani Brahmna, Samba



## THE DESIGN

- a) Classrooms, offices, library etc. have high ceiling, wide doors and large windows.
- b) Building is designed in such a way that corridors and classrooms receive ample sunlight.
- c) Curtains are provided for laboratory windows to avoid glare. Natural light in the classrooms maintained enough lux.
- d) Ventilation in classrooms is facilitated by large windows and fans of the classrooms.
- e) Air conditioners are used in offices, Computer labs, staff rooms, Conference Halls and Chairman Gallery.

## INDOOR AIR QUALITY (IAQ)


It refers to the air quality within & around buildings and structures, it relates to the health and comfort of building occupants. Common indoor pollutants are listed as below:

- Carbon monoxide – Sources of carbon monoxide are incomplete combustion of fossil fuels
- Volatile organic compounds (VOCs) – VOCs are emitted by paints and lacquers, paint strippers, pesticides, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions etc.
- Carbon dioxide – Due to human respiration.
- Particulate matter – Due to construction and maintenance activities, vehicular pollution.
- Nitrogen Oxides- Due to vehicular pollution


Kitchen in the canteen and hostel use liquefied petroleum gas (LPG), a clean fuel. In classrooms, the mode of ventilation is natural draft (through windows) and is enhanced by fans. Air conditioners are used in some offices and computer laboratories. ACs are serviced regularly to ensure indoor air quality. Green belts have been set up in the campus area.

## GREEN BELT/ LANDSCAPING

College campus has 5 gardens and 4 green belts. College green belt area, having 7 variety of plants, 14 different variety of trees, making a total of 131 trees and 50 plants. List of few plants and trees present in the campus is given in below. For pictures you can refer the Annexure. Plantation improves aesthetics and helps as a buffer in reducing noise level, maintaining temperature of the area. Herbal garden has different sections in which specific types of plants planted with respect to their medicinal importance. Indoor plants have aesthetic appearance as well as health benefits.

  
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Sl. No	Name of Tree	Scientific Name	No of Tree
1	Mango	Mangifera indica	9
2	Guava	Psidium guajava	13
3	Sagwan	Tectona grandis	5
4	Poplar	Populus	5
5	Alustrainia	NA	4
6	Bottlepalm	Hyophorbe lagenicaulis	2
7	Kinnu	Citrus reticulata	3
8	Gaigal	Citrus pseudolimon	2
9	Bottlebrush	Callistemon	5
10	Silverpalm	Coccothrinax argentata	32
11	Safeda	Manilkara zapota	11
12	Belpatri	Aegle marmelos	5
13	Ashoka tree	Saraca asoca	30
14	Amla	Phyllanthus emblica	5
Name of Plant			
15	Rose China	Rosa chinensis	22
16	Dakseena	NA	10
17	Panjapalm	NA	1
18	Keli	Canna spp	2
19	Jalbel	NA	2
21	Pistal Palm	NA	8

  
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### **3. PERFORMANCE ASSESSMENT OF ELECTRICAL SYSTEM**

#### **INTRODUCTION**

The first step to commence audit at site was to study the electrical network as well as to conduct study of the electrical system & network at the facility. This chapter presents the analysis of electrical system of Dogra Educational Trust.

#### **ANALYSIS**

##### **Electricity Consumption from Grid**

Three different electricity meters are provided for separate monitoring of the 3 different buildings of the college. Electricity is being provided by the Jammu Power Distribution Corporation Limited (JPDCCL). Under this section, we have represented the electricity consumption pattern of the facility. We have taken into consideration the electricity bills (of last 12 months) of the facility. The 3 buildings each have a sanctioned load of 10 kW. The supply metering is in kW.

Sl. No	Institution/College	Electricity Unit Consumed in last 12 month
1	Dogra College of Education	14969
2	Dogra Law College	21371
3	Dogra Degree College & Dogra Girls Hostel	34931

##### **Electricity Consumption from Solar**

The campus also uses solar energy generated in house from the Roof Top Solar Photovoltaic system for use in the campus. The system is an On grid type i.e. it exports back the unutilised excess units generated to the grid. A total of three 5 kWp rated system has been installed. Below we have given the total energy generated and energy exported from the solar system.

Sl. No	Department/College	Units generated in last 12 month	Electricity Exported
1	Dogra Law College	6506	1428
2	Dogra Degree College	6570	693
3	Dogra College of Education	5663	1055

##### **Diesel Consumption**

Campus has employed two generator sets for its Power backup solution. Both the generator sets use diesel as a fuel. Below we have presented the annual fuel consumption of both the DGs and average fuel consumption per hour.

Sl. No	DG Set	Fuel Consumed of last 12 months	Average fuel consumption
1	70 KVA	685 Litres	6 Litres per hours
2	7.5 KVA	335 Litres	3.5 Litres per hours



### LPG Consumption

The campus uses commercial LPG cylinders as a source of fuel in their kitchens. The campus has two kitchens being Hostel Mess and campus canteen respectively. Below we have presented the monthly LPG consumption of both the kitchens.

Sl. No	Name of the Kitchen	Average LPG Consumption per month
1	Hostel Mess	4 LPG Cylinder (Commercial)
2	Campus Canteen	02 LPG Cylinder (Commercial)

### Air Conditioning System

The campus uses Split as well as Window type ACs for cooling purposes in their buildings. College has 16 air conditioners with star ratings. [Standards set by Bureau of Energy Efficiency (BEE)]. Below we have given the Types of ACs, their quantities, capacity as well as star ratings respectively.

Sl. No	Type of AC	Quantity	Capacity	Star Rating
1	Window AC	6	1.5 Ton	3 Star
2	Window AC	1	2 Ton	3 Star
3	Window Ac	1	0.8 Ton	3 Star
4	Split AC	3	2 Ton	3 Star
5	Split AC	5	1.5 Ton	3 Star

### Other Miscellaneous Systems

LED tube lights, LED bulbs & fans are installed in classrooms, offices, library, etc. For efficient energy consumption and saving on electricity bills, college has already replaced incandescent bulbs and tube lights with LEDs. Most of the computers have LED/LCD screens. But any occupancy sensors haven't been installed in places like washrooms, staircases, etc. Below we have presented the list of other electrical equipments used inside the campus.

Sl. No	Equipment	Capacity	Quantity
1	Water Cooler	120 litres	2
2	Water Cooler	80 litres	1
3	Water Cooler	20 litres	1
4	Ceiling Fan	NA	230
5	Computers	NA	49
6	Printer	NA	10
7	Photostat Machine	NA	2
8	Water Purifier	NA	4
9	CCTV Cameras	NA	64
10	Multimedia Projectors	NA	9
11	Transformers	15 KVA	2
12	Transformers	10 KVA	1
13	SERVO	50 KVA	2

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## RECOMMENDATIONS FOR SAVINGS

The campus management can take certain baby steps in order to save more on their electricity bills. The savings will come out to be huge in the long run.

1. **Reflective Window Films:** Air conditioned rooms windows which receive direct sunlight should cover their sun facing glass windows and doors with reflective films. These films having a reflective surface will help to reflect back most of the incident sun light which increases the room temperature and increases the heat load on the AC units. Using curtains isn't that much effective since the curtains absorb all the heat from the sunlight and radiate it back in the room.
2. **Sealed Doors & windows:** This might sound absurd but leakage of the cold air from the room or hot air coming inside the room can increase the heat load on the AC units. Although the windows and doors already come with rubber gaskets in order to prevent the leakage but they do depreciate with time either due to age or some other factors such as being damaged by mice, rodents etc.
3. **Optimum Temperature for ACs:** The college management should try to spread awareness about the optimum temperature set of the ACs. The Bureau of Energy Efficiency (a body of the Ministry of Power) has said that the reduction in AC temperatures to 24 degrees from the conventional 18-21 degrees can result in 24 percent of energy savings.

From an electricity bill savings point of view, changing the temperature setting to 24 degrees from the current 18 degrees will reduce the power bills by around Rs 6,000 annually. Increasing the temperature further to 27 degrees will reduce the yearly bill by almost Rs 8,500 compared to 18 degrees.

Now there is a common misconception that the **AC will take longer to cool if we set the temperature to 24 degrees**. The thermostat in the AC just checks the temperature of the air inside the room and stops the compressor when the temperature reaches the desired level. This means that the compressor will work longer if the temperature is set to a lower level. So, it will work more and use more electricity if the temperature is set to 18 degrees Celsius than if it is set to 24-degree Celsius. This is because it will take less time for air to reach 24-degree Celsius than 18 degrees Celsius as the compressor is working with the same power or wattage.

4. **Solar Street Lights:** The campus can install solar street lights in its premises to save more. These lights having a solar panel on them will charge themselves during the day and will eventually turn ON automatically once it starts getting dark.
5. **BLDC Fans:** The campus management should start replacing the conventional Induction motor based ceiling fans with energy efficient BLDC fans in a very similar way they have replaced the conventional lighting system with LEDs. BLDC fans are around 50 % more energy efficient than the conventional type fans.



## 4. WATER MANAGEMENT

### INTRODUCTION

All the water requirement of the campus is fulfilled by the ground water. The college has its own bore well in the campus itself. As informed by College's management team, daily water consumption for the entire campus when in full operation is around 14 KL.

### OBSERVATIONS

- Water is stored in the underground storage tank of capacity 14 KL, and then transferred to 22 overhead tanks, each of capacity 1 KL using pumps and then distributed to washrooms, basins, kitchens and water purifiers/ coolers installed in the College building.
- As per IS 1172 standards for non-residential institutions, water consumption should be maximum 45 L/person/day. Water consumption of the College works out to be around 10 L/person/day, which is well under limit.
- For drinking purpose, RO Filters and water coolers are installed in the campus. For each college 3 different water purifiers and coolers are installed.
- Hostel canteen and college cafeteria are water intensive areas. Water conservation faucets (non-concussive taps, aerator taps) should be fitted in the water intensive area to conserve water.
- As informed by College's management team, there are no such leaky taps/tap water leakage in the Campus.
- Signage on water conservation are installed in washrooms or near water purifiers.

### RECOMMENDATIONS

- There is no such Rain Water harvesting system deployed in the campus. The region receives around 40 inches of rainfall annually and that water can be conserved for future use. That will eventually decrease the campus' dependency on the ground water system.
- No sprinkler or Drip irrigation method is used in the gardens to water the plants. Such a system must be installed to conserve water.
- There is no such arrangement for the treatment of sewage water coming out of the campus. It's being discharged in the nearby drain. The management should consider the installation of a sewage treatment plant for recycling of the water and decrease its discharge.
- Some other practices such as dual flushing systems in the washrooms, dry and wet mopping for floor cleaning can be implemented for water conservation

### WASTEWATER MANAGEMENT

- Wastewater is mainly generated from washing, toilet flushing, canteen kitchen and cafeteria. Total 19 washrooms are provided in the whole campus.
- Currently, all the sewage/sanitary wastewater generated is sent to municipal sewer line. Sewage treatment plant should be installed for the treatment and recycling of waste water.

## 5. WASTE MANAGEMENT

### SOLID WASTE MANAGEMENT

Solid waste generated from campus includes mainly stationary waste, wet (food/ organic) waste and E-waste.

- Coloured/segreated dustbins are placed in the premises. Segregation of wet and dry waste is practiced within the campus. Waste bins are provided on each floor, in staff rooms, offices, washrooms, kitchen and in campus area.
- Being a College with hostel/residential facility, the quantity of wet (food/ organic) waste generated in the premises is moderate. Biodegradable wet waste is mostly generated from the canteen and cafeteria. Organic waste generated is sent to municipal corporation for processing.
- In other areas like classrooms, mostly paper waste and plastic wrappers are generated.
- Since there are a lot of trees and greenery around the campus, a lot of organic/horticulture waste is produced due to leaf fall.
- College should initiate the process of installing a composting unit for the treatment of canteen waste and horticulture waste.

### PAPER WASTE MANAGEMENT


In an academic institution, waste paper is one of the main solid wastes generated in the premises. College should take steps to minimise and avoid paper usage. They can take simple steps like

- Taking prints and photocopies on both sides of the paper to avoid excess paper usage. If possible photocopy should be avoided, and digitalisation of the documents should be practised.
- Internal notices and communications should be made through e-mail only wherever possible.
- College has a total of three libraries in the whole campus with books; journals, magazines, newspapers, etc. Library also have an e-book facility.
- College can install Paper Recycling Unit, which can be used for recycling the waste paper.
- The college should encourage students to use eco-friendly material and recycle old papers/ scrap for decoration purposes during College festivals.

### E- WASTE MANAGEMENT

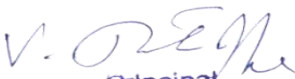
E- waste is broadly comprised of discarded computer monitors, motherboards, mobile phones and chargers, compact discs, headphones, Printed Circuit Boards (PCB), televisions etc.

- College is digitized to a large extent. This includes classrooms, library, projectors for academic work etc.
- College has enough electronic equipments, such as computers, projectors, air conditioners etc. in working condition.

  
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- The campus doesn't generate any significant amount of e waste. Even if produced, its sent to the municipal corporation for processing.
- College strictly follows the guidelines regarding plastic usage and has prohibited the use of single use plastic e.g. carry-bags, glasses, spoons etc., in the campus.
- College can also take certain steps like safe disposal of discarded lead acid batteries from the UPS. These batteries should be disposed of properly after use as mishandling of batteries can lead to leakage of Lead into the environment.
- Campus can identify authorised e waste dealers for this purpose and send them their e waste.

  
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## 6. GREEN STEPS TAKEN BY CAMPUS

### OBSERVATIONS

College campus was audited with respect to Green Audit Checklist developed by Inventum Power Private Limited. Based on the data available for review, it is understood that college is actively taking initiatives in environment related activities. College has taken green initiatives by:

- a) Installing a renewable energy system, the Solar Photovoltaic system produces and even exports energy to the grid. This has dual benefits: Reduction in electricity bills & reduction of carbon emission due to extra energy generation from renewable sources.
- b) Buildings are well designed with wide windows and wide passages and big windows to utilise sunlight, and for ventilation.
- c) College library has e book facility which encourages less use for paper books and thus reduces stress on the environment.
- d) College has trees, shrubs and potted plants present in the campus.
- e) Understanding the importance of efficient energy use, college has already replaced all the conventional lighting sources with LEDs.
- f) In order to spread awareness among the students, college has installed awareness spreading poster regarding water saving & plastic ban inside the campus.


### RECOMMENDATIONS

Although college has already implemented some of the measures to encourage energy saving, we are suggesting some more ways which can be more helpful.

- a) College should think about implementing green initiatives such as rainwater harvesting, vermicomposting, etc. for sewage treatment which help in promoting sustainability.
- b) Solar water heating system should be implemented for the Hostels. The energy required for heating the water is gained from electricity. Use of solar heater will reduce the electricity consumption & Energy Bills.
- c) College should develop monitoring mechanism and generate & maintain the performance records of the green infrastructure.
- d) Water consumption can be reduced further through various conservation methods. Replacement of all old water faucets with water saving faucets such as pressmatic taps, aerator taps, jet sprays etc. can save water and help in minimising the water footprint.
- e) Treated sanitary wastewater can be recycled for toilet flushing and cleaning.
- f) College should test water quality at regular intervals, develop water demand/ balance diagram and a plan delineating water conservation practice.
- g) Records of pipe/ water taps leakage complaints should be maintained as a part of Standard Operating Procedures (SOPs).
- h) Control sensors can help to reduce consumption by automatically dimming lights when people are not around.



- i) It is recommended to measure emissions from diesel generators and ambient air quality at least once a year.
- j) Safety, Health and Environment (SHE) groups can be formed which will include staff members and students. They can have regular meetings, and suggestions to be recorded and implemented if found suitable.
- k) Environment and eco clubs can be formed by the college students among themselves in order to spread awareness about the environment.
- l) College can organise short 1 day workshops/trips to the nearby bio diverse areas, biodiversity parks, wetlands and other places of ecological importance in order to increase the awareness and sensitivity among students and faculty.
- m) Records of green and environmental initiatives conducted by College should be maintained properly which will include aim & objective of the initiative, details in brief and the outcome.

  
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# ANNEXURE

1. Lighting in the class rooms. Blinds are provided to avoid glare.



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2. Enough light in the rooms even without the artificial lights.



3. Green belt in the campus.





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4. Diesel Generators of the Campus.

5. Solar Panels of the Campus



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6. Water Coolers of the Facility.

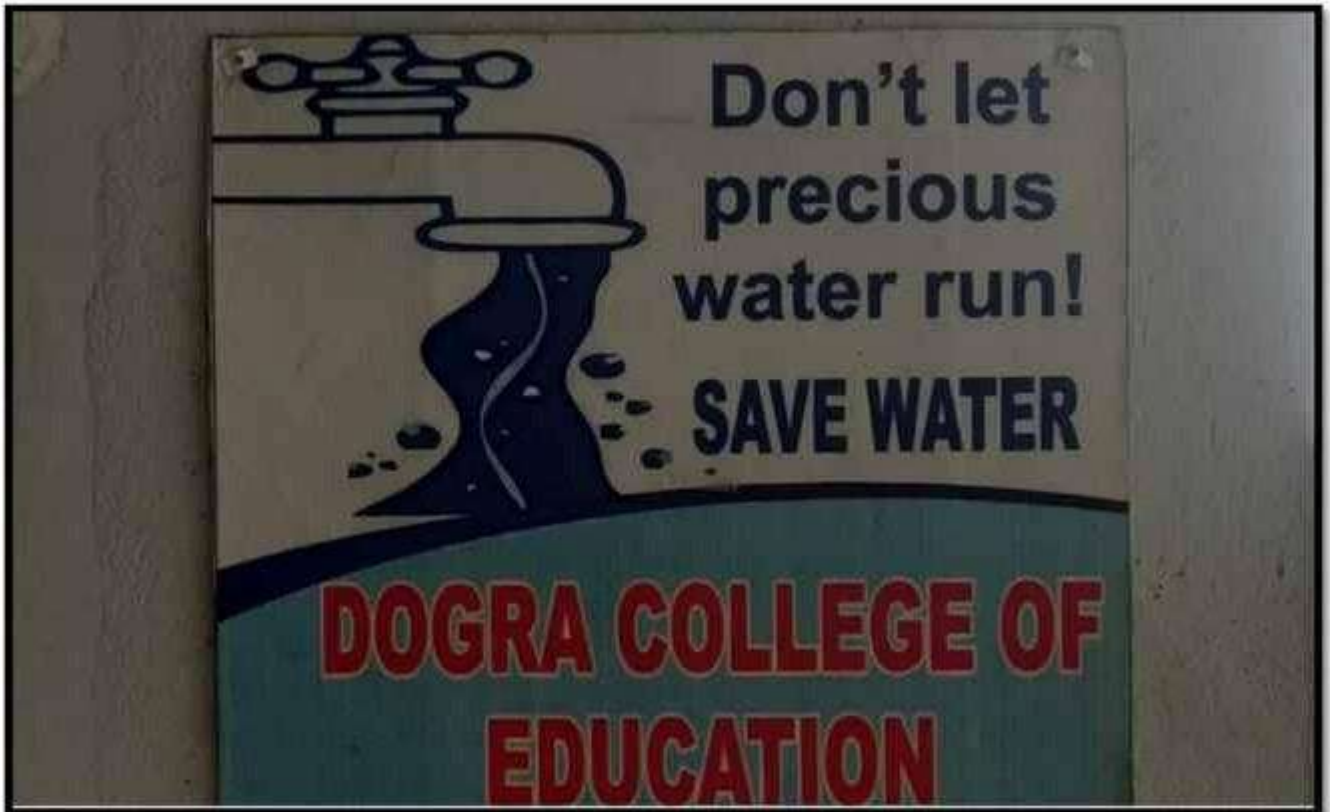


7. RO System of the campus





8. Posters for encouraging water saving.



9. Posters for ban of single use plastic.



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# THANK YOU



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