

Date: 10 /06 / 2021

CERTIFICATE OF ENVIRONMENT AUDIT


This is to certify that the SSP Nature Solution Environment Consultant Pvt. Ltd. Has conducted "Environment Audit" of "D. Y. Patil Education Society, Kolhapur" (Institution deemed to be University) declared u/s3 of UGC Act, 1956, 869, E, kasabaBavada, Kolhapur-416006 during the academic year 2020-21. The green audit was conducted in accordance with the applicable standards prescribed by Central Pollution Control Board, New Dehli and Ministry of Environment, Forest & Climate change, New Dehli. The audit involves water, waste water, energy, air, green inventory, solid waste, etc and gives 'Management Plan', which the institute can follow to minimize impact on institutional working framework. In an opinion and to the best our information and according to the information given to us, said green audit gives a true and fair view in conformity with environmental auditing principles accepted in India.

Thanking you,



Director

S. S. Patane.

D. Y. Patil Education Society (Institution Deemed to be University) Kolhapur	
Inward No.	417
Date:	10 / 06 / 2021
	 Sign

**D. Y. PATIL EDUCATION SOCIETY
INSTITUTION DEEMED TO BE UNIVERSITY KOLHAPUR**

Reaccredited by NAAC with 'A' Grade



ज्ञानाधिनम् जगत् सर्वम्

Environment Audit

(2020-21)

Introduction

a. Environment Audit for Environmental Protection:

- Environment Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the eco-friendly ambience. The purpose of Environment auditing is to assess periodically the compliance of completed or on-going activities with the requirements of legislation, measures proposed in environmental policies, environmental management systems and environmental schemes or the provisions of standards and contracts.

b. Benefits of Environment Audit:

- Ensuring legislative compliance.
- Reducing environmental impacts.
- Reducing waste, water and energy costs.
- To safeguard the environment and natural resources.
- Empower the organization to frame a better environmental performance.
- It portrays good image of institution through its clean and Environment campus.
- Finally, it will help to built positive impression for the upcoming NAAC visit.

c. NAAC criteria VII Environmental Consciousness :

Environment Audit is assigned to the criterion VII of NAAC. National Assessment and Accreditation Council which is a self governing organization that declares the institutions as Grade A, Grade B or Grade C according to the scores assigned at the time of accreditation of the institution. The intention of Environment audit is to upgrade the environmental condition in and around the institution. It is performed by considering some environmental parameters like water and wastewater management, energy conservation, waste management, air monitoring, etc. for making the institution more eco-friendly.

Students are the major strength of any academic institution. Practicing Environment actions in any educational institution will inculcate the good habit of caring nature in students. Many environmental activities like plantation and nurturing saplings and trees, cleanliness drives, bird

watching camp, no vehicle day, rain water harvesting visits to ecologically important places through Environment clubs will make the student a good citizen of country.

Need of 'Environment and Environmental Audit' is a management tool which comprises systematic assessment of the different components of the ecosystem in which the establishments have been made. It is the process of identifying and determining whether the institution's practices are eco-friendly and sustainable. With modernization, use of resources and chemicals have increased which have negatively impacted the environment creating an imbalance in nature. This is now a great matter of concern. Environment and Environmental audit is a way to ensure that such negative impacts on the campus environment, due to the development and other activities, are kept at a minimum. Realising the importance of Environment and Environmental audit, the Internal Quality Assurance Cell (IQAC) of the University has constituted a team to work towards such environment-related assessments on the Campus. An Eco-Friendly University agenda for Assam Don Bosco University is its road map for building and operating a healthy and self-renewing vibrant Campus community. With an idea to create an environment where youth can be educated to live a sustainable life in harmony with nature, the University has formulated the eco-friendly policy with the following objectives:

- Creating a collaborative effort among the University fraternity in fostering an eco-friendly learning and working environment.
- Ensuring the sustenance of biodiversity by maintenance of the natural environment in addition to conservation, restoration, and remediation of existing land and water.
- Managing waste generated in the Campus through proper disposal and treatment.
- Commitment to sustainable management of land through agroforestry and kitchen gardening for meeting the food requirements in the Campus.
- Raising awareness of real-world issues affecting the rural communities living adjacent to the University Campus and working towards addressing these issues in partnership with the communities through teaching, research and extension activities.
- Encouraging students to participate in outreach education programmes as a part of Service Learning.

- Protecting, monitoring, and conserving flora and fauna of the Campus and preservation of their natural habitat.
- Identifying existing invasive species to reduce their negative impact on the indigenous flora and fauna.
- Involving local communities in the custodianship of natural resources and utilizing local resources for infrastructure construction purposes.

The Environment and Environmental audit report consists of five components- Land, Energy, Air, Waste and Water.

Objectives: The major objectives of the Environmental auditing are:

1. To document the land use patterns in the Campus
2. To estimate the energy requirements of the Campus
3. To estimate the water quality of the Campus
4. To inventorize the biodiversity of the Campus
5. To document the waste disposal system of the Campus

d. Profile of, D.Y. Patil Education Society (Institution Deemed to be University) Kolhapur:



Dr. D.Y. Patil,

Padma Shri Awardee

**Founder President
Former Governor of States of Tripura, Bihar and West Bengal**



Dr. Sanjay D. Patil

President

'D.Y. Patil Education Society (Institution Deemed to be University), Kolhapur'

D.Y. Patil Education Society (Institution Deemed to be University), Kolhapur

The “DY Patil Group” was established in 1983 by Dr. Dnyandeo Yashwantrao Patil, Padma Shri Awardee, former Governor of States of Tripura, Bihar and West Bengal. Affectionately known to all as “Dada”, Dr. D. Y. Patil is a well known social worker, philanthropist & an educationist of international repute. The Group has focused on education and health care in the last four decades and is one of the largest private education providers in Maharashtra with over 150 educational institutions with programs in diverse fields.

The Group is actively engaged in Education and Health Care. Today, the movement started by ‘Dada’ has educated more than 300000 students from primary to doctoral level through the continuous leadership of the second generation of his family and the dedicated efforts of over 11000 staff working in these institutions. The group has three Deemed to be Universities at Kolhapur, Navi Mumbai and Pune and three Private State Universities. In addition the D. Y. Patil Group has diverse interests that are in truth investments in the progress of society and the nation. The group is also engaged electricity generation, Sports, Culture, Hospitality and Agribusinesses.

Vision

- To become a world class dynamic institution of education research & training to develop globally competitive, professional and socially responsible human resource.

Mission

- To ensure globally relevant quality higher education and skill enhancement for providing required trained manpower to the nation & the world.
- To promote symbiotic relations with industry, academic and research institutions and community to meet the expectations of various stakeholders.
- To engage in interdisciplinary research and innovate for furtherance of knowledge, technology and growth.
- To put in place dynamic technocracy for effective use of emerging trends in curriculum development, and pedagogy, evaluation and system management.
- To provide an environment for holistic evolution of the learners as human, socially responsible and conscious of sustainable ecosystem.

Goal

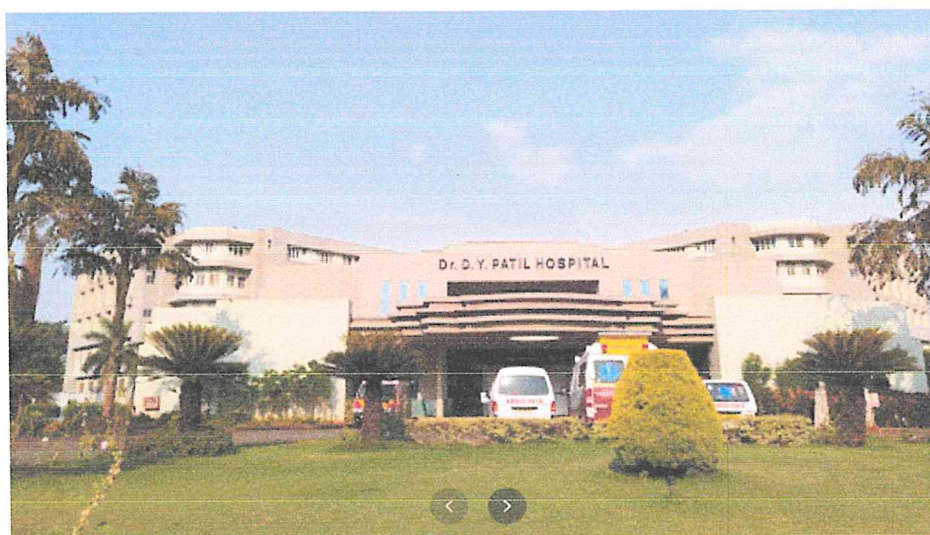
- University to be recognized as one of the top institutions of higher learning in the next decade and achieve global recognition.

INSTITUTION PROFILE IN BRIEF

NAME OF THE COLLEGE : D.Y. Patil Education Society (Institution Deemed to be University), Kolhapur

ESTABLISHMENT : 1983

PIONEERS : **Padmashri Dr. D. Y. Patil**



Institution, consist of G+4 and G+5 buildings, is situated at kasaba bawada in the city with necessary infrastructure for the departments of all the faculties. A proper care is taken to provide basic amenities for the students & the staff members. The facilities are as follows....

DYP Medical College Infrastructure

- **Classroom** : 8 spacious classrooms with necessary furniture & blackboards in all buildings of the college.
- **Library**: The library of the college is big stored independent building with qualified staff and more than 17 thousand books.
- **Laboratory**: 14 spacious laboratories with Computers with Battery backup, Printer, Scanner, LCD projectors & equipments & furniture etc.
- **Demo Room**: 7 spacious demo rooms with proper infrastructure.
- **Administrative Office**: The spacious LAN computerized administrative office with 19 cabins and modern technology & with necessary facilities.
- **Open Air Theatre**: An open air theatre of 4000 sq. ft. with paving blocks & stage is used for the big functions.
- **Covered Auditorium**: 2400 sq. ft. Covered Auditorium with a proper sitting capacity.
- **Conference Hall**: Independent conference hall with necessary facilities for different activities of the departments.
- **Study Room**: In the library building one study room for students & one study room for boys & girls students. Both the study rooms are spacious & necessary furniture & facilities, drinking water, toilet etc.
- **Reading Room**: 2 study rooms, 1 for PG and 1 for UG.
- **Ladies room**: 1 **BoysRoom**: 1
- **Museum**: Developed 3 number of museums for medical study.
- **Animal House**: 1 animal house is developed by pharmacology department as per requirement.
- **Canteen**: One canteen in the campus providing tea & snacks with the size of 2000 sq. ft.
- **Hostel**: Boys and Girls' hostel with facility of rooms with beds, canteen, T.V., Study Room with newspapers. With proper capacity as per requirement.
- **Toilets**: Total number of toilets are 67 including college, office, hostels, etc.
- **Botanical Garden**: We have developed 11500 sq. ft. garden for trees & plants with many types of species.

DYP Hospital Infrastructure

- **Classroom** : 1 spacious classrooms with necessary furniture & blackboards in all buildings of the college.
- **Demo Room**: 12 spacious demo rooms with proper infrastructure.
- **Cabins**: 48 spacious cabins with proper infrastructure for 48 faculties.
- **OPD**: Different departments for number of opd's as follows.

1	Surgery	2	Radiology
3	Audiometry	4	Medicine
5	Pediatrician	6	Pathology
7	Ortho	8	Radiology & MRI
9	Sonography	10	Gynecology
11	Dermatology	12	Dentist
13	Psychiatrics	14	Pulmonary
15	ENT	16	Ophthalmology
17	Pharmacy	18	ECG Room
19	Blood Bank	20	Store

- **Central research Lab**: 1
- **Molecular Lab**: 1
- **Cybillation& skills**: 1
- **Operation Theater**: 14
- **I C U**: 2
- **Canteen**: 1
- **Toilet**: 250

Methodology

The college has conducted Environment Audit in the year 2017-18, on a yearly basis. The audit was carried out in three phases.

a. Questionnaire survey:

It includes administrative issues associated with the planning of audit, selecting the personnel for the audit team, preparing the audit protocol used by organization, obtaining background information, etc. The scope of the audit was defined at this step. It was decided that the information related to Water and Wastewater management, Energy conservation, green belt, Carbon inventory, Solid waste management, Hazardous waste management, Air and noise quality status, activities of nature club, etc. should be gathered for the audit purpose. For collecting data related to these different areas, specific questionnaires were prepared.

b. Onsite visit and observations:

The data related to above mentioned areas was collected by visiting each and every facility of college campus. The questionnaires were filled up according to the present situation. Photographic documentation was also done with the help of sophisticated camera.

c. Data analysis:

After collection of secondary data, the reviews related to each environmental factor were taken by the Environment audit team. The data was tabulated, analyzed and graphs were prepared using computer. Depending upon the observations and data collected, interpretations were made. The lacunas and good practices were documented. The Environmental Management Plan (EMP) was prepared for the next academic year in order to have better environmental sensitization. Finally, all the information was compiled in the form of Environment Audit Report.

Environmental Auditing Process

Planning



Choosing Audit Team



Collection of Data



Analysing Results of Audit



Evaluating Audit

Overview of Environment Audit

a. Profile of D.Y. Patil Education Society (Institution Deemed to be University), Kolhapur:

D.Y. Patil Education Society (Institution Deemed to be University), Kolhapur is situated in Maharashtra at $16^{\circ}72'943''\text{N}$ and $72^{\circ}24'409''\text{E}$, in the Kolhapur District and it is at altitude of 760 fts above mean sea level.

Satellite image of D.Y. Patil Education Society (Institution Deemed to be University), Kolhapur Campus



Source: Google Earth

- | | |
|--------------------------|---------------------|
| a) Entrance | e) Lecture Building |
| b) College Main Building | f) Botanical Garden |
| c) Parking | g) Sanstha Office |
| d) Library | h) Labs |

Dr. D. Y. Patil Hospital casualty Kolhapur is situated in Maharashtra at $16^{\circ}71'459''$ N and $74^{\circ}25'655''$ E, in the Kolhapur District and it is at altitude of 760 fts above mean sea level.

Dr. D.Y.Patil Hospital casualty Kolhapur Campus



- a) Entrance
- b) College Main Building
- c) Parking
- d) Playground
- e) Lecture Building
- f) Botanical Garden
- g) Canteen
- h) Helipad

In its effort towards creating an eco-friendly campus, the University encourages its Faculty and Students to engage in conserving the Campus environment, its flora and fauna, through activities that include individual and collaborative research, conservation practices, activities and initiatives of the Eco Club and the University as a whole.

Sr.	Particular	Content		
1.	Name of the project	"D.Y. Patil Education Society, KOLHAPUR"		
2.	Name, contact number & address of Proponent	Name	D.Y. Patil Education Society, Kolhapur	
		Address	869, E, D. Y. Patil Vidyanagar, Kasba Bawada, Kolhapur.	
		Telephone	(0231) 2601235/36	
		Email ID	info@dypatilkolhapur.org	
3.	Name, contact number & address of Consultant	Name	SSP Nature Solution Environment Consultant Pvt. Ltd.(OPC)	
		Address	Pune, Kolhapur	
		Telephone		
		Mobile	9881981112	
		Email ID	ssp.naturesolutions@gmail.com	
4.	Type of project:	Educational		
5.	Location of the project	Kasba Bawada, Kolhapur.		
6.	Whether in Corporation/ Municipal / other area	Kolhapur Municipal Corporation		
7.	Total Plot Area (sq.m.)	Sr. No. 869	1,20,000	Sq. ft.
		Total	1,20,000	Sq. ft.
8.	Permissible FSI (including TDR etc.)	As per local body		
9.	Built-up Area (FSI & Non-FSI)	FSI =	1,20,000	Sq. ft.
		Non FSI =	22,500	Sq. ft.
		Open Space =	11500	Sq. ft.
		Total =	154000	
10.	Ground-coverage percentage (%) (Note: Percentage of plot not open to sky)	13516.87 Sq. ft.		
11.	Height of the building	G+5		
		18 to 22 meter		

Sr.	Particular	Content		
12.	Name of the project	"D.Y. PatilHospital, KOLHAPUR"		
13.	Name, contact number & address of Proponent	Name	D.Y. PatilHospital, Kolhapur	
		Address	507, E, D. Y.Patil Hospital, Kadamwadi, Kolhapur.	
		Telephone	(0231) 2657781	
		Email ID	hospital.dypatilmedicalkop.org	
14.	Name, contact number & address of Consultant	Name	SSP Nature Solution Environment Consultant Pvt. Ltd.(OPC)	
		Address	Pune, Kolhapur	
		Telephone		
		Mobile	9881981112	
		Email ID	ssp.naturesolutions@gmail.com	
15.	Type of project:	Educational and medical		
16.	Location of the project	Kadamwadi, Kolhapur.		
17.	Whether in Corporation/ Municipal / other area	Kolhapur Municipal Corporation.		
18.	Total Plot Area (sq.m.)	Sr. No. 507	6,50,000	Sq. ft
		Total	6,50,000	Sq. ft
19.	Permissible FSI (including TDR etc.)	As per local body		
20.	Built-up Area (FSI & Non-FSI)	FSI =	3,50,000	Sq. ft
		Non FSI=	1,50,000	Sq. ft
		Open Space=	1,10,000	Sq. ft
		Gymkhana=	600	Sq.ft.
		Total=	6,10,600	Sq.ft.
21.	Ground-coverage percentage (%) (Note: Percentage of plot not open to sky)	101516.87 Sq. m Play Ground 1,30,000 sq. ft. with green lawn.		
22.	Height of the building	G+4		
		15 to 18 meter		

b. Water and Wastewater Audit:

Water audit can be defined as a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing and recycling of water. Water Audit is nothing but an effective measure for minimizing losses, optimizing various uses and thus enabling considerable conservation of water in irrigation sector, domestic, power and industrial as well. A water audit is a technique or method which makes possible to identify ways of conserving water by determining any inefficiencies in the system of water distribution. The measurement of water losses due to different uses in the system or any utility is essential to implement water conservation measures in such an establishment.

Water accounting is the process of communicating water resources related information and the services generated from consumptive use in a geographical domain, such as a river basin, a country or a land use class; to users such as policy makers, water authorities, managers, etc.

Importance of Water Audit:

- Water audit improves the knowledge and documentation of the distribution system.
- Identifies the problem and risk areas and a better understanding of what is happening to the water after it leaves the source point.
- Leads to reduced water losses.
- Improved financial performance.
- Improved reliability of supply system.
- Efficient use of existing supplies.
- Better safeguard to public health and property and reduced legal liability.
- Reduced disruption, thereby improving level of service to customers.
- Large potential cost savings that can be achieved by water harvesting, through the recycling of water and the use of rain water.

It is observed that a number of factors like climate, culture, food habits, work and working conditions, level and type of development, and physiology determine the requirement of water. The community which has a population between 20,000 to 100,000 requires 100 to 150 liters per person (capita) per day. The communities with a population can consume over 100,000 — 150 to 200 liters person (capita) per day. As per the standards provided by WHO Regional office for South East Asia Schools requires 5-7liters per student; 15-20liters per student if water-flushed toilets, Staff accommodation requires 45liters per person per day and for sanitation purposes it depends on technology.

i) Water Audit:

Water usage can be defined as water used for all activities which are carried out on campus from different water sources. This includes usage in all residential halls, academic buildings, on campus and on grounds. Wastewater is referred as the water which is transported off the campus. The wastewater includes sewerage, residence, hall waters used in cooking, showering, clothes washing as well as wastewater from chemical and biological laboratories which ultimately going down in sink or drainage system.

Water Audit Process:

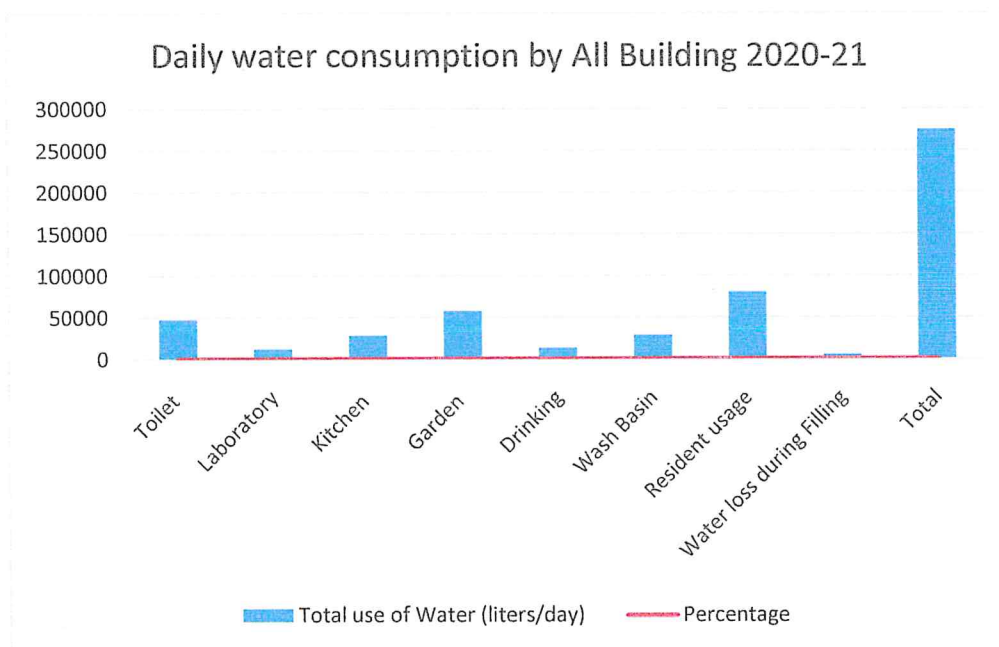


ii) Overall water consumption in D.Y. Patil Education Society (Institution Deemed to be University), Kolhapur:

From the data collected for water audit of Institution, Kolhapur, the water distribution and water consumption pattern is noticed as follow. The college is having main building for administrative work as well for teaching work. For the water audit purpose we categorized the college campus area into three buildings namely as Medical college, Hospital, Girls & Boys hostel, Garden, etc.

In water audit study the daily water consumption by all Buildings is found to be as follows.

Daily water consumption by All Building 2020-21									
Site	Toilet	Laboratory	Kitchen	Garden	Drinking	Wash Basin	Resident usage	Water loss during Filling	Total
Total use of Water (liters/day)	48000	12500	28300	58000	13440	28800	80460	5500	275000
Percentage	17.45455	4.545454545	10.29091	21.09091	4.887273	10.47273	29.25818	2	100



Graph No. 3.1 Daily water consumption by all buildings

The total water consumption per day for all buildings is found to be 2,75,000 lit/day.

Water Resources and usage Chart:

	TAP	COOLER	UG TANK	OH TANK	TANKCPT	SOIL WST	BOREWELL
MEDICAL COLLEGE	152no	5no	1no	8no	1 LKH	s tank	openwell
LADIS HOSTEL	76no	1NO	4 NO	12NO	70 K	S TANK 2	1 NO
JENTS HOSTEL	60no	1 NO	1NO	6 NO	50K	S TANK 1	OPENWELL
HOSPITAL	649no	19	2 NO	9NO	3LKH	S TANK 2	2 NO
						STP	

1.1 1. What is Hospital Sewage and why to treat it?

Generally, wastewater is defined as the composition of physical, chemical and biological waste present in wastewater. Hospital sewage is a wastewater generated relatively in larger quantities from all the units of the hospitals such as emergency and first aid, operating rooms, drug treatment, ICU, chemical and biological laboratories, radiology, canteen and laundry activities, etc.

Since, hospital sewage/wastewater consists of various potentially hazardous components that will cause many risks on human and environment by polluting surface and ground water. Hence, hospital sewage treatment is very much required.

The major objective of hospital wastewater treatment plant is to treat the influent (untreated wastewater) generated by the hospitals and healthcare sectors before its direct release into natural environment. Hospital wastewater may have an adverse impact on environments and human health. Therefore, proper wastewater management in each and every hospital is prerequisite.

1.2 2. Hospital Sewage Characteristics:

Wastewater from various hospitals consists of:

1. Microbial pathogens and harmful bacteria and virus
2. Pharmaceuticals and its metabolites
3. Radioactive isotopes
4. Hazardous chemicals, heavy metals
5. Drug residues

1.3 **3. Hospital sewage or wastewater treatment plant process:**

Compact or packaged sewage treatment plant for hospitals is done in series of steps. Conventional treatment processes involved to remove impurities from the influent are listed below.

1. Preliminary Stage or Pretreatment: As a first stage, preliminary treatment process is essential in most of the sewage treatment plant (STP). It removes items such as sticks, rags and other large debris and heavy inorganic solids contained in the hotel influent through bar screens. Removal of these materials protects plant's equipments from damage. The inorganic settled is called as grit which is removed using grit chamber.

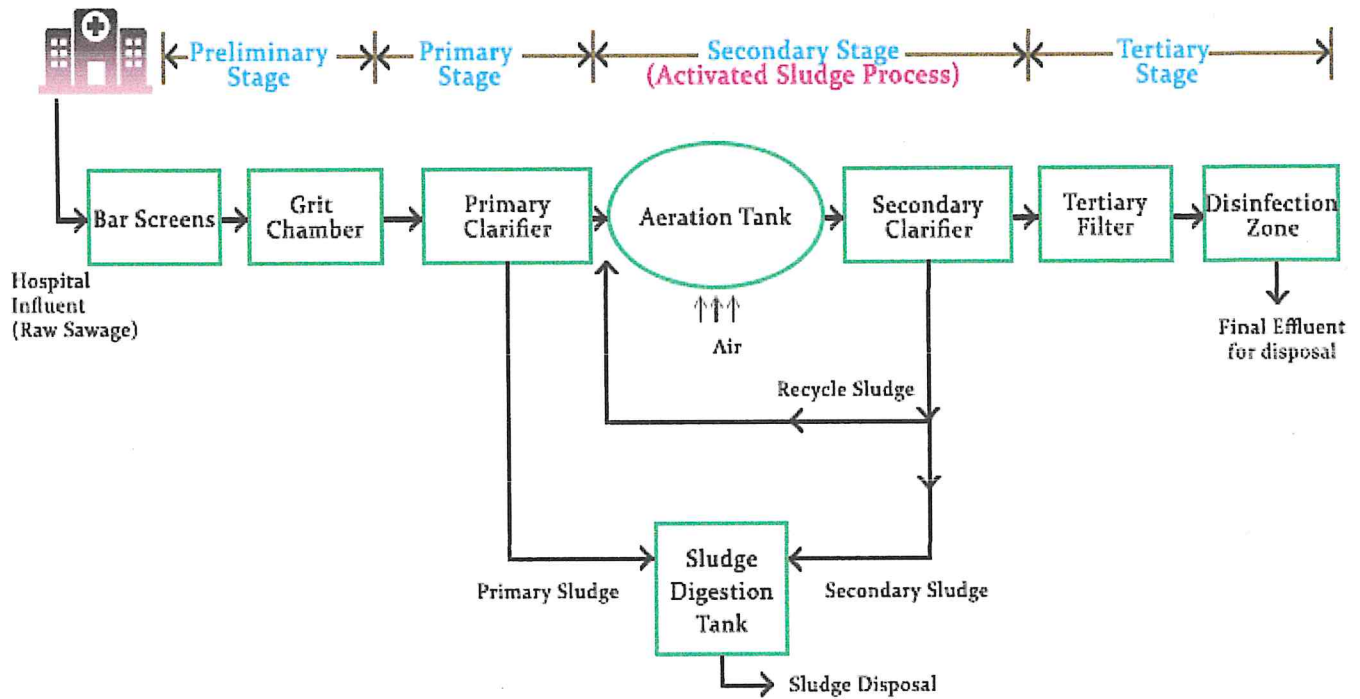
2. Primary Treatment Stage: This is the second step in sewage treatment system. Physical separation of solids and greases from wastewater is done in this stage. Now, water flows into primary filter or clarifiers for few hours to allow solid particles to settle down and lighter particles will float to the top will be skimmed off from the tank. The settled solid is called as primary sludge or primary effluent contains about 60-70% of solids. Partly treated wastewater is now subjected to next treatment level.

3. Secondary Treatment Stage: It is a biological treatment process removes dissolved inorganic materials present in soluble and colloidal form from the wastewater. Here, bacteria are used convert the colloidal and dissolved organic matter. Now the partially treated wastewater from primary tank flows into the aeration tank and air is supplied through air blower to provide oxygen for microbes. When wastewater flows into secondary clarifier, where solids settle down which is called as secondary sludge and part of it is recycled for activated sludge process and remaining is mixed with primary sludge which will be send to sludge digestion tank and then disposes off. This stage removes about 90% of inorganic solids.

4. Tertiary or Advanced Treatment Stage: This is the last stage in most of the STP's. This stage removes the suspended solids and organic matter which was not removed in secondary treatment. The pathogenic microorganisms which were not removed during biological treatment process will get removed by the process called disinfection. Several disinfection agents can be used depending on wastewater condition (pH, clarity etc). It is achieved by means of physical or chemical disinfectants like chlorine, UV light, ozone etc. Now, disinfected wastewater is suitable for disposal or reuse.

If the water is not treated adequately, the harmful contaminants in the sewage is hazardous to human health and natural environment. So, Sewage treatment Plant in hospitals is always necessary to reduce harmful impact on the environment.

Conventional processes involved in Sewage Treatment Plant (STP) for Hospitals is shown below:



Water management Practices:

● Rain Water Harvesting (RWH) is practiced by means of recharge wells, recharge bore, and water tanks (for storage of rainwater). The institution Campus is independent of the city water supply system as it relies on three bore wells and four natural ponds, present in the Campus, to cater to the water requirements. Bore wells were made to help with the construction as well as to ensure drinking water for the campus. Three Bore Wells and Four natural ponds which helps with the construction as well as to ensure drinking water for the campus.

What is RWH?

Rain water harvesting is collection and storage of rain water that runs off from roof tops, parks, roads, open grounds, etc. This water run off can be either stored or recharged into the ground water. A rainwater harvesting systems consists of the following components:

1. catchment from where water is captured and stored or recharged,
2. conveyance system that carries the water harvested from the catchment to the storage/recharge zone,
3. first flush that is used to flush out the first spell of rain,
4. filter used to remove pollutants,
5. storage tanks and/or various recharge structures.

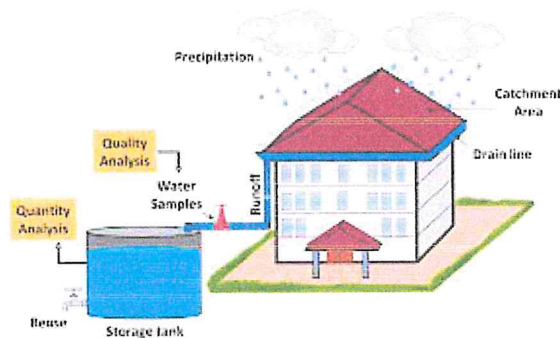
Why do RWH?

Rain may soon be the only source of clean water. Rainwater harvesting systems use the principle of conserving rainwater where it falls and have the following benefits:

- Helps meet ever increasing demand of water.
- Improves quality and quantity of groundwater.
- Reduces flooding.

How?

Setting up a rainwater harvesting is not difficult but requires some sort of understanding of hydrology and architecture and as a result most people find it too complicated to do it themselves. In order to make it simple and convenient for everyone to set up a rainwater harvesting system suitable for their needs, we have prepared a set of guidelines which will help you to set up your own rainwater harvesting system quickly and efficiently.



Solar Water Heating System

Solar water heating system is a device that helps in heating water by using the energy from the SUN. This energy is totally free. Solar energy (sun rays) is used for heating water. Water is easily heated to a temperature of 60-80o C. Solar water heater of Solar water heaters (SWHs) of 100-300 liters capacity are suited for domestic use. Larger systems can be used in restaurants, canteens, guest houses, hotels, hospitals etc. A 100 liters capacity SWH can replace an electric geyser for residential use and may save approximately 1500 units of electricity annually. The use of 1000 SWHs of 100 liters capacity each can contribute to a peak load saving of approximately 1 MW. A SWH of 100 liters capacity can prevent emission of 1.5 tones of carbon dioxide per year.

Working Of a Solar Water Heater

The Sun's rays fall on the collector panel (a component of solar water heating system). A black absorbing surface (absorber) inside the collectors absorbs solar radiation and transfers the heat energy to water flowing through it. Heated water is collected in a tank which is insulated to prevent heat loss. Circulation of water from the tank through the collectors and back to the tank continues automatically due to thermo siphon system. Based on the collector system, solar water heaters can be of two types: A solar water heater consists of a collector to collect solar energy and an insulated storage tank to store hot water. The stored hot water can be used later any time.

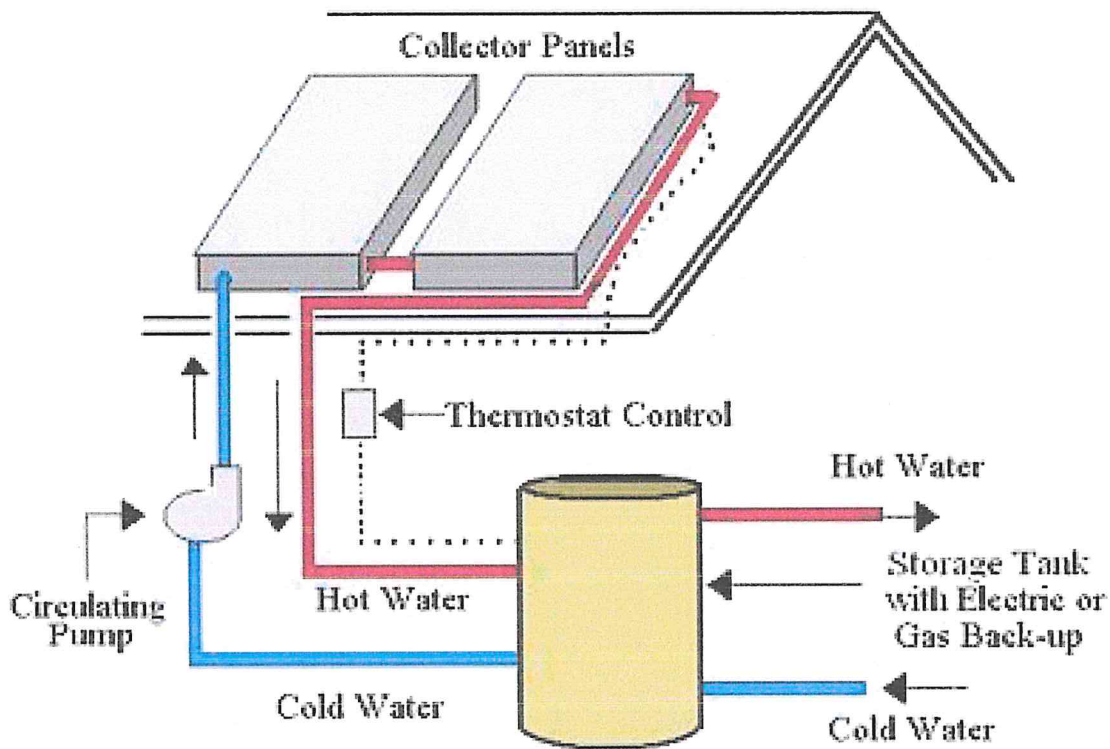
Main Components Of Solar Water Heating System

Main components of solar water heater system are

- Solar Collector(to collect solar energy)
- Insulated tank (to store hot water)
- Supporting stand
- Connecting pipes and instrumentation etc.

Applications Of Solar Water Heater

- Water heating is one of the most cost-effective uses of solar energy. Every year, several thousands of new solar water heaters are installed worldwide. Solar water heaters can be used for Homes, Community Centers, Hospitals, Nursing homes, Hotels, Restaurants, Dairy plants, Swimming Pools, Canteens, Ashrams, Hostels, Industry etc. Use of solar water heater can curtail electricity or fuel bills considerably.
- Usage of solar water heater for any application where steam is produced using a boiler or steam generator can save 70-80% of electricity or fuel bills. A residence can save 70-80% on electricity or fuel bills by replacing its conventional water heater with a solar water heating system. Solar water heaters are known to have the fastest repayment of investment in 2 to 4 years depending upon use and fuel replaced.



Active Solar Water Heating System

The solar is installed on institution building of hostels with capacity of 5000 litres/day.

c.Total Electric Energy Audit :

An electricity audit is simply an audit or calculation of how much electricity you are using in your home and of where that electricity is going.

An energy audit is an analysis of a facility, indicating how and where that facility can reduce energy consumption and save energy costs. Its insight to energy efficiency and conservation can lead to significant savings on the company's utility.

Importance of Electric energy Audit:

- The audit will not only inform you of opportunities but provide you with financial analysis. This will enable prioritization based on financial benefit and return on investment.

- Provide you with solid, easy to understand technical information regarding the proposed energy conservation measures.
- A good quality audit will analyze your historical energy use and find potential issues using statistical methods.
- Provide you with emissions analysis to help you understand the benefits of your decisions from an environmental standpoint.
- Understand where energy is used and which areas are worth focusing on the most (energy hogs).
- Provide you with benchmark information to help you understand your energy use performance compared to others in your field and area.

DYPatilMedicalCollege&UniversityBuilding ElectricalLoadDetails						
Floor	Location	Description	Quantity	Wattage	TotalLoadin KW	
GroundFloor	DEPARTMENTOFPHARMACOLOGY	Fan	37	60	2.22	
		EXFan	5	40	0.2	
		20wattLedTube	62	20	1.24	
		AC	2	1500	3	
		Fridge	2	250	0.5	
		15wLedFitting	26	15	0.39	
		AirColler	2	300	0.6	
		Lympholyzer	1	500	0.5	
		Centrifuge	2	250	0.5	
		DistillwaterPlant	1	300	0.3	
		HotAirOven	2	1000	2	
		Incubator	2	1000	2	
		Speakers	4	60	0.24	
	PH.DLAB	Water bath	3	1000	3	
		Silarmachine	2	20	0.04	
		Ultrasonicator	1	750	0.75	
		Centrifuge	2	350	0.7	
		Xenon lamp	1	900	0.9	
		Spectometer	1	350	0.35	
		Battery tester	1	150	0.15	
		Incubater	3	1000	3	
		Distillwaterplant	1	300	0.3	
		Furnace	2	1500	3	
		computer	13	250	3.25	
		UPS	1	800	0.8	
		Fan	7	60	0.42	
		Tube	15	18	0.27	
	READINGROOM	2*2Fiting	27	40	1.08	
		Fan	18	60	1.08	
	BASEMENT	BASEMENT	7 HP MOTOR	2	5222	10.444
	DepartmentofMicrobiology		Fan	36	60	2.16
			ExFan	4	60	0.24
			Ledtubelight	48	20	0.96
		AC	1	1200	1.2	
		Fridge	5	250	1.25	

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FirstFloor		40watttube light	24	40	0.96
		Autoclave	4		0
		incubator	3	1000	3
		Centrifuge	3		0
		Hotairoven	2	2000	4
		Water bath	2	1000	2
		Dean office andothers(M80hall&Girls boysroom)	Tubelight(20W)	32	20
		Fan	21	60	1.26
		Ac	4	1200	4.8
		2 x2 fitting	8	40	0.32
		CFL bulb	16	20	0.32
		15 wattLED fitting	14	15	0.21
	AuditoriumHall	Tube	20	20	0.4
		Fan	18	60	1.08
		Ac	8	1200	9.6
		Mike system	1	200	0.2
		Projector	1	200	0.2
		Speaker	4	200	0.8
	ITSection	2*2fitting	4	40	0.16
		Fan	5	60	0.3
	DepartmentofBiochemistry		Fan	18	60
		Exfan	4	60	0.24
		Tube	30	20	0.6
		Ac	1	1200	1.2
		Fridge	3	250	0.75
		Mike system	1	200	0.2
		Centrifuge	2	250	0.5
		Micro Oven	2	2000	4
		Kanainstrument	2	250	0.5

D Y Patil Hospital Electrical Load Details

Location	Description	Quantity	Wattage	Total Load in KW
LAUNDRY DEPARTMENT	Motor 3 HP	3	2250	6.75
	Motor 5 HP	2	3750	7.5
	Dryer Machine 27 KW	2	27000	54
	Motor 3 HP	2	2250	4.5
CENTRAL CANTEEN	TUBE	25	36	0.9
	TUBE	20	20	0.4
	Refrigarator	9	350	3.15
	FAN	20	60	1.2
	DEEP FRIDGE	3	750	2.25
MAIN OT	LED	63	36	2.268
	LED	31	15	0.465
	FAN	20	60	1.2
	AC	4	1200	4.8
	LED	20	9	0.18

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	Central AC	4	3500	14
CONSELEING ROOM	FAN	1	60	0.06
	Tube	1	20	0.02
	Bulb	1	9	0.009
HOD ROOM	FAN	1	60	0.06
	Tube	2	20	0.04
WATER COOLAR	Computer	1	250	0.25
	Tube	17	20	0.34
	Moniter	5	250	1.25
	Ventilater	1	150	0.15
	X - Ray Box	2	400	0.8
CSSD	LED	25	20	0.5
	Tube	8	36	0.288
	Tube	5	20	0.1
NURSING COLLEGE + JUN COLLEGE	Computer	24	250	6
	UPS 5 KVA	1	4000	4
	UPS 3 KVA	1	2400	2.4
	Tube	95	36	3.42
	Tube	60	20	1.2
	Boarwell Motor	1	3730	3.73
	Geysar	1	1500	1.5
	FAN	75	60	4.5
	AC 1.5 Tone	15	1500	22.5
	Wall Fan	5	60	0.3
	Zerox Machine	1	950	0.95
	UPS 5 KVA	1	4000	4
	Wall Fan	4	60	0.24
	Computer	5	250	1.25
Temple & Main Gate	UPS	5	200	1
	FAN	1	60	0.06
	LED	4	250	1
	LED	2	400	0.8
	Name Board	2	400	0.8
	Bulb	10	40	0.4
	Mice System	1	150	0.15
	Water Motor 3 HP	1	2250	2.25

Campus Area	Bagicha Pole LED	4	200	0.8
	LED	4	150	0.6
	LED	4	150	0.6
STP PLANT	Boarwell Motor 5.5 HP	1	4103	4.103
	Motor 17 HP	3	12682	38.046
	Motor 2 HP	4	1492	5.968
	Motor 3 HP	3	2238	6.714
OXIGEN Departrtment	Motor 5 HP	3	3730	11.19
	Motor 10 HP	1	7460	7.46
5 th Floor INTAN HOSTEL GIRLS	Tube	35	20	0.7
	FAN	20	60	1.2
	TV	1	250	0.25
	Water coolar	1	250	0.25
	Geysar	1	1500	1.5
	0.5 HP Motor	1	373	0.373
PATHOLOGY LAB	LED	20	15	0.3
	LED	100	15	1.5

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	FAN	22	60	1.32
	UPS	2	200	0.4
	Central AC	1	3500	3.5
	AC 1.5 Tone	11	1500	16.5
	Micro Machine	6	400	2.4
	Micro Fog Machine	9	400	3.6
	Refrigarator	3	250	0.75
	Deep Fridger	1	500	0.5
	Blood Cluchar Machine	1	250	0.25
	Printer	2	500	1
	Auto Glow	2	150	0.3
	Tube	4	20	0.08
	AJB Machine	1	50	0.05
	Centrifuse Machine	2	180	0.36
	Histro Pad	1	200	0.2
	Computer	7	250	1.75
NEW RAJIV GANDHI OFFICE	Tube	1	20	0.02
	Fan	1	60	0.06
	Computer	5	250	1.25
	UPS 5KVA	1	4000	4
	UPS 6KVA	1	4800	4.8
	Printer	1	500	0.5
	Ultra white Tube	5	36	0.18
PG HOSTEL	Tube	4	36	0.144
	Tube	55	20	1.1
	TV	2	250	0.5
	LED	150	15	2.25
	FAN	60	60	3.6
	Refrigarator	10	250	2.5
	Bulb	85	9	0.765
	Water Cooler	2	300	0.6
5th Floor Canteen	Tube	1	20	0.02
	Oven	2	2000	4
	Mixer	1	350	0.35
	Refrigarator	3	250	0.75
	Fan	1	60	0.06

5th Floor Intan Hostel Boys	Tube	60	20	1.2
	FAN	20	60	1.2
	TV	1	250	0.25
	COOLER	1	350	0.35
	0.5 HP Moter	1	373	0.373
	Geysar	1	1500	1.5
4th Floor Aaya Ward	LED Tubeset	70	20	1.4
	FAN	50	60	3
	TV	3	250	0.75
	PL Tube	12	36	0.432
	BULB	30	9	0.27
4th Floor Special Room	LED Tubeset	32	20	0.64
	FAN	22	60	1.32
	TV	22	250	5.5
	BULB	44	9	0.396
4th Floor Female Medicine Ward	LED Tubeset	40	20	0.8
	FAN	55	60	3.3

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	TV	2	250	0.5
	PL Tube	12	36	0.432
	BULB	30	9	0.27
	Tuberset	20	36	0.72
4th PASSAGE	LED Tuberset	10	20	0.2
4th RICH LAB	Tuberset	20	36	0.72
	LED	4	36	0.144
	FAN	20	60	1.2
	LED	75	15	1.125
	Computer	7	250	1.75
	AC	10	1200	12
	Projector	1	250	0.25
	Refrigerator	5	250	1.25
	Deep Fridge	3	500	1.5
3rd Floor ENT & OPTNAM	LED Tuberset	65	20	1.3
	FAN	60	60	3.6
	Tubset	60	36	2.16
	Water Cooler	1	300	0.3
3rd Floor Female Surgery	LED Tube	30	20	0.6
	FAN	35	60	2.1
	Tubset	10	36	0.36
3rd Floor Sayketrick	Tuberset	20	36	0.72
	FAN	40	60	2.4
	AC 1.5 Ton	2	1500	3
	PL Tube	40	36	1.44
	LED Tuberset	10	20	0.2
	Computer	2	250	0.5
	UPS	2	200	0.4
3rd Floor Children ward	LED tuberset	95	20	1.9
	FAN	125	60	7.5
	PL Tube	6	40	0.24
	Tuberset	50	36	1.8
	Refrigerator	1	250	0.25
	X-Ray Machine	1	700	0.7
	Geyser	1	1500	1.5
	Exhaust	4	60	0.24
	AC 1.5 Ton	3	1500	4.5
	Ventilator & Monitor	15	250	3.75
2nd Floor Passage	LED	15	36	0.54
	LED	35	15	0.525
	Table Fan	1	60	0.06
	FAN	12	60	0.72
2nd Floor SICU, MICU	LED	30	15	0.45
	LED	55	24	1.32
	FAN	8	60	0.48
	TV	2	250	0.5
	AC	2	1200	2.4
	Central AC	4	2000	8
	Refrigerator	2	250	0.5
	UPS 20KVA	2	2000	4
	Computer & UPS	6	400	2.4
	Tuberset	5	30	0.15
	X-Ray Machine	2	400	0.8
	Monitor & Ventilator	20	250	5
Dialysis	Tube	10	20	0.2
	FAN	15	60	0.9
	TV	1	250	0.25
	0.5 HP Motor	2	373	0.746
	Dialysis Machine	3	1200	3.6
	Tube	35	36	1.26
	LED Tuberset	15	15	0.225
	Tubset	3	36	0.108
	R O Plant	2	300	0.6
	UPS 10KVA	1	1000	1

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	LED	43	9	0.387
	Wall Fan	5	60	0.3
	LED	2	15	0.03
	Computer & UPS	1	400	0.4
	Central AC	8	2000	16
	FAN	10	60	0.6
CONFERENCE HALL	Central AC	5	2000	10
	Spot Light	32	20	0.64
	Bulb	36	9	0.324
	Projector	1	250	0.25
	Audio System	1	200	0.2
2 nd floor MEDICINE WARD	TUBE	75	20	1.5
	FAN	55	60	3.3
	AC	4	1200	4.8
	Bulb	15	9	0.135
	Geyser	1	1500	1.5
	Computer & UPS	4	400	1.6
	Refrigerator	1	250	0.25
2nd floor SERGERY WARD	LED TUBE	75	20	1.5
	FAN	75	60	4.5
	Bulb	15	9	0.135
	AC	2	1200	2.4
	Refrigerator	1	250	0.25
	Geyser	1	1500	1.5
	Computer&UPS	5	400	2
RADIOLOGY	BULB	75	9	0.675
	Computer & UPS	20	400	8
	Wall FAN	5	60	0.3
	Refrigerator	2	250	0.5
	TV	1	250	0.25
	X-Ray Machine	2	350	0.7
	MRI- Machine	1	1500	1.5
	Water coolar	1	300	0.3
	Xerox Machine	1	500	0.5
	CT Scan Machine	1	800	0.8
	LED	30	15	0.45
	LED	30	9	0.27
	LED Tube	2	20	0.04
	Central AC	6	2000	12
	AC 1.5 Ton	2	1500	3
	MRI Xerox Machine	2	500	1
	Name Board	1	250	0.25
	UPS 100 KVA	2	80000	160

1 st Floor Account	Tube	5	20	0.1
	Computer & UPS	5	400	2
	FAN	3	60	0.18
	Wall Fan	1	60	0.06
	Stand Fan	1	60	0.06
	Xerox Machine	2	500	1
	Printer	3	500	1.5
1st Floor Old Redology	AC	2	1200	2.4
	Projector	1	250	0.25
	Computer & UPS	2	400	0.8
	Tube	20	20	0.4
	FAN	15	60	0.9
PASSAGE	LED	16	36	0.576
	LED	24	15	0.36
R.N.T.C.P	Tubeset	14	36	0.504
	AC 1.5 Ton	4	1500	6
	LED Tubeset	1	20	0.02
	Wall Fan	6	60	0.36

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	Refrigerator	1	250	0.25
	Computer & UPS	2	400	0.8
GAYNAC WARD	Tubeset	8	36	0.288
	LED Tubeset	115	20	2.3
	Fan	50	60	3
	Computer & UPS	2	400	0.8
	AC 1.5 Ton	2	1500	3
	Refrigerator	1	250	0.25
	Exhaust	1	60	0.06
	OT Light	1	400	0.4
	OT AC	2	2000	4
READING HALL	Tubeset	15	36	0.54
	LED Tubeset	12	20	0.24
	Fan	12	60	0.72
MEDICAL	Central AC	1	2000	2
	Refrigerator	1	250	0.25
	Computer & UPS	4	400	1.6
	LED Tubset	15	15	0.225
	LED Tubeset	5	20	0.1
	LED Tubeset	9	20	0.18
ENT OPD	LED	20	15	0.3
	Computer & UPS	3	400	1.2
	Refrigerator	1	250	0.25
	FAN	6	60	0.36
	Tube	2	20	0.04
	Auto Glow Machine	1	150	0.15
	ENT Machine	1	200	0.2
	AC	2	1500	3
	LED	2	9	0.018
OPHT OPD	LED	14	15	0.21
	Refrigerator	1	250	0.25
	FAN	8	60	0.48
	LED Tube	11	20	0.22
	AC 1.5 Tone	1	1500	1.5
	Computer & UPS	3	400	1.2
DEMO ROOM	AC 1.5 Tone	1	1500	1.5
	LED	6	15	0.09
	Wall FAN	2	60	0.12
WASHROOM	LED Tube	7	20	0.14
PASSAGE	Tube	15	36	0.54
	LED	16	15	0.24
	FAN	4	60	0.24
	LED	23	9	0.207
	LED	16	2	0.032
	Name Board	1	150	0.15
	Hallogen	1	150	0.15
PASSAGE	LED	14	6	0.084
	LED	2	9	0.018
	LED	5	20	0.1
	LED	3	36	0.108
	LED	6	20	0.12
	Lift	2	5595	11.19
	LED	16	15	0.24
	Water Cooler	1	350	0.35
BLOOD BANK	LED	3	9	0.027
	LED	7	24	0.168
	Bulb	18	9	0.162
	PL Tubeset	31	36	1.116
	FAN	1	60	0.06
	AC 1.5 Tone	12	1500	18
	Air Curtan	1	150	0.15
	Tube	1	20	0.02
	Wall Fan	1	60	0.06
	Computer & UPS	3	400	1.2
	Refrigerator	4	250	1

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	Fridge	1	250	0.25
	Shoe Polish Machine	1	150	0.15
	UPS 40 KVA	1	32000	32
	Blood Check Machine	2	300	0.6
ODA METRIC ROOM	AC	1	1200	1.2
	LED	4	15	0.06
	Computer & UPS	1	400	0.4
	Sound System	1	200	0.2
PASSAGE	LED	2	24	0.048
	LED	8	15	0.12
	LED	2	36	0.072
CASH COUNTER	LED	2	36	0.072
	FAN	2	60	0.12
	Tube	2	36	0.072
	Computer & UPS	6	400	2.4
CASE PAPER	LED	2	36	0.072
	FAN	2	60	0.12
	LED	5	9	0.045
	Computer & UPS	5	400	2
PRESIDENT CABIN	Central AC	1	1500	1.5
	PL Fiting	7	36	0.252
	LED	3	15	0.045
	Fan	5	60	0.3
	Exhaust	2	60	0.12
	Refrigarator	1	250	0.25
	Tube	1	20	0.02
	TV	1	250	0.25
	Computer	1	200	0.2
	UPS	1	200	0.2
ACCIDENT WARD	LED	82	9	0.738
	Fan	30	60	1.8
	LED	40	40	1.6
	AC	1	1200	1.2
	UPS 20 KVA	1	16000	16
	Water Coolar	1	250	0.25
TOTAL Load in KW				830

Farnandis Boy's Hostel Electrical Load Details				
Location	Description	Quantity	Wattage	Total Load in KW
FERNANDIS HOSTEL	FAN	45	60	2.7
	Tube	45	36	1.62
	Motor 5 HP	1	3570	3.57
	Motor 1 HP	1	750	0.75
	Water coolar	1	300	0.3
	Aqua Guard	1	300	0.3
	Refrigarator	1	250	0.25
	Mixer	1	300	0.3
Total Load in KW				10

DYPatilGirlsHostel,RamanmalaKolhapur				
Location	Description	Quantity	Wattage	TotalLoadin KW
AWing	LEDTubset	44	20	0.88
	Fan	22	60	1.32
	Gizzer	3	3000	9
	Passage,Bathroom&Other Area	1	300	0.3
BWing	LEDTubset	54	20	1.08
	Fan	27	60	1.62
	SolarSysteamHeater	1	2000	2
	Aquaguard,Cooler	1	700	0.7
	Passage,Bathroom&Other Area	1	500	0.5
CWing	LEDTubset	54	20	1.08
	Fan	27	60	1.62
	Gizzer	3	3000	9
	Passage,Bathroom&Other Area	1	500	0.5
Canteen& Other Area	Fan&LEDTubset	1	500	0.5
	1HpMoter	3	750	2.25
	2HpSubmersibalPump	1	1470	1.47
	5HpBoaringMoter	1	3675	3.675
	Refrigerator	4	500	2
TotalLoadin KW				39

Solar System for Electricity:

Solar power is pollution free and causes no greenhouse gases to be emitted after installation. Reduced dependence on foreign oil and fossil fuels. Renewable clean power that is available every day of the year, even cloudy days produce some power.

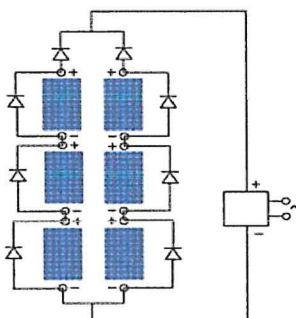
Theory and construction

Photovoltaic modules use light energy (photons) from the Sun to generate electricity through the photovoltaic effect. Most modules use wafer-based crystalline silicon cells or thin-film cells. The structural (load carrying) member of a module can be either the top layer or the back layer. Cells must be protected from mechanical damage and moisture. Most modules are rigid, but semi-flexible ones based on thin-film cells are also available. The cells are usually connected electrically in series, one to another to the desired voltage, and then in parallel to increase current. The power (in watts) of the module is the mathematical product of the voltage (in volts) and the current (in amperes) of the module. The manufacturing specifications on solar panels are obtained under standard condition, which is not the real operating condition the solar panels are exposed to on the installation site.

A PV junction box is attached to the back of the solar panel and functions as its output interface. External connections for most photovoltaic modules use MC4 connectors to facilitate easy weatherproof connections to the rest of the system. A USB power interface can also be used.

Solar panels also use metal frames consisting of racking components, brackets, reflector shapes, and troughs to better support the panel structure.

Module interconnection



A connection example, a blocking diode is placed in series with each module string, whereas bypass diodes are placed in parallel with modules.

Module electrical connections are made with conducting wires that take the current off the modules and are sized according to the current rating and fault conditions.

Panels are typically connected in series of one or more panels to form strings to achieve a desired output voltage, and strings can be connected in parallel to provide the desired current capability (amperes) of the PV system.

Blocking and bypass diodes may be incorporated within the module or used externally, to deal with partial array shading, to maximize output. For series connections, bypass diodes are placed in parallel with modules to allow current to bypass shaded modules which would be high resistance. For paralleled connections, a blocking diode may be placed in series with each module's string to prevent shaded strings' internal impedance from short circuiting other strings.

Concentrator

Some special solar PV modules include concentrators in which light is focused by lenses or mirrors onto smaller cells. This enables the use of cells with a high cost per unit area (such as gallium arsenide) in a cost-effective way.

Inverters

In general with solar panels, if not enough current is taken from PVs, then power isn't maximised. If too much current is taken then the voltage collapses. The optimum current draw depends on the amount of sunlight striking the panel. Solar panel capacity is specified by the MPP (maximum power point) value of solar panels in full sunlight.

Solar inverters convert the DC power to AC power by performing the process of maximum power point tracking (MPPT): solar inverter samples the output Power (I-V curve) from the solar cell and applies the proper resistance (load) to solar cells to obtain maximum power.

MPP (Maximum power point) of the solar panel consists of MPP voltage (V mpp) and MPP current (I mpp): it is a capacity of the solar panel and the higher value can make higher MPP.

Solar panels are wired to inverters in parallel or series (a 'string'). In string connections the voltages of the modules add, but the current is determined by the lowest performing panel. This is known as the "Christmas light effect". In parallel connections the voltages must be the same to work,

but currents add. Arrays are connected up to meet the voltage requirements of the inverters and to not greatly exceed the current limits.

Micro-inverters work independently to enable each panel to contribute its maximum possible output for a given amount of sunlight, but can be more expensive.

Efficiency

Each module is rated by its DC output power under standard test conditions (STC) and hence the on field output power might vary. Power typically ranges from 100 to 365 Watts (W). The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 W module will have twice the area of a 16% efficient 230 W module. Some commercially available solar modules exceed 24% efficiency. Currently, the best achieved sunlight conversion rate (solar module efficiency) is around 21.5% in new commercial products typically lower than the efficiencies of their cells in isolation. The most efficient mass-produced solar modules[disputed – discuss] have power density values of up to 175 W/m² (16.22 W/ft²).

Scientists from Spectro lab, a subsidiary of Boeing, have reported development of multi-junction solar cells with an efficiency of more than 40%, a new world record for solar photovoltaic cells. The Spectro lab scientists also predict that concentrator solar cells could achieve efficiencies of more than 45% or even 50% in the future, with theoretical efficiencies being about 58% in cells with more than three junctions.

Capacity factor of solar panels is limited primarily by geographic latitude and varies significantly depending on cloud cover, dust, day length and other factors.

Technology

Most solar modules are currently produced from crystalline silicon (c-Si) solar cells made of multicrystalline and monocrystalline silicon. In 2013, crystalline silicon accounted for more than 90 percent of worldwide PV production, while the rest of the overall market is made up of thin-film technologies using cadmium telluride, CIGS and amorphous silicon.

Emerging, third generation solar technologies use advanced thin-film cells. They produce a relatively high-efficiency conversion for a lower cost compared with other solar technologies. Also, high-cost, high-efficiency, and close-packed rectangular multi-junction (MJ) cells are usually used

in solar panels on spacecraft, as they offer the highest ratio of generated power per kilogram lifted into space. MJ-cells are compound semiconductors and made of gallium arsenide (GaAs) and other semiconductor materials. Another emerging PV technology using MJ-cells is concentrator photovoltaics (CPV).

Thin film

In rigid thin-film modules, the cell and the module are manufactured on the same production line. The cell is created on a glass substrate or superstrate, and the electrical connections are created in situ, a so-called "monolithic integration." The substrate or superstrate is laminated with an encapsulant to a front or back sheet, usually another sheet of glass. The main cell technologies in this category are CdTe, or a-Si, or a-Si+uc-Si tandem, or CIGS (or variant). Amorphous silicon has a sunlight conversion rate of 6–12%. [citation needed]

Flexible thin film cells and modules are created on the same production line by depositing the photoactive layer and other necessary layers on a flexible substrate. If the substrate is an insulator (e.g. polyester or polyimide film) then monolithic integration can be used. If it is a conductor then another technique for electrical connection must be used. The cells are assembled into modules by laminating them to a transparent colourless fluoro polymer on the front side (typically ETFE or FEP) and a polymer suitable for bonding to the final substrate on the other side.

The solar is installed on institution building with capacity of 500 kw, and right now only used for single building using only 300 to 350 units per day. Whatever available balance will be reversed to MSEB.



Solar Panel

d. Solid waste audit:

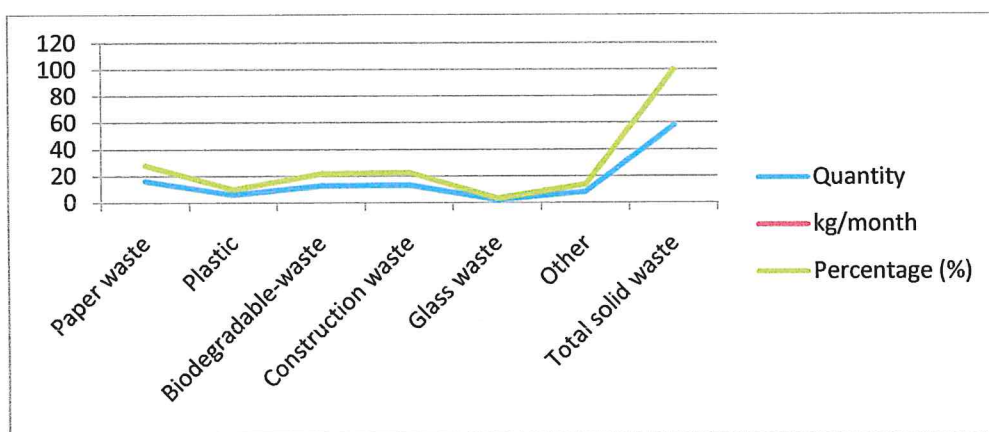
Solid waste management is becoming a major public health and environmental concern world over. Improper solid waste disposal leads to substantial negative environmental impacts e.g., pollution of air, soil, water and generation of greenhouse gases from landfills. Many insect borne diseases are spread through garbage. Therefore, it is necessary to manage the solid waste appropriately to reduce the load on waste management system. The intention of this inventory is to find out the quantity, volume, type and current management practice of solid waste generation in Institution, Kolhapur.

This survey related to solid waste generation would be helpful for making the college more environments friendly.

- Generation of solid waste in Institution, Kolhapur:**

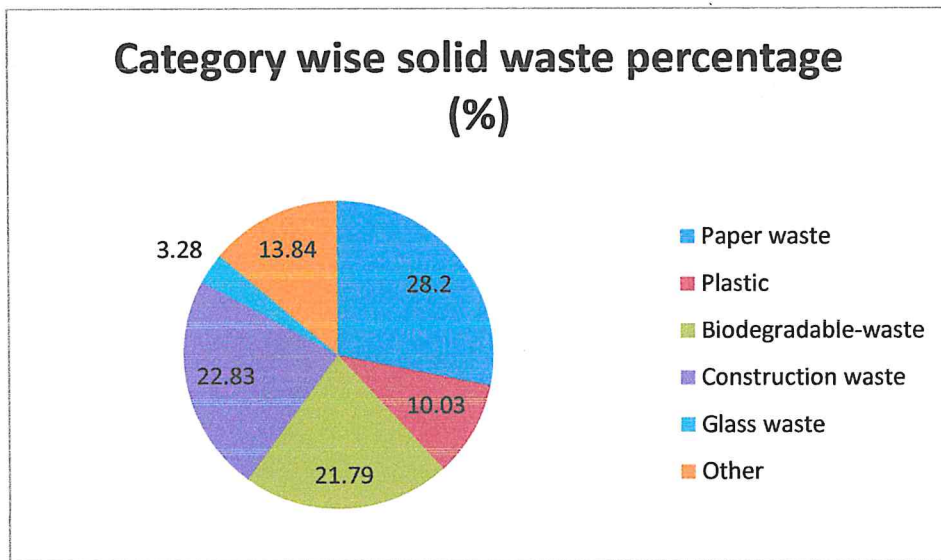
Category wise solid waste generation at Institution, Kolhapur (kg/month)

Category of waste	Paper waste	Plastic	Biodegradable-waste	Construction waste	Glass waste	Other	Total solid waste
Quantity kg/month	16.3	5.8	12.6	13.2	1.9	8.0	57.8
Percentage (%)	28.20	10.03	21.79	22.83	3.28	13.84	100



Category wise solid waste generation at Institution, Kolhapur

The average amount of solid waste generated per month in Institution, Kolhapur was 57.8 kg/month. On the basis of observations the highest quantity of solid waste generated is paper waste which is about 16.3 kg/month and construction waste is about 12.6 kg/month respectively. The examination department generated paper waste in large quantity in the college. The glass waste is produced in minimum quantity i.e. 1.9 kg/month. Besides, the above mentioned wastes, plastic waste is generated in the form of plastic wrappers of food items, old broken chairs, old broken water tank, etc.

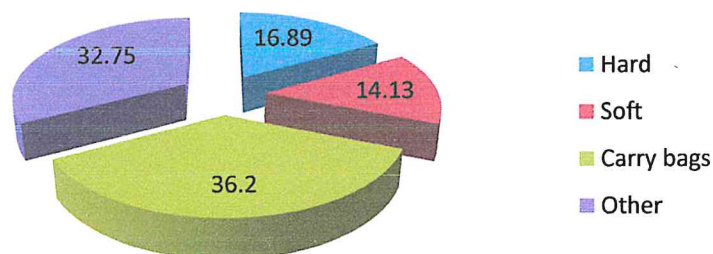


- Plastic waste generation and its distribution in college campus

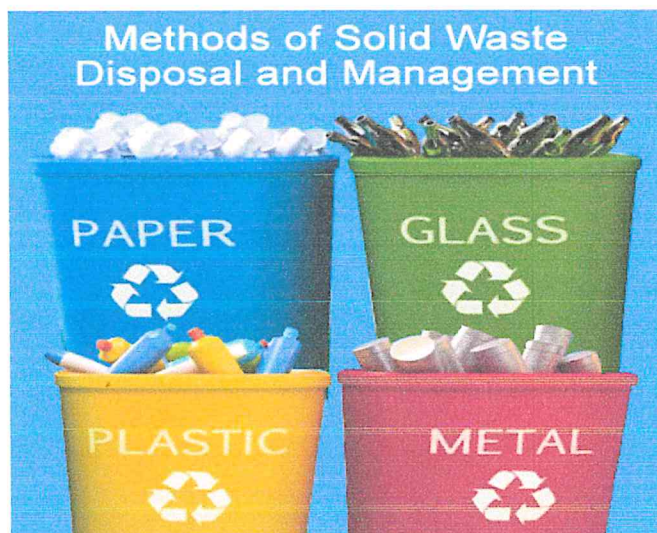
Category	Plastic kg/ month				Total
	Hard	Soft	Carry bags	Other	
Quantity	0.98	0.82	2.1	1.90	5.8
Percentage	16.89	14.13	36.20	32.75	100

Categorization of plastic waste at Institution, Kolhapur(kg / month):

Categorization of plastic waste Percentage (%)



The graph shows that the hard plastic and carry bag waste is generated in higher amount which is 36.2% and 32.75% respectively. The soft plastic and other plastic waste also generated in the college is 14.13% and 16.89% respectively



e. Hazardous waste audit:

Institution, Kolhapur is one of the well known educational institutes having number of student strength. This college caters the facility for Medical faculties students in their campus. Many department having chemicals hazardous waste but they provided their chemical and water treatment plant at the back side. That image is enclosed at the bottom. If there is other waste is produces will hand over to the particular authority.

f. E-waste:

Generation of e-waste is found on every educational institute. It is observed that the E-waste generated at Institution, Kolhapur is of Schedule II category. Computers, Printers, Laptops, Scanners, Internet Routers and Xerox machines are used for administrative work. . The wire required for the connectivity also gets included in the e waste. The college has its own computer laboratory of 50 computers. The library uses some electronic scanners which after its use can become e-waste. Presently, the college is dispatching the e waste to D.Y. Patil Education Society (Institution Deemed to be University), Kolhapur main office where the waste is collected centrally and it is given to authorised e-waste collector.

Key Observations:

- The average waste generated in the college is. 57.8Kg/month
- Highest quantity of solid waste is of paper waste16.3Kg/month
- Biodegradable waste is 12.6 Kg/month.
- Plastic waste is about 5.8% to the total solid waste on the college campus.
- Some of the classrooms were found without solid waste baskets.
- There is need of some improvements into the collection of solid waste.
- Solid waste is to be segregated at the source.



g. Ambient air quality status:

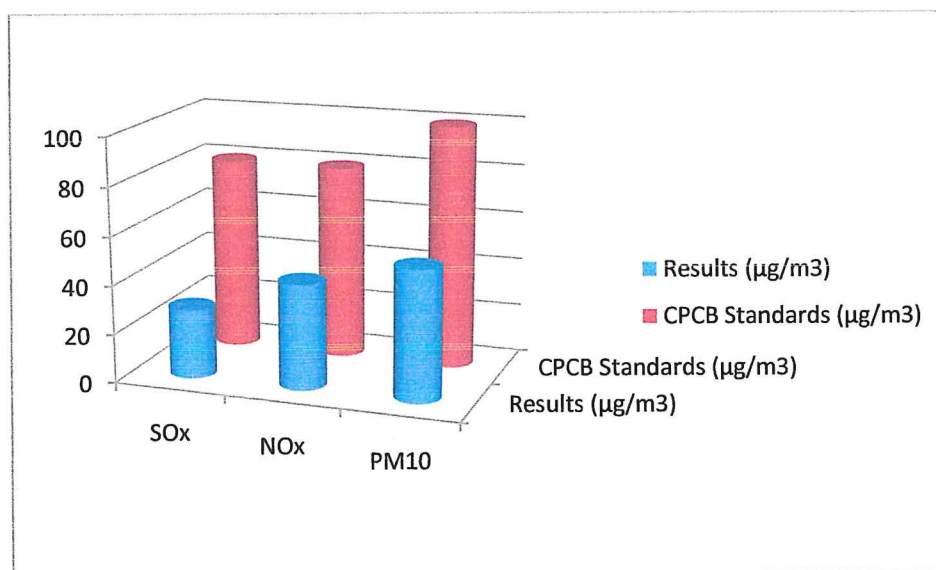
Ambient air sampling is important part of environmental monitoring. Particulate matter and trace gases sampling were carried out on the college campus. The sampling was carried out using calibrated Handy Dust Sampler APM 821 with flow rate 1 lit/min equipped with glass fibre filter paper (size 25 mm). The sampling period was 2 hrs.

Sulphur dioxide (SO₂) and Oxides of Nitrogen (NO_x) in the air were estimated with West and Gaeke method and Jacob and Hochheiser modified method respectively. Particulate matter (PM₁₀) was measured gravimetrically. The samples were collected and analyzed in the approved laboratory. The details of air quality status in the college are given as bellow:

Ambient air quality status of Institution, Kolhapur

Sr. No.	Parameters	Results (µg/m ³)	CPCB Standards (µg/m ³)
1	SO _x	28.57	80
2	NO _x	43.33	80
3	PM ₁₀	53.61	100

It was observed that all the air quality parameters analyzed were within the Ambient Air Quality Standards of Central Pollution Control Board, India. The air quality is good in the college campus as well as surrounding.



Ambient air quality status of Institution, Kolhapur.

h. Ambient noise monitoring status:—

Ambient noise monitoring was carried out in different areas of college campus like at college campus entry, college gate, corridor, floor and ladies hostel. The sampling was carried out using calibrated Sound Level Meter (AZ 8921) by logarithmic scale in Decibels (dB). The noise readings were collected in the college campus and calculated. The details of noise status in college campus are given as below:

Ambient Noise levels in Institution, Kolhapur.

Sr. No.	Site Name	Results dB (A) Leq	Standards(Day Time) dB (A) Leq
1	College Campus Entry	66.21	50
2	College Gate	62.04	50
3	Corridor	60.82	50
4	Floor	56.27	50
5	Hostel	48.54	50
6	Canteen	58.39	50
7	Library	36.17	50

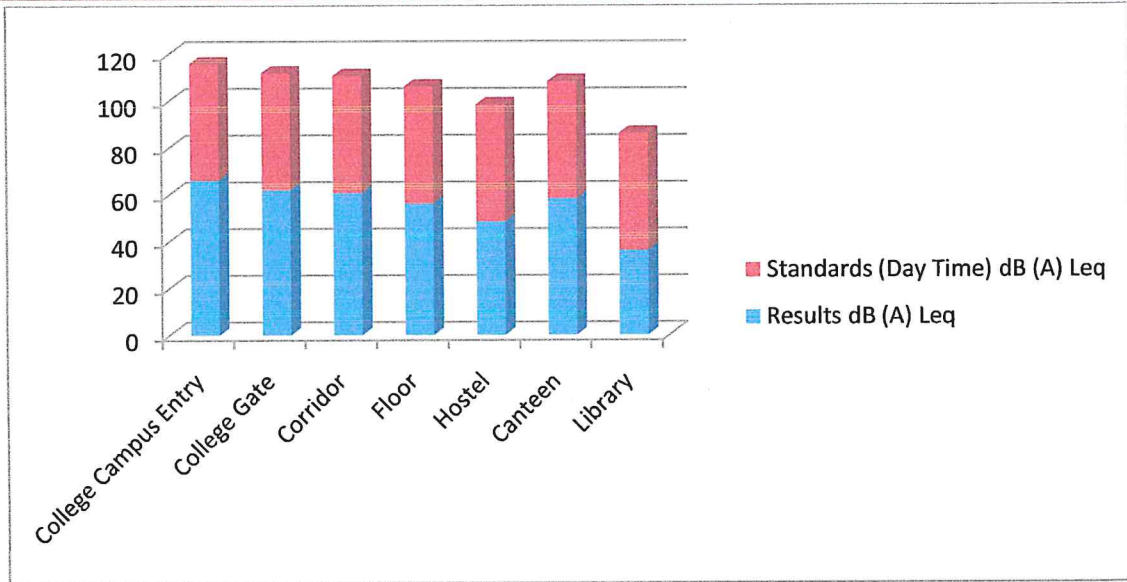
Note: - 1. All parameters expressed in dB (A) Leq.

2. Monitoring is carried during day time.

3. Day time is from 6.00 a.m. to 10.00 p.m.

It is observed from the table that the Ambient Noise levels overall in college is on higher side except ladies hostel as compared to the standards of Central Pollution Control Board for the day time.

Since the college is located adjacent of main roads and therefore, the major source of noise is automobile noise, rolling noise. The human communication and transportation are causing high level sound. It is advisable to increase the Environmentcover in the surrounding to avoid noise.



Ambient Noise levels in Institution, Kolhapur.

- Parking and traffic management:**

Traffic generated from this project will confluent on 15 m wide road to college.

Parking statement:

Total parking area	2425.74 m ²
Area per car	25 m ² for 4 wheeler 4 m ² for two wheeler

(Width of all internal roads (m) : Width of dive ways is 9 m to 12 m wide)

- **Bird's diversity:**

The diversity among birds is striking. ... Birds live in a variety of different habitats. Birds that live in different habitats will encounter different foods and different predators. Birds can be carnivores (feeding on other animals), herbivores (feeding on plants), or generalists (feeding on a variety of foods).

Sparrow, crow, bulbuls, Eagle, Pigeon, Cuckoo, Bat, Butterfly, etc these species are seen regularly around the campus.

- i. **Details of tree census in College campus:**

The beginning of the 21st century brought growing concern about global warming, climate change, food security, poverty, and population growth. CO₂ is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40% from preindustrial levels to more than 390 parts per million CO₂. On this background it is a need of time to cover the educational campuses with Environmentcover interrelated with climate change.

The current is a present status of tree cover, vegetation and carbon storage assessment of area under D.Y. Patil Education Society (Institution Deemed to be University), KolhapurCampus. In an era of global warming and climate change; carbon emission, carbon sequestration, mitigation, adaptation are the keywords in academia. Carbon sequestration is a phenomenon of converting atmospheric carbon i.e. CO₂ in to other pools of carbon such as vegetation, soil, ocean etc. in various forms to mitigate global warming. It is one of the important clauses of Kyoto Protocol. Current tree census methodology has been adopted from the guidelines set by Indian Institute of Remote Sensing, Dheharadon, Govt. of India.

- **Total biomass :**

Biomass, in ecology, is the mass of living biological organisms in a given area or ecosystem at a given time. Biomass can refer to *species biomass*, which is the mass of one or more species, or to *community biomass*, which is the mass of all species in the community. It can include microorganisms, plants or animals. The mass can be expressed as the average mass per unit area, or as the total mass in the community. 0.378 tonsof total biomass of woody vegetation have been recorded inThe New College Kolhapurcampus during the current tree census.

- **Carbon stock:**

Forests and trees act as natural carbon stores, but this carbon is released when the trees are felled and the area deforested. The amount of carbon stored within an area of land varies according to the type of vegetation cover. 0.1891 tonsoftotalcarbonstocks are presenton thecampus.

- **Carbon Sequestration:**

Carbon sequestration describes long-term storage of carbon dioxide or other forms of carbon to either mitigate or defer global warmingand avoid dangerous climate change. It has been proposed as a way to slow the atmospheric and marine accumulation of greenhouse gases, which are released by burning fossil fuels. Vegetation carbon pool having the potential of 560 Pg (Pg: Petagram= billion ton) of carbon storage globally. In the current study the focus is given on the assessment of existing carbon stock stored The New College Kolhapurcampus in the form of woody vegetation by enumerating every tree species. Overall 0.694 tons of CO₂has captured and stored by the woody plants present in the college campus. A single tree consumes 0.0218 tonsof CO₂ approximately annually consequently, as the campus possess 69 mature woody plants 1.5042 tonesof CO₂ is consumed yearly by all woody vegetation on the college campus.

- **Oxygen released :**

Woody vegetation on The New College Kolhapurcampus has released 1.85 tonsof oxygen in their lifetime till date. Released oxygen is directly proportional to CO₂ sequestrate in the ratio of 32/12. Thus, it is supposed to release of oxygen annually. It is assumed that a single tree supports oxygen demand of two people for their life.

- **Total number of trees enumerated onD.Y. Patil Education Society (Institution Deemed to be University), Kolhapurcampus:**

All the collected data was tabulated and analyzed with the help of MS- Excel spreadsheets and objected findings were extracted by using various factors given by Inter governmental Panel on Climate Change (IPCC).

- **Total number of trees enumerated onD.Y. Patil Education Society (Institution Deemed to be University), Kolhapur campus:** Total 717 numbers of trees with more than 10 cm girth and height more than 4 ft have been enumerated. Girth and height of every tree has been measured.
- Total 591 numbers of potted plants.
- Total 71 numbers types of shrubs species.

- Total No. of species identified in D.Y. Patil Education Society (Institution Deemed to be University), Kolhapur campus

Tree Species chart with Names

Sr. No.	Common Name	Botanical Name	Medical College	Hospital	Nursing	Total
1	Phoenix palm	Phoenix palm		03	03	06
2	Santipani	Alostonia Scholaris	01	23		24
3	Latania Palm	Latania lontaroides		02		02
4	Cycas Palm	Cycas revolute		07		07
5	Umber	Ficus Racemosa		04	01	05
6	Peltophonum	Peltophonum pterocarpum	01	56	08	65
7	Royal plam	Rovstonea regia		01		01
8	Almond	Prunus dulcis	01	04	02	07
9	Terminalia	Terminalia Mentaly	06	05		12
10	Fishtail Plam	Carvota		15		15
11	Ficus Nuda	Ficus beniamina nuda		14		14
12	Golden Cyprus	Golden cypress	13	06		19
13	Tabobua	Tabobua impetiginosa		28		28
14	Ficus	Ficus beniamina	04	11		15
15	Bottal Brush	Golden bottal brush		06		06
16	Kanchan	Bahunia Variegata	01	09		10
17	Rain Tree	Samanea saman	02	01		03
18	Tabal Palm	Livistona Rotundi folia	02	05		07
19	Spathodea	Spathodea Cammanulata		08	05	13
20	India bael	Aegle marmelos	01			01
21	Conocamus	Conocamus erectus		330		330
22	Kadam	Neolamarckia Codamba		03		03
23	Ficus	Ficus Black		11	18	29
24	Ficus	Ficus Microcrappa	08			08
25	Areca Palm	Areaca Catechu	02	16	05	23
26	Sindur plant	Bixa Orellana	02		02	02
27	Golmohar	Royal Poinciana			02	02
28	Buddha Bombu	Buddha belli bombu	01	01		02
29	Vad	Ficus Benghalansis	02	01		03

Sr. No.	Common Name	Botanical Name	Medical College	Hospital	Nursing	Total
30	Paniatak	Nvetanthes arbor			01	01
31	Sonchafa	Michelia Champa			01	01
32	Trangal plam	Revenala Madagas Coriensis		02		02
33	I. Christmas Tree	Arauearia Calummaris	02	04		04
34	Coconut	Cocos nucifera		04		04
35	Plumeria Alba	Plumeria alba		09		09
36	Foxtail plam	Wodyetia bifuracata	03			03
37	Peepal (Sacred fig)	Ficus religiosa		01		01
38	Date palm	Phonenix dectylifera	04	15		19
39	Pisunia alba	Pisonia alba	03			03
40	Silver ok	Grevillea robusta	02			02
41	Neem Tree	Azadirachara India	01			01
42	Cassia	Cassia Fistula			03	03
43	Mango Tree	Mangifera indica				
44	Mejestv palm					
45	Jack fruit	Jack fruit	01	01		02
	Total					717

Potted Plant Species with Names

Sr. No.	Plant Name	Medical College	Hospital	Total
1	Areca Palm	118	23	141
2	Rapies Palm	03	08	11
3	Sheflora	02	03	05
4	Tabel Palm	04		04
5	Dresena Mahatma	01		01
6	Aglonema	14		14
7	Aspragus	01		01
8	Pendanuns	02	02	04
9	Brassia	04		04
10	Golden Ficus	02		02
11	Rabber Merchera	03		03
12	Cptrus Lemen	01		01
13	Difen Becia	06	06	12
14	Marranta	02		02
15	Green Cyprus	01		01
16	Croton	03	01	04
17	Caner	01		01
18	Exora	01		01
19	Rose	01	02	03
20	Morya exotica	01	07	08
21	Mogra	01	01	02
22	Alvera	02	01	03
23	Pedilanthus	01	0	01
24	Cana		04	04
25	Baby croton		21	21
26	Krishna Kamal		02	02
27	Sontakka		01	01
28	Heleconla		01	01
29	Golden Bobu		03	03
30	Lotus		03	03
31	Gokham		01	01
32	Yukka Green		01	01
33	Bramha Kamal		08	08
34	Areliia		02	02
35	Songs of India		03	03
36	Pudica Chafa		02	02
37	Spider lily		02	02

Medicine Plant in Potted

Sr. No.	Common Name	Medical College Botanical Name	
1	<u>Lasun Vel</u>	<u>Allium Sativum Linn</u>	01
2	<u>Corfad</u>	<u>Aleo Vera</u>	01
3	<u>Vekhand</u>	<u>Acours Calamus</u>	01
4	<u>Adulsa</u>	<u>Adhatoda Vasica</u>	01
5	<u>Arjun</u>	<u>Terminalia Arjuna</u>	01
6	Citrus Lemon	<u>Cirtus Lemon</u>	01
7	Insulin	<u>Costus Ingeneus</u>	01
8	<u>Satavri</u>	<u>Asparagus Affieina lis</u>	01
9	<u>Dalchini</u>	Cinnamon	01
10	<u>Nagarmotha</u>	<u>Cuperus Rotundus</u>	01
11	<u>Parijatak</u>	<u>Nyctanthes arbor Tristis</u>	01
12	<u>Bahava</u>	<u>Cassia Fishula</u>	01
13	<u>Gulvel</u>	<u>Traspord Cardifilia</u>	01
14	Lemon	Paper Lemon	01
15	<u>Vatruksh</u>	Banyan	01
16	<u>Kailaspati</u>	<u>Caupita Guianensis</u>	01
17	<u>Kanchan</u>	<u>Bauhinia purpurea</u>	01
18	<u>Bakul</u>	<u>Mimusops Santalinus</u>	01
19	<u>Pimpal</u>	<u>Ficus religiosa</u>	01
20	<u>Cadulimb</u>	<u>Azadirachta indica</u>	01
21	<u>Sadafully</u>	<u>Vinca rosea</u>	01
22	<u>Satvin</u>	<u>Alstonia Scholaric</u>	01
23	Taman	<u>Lagerstroemia Flos regineae</u>	01
24	Umber	<u>Ficus rocemosa</u>	01
25	<u>Ractchandani</u>	<u>Pterocarpus santalinus</u>	01
		Total	591

Shrub Plant Species with Names

Sr. No.	Medical College	Hospital	Nursing
1	<u>Khupia</u>	<u>Vadeliva</u>	<u>Vedeliya</u>
2	<u>Musanda</u>	<u>Panda Ficus</u>	<u>Panda Ficus</u>
3	<u>Exora</u>	<u>Pudica Chafa</u>	<u>Pudica Chafa</u>
4	<u>Plumbago</u>	<u>Yaforbia</u>	<u>Yuforbia</u>
5	<u>Arelia</u>	<u>Plumbago</u>	<u>Plambago</u>
6	<u>Spider Lily</u>	<u>Cana</u>	<u>Cana</u>
7	<u>Dressena</u>	<u>Heloconia</u>	<u>Heloconia</u>
8	<u>Songsof India</u>	<u>Black Codia</u>	<u>Black codia</u>
9	<u>Jatrofa</u>	<u>Rohia</u>	<u>Ruhia</u>
10	<u>Tagar</u>	<u>Bamboo Grass</u>	<u>Bamboo grass</u>
11	<u>Ticoma</u>	<u>Druranta</u>	<u>Druranta</u>
12	<u>Jai</u>	<u>Almenda</u>	<u>Almenda</u>
13	<u>Jaswand (Hibiscus)</u>	<u>Boganvelia</u>	<u>Boganvedilia</u>
14	<u>Eranthimum Yellow</u>	<u>Morya Exotica</u>	
15	<u>Almenda</u>	<u>Songs of India</u>	
16	<u>Pendanuns</u>	<u>Tagar</u>	
17	<u>Amar Lily</u>	<u>Jatrofa</u>	
18	<u>Aster</u>	<u>Rabber Lily green</u>	
19	<u>Thima Acalifa</u>	<u>Black lily</u>	
20	<u>Rui</u>	<u>Rubra lily green</u>	
21	<u>Costus</u>	<u>Rappies palm</u>	
22	<u>Heloconia</u>	<u>Jiranium</u>	
23	<u>Sadafully</u>	<u>Ticoma Rosia</u>	
24	<u>Hemelia</u>	<u>Ticoma New Red</u>	
25	<u>Monthihut</u>	<u>Pentas</u>	
26	<u>Temerjiay Execta</u>	<u>Pendanus</u>	
27	<u>Limuneca Speataca</u>	<u>Ribben Grass</u>	
28	<u>Adulsa</u>	<u>Lily green Grass</u>	
29	<u>Ficus Golden</u>	<u>Presena Merigenta</u>	
	Total		71

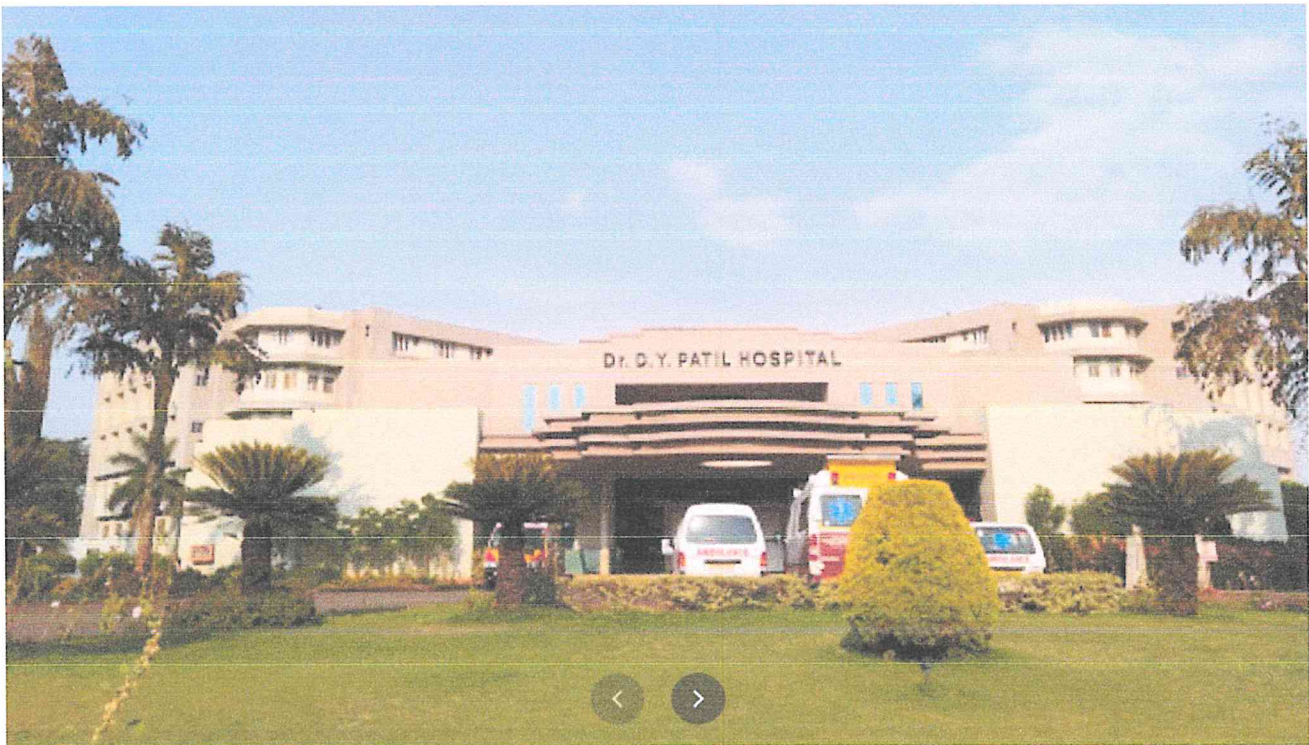
Gardening Photo Gallery



Environmental protection through activities conducted



Front view of Institution



Front view of Hospital



Institution office



Botanical Garden



Practical Laboratory



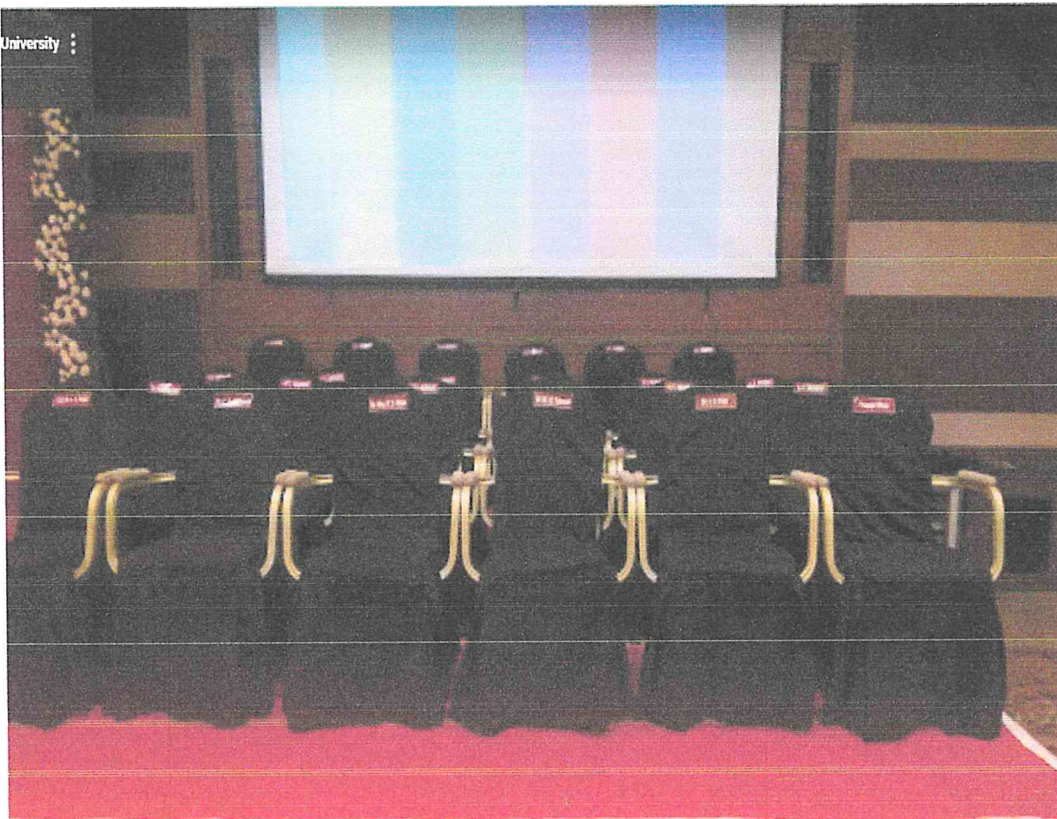
General check up camp



Social training program



Open air Auditorium



Covered Auditorium



Open Parking



Drinking water facility



Biogas Plant



Sewage treatment plant

CONCLUSION AND MANAGEMENT PLAN

The SSP Nature Solutions Environment consultant Pvt. Ltd., Kolhapur has conducted an Environment Audit of D.Y. Patil Education Society (Institution Deemed to be University), Kolhapur in the academic year 2018-19. Environment auditing is the process of identifying and determining whether institution practices are eco-friendly and sustainable. The main objective of college to carry out Environment audit is to check Environment practices followed by college and to conduct a well formulated audit to understand where we stand on a scale of environmental soundness.

Conclusions:

From the Environment audit conducted by college following are some of the conclusions which can be taken for improvement of the college campus to become environment friendly college campus.

1. College takes efforts to dispose majority waste by using proper methods.
2. Confidential paper waste is disposed properly.
3. Glass waste is to be disposed properly.
4. Electricity consumption is more at some departments.
5. Use of CFL lamps in the college is minimum. Its use should be encouraged and now converted to LED lights.
6. Toilets and bathrooms are consuming more water.
7. Roof top rain water harvesting should be planned which is useful for filling up of tanks on campus.
8. E-waste segregation, handling and disposal are properly done.
9. Practice of waste segregation to be initiated.
10. Air quality on the campus is good.
11. Conduct more seminars and group discussions on environmental education and awareness.

Recommendations:

Following are some of the key recommendation for improving campus environment.

1. College should develop its own Environmental Policy by using guidelines given in Environment Audit document.
2. The data related to all measured environmental parameters should be monitored and recorded regularly and information be made available to administration.
3. The college should develop internal procedures to ensure its compliances with environmental legislation and responsibility be fixed to carry out it in practice.
4. Wherever possible the waste should be reused or recycled.
5. All street lighting should be changed to LED lights and solar systems to save electricity.
6. Rain water harvesting must be installed for every building.
7. Drip irrigation for gardens and vegetable cultivation can be initiated.

ENVIRONMENT MANAGEMENT PLAN:

By understanding the dynamics of present situation of resource utilization and current practices of waste disposal we have prepared an Environment Management Plan (EMP) for the D.Y. Patil Education Society (Institution Deemed to be University), KolhapurDist. Kolhapur. This plan not only will provide the strengths, weaknesses and remedies for the Environment and clean campus but also give priority of the sector where the college has to give more efforts to improve its environment.

Sector	Strengths	Suggestions
Solid Waste		
Paper	<ol style="list-style-type: none"> 1. Pulping of major portion of papers i.e. answer sheets, bills and other administrative papers. 2. Use of one sided papers in many departments and main building 	<ul style="list-style-type: none"> • Towards paperless office: More use of e-mails, e-money transfer and advance IT technology for communication
Plastic	Reuse of plastic at some departments	<ul style="list-style-type: none"> • Segregation of waste at the source and sending plastic waste for recycling • Ban on Plastic carry bags in College premises
Biodegradable waste	Solid waste generated	<ul style="list-style-type: none"> • Segregation of solid waste help in composting process
Energy		
Electricity	Use untraditional source of energy	<ul style="list-style-type: none"> • Employment of more solar panels and other renewable energy sources. • Electrification of street lights by solar power. • Use of solar pumps for water tanks. • General awareness about electricity saving.
Fuel	Use of public Transport system is comparatively more by staff and students.	<ul style="list-style-type: none"> • 'Cycle on rent' service for student • General awareness about efficient use of fuel.
Water		
Water utilization	College has potential of Rain water harvesting.	<ul style="list-style-type: none"> • Installation of automatic water pumps to avoid overflowing losses • Proper and timely maintenance of plumbing at all departments • Installation of rain water harvesting assembly.

Hazardous Waste		
E-waste	<ul style="list-style-type: none"> E waste is sent to E waste collection center at Kolhapur. 	<ul style="list-style-type: none"> There must be segregation of e-waste from regular waste and also among the e-waste. E-waste in all forms not only computers, should be collected properly
Air and Noise		
Air and Noise	Air quality is still in good condition	The plantation can be increased by vertical gardening.
Tree Census		
Tree Vegetation	There is requirement of Tree Plantation	Avoid monoculture, variety of species should be planted in campus area and surrounding of ground.