ST. JOHN'S COLLEGE

ANCHAL

GREEN AUDIT

2018-2019

For sustainable future

Prepared & submitted by

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Introduction

Green auditing is the process of determining whether the operations and practices of an institution are in compliance with regulatory requirements, environmental policies, procedures and accepted standards, i.e., it is an evaluation to determine what we need to do to help our planet and how you can live a more sustainable lifestyle. A green audit is also known as an 'eco audit' or an 'environmental audit' which is a 'snap shot' of the environmental resources being used at a specific venue during a specific time to use as motivation to implement cleaner and greener projects.

In human civilization, universities and colleges have broad impacts around them, both negative and positive ways. However, the activities pursued by colleges can create a variety of adverse environmental impacts. They are analogous to small cities encompassing within their campus borders a myriad of diverse operations and activities that can impact the environment. These can include research laboratories, conference centers, cafeterias, hostels, generators, sports facilities, incineration, wastewater treatment, construction and demolition, grounds maintenance, drinking water supply and solid wastes as well as hazardous materials, ozone-depleting substances, asbestos, infectious and radiological waste.

Purpose

The purpose of green auditing is to determine and understanding how our actions in an around the college affect the environment and invariably planet Earth. Specifically, it is a systematic, periodic, documented and objective process in assessing an organization's activities and services in relation to:

- Assessing compliance with the relevant statutory environmental regulations, internal policies and accepted practices;

- Facilitating and promoting good environmental management practices;
- Identify ways to reduce waste, improve overall efficiency and minimize liability risks and prevent economic loss;
- Maintaining credibility with the public and raising student's awareness and enforcing commitment to sustainable development
- Exploring improvement opportunities and establishing an Environmental Management System (EMS)

Goals

This green audit is primarily focused on six environmental parameters with following goals:

- To encourage efficient energy use and reporting
- Encourage full accounting of GHG emissions in the campus
- Encourage the production or utilization of renewable energy
- Encourage efficient water use and reporting
- Provide the physical and organizational structure to make recycle and reduce the overall waste stream
- Ensure the quality of the indoor environment
- Minimizing the impact of noise pollution
- Ensure proper handling and disposal of hazardous wastes and materials generated
- Promote biodiversity conservation by preservation and restoration of natural areas
- Minimizing the impact of e-waste
- Reducing the use of paper
- Create an atmosphere of awareness and sense of responsibility on campus regarding

environmental issues and engage students, faculty, staff and administration to these issues.

In a time when climate change and the over-exploitation of non-renewable natural resources are growing issues – green auditing allows all of us to play an effective role in reducing in reducing our impacts on the planet; and at the same time, enhance our relationship with the planet's other inhabitants and the environment. Therefore, the following sections may explain a brief note on the possible environmental impacts and environmental consciousness of St. John's College.

SOLID WASTE MANAGEMENT

Generation of solid wastes in excess of natural recyclable limit is a matter of serious concern all over the world. A major chunk of solid wastes generated remain unattended to causing health hazards and/or nuisance to the total functioning of the college. With the emerging concern on large quantity of the waste being produced in the form of solid waste, the concept of solid waste management (SWM) becomes one the key focus of sustainable development principles which is based on policies, and practices that are resource conserving, follow standards that can be met in the long term and respect values of equity in human access to resources. So there is a need for genuine and organized initiatives in the solid waste management in the college.

Methodology

Primary data on sources of solid wastes generation, characteristics of solid wastes were collected by proper survey and surveillance of the college premises over a year. Random sampling techniques were adopted for the quantification of the solid wastes generated in the campus.

Sources of solid wastes generation

Solid wastes are mainly generated by students, college office, library, canteen and department

laboratories. Our survey confirms that about 80 – 85 percent of the students, faculties and staff are coming with their lunch box. Details on sources of solid wastes generation in the campus can be summarized as follows:

Table 1: Sources of Solid wastes (in percentage)

Sl. No.	Sources	Percentage
1	Domestic wastes (Food and other domestic waste generated by students, faculties and staff)	53
2	Canteen	17
3	Administrative Building and Library	13
4	Left over from trees, plants, leaves, twigs, etc.	9
5	Laboratories	6
6	Construction wastes	2

Percentage of solid wastes generation was based on annual average, which may be varying from time to time and season to season.

Characteristics of solid wastes:

Character wise, 71 – 80 percent of solid wastes generated were of organic wastes that are biodegradable, 5.5 – 10.0 percent composed of paper, cartons, cardboards, etc and 5 – 9 per cent comprises plastic, rubber, metals, etc. characterizations of solid wastes generated in the campus are shown in Table 2:

Table 2: Characterizations of Solid Wastes (in percentage)

Sl. No.	Nature	Percentage
1	Organic (bio degradable) Wastes	71 - 80
2	Paper, Cartons, Cardboards, etc	5.5 – 10.0
3	Plastic, Rubber, Metals, Glass, etc.	5 - 9
4	Construction of Wastes, Soils, other hazardous wastes	4.9 – 11.5

Percentage of Solid Wastes Characteristics was based on annual average, which may be varying from time to time and season to season.

Quantity of Solid Wastes

The quantity of solid wastes varies greatly for different sources and time of the year. In india, the quantity of solid waste generated ranges from as low as 50 to 100 per head per day in tribal areas to as high as 500 to 700 g per head per day in urban areas and metros (Saxena, 2001; Singhal and Pandey, 2001). So, by assuming that about 45 -55 g of wastes was generated per day per head in the campus, an approximately 57 – 70 kg of wastes were generated per day in the campus. Therefore, in an academic year (190 working days), approximately 10.8 – 13.2 tonnes of wastes were generated in the campus.

Solid waste management

Presently there is no scientific and sustainable way of solid waste management system in the campus. There is no proper segregation of wastes and no separate waste bins for organic and inorganic wastes. Currently biodegradable wastes are partially collected and disposed in the biogas plant available in the quarters and the rest are openly dumping along with papers, cartons, plastic covers, leaves, litter, etc behind the campus building and open burning of the same in holidays or weekends.

Observations

- Domestic wastes generated by students, faculties and staffs contribute the major portion of wastes, followed by canteen and office.
- About 71 – 80 per cent of the wastes are of organic (biodegradable) in nature, which is followed by paper and plastic wastes.

- Approximately about 10.8 – 13.2 tons of wastes were generated in the campus per academic year.
- There is no scientific and sustainable way of solid waste management system within the campus. For biodegradable wastes, a biogas plant is available in nearby quarters.

Recommendations

- Steps should be taken to install separate collection bins in different localities of the campus by considering the waste generation trends.
- Steps should be taken to set up a Biopark within the campus to initiate the scientific and sustainable way of solid waste management system.
- Based on the solid waste characteristics, it is recommended to introduce aerobic composting, either vermin or window composting techniques.
- It is also recommended to set up a Biogas plant within the campus to convert the wastes to energy sources.
- Awareness campaign and seminars should be conducted to reduce food waste, composting techniques and solid waste management for students and staff.
- Steps should be taken to recycle or reuse the paper, plastic, glass, metal, etc. wastes generated in the campus.
- Set up an Environmental Monitoring Committee to check the proper functioning of Solid Waste Management System.
- Environmental guidelines should be displayed in the college campus and canteen.

WATER CONSERVATION

As water is an essential condition of life on this plant, water resources have been a decisive factor in the growth and development of human civilizations throughout history. Maintaining purity of

fresh water resources to the utmost level is of prime importance to meet the new challenges of the modern society especially in an educational institution. Non-availability of good quality drinking water is a critical problem in most of the areas of Anchal Grama Panchayat especially during summer months. Groundwater has been the mainstay for meeting the domestic needs of the college besides, fulfilling the irrigation needs of gardens. However, the groundwater potential of this region is comparatively very low as compared to that of many other parts of the State. The groundwater level receding drastically during the summer months and drying up of the wells are common features.

Methodology

Reconnaissance survey was carried out to find out the major water consumption and wastewater generation sectors in the college. Routine water quality analyses were carried out according to standard methods to assess the potability of drinking water. Quantification of water consumption and wastewater generation was carried out based on per capita consumption per day (approximately 1.5 L per day) and out of which 70 – 80 per cent are discharged as wastewater.

Water consumption

Major water consumption areas in the college can be summarized as in Table 3. Hand washing and bathroom facilities were found to be consuming major portion of water, which his followed by canteen, chemistry and environmental science laboratory. As per the strength of students and staff, approximately 2000 L of water was consuming per day and annual water consumption may comes around 380 KL. Percentage of consumption may change according to different factors like seasons, practical exams and project works, etc.

Table 3: Significant Areas and Annual Water Consumption in Percentage

Sl. No.	Priority Areas	Percentage
1	Hand Wash and Toilets	46 -52
2	Canteen	14 – 18
3	Chemistry Laboratory	12 – 16
4	Environmental Science Laboratory	11 – 14
5	Zoology and Botany Labs	04 – 08
6	Staff Quarters	04 – 09
7	Gardening	02 - 03

Wastewater Generation

Wastewater generation was generally from hand wash areas and toilets, washing and cleaning facilities of canteen, washing of glasswares in the laboratories, running of distillation ad soxhlet apparatus. Approximately 1400 – 1600 liters of water was discharged as wastewater per day and the annual discharge comes about 266 – 304 KL.

Water and Wastewater Management

Water source for drinking and domestic activities is mainly coming from a pond and a open well located within the campus. Drinking water quality analysis revealed that the groundwater is suitable for drinking purposes after disinfection or heating. Besides, the college is successfully running a rainwater harvesting tank of capacity 1.5 lakh liters to meet the demand of water during summer months. Analysis report of rainwater stored in the harvesting tank is presented in Table 4– 9. Both the above water sources are adequately meets the demand of water in the college campus.

Table 4: Water quality analysis report of rain water (February, 2018)

Sl. No.	Parameter	Value	Prescribed limit
1	pH	5.92	6.5 – 8.5
2	Conductivity (µS)	132	-
3	Turbidity (NTU)	1.5	10
4	TDS (mg/l)	164	500
5	Total hardness (mg/l)	40	300
6	Total alkalinity (mg/l)	38	200
7	Residual Chlorine (mg/l)	NIL	0.2
8	Nitrate – Nitrogen (mg/l)	0.57	45
9	Phosphate (mg/l)	0.155	-
10	Sulphates (mg/l)	1.84	150
11	Potassium (mg/l)	0.9	-
12	Calcium (mg/l)	1.4	75
13	Magnesium (mg/l)	0.3	30
14	Total Coliforms (MPN / 100 ml)	NIL	10
15	Fecal Coliforms (MPN / 100 ml)	NIL	0

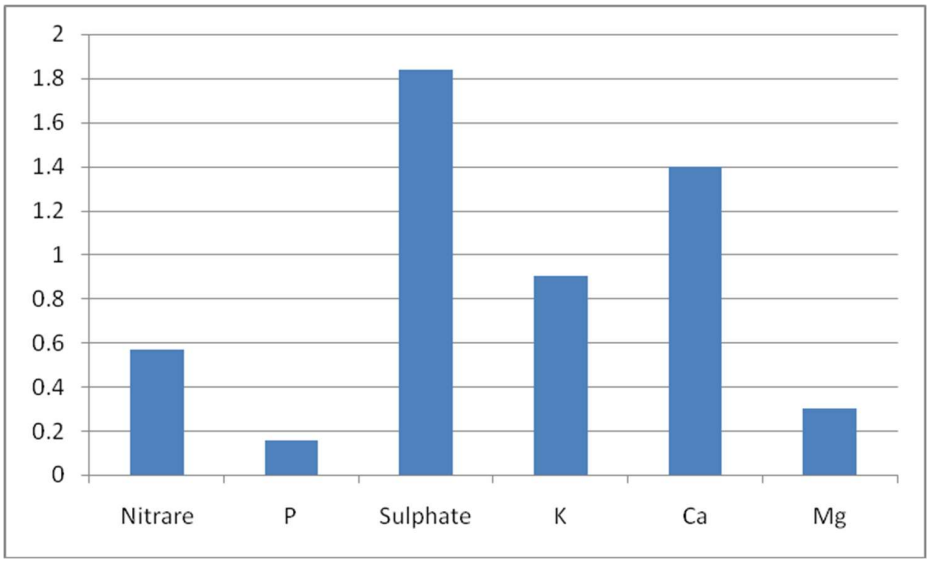


Table 5: Water quality analysis report of rain water (June, 2018)

Sl. No.	Parameter	Value	Prescribed limit
1	pH	5.92	6.5 – 8.5
2	Conductivity (µS)	132	-
3	Turbidity (NTU)	1.5	10
4	TDS (mg/l)	164	500
5	Total hardness (mg/l)	40	300
6	Total alkalinity (mg/l)	38	200
7	Residual Chlorine (mg/l)	NIL	0.2
8	Nitrate – Nitrogen (mg/l)	0.57	45
9	Phosphate (mg/l)	0.135	-
10	Sulphates (mg/l)	1.84	150
11	Potassium (mg/l)	0.9	-
12	Calcium (mg/l)	1.4	75
13	Magnesium (mg/l)	0.24	30
14	Total Coliforms (MPN / 100 ml)	NIL	10
15	Fecal Coliforms (MPN / 100 ml)	NIL	0

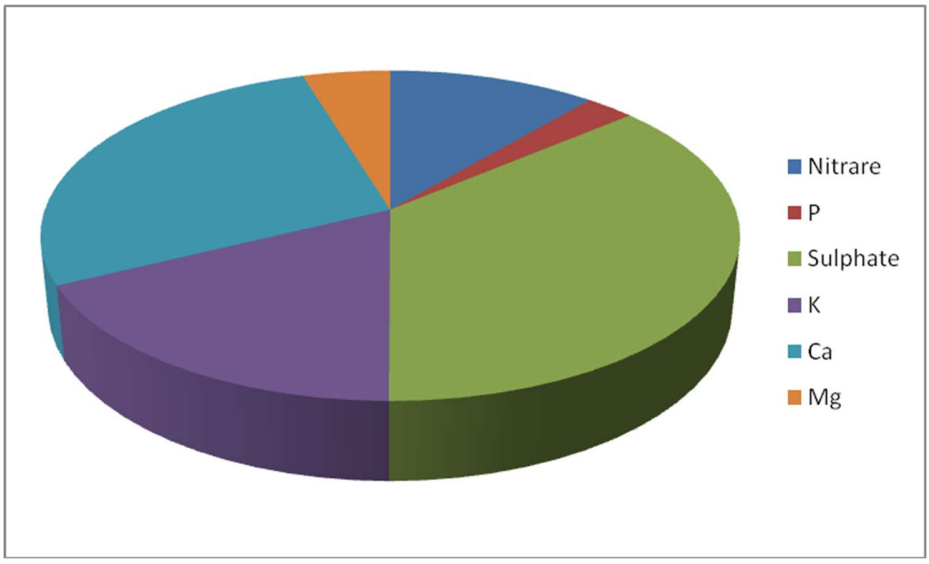


Table 6: Water quality analysis report of rain water (Sepember, 2018)

Sl. No.	Parameter	Value	Prescribed limit
1	pH	5.92	6.5 – 8.5
2	Conductivity (µS)	122	-
3	Turbidity (NTU)	1.5	10
4	TDS (mg/l)	164	500
5	Total hardness (mg/l)	40	300
6	Total alkalinity (mg/l)	28	200
7	Residual Chlorine (mg/l)	NIL	0.2
8	Nitrate – Nitrogen (mg/l)	0.457	45
9	Phosphate (mg/l)	0.125	-
10	Sulphates (mg/l)	1.84	150
11	Potassium (mg/l)	0.9	-
12	Calcium (mg/l)	1.4	75
13	Magnesium (mg/l)	0.3	30
14	Total Coliforms (MPN / 100 ml)	NIL	10
15	Fecal Coliforms (MPN / 100 ml)	NIL	0

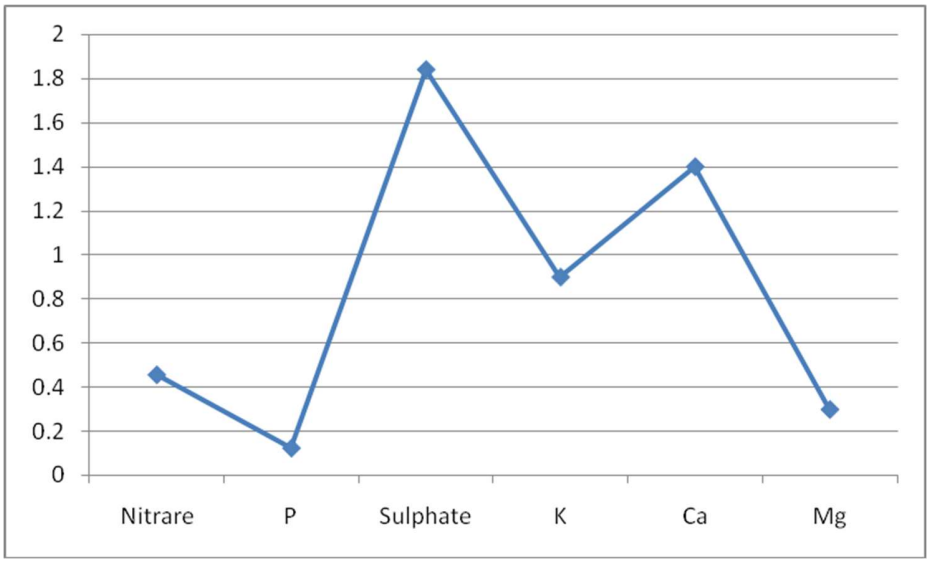


Table 7: Water quality analysis report of rain water (February, 2019)

Sl. No.	Parameter	Value	Prescribed limit
1	pH	6.02	6.5 – 8.5
2	Conductivity (µS)	132	-
3	Turbidity (NTU)	1.5	10
4	TDS (mg/l)	169	500
5	Total hardness (mg/l)	40	300
6	Total alkalinity (mg/l)	38	200
7	Residual Chlorine (mg/l)	NIL	0.2
8	Nitrate – Nitrogen (mg/l)	0.57	45
9	Phosphate (mg/l)	0.155	-
10	Sulphates (mg/l)	1.84	150
11	Potassium (mg/l)	0.9	-
12	Calcium (mg/l)	1.7	75
13	Magnesium (mg/l)	0.3	30
14	Total Coliforms (MPN / 100 ml)	NIL	10
15	Fecal Coliforms (MPN / 100 ml)	NIL	0

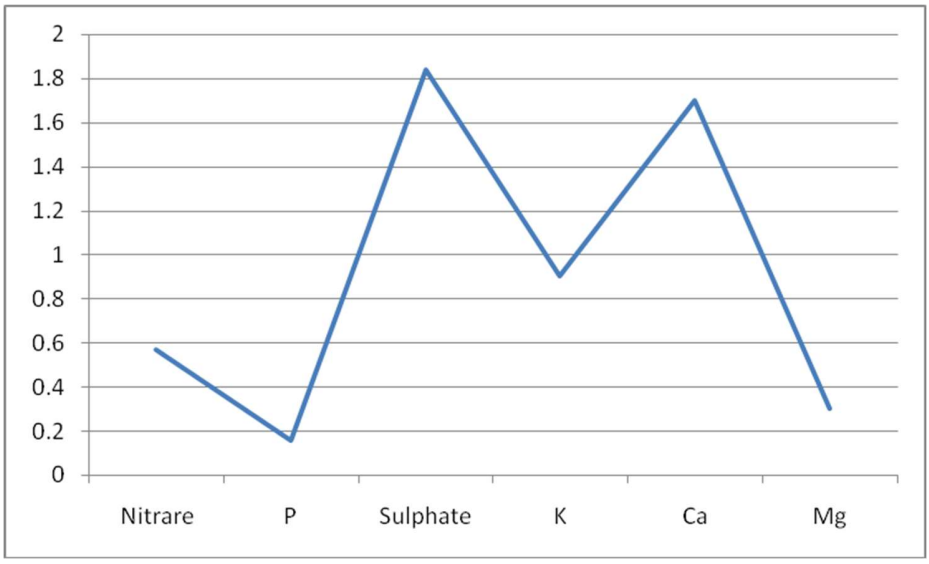


Table 8: Water quality analysis report of rain water (June, 2019)

Sl. No.	Parameter	Value	Prescribed limit
1	pH	6.2	6.5 – 8.5
2	Conductivity (µS)	130	-
3	Turbidity (NTU)	1.3	10
4	TDS (mg/l)	145	500
5	Total hardness (mg/l)	40	300
6	Total alkalinity (mg/l)	38	200
7	Residual Chlorine (mg/l)	NIL	0.2
8	Nitrate – Nitrogen (mg/l)	0.57	45
9	Phosphate (mg/l)	0.15	-
10	Sulphates (mg/l)	1.4	150
11	Potassium (mg/l)	0.9	-
12	Calcium (mg/l)	1.4	75
13	Magnesium (mg/l)	0.2	30
14	Total Coliforms (MPN / 100 ml)	NIL	10
15	Fecal Coliforms (MPN / 100 ml)	NIL	0

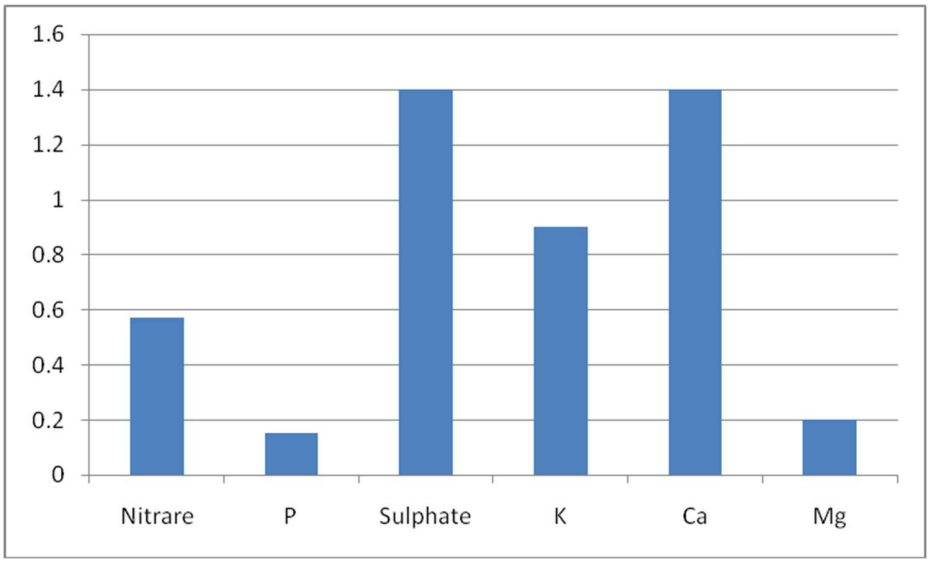
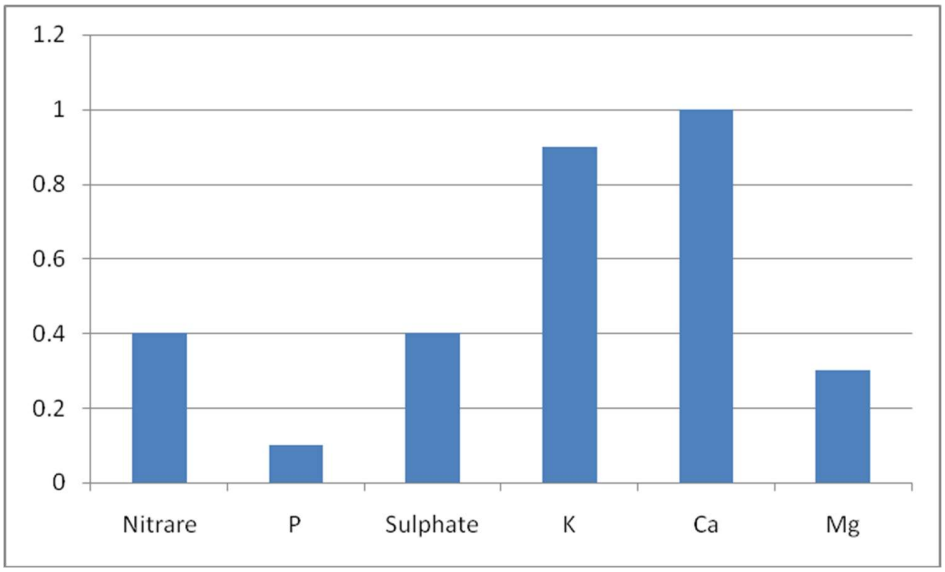


Table 9: Water quality analysis report of rain water (September, 2019)

Sl. No.	Parameter	Value	Prescribed limit
1	pH	6.92	6.5 – 8.5
2	Conductivity (µS)	98	-
3	Turbidity (NTU)	1.5	10
4	TDS (mg/l)	110	500
5	Total hardness (mg/l)	40	300
6	Total alkalinity (mg/l)	28	200
7	Residual Chlorine (mg/l)	NIL	0.2
8	Nitrate – Nitrogen (mg/l)	0.4	45
9	Phosphate (mg/l)	0.1	-
10	Sulphates (mg/l)	0.4	150
11	Potassium (mg/l)	0.9	-
12	Calcium (mg/l)	1.0	75
13	Magnesium (mg/l)	0.3	30
14	Total Coliforms (MPN / 100 ml)	NIL	10
15	Fecal Coliforms (MPN / 100 ml)	NIL	0



As far as the wastewater is concerned, currently there is no facility to make the water recycle or reuse. Wastewater generation from bathrooms was disposed through septic tanks. However, wastewater generates from the hand wash, staff quarters, canteen and laboratories are discharged

directly into nearby land without any proper treatment or disinfection. Also there is no proper treatment facility to recycle or reuse such water.

Observations

- Water consumption in the college is mainly for hand wash, toilets, canteen and laboratories.
- About 2000 liters of water was consuming per day and the annual average may comes around 380 KL.
- Approximately 70 – 80 per cent of the consumed water is discharged as wastewater, i.e., 1400 – 1600 liters per day.
- Drinking water source of the college is a well maintained pond and an open well. Also maintains a 1.5 lakh liter rainwater harvesting tank within the college campus.
- Water quality analyses revealed that both the water can be sued for drinking purposes, but only after disinfection or heating.
- Septic tanks are used to dispose the wastewater generated from toilets and there is no proper treatment and management of wastewater generated from other sources.

Recommendations

- Initiatives should be taken to recycle or reuse the wastewater generated from hand wash regions, canteen and from laboratories especially the wastewater generated by running distillation and soxhlet apparatus.
- Steps should be taken to collect and treat wastewater generated from hand wash and laboratories. Treated water can be used for gardening purposes especially during summer.

- Steps should be taken to provide drinking water to the students and staff after treatment and disinfection.
- Monitor the indiscriminate use of water during peak hours especially in the hand wash region.
- Monitor and maintain the pipes and taps especially in the laboratories and toilets to avoid or reduce the wastage of water.
- Educate the students and staff about the significance of water and wastewater management and conservation.

ENERGY CONSERVATION

We depend on energy for almost everything in our lives as we wish to make our lives comfortable, productive and enjoyable. But, most of us forget that energy is available in abundance but it is limited and hence to maintain the quality of life, it is important that we use our energy resources wisely. If we do not conserve energy, the energy will exhaust and we will have nothing to use. Also energy conservation is also important when it comes to climate change. Currently, erratic climates and climatic changes are the greatest threats that we are facing today. Hence it is important to conserve energy.

Energy conservation means making an effort to reduce the consumption of natural energy sources like electricity, water and so on. Hard facts on why energy conservation is a must are outlined below.

- We use energy faster than it can be produced.
- Energy resources are limited.
- Most of the energy sources we use cannot be reused and renewed.
- We save the country a lot of money when we save energy.

- We save our money when we save energy
- We save our energy when we save energy
- Energy saved is energy generated
- Save energy to reduce pollution

Institutions like colleges consume comparatively large amount and is responsible for GHGs emissions in the atmosphere annually. Energy consumption within the colleges varies by great amounts depending on:

- The function and type of building
- The age of the building
- Its location with respect t o the climate
- Its size and
- Occupancy or number of users

Energy bills form a big part of the annual financial budgets of colleges. They can be reduced by integrating energy efficiency features. Although the initial capital cost may be higher for such buildings, it can significantly reduce the operational costs of the buildings over its lifetime. It is important for the colleges to have sustainable policies including benchmarks and energy monitoring procedures.

Energy conservation within the colleges is a responsibility of not only the management and the architects. It is equally important to involve the actual users of the infrastructure i.e., the staff and the students in energy saving measures and strategies, which follows is the energy consumption pattern of the college in the year 2018-19.

Methodology

Reconnaissance survey was carried out in the college buildings to enumerate the number of electronic items like fluorescent lamps, fans, air conditioners, heaters, projectors, computers etc. effort had been also made to analyze the usage pattern of each items. Secondary data like the electricity bills were also used to compute the average monthly use of electricity in the college.

Energy consumption pattern:

The electricity connection of entire college is divided into auditorium, staff quarters, water tank and main campus with separate connection number and bill. So the energy consumption of the college was studied accordingly. The survey carried out in the main campus to enumerate the number of electronic items except the analytical instruments is summarized as follows:

Table 10: Quantification of electronic items in the main campus

Sl No.	Electronic Items	Number
1	Fluorescent Tubs	161
2	Fans	90
3	CFL Bulbs	24
4	Air Conditioners	11
5	LCD Projectors	12
6	Sound Systems	2
7	Computer & Accessories	63
8	Photocopies	4
9	Heaters & Induction Cooker	4
10	Water purifier	5
11	Electric motor	1

Number of computer & accessories include the laptops and printers used by teachers in the campus at the time of survey. Annual average energy consumption pattern can be depicted in Figure 1.

Average monthly consumption of electric current in different sections of the campus can be summarized as:

Table 11: Monthly consumption of electricity in the main campus

Sl. No.	Area	Average monthly consumption in KWh	Average monthly expense (Rs.)
1	Auditorium	79	595
2	Staff Quarters	181	749
3	Water Tank	78	955
4	Main Campus	1555	13471

The study confirms that at an average about 1.4 KWh of energy is consuming per student per month and an average Rs. 10 was spending for each student per month for electricity charges.

Observations

- Most of the class rooms are well ventilated, so the energy consumption for cooling was comparatively less.
- Asbestos roofing was found to be elevating the room temperature, especially in not well ventilated rooms like staff rooms, so the energy consumption is high.
- Average consumption of electricity per students is 1.4 KWh per month.
- High energy consuming lab equipments were found to be variable and comparatively higher during the P. G. student's projects works.
- Lighting of the class rooms, library, departments and laboratories were found to be consumes about 45% of the total energy consumption.

Recommendations:

- Steps should be taken to replace the fluorescent lamps with more energy efficient and durable LED bulbs.
- Steps should be taken to install zero carbon technologies like photovoltaic panels solar

thermal panels or wind turbines (depending upon meteorological conditions) to reduce the dependency on non-renewable resources.

- Steps should be taken to replace CRT monitors of the computer (if any) with energy efficient LED/LCD monitors.
- Initiates should be taken to replace the asbestos roofing o f the college class rooms and auditorium to reduce the heat generation in the rooms.
- Create awareness about the various energy efficiency measures amongst the users by actively involving the users to participate in energy conservation programmes, campaigns, etc.

INDOOR AIR QUALITY

Air pollution has become a growing problem across the world and transportation is recognized as the major source of air pollution in developing countries. The gaseous and particulate materials added to the atmosphere by the activities of man are considered to be pollutant when their concentrations are sufficient to produce any harmful effects. The majority of man-made emissions to the atmosphere also have natural sources and in many cases these are larger than the pollutants ones. Similarly, in Anchal Grama Panchayat, pollutants from cashew factories and automobiles exhaust are the root cause of air pollution besides natural sources like pollen grains from rubber plantations and dust. Among the extremely large number of substances in the ambient air, several of them exert irritant and inflammatory effects on the respiratory organs. People sensitive to aeroallergens have respiratory diseases like emphysema, bronchitis, asthma or heart problems. Since, the students are exposed to such pollutants for ling time, it is necessary to monitor the indoor air quality of the college.

Methodology:

Reconnaissance survey was carried out for an in-depth assessment of each room regarding the ventilation, comfort, breathing ailments, etc. air quality assessment was also carried out in the campus to assess the air quality of the campus. Sampling was carried out during the post monsoon months of December and March. Air sampling consists of tests for humidity, temperature, RSPM and SPM as per standard methods.

Indoor Air Quality:

Indoor air quality of the campus was found to be well below the National Ambient Air quality Standards. Study confirms good air circulation in the class rooms, which may be the controlling factor of the temperature and humidity level in the class rooms. However, the temperature profile of the class rooms, especially in the first floor was found to be uncomfortable during the summer days, which may be due to circulation of hot summer air and the asbestos roofing of the building. Similarly, the SPM and RSPM were found to be increasing during summer months. The results of the analysis are summarized Figure 2 – 5 and Table 12.

Table 12: Analysis report of air samples

December 2018 (in 24 hrs average in µg/m^3)			**March 2019 (in 24 hrs average in µg/m^3)**		
Date	**RSPM**	**SPM**	**Date**	**RSPM**	**SPM**
07.12.13	60.28	132.66	08.03.14	79.87	157.8
14.12.13	72.05	105.49	15.03.14	74.23	173.95
21.12.13	44.38	116.66	22.03.14	73.59	106.94
28.12.13	56.07	128.49	29.03.14	81.4	165.88
Average	**58.2**	**120.83**	**Average**	**77.27**	**151.14**
NAAQC	100	200	**NAAQC**	100	200
NAAQC – National Ambient Air Quality Standards E(p)rules, schl. Vii, gsr 176(e) dt. 02.04.1996					

Observations:

- Air quality parameters analyzed were found to be well below National Ambient Air Quality Standards.
- Temperature profile of the first floor of the college was found to be comparatively high especially during noon hours.
- Most of the class rooms are well ventilated and there is enough air circulation.
- Average percentage of humidity was below 80%
- RSPM and SPM concentration were found to be high in summer months and not affecting the students as the class is well ventilated.
- Even though some cases of skin irritations were reported due to high temperature, comparatively the allergic disorders were meager among students and teachers.
- College currently uses low VOC paints, which is good for air quality.
- Overall the indoor air quality of the college is good.

Recommendations

- Initiatives should be taken to replace the asbestos roofing of the college class rooms.
- Proposed to install more and efficient exhaust fans in the laboratories of chemistry and environmental science department.

BIOLOGICAL DIVERSITY

Biological diversity is a gift of nature to Man as it provides the basis for life on earth and its loss has far reaching ethical, economic, health, social and ecological consequences. It is immensely valuable because future practical values are unpredictable as variety is inherently interesting and attractive and our understanding of ecosystem is insufficient to be ascertaining the impact of

removing any of its components (McNeely, 1994). Because of topography, climate, altitudinal an latitudinal zones, Western Ghats have gifted with rich biological diversity with high percentage of endemism. Unfortunately, biodiversity is facing serious threats from habitat loss, pollution, over consumption and invasive species. Species are disappearing at an alarming rate and each loss affects nature's delicate balance and our quality of life. Without this variability in the living world, ecological systems and functions would break down, with detrimental consequences for all forms of life, including human beings.

Being located nearby to southern slope of Western Ghats (Shendurney WLS), college and its campus may abide high biodiversity and it is the responsibility of the students and staff to preserve it. Maintaining a biologically diverse environment is the foundations for a healthy planet and human well-being. By examining the habitats, species and areas of our envrioenmnt, one can determine how biologically diverse your environment is, but more importantly, 'how green your carbon footprint is'.

Methodology:

Reconnaissance surveys were carried out for the qualitative study of biological diversity of the campus irrespective of seasons. Effort has been made to record all the species of plants and animals found in the campus. Quantitative estimation was not performed.

Plant Diversity:

About 32 species of herbs, 20 species of shrubs and 37 tree species were identified and recorded in the campus. Flora of the college campus is summarized as follows:

Table 13: Floral diversity of the campus

Herbs, Climbers and Grasses		
Sl. No.	**Scientific name**	**Local / English Name**
1	*Tridax procumbens*	Kumminnippacha
2	*Leucas aspera*	Thumba
3	*Catharanthus roseus*	Shavanari
4	*Aerva lanata*	Balipoovu
5	*Rhinacanthus nasuta*	Nagamulla
6	*Asparagua racemosus*	Sathavari
7	*Andrographis paniculata*	Kiriyath
8	*Desmodium gangeticum*	Orila
9	*Alternanthera philoxerodies*	Alligator weed
10	*Eclipta prostrate*	Kanjunni
11	*Ageratum conyzoides*	Appa
12	*Hemidesmus indicus*	Narineendi
13	*Acalypha indica*	Kuppamani
14	*Ipomea hederacea*	Taliyari
15	*Phyllanthus niruri*	Kizhar Nelli
16	*Clitoria ternatea*	Shangupushpam
17	*Cyperus rotundus*	Muthanga
18	*Hydrocotyle asiatica*	Muthil
19	*Mimosa pudica*	Thottavadi
20	*Piper nigrum*	Kurumulaku
21	*Heliconia rostrata*	Kammalchedi
22	*Musa paradisiacal*	Vazha
23	*Colocasia esculenta*	Chembu
24	*Sida cordifolia*	Kurunthotti
25	*Eclipta alba*	Kayyoni
26	*Achyranthus aspera*	Katalati
27	*Biophytum sensitivum*	Mukkuti
28	*Centella asiatica*	Kudangal
29	*Euphorbia hirta*	Chittirapala
30	*Ocimum sanctum*	Thulasi
31	*Vinca minor*	
32	*Scoparia dulcis*	Kallurukki

Shrubs		
Sl. No.	**Scientific name**	**Local / English Name**
1	*Hamelia patens*	Pavizhamulla
2	*Caesalpinia pulchirima*	Rajamalli

3	*Combretum indicum*	Yashoda poovu
4	*Clerodendrum infortunatum*	Peruvalam
5	*Hibiscus rosa sinensis*	Chembarathi
6	*Allamanda cathartica*	Kolammbi
7	*Jasminum grandiflorum*	Mulla poovu
8	*Cupressus macrocarpa*	Cypress
9	*Bambusa balcooa*	Bamboo
10	*Chamaedorea cataractarum*	Cat palm
11	*Cyrtostachys renda*	Lipstick Palm
12	*Datura repens*	Gold Spot
13	*Punica granatum*	Pomegranate
14	*Solanum nigrum*	Mulaku Thakkali
15	*Solanum torvum*	Chunda
16	*Nerium indicum*	Arali
17	*Manihot esculenta*	Maracheeni
18	*Ixora coccinia*	Thetti
19	*Euphorbia pulcherrima*	Chadurakalli
20	*Lantana camara*	Aripoovu
Trees		
Sl. No.	**Scientific name**	**Local / English Name**
1	*Dillenia pentagyna*	Kudapunna
2	*Artocarpus hirsutus*	Anjali
3	*Syzygium cumini*	Njaval
4	*Tectona grandis*	Teak
5	*Terminalia catappa*	Badam
6	*Adenanthera pavonina*	Manjadi
7	*Macaranga peltata*	Vatta
8	*Polyalthia longifolia*	Aranna maram
9	*Hevea brasiliensis*	Rubber
10	*Carica papaya*	Papaya
11	*Psidium guajava*	Perakha
12	*Azadirachta indica*	Vepu
13	*Cassia fistula*	Kannikonna
14	*Phyllanthus emblica*	Nelli
15	*Delonix regia*	Gulmohar
16	*Acacia catechu*	Acacia
17	*Artocarpus heterophyllus*	Plavu
18	*Mangifera indica*	Mavu
19	*Moringa oleifera*	Muringa
20	*Cycas revolute*	Cycas
21	*Pithecellobium saman*	Rain tree

22	*Coccus nucifera*	Coconut
23	*Ficus benjamina*	Ficus
24	*Lagestroemia lanceolata*	Poovmarathu

25	*Araucaria hetrophylla*	Araucaria
26	*Zamia furfuracea*	Zamia
27	*Albizia chinensis*	Albizia
28	*Laucaena leucocephala*	Subabul
29	*Gliricidia sepium*	Sheemakonna
30	*Greillea robusta*	Silver oak
31	*Carallia brachiata*	Vallavam
32	*Ficus glomerata*	Thondi
33	*Tabernaemontana heyneana*	Pala
34	*Alstonia scholaria*	Ezhilampala
35	*Swietenia macrophylla*	Mahagony
36	*Bauhinia purpurea*	Mandaram

Animal Diversity:

About 11 species of mammals, reptiles and amphibians, 15 species of birds and 17 species of butterflies and moths were identified and recorded in the campus. Fauna of the college campus is summarized as follows:

Table 14: Floral diversity of the campus

Mammals, Reptiles and Amphibians		
Sl. No.	**Scientific name**	**Local / English Name**
1	*Felis catus*	Cat
2	*Canis lupus familiaris*	Dog
3	*Rattus rattus*	Rat
4	*Funambulus palmarum*	Common squirrel
5	*Chamaeleo chamaeleon*	Chameleon
6	*Daboia russelli*	Russells' viper
7	*Helogale parvula*	Mongoose
8	*Bungarus caeruleus*	Common Krait
9	*Bufo melanostictus*	Common Indian Toad
10	*Bufo beddomii*	Toad
11	*Rousettus leschenaultia*	Fruit Bat

Birds		
Sl. No.	**Scientific name**	**Local / English Name**
1	*Corvus splendens*	Crow
2	*Endynamys scolopacea*	Cuckoo
3	*Passer domesticus*	House sparrow
4	*Dinopiam benghalense tehminae*	Common wood pecker
5	*Centropus sinensis*	Greater Coucal
6	*Acridotheres tristis*	Common Myna
7	*Athena brama*	Spotted Owlet
8	*Columba livia intermedia*	Rock Pigeon
9	*Psittacula krameri*	Rose Ringed Parakeet
10	*Streptopelia chinensis suratensis*	Spotted Dove
11	*Pycnonotus jocosus*	Red whiskered Bulbul
12	*Corvus macrorhynchos culminatus*	Large billed crow
13	*Micropternus brachyurus jerdonii*	Rufous Woodpecker
14	*Alcedo atthis taprobana*	Common Kingfisher
15	*Butrorides striatus*	Little Heron
Butterflies and Moths		
Sl. No.	**Scientific name**	**Local / English Name**
1	*Papilio dravidarum*	Malabar Raven
2	*Pachliopta pandiyana*	Malabar Rose
3	*Triodes minor*	Southern Birdwing
4	*Euploea core*	Common Indian Crow
5	*Papilio polymnestor*	Blue Mormon
6	*Junonia iphita*	Chocolate pansy
7	*Chilades trochylus*	Grass Jewel
8	*Hypolimnas missippus*	Danaid Eggfly
9	*Ariadne merione*	Common Castor
10	*Catopsilia Pomona*	Common Emigrant
11	*Pachliopta hector*	Crimson Rose
12	*Acraea tirpsicore*	Tawny Coster
13	*Idea malabarica*	Malabar Tree Nymph
14	*Pseudozizzeeria maha*	Pale Grass Blue
15	*Danaus genutia*	Common Tiger
16	*Ideopsis vulgaris*	Glassy Blue Tiger
17	*Delias eucharis*	Common Jezebel

Observations:

- College campus is immensely rich in biological diversity especially in the floristic diversity.
- About 89 species of plants belonging to herbs, shrubs and trees were identified and

recorded in the campus.

- 43 animal species belonging to mammals, reptiles, amphibians, birds and butterflies were identified and recorded in the campus.
- Detailed study can reveal more species of pasts and animals.

Recommendations:

- Initiatives should be taken to preserve and document the biodiversity of the campus.
- Steps should be taken to publicize the biodiversity potential of the campus.
- Efforts should be taken to check the bio-invasion of exotic species.
- Efforts should be taken to propagate endemic plants.
- Steps should be taken to commence an medicinal plant depository in the campus in association with Botany department.

E-WASTE

'E-waste' is a popular, informal name for electronic products nearing the end of their 'useful life'. Electronic waste, popularly known as 'e-waste' can be defined as electronic equipments / products, power plug, batteries which have become obsolete due to: advancement in technology, changes in fashion, style and status nearing the end of their useful life. In encompasses ever growing range of obsolete electronic devices such as computers, servers, monitors, TVs & display devices, telecommunication devices such as cellular phones & pagers, calculators, audio & video devices, printers, scanners, copiers and fax machines refrigerators, air conditioners, washing machines and microwave ovens. It also covers recording devices such as DVDs, CDs, floppies, tapes, printing cartridges, military electronic waste, automobile catalytic converters, electronic components such as chips, processors, mother boards, printed circuit boards, industrial electronic such as sensors, alarms, sirens, security devices, automobile electronic devices.

E-waste is dangerous as certain components of some electronic products contain materials that are hazardous depending on their condition and density. The hazardous content of these materials pose a threat to human health and environment. For instances, discarded computers, televisions, VCRs, stereos, copiers, fax machines, electric lamps, cell phones, audio equipment and batteries if improperly disposed can leach lead and other substances into soil and groundwater.

Similarly, personal computer s(PCs) contain certain components, which are highly toxic, such as chlorinated and brominated substances, toxic gases, toxic metals, biologically active materials, acids, plastics and plastic additives. These hazardous contents may pose an environmental and health threat. Thus proper management is necessary while disposing or recycling e-wastes. Many of these products can be reused, refurbished or recycled in an environmentally sound manner so that they are less harmful to the ecosystem. College campuses are the pioneer institutions in which the electronic gadgets like PCs, electric switches, electronic instruments, etc. were extensively used and discarded due to technological up-gradation or the end of their useful life. It is estimated that75% of electronic items are stored due to uncertainty of how to manage it. These electronic junks lie unattended in normally mixed with other wastes and are finally disposed off at landfills. So, it is imperative to study the e-waste generation in a college campus and make people aware about the e-waste management.

Methodology:

Reconnaissance surveys were carried out in the offices, departments and computer centre to enumerate the probable e-waste generation per year.

E-waste generation

The study confirms that e-wastes were mainly generated from computer rooms, departments and offices. Major portion of e-waste belongs to:

- Electronic items like fluorescent lamps, CFL lamps, bulbs;
- Computer parts like SMPS, mother boards, networks cards;
- UPS batteries and batteries
- Analytical instruments, electrodes
- Switches, ELCBs, circuit breakers, etc.

E-waste Management

Currently, no proper measures were adopted to discard or reuse or recycle the e-wastes generated in the campus. All the wastes were found to be stored in an isolated places and finally selling to recycling vendors. Most of the discarded analytical instruments were kept in the store room for long period, as it cannot be disposed due to technical reasons.

Recommendations:

- Initiatives should be taken to use more efficient and durable LED bulbs instead of fluorescent and CFL lamps.
- Steps should be taken to replace all the incandescent bulbs for general lighting in favour of more energy efficient and durable LED bulbs.
- Efforts should be taken to maintain the analytical instruments and other electronic equipments.
- Efforts should be taken to prevent the open dumping and open burning of e-wastes, in any case.
- Training for all the students and staff on environmental health and safety by conducting workshops and orientation programs.

CONCLUSION

Conducting a green audit is no longer an option but a sound precaution and a proactive measure in today's environment. A green audit is generally done to determine a baseline (a starting point) to guide us on how to improve a situation and how much environmentally conscious we are. A green audit can be also a useful tool for a college to determine where they are using the most energy or water or producing more wastes. It is also helpful to consider how to implement changes and make savings, how to recycle or reduce the wastes. Indeed, evidence suggests that green audit has a valuable role to play, encouraging systematic incorporation of environmental perspectives into many aspects of an organization's overall operation, helping to trigger new awareness and new priorities in policies and practices.

Colleges are in a unique position as educational institutions to be leaders in pursuing environmentally sustainable solutions. The younger generations, students are the effective media to bring enormous changes in the society and hence educating about the environment to the young minds is the right step and also this is the right time for the same. The resource base is not in exhaustible and there must exist some limit beyond which the rate of exploitation of natural resources will comprise the ability of future generations to meet their own needs. Hence the focus must be on reducing consumption with a view to achieving sustainability. Wherever possible, strategies for reducing consumption of energy and materials, and greater use of renewable resources, should be incorporated in design, construction and implementation.