

Green Audit Report 2019



Handique Girls' College
Guwahati

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Introduction:

The term Green acronymically is called as Global Readiness in Ensuring Ecological Neutrality (GREEN). "Green Auditing", an umbrella term, is known by another name Environmental Auditing and both the terms are being used interchangeably. Green Accounting can be defined as systematic identification quantification, recording, reporting & analysis of components of ecological diversity & expressing the same in financial or social terms.

The green audit practically involves energy conservation, use of renewable sources, rain water harvesting and water conservation, efforts of carbon neutrality, plantation, hazardous waste management & E-waste management. The concept of green audit can be used as a management tool to evaluate the environmental standards; thereby can perform better and better for the sustainable development of the organization.

It is necessary to conduct a green audit in college campus because student should be aware of it, its advantages to save the planet & they become good citizen of our country. Green audit and sustainable development is intricately related to each other. Strong green audit process facilitates sustainability and help to reduce the wastage.

Green audit forms part of a resource management process. Although they are individual events, the real value of green audits lies in the fact that it should be carried out at defined intervals and the results can illustrate improvement or change over time. Here, an effort has been made to prepare a comprehensive environmental audit of Handique Girls' College campus. Target areas included in this green auditing are water, energy, waste, green campus.

1. Auditing Water Consumption:

Water auditing is conducted for the evaluation of facilities of raw water intake and determining the facilities for water treatment and reuse. The present investigation tries to find out a way that can be adopted and implemented to balance the demand and supply of water. It is therefore essential that any environmentally responsible institution examine its water use practices.

Main water uses in the college (campus and hostel): Garden, Laboratory, Cleaning, Canteen, Drinking, Toilets, Bathrooms, Hostel, Washing, Construction works and Office uses.

The overall water consumption in the college: 16 K.Ltr./Day

Following are the areas of water consumption in the college and hostel campus:

Sl No.	Water Used For
1	Toilets & Urinals
2	Hostel (Bathroom & Toilet, Kitchen, cleaning, washing and drinking)
3	Canteen
4	Laboratory
5	Gardening
6	Construction work
7	Leakage

The water installations available in the college are -

- Water cooler with drinking water filtration facility
- Urinals and toilets
- Bathrooms
- Water taps in common place, canteen etc.
- Water taps in laboratories

Water consumption

- Quantity of water pumped – 16 K. liter./day
- Water charges paid – Rs. 15,840/- per month (Municipal water supply)
- Number of water tanks for water storage (College & Hostel campus) -15
- Amount of water stored – 20000 L

Water audit observations

The reasons of water wastage are -

- Leaving the water taps open after use.
- Leakages from taps
- Over use of water.

Recommendations

- All leaking tapes to be repaired.
- Establishment rain water harvesting system
- Involve students by giving them real time projects on water conservation and reward good ideas after implementing them
- Use of tap water can be controlled by regulating discharge per hour. Provide push button taps limiting the time for 30 secs
- Canteen can reduce the use of trays to a certain extent.
- Installation of water treatment system.

2. Auditing Energy management

This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

Following are the electrical installations in the college -

- CFL bulbs
- LED lights
- Tube lights
- Fans
- Air conditioners
- Electrical Equipments

- Desktop and laptop computers
- Photocopier machine
- Televisions
- Water pumps

Other energy needs/installations

- Gas cylinder requirements (Hostel, Canteen & Laboratory)
- Generators

Electricity Consumption

- Electricity Consumption per year was 110097 units.
- Avg. Electrical Consumption per month was 9175 units.
- Avg. Electrical Consumption per day was 306 units.
- Mean Electricity charges Rs.89993.5 /month

Electricity saving methods adopted in the college

- Turn off electrical equipments when not in use
- Use energy efficient light-emitting diode (LED) bulbs instead of incandescent and CFL bulbs
- Maintain fault free appliances and replace old appliances.
- Use computers and electronic equipments in power saving mode.

Energy Audit Observations

- The college has assessed the electrical load calculation.
- Looking at the range of college activities and working hours, monthly use of electricity in the college is very high.
- There are fans of older generation and non energy efficient which can be phase out by replacing with new energy efficient fans.
- Regular monitoring of equipments and immediate rectification of any problems.
- Awareness on conservation of energy, water and fuel consumption needs to be communicated among the stakeholders.

The total energy utilization of the college for different purposes is approximately 10000 units/month and electricity charges per month are Rs.90000/month.

Recommendations

- Installation of solar panel to tap the non conventional sources of energy.
- Energy saving through the replacement of tube lights to LED lights.
- Energy efficient electrical equipments especially fans and pump sets can be replaced against old ones.
- Awareness programs for the stakeholders to save energy may also increase sustainability in the utilization of various energy sources.

3. Auditing Solid waste generation

Pollution from solid waste is aesthetically unpleasing and results in large amounts of litter in our communities which can cause health problems. Plastic bags and discarded ropes and strings can be very dangerous to birds and other animals. This indicator addresses waste production and disposal, plastic waste, paper waste, food waste, and recycling. Solid waste can be divided into two categories: general waste and hazardous waste. General wastes include what is usually thrown away in homes and college such as garbage, paper, tins and plastic items, pens, plastic/glass bottles etc. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals and petrol. Unscientific landfills may contain harmful contaminants that leach into soil and water supplies, and produce greenhouse gases contributing to global climate change. Furthermore, solid waste often includes wasted material resources that could otherwise be channeled into better service through recycling, repair, and reuse. Thus the minimization of solid waste is essential to a sustainable college. Here efforts have been made to diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems. It is therefore essential that any environmentally responsible institution examine its waste processing practices.

The college has over 2500 stake holders that include students, teaching and non-teaching members that led to the generation of a sizeable amount of solid waste per day. The sources of solid waste in the college are classrooms, laboratories, staff rooms, office, library, canteen, toilets, grounds and the hostel. Solid waste generation in the college & hostel campus primarily of biodegradable, non-biodegradable, hazardous and E-waste besides there are liquid waste.

Characteristic and Disposal Practices

The types of solid waste generated have been characterized and the quantity assessed as follows:

Sl. No.	Source	Type of waste generated	Quantity of waste generated/ day in the College
1.	Classrooms	Paper, plastic wrappers, plastic bottles, pens, tetra packs, cardboard, thermo Cole	39 kgs (approx.) including 12 kgs (approx.) of vegetable peels, rotten vegetables and leftover food that is biodegradable.
2.	Laboratories	Paper, filter paper, plastic bottles, broken glass, pins, growth media	
3.	Staffrooms	Paper, plastic wrappers, plastic bottles, pens, aluminium foil, leftover food	
4.	Office	Paper, plastic wrappers, plastic bottles, pens, metal clips, pins, rubber band, old printer cartridges	
5.	Computer Centre	Paper, metal clips, pins, old printer cartridges, old CDs	
6.	Canteen	Disposable plates, cups, paper boxes, plastic wrappers, aluminium foil, vegetable peels, rotten vegetables, leftover food, plastic bottles	
7.	Library	Paper, plastic,	
8.	Toilets	Paper, plastic, sanitary napkins	
9.	Grounds	Grass cuttings, dry leaves, twigs	
10	Hostel (including	Paper, plastic wrappers, plastic bottles,	

	living quarters, toilets and the kitchen)	broken glass, tetra packs, aluminium foil, vegetable peels, rotten vegetables, leftover food, sanitary napkins, etc.	
11	Both campuses	Construction debris, broken furniture, unserviceable equipment, batteries etc.	Not generated on daily basis

Disposal practices adopted

1. Segregation of the waste into wet and dry waste and disposal in separate, different coloured, bins.
2. Non-biodegradable waste, which is dry waste, is disposed of in notified municipal collection centres.
3. Used solid microbial growth media is sealed in autoclavable bags and disposed after decontamination by autoclaving.
4. Construction debris generated in the college is disposed by contractors in authorized landfill sites.
5. For unserviceable equipment and batteries, the college has negotiated buy-back or removal from site agreement during replacement.

Recommendations

- Serve beverages in refillable glass containers instead of cans or throwaway bottles.
- Reduce use of plastic. Make an effort to make the college plastic free campus.
- Recyclables should be segregated at source and stored.
- Compostable solid waste (kitchen and garden) may be converted into compost and be used in the garden
- Minimise the use of paper.
- Never use open fires to dispose of wastes

Auditing for E- Waste Management

The college has large numbers of computers, printers and a couple of Xerox machines. The E-waste and defective items from computer lab are being stored properly. The institution has decided to contact approved E- waste management and Disposal facility in order to dispose E-waste in scientific manner.

Recommendations

- Put out charts or graphics in every corner of the college to make students aware “What is e-waste?” and put pictures of items which are e-waste. This will help students to recognise them.
- Never throw e-waste in the trash.
- Organise what you have and give away or donate it to someone who can and will use it (E-bay and Olx and other online marketing agencies can be used)
- Some shops have a buy-back programme. Take them to these shops.
- Start using cloud technology to minimise the use of hard drives and pen drives
- Learn the disposal method of any item bought. Many electronic items have toxic materials in them as a result, it is important to know about the right away of disposal.
- If possible, unnecessary buying of electronic gadgets should be minimised.

Discharge of pollutants to the Environment per unit of the output

About 1.0 m³ of Laboratory effluent and 3.5 m³ of domestic (hostel and college campus) effluent were generated per day respectively during the year 2018-19. Liquid waste generated in the laboratories is checked for corrosiveness and disposed of after neutralization. Waste water from toilets and bathrooms is disposed in the drainage system and for sewage disposal there is system of onsite septic tank.

4. Auditing for green campus

The plants in the campus and nearby areas of the college play an important ecological role within the campus and also the adjoining areas. These are also food plants and roosting sites of a number of bird species. Moreover these have also contributed in the aesthetic beauty to the area. The biodiversity status within the campus area has been worked out particularly in respect of floristic diversity and avian diversity (Table 1 & 2).

- Total open area – 8159.365 sq.m.
- Total built up area – 10,361.9 sq.m.
- Total number of plant species identified – 43
- Total number of birds recorded identified within the campus - 33
- Tree cover of the campus – 100 m²
- Garden (flower and medicinal plants) area inside the college – 10% of the total area (approx.)

To generate interest on the nature conservation and also to inculcate social responsibility towards a green and clean environment, the college undertakes several eco-friendly initiatives within and outside the campus. Some of these activities are –

- Plantation and caring of plants in the campus and outside the campus.
- Timely disposal of wastes from the campus.
- Celebration of important days like World Environment Day, Biodiversity day with great importance to generate awareness among the students.
- Plastic free (single use) campus.
- Paperless office.
- Distribution of plant saplings for welcoming guests.
- Grow potted indoor plants in every department wherever it is possible.

Plantation program

The institute has organized various Plantation program in and outside the college campus and adopted villages, parks etc through NSS unit and environment cell of the college. The plantation program includes plantation of various types of ornamental, fruit bearing and medicinal plant species. This activity is done during the month of May and June i.e. onset of the monsoon season. This program helps to maintain eco-friendly environment within and outside the campus as well.

Routine Green Practices

The college celebrates days like World Environment Day, Biodiversity day with great importance to generate awareness among the students, faculties as well as staff members. Popular talks on environmental problems are organized. Besides, distribution of saplings, poster competition etc. are some activities carried out to celebrate the day.

Vermi Composting:

The institute is has started vermi composting within the college and hostel campus since 2010-11. The main purpose of this is to reduce disposable waste in the college campus and manure thus produced is used in the floricultural activities within the campus. The main benefit of the process is to reduce the waste in the environment and also to generate awareness among students

Eco friendly construction:

The college canteen with a built up area of 143sq. mt. has been constructed using Bamboo as a major construction material thereby reducing the use of RCC and promoting the use of eco - friendly material. The canteen and has been built with the assistance from the Cane and Bamboo Technology Centre, Guwahati.

Biodiversity available in the Campus:

Although HGC is situated in the heart of Guwahati city, it is fortunate enough to have Dighalipukhuri pond along the north side of the College campus. The beautiful pond nearby enriches the biodiversity of the college campus and represents a very important area for avian fauna. The campus is enriched with a diverse flora including 20 species of trees, 23 species of shrubs and 2 gymnosperms. The plants include Fruit bearing trees, timber yielding trees, medicinal plants, ornamental plants and dye yielding plants. Among the avian species, 33 bird species are sighted in the college campus belonging to 25 families which include some resident birds, common birds and winter migratory bird also. Another visitor sighted within the college campus is a primate-common monkey (*Rhesus macaque*).

List of plants

Timber yielding plants-

1. *Anthocephalus chinensis* (Kadam)
2. *Polyalthia longifolia* (Debdaru)
3. *Mesua ferea* (Nahor)

Fruit bearing plants-

1. *Ficus glomerata* (Fig)
2. *Syzigium cuminii* (Jamun)
3. *Mangifera indica* (Mango)
4. *Artocarpus integrifolia* (Kothal)
5. *Psidium guajava* (Guava)
6. *Annona squamosa* (Custard apple-Atlos)
7. *Borassus flabelifer* (Taal)
8. *Punica granatum*

Plants having medicinal value -

1. *Azadirachta indica* (Neem)
2. *Oroxylum indicum* (Bhatghila)
3. *Crataeva nurvala*
4. *Adenanthera pavonia* (Kuchandan)
5. *Saraca indica* (Asok)
6. *Phyllanthus emblica* (Amlokhi)
7. *Garcinia kydia*
8. *Pongamia pinnata*
9. *Clerodendrum splendens*
10. *Clerodendrum colebrookianum*
11. *Clerodendrum viscosum*
12. *Clerodendrum indicum*
13. *Flamingia strobilifera*
14. *Citrus aurantifolia*
15. *Asparagus racemosus*
16. *Plumbago zeylenicum*
17. *Pogostemon benghalensis*
18. *Zingiber zerumbet*
19. *Zingiberamada*
20. *Cestrum nocternum*
21. *Murraya koenigii*

Plants having ornamental value -

1. *Mesua ferea* (Nahor)
2. *Bauhinia racemosa* (Boga kanchan)
3. *Areca saccharifera*
4. *Tabernaemontana divaricata*
5. *Mussaenda frondosa*
6. *Mussaenda philippica*
7. *Bougainvillea spectabilis*
8. *Nyctanthes arbortristis*

Dye-yielding plant -

1. *Bixa orellana* (Anatto dye plant)

Gymnosperms -

1. *Cycas revoluta*
2. *Thuja japonica*

Some macrophytes are also present within the campus like *Pistia*, *Bladderwort*.

List of avian species

Common resident birds

Common Name	Family	Scientific Name
1. Asian koel	Cuculidae	<i>Eudynamys scolopaceus</i>
2. Asian Palm Swift	Apodidae	<i>Cypsiurus balasiensis</i>
3. Asian Pied Starling	Sturnidae	<i>Gracupica contra</i>
4. Black Drongo	Dicruridae	<i>Dicrurus macrocercus</i>
5. Black Hooded Oriole	Oriolidae	<i>Oriolus xanthornus</i>
6. Black kite	Accipitridae	<i>Milvus migrans</i>
7. Black rumped woodpecker	Picidae	<i>Dinopium javanense</i>
8. Blue Throated Barbet	Ramphastidae	<i>Megalaima asiatica</i>
9. Brown Hawk owl	Strigidae	<i>Ninox scutulata</i>
10. Common myna	Sturnidae	<i>Acridotheres tristis</i>
11. House sparrow	Passeridae	<i>Passer domesticus</i>
12. Jungle Myna	Sturnidae	<i>Acridotheres fuscus</i>
13. Rose Ringed Parakeets	Psittacidae	<i>Psittacula krameri</i>
14. Spotted owlet	Strigidae	<i>Athene brama</i>
15. Median egret	Ardeidae	<i>Mesophyx intermedia</i>
16. Tailor bird	Cisticolidae	<i>Orthotomus sutorius</i>
17. Tree sparrow	Passeridae	<i>Passer montanus</i>
18. Pigeon	Columbidae	<i>Columba livia</i>
19. Fulvous breasted woodpecker	Picidae	<i>Dendrocopus macei</i>
20. Pond Heron	Ardeidae	<i>Ardeola grayii</i>
21. Rufous Treepie	Corvidae	<i>Dendrocitta vagabunda</i>
22. White throated Kingfisher	Alcedinidae	<i>Halcyon smyrnensis</i>
23. Blue Throated Barbet	Ramphastidae	<i>Megalaima asiatica</i>
24. Cinereous tit	Paridae	<i>Parus major</i>
25. Oriental Magpie Robin	Muscicapdae	<i>Oriolus xanthorus</i>
26. Oriental Pied Hornbill	Buceotidae	<i>Anthracoceros albirostris</i>
27. Red Vented Bulbul	Pycnonotidae	<i>Pycnonotus cafer</i>
28. Purple Sunbird	Nectariniidae	<i>Cinnyris asiaticus</i>
29. Spotted Dove	Columbidae	<i>Stigmatopelia chinensis</i>
30. Citrine Wagtail	Motacillidae	<i>Motacilla citrela</i>
31. Coppersmith Barbet	Ramphastidae	<i>Megalaima haemacephala</i>
32. Little Cormorant	Phalacrocoracidae	<i>Phalacrocorux niger</i>

Winter Migrant

1. White Wagtail	Motacillidae	<i>Motacilla alba</i>
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APPENDIX

CERTIFICATE

Certified that the total annual lighting power requirements for Handique Girls' College, Guwahati, as assessed in February, 2019 is 26819 KWH and of this, 6138 KWH is met through LED installations. The details of the LED and non LED lighting installations are given below -

Sl. No	Item	College Campus			Hostel Campus		
		Quantity	Watts	Total (Watts)	Quantity	Watts	Total (Watts)
1	LED Bulb	96	12	1152	25	12	300
2	LED Tube	127	18	2286	73	18	1314
3	LED Surface light	19	18	342	0	0	0
4	LED Flood light	08	120	960	0	0	0
5	LED ceiling light	31	20	620	0	0	0
6	Single Tube light	334	40	13360	135	40	5400
7	1x2 Tube light	125	20	2500	0	0	0
8	1x4 Tube light	116	20	2320	0	0	0
				73540			7014

Electricity consumption of Academic campus for lighting

Total wattage as per provision = 23.540 KW
 70% of total provision is considered as to be used at a time = 16.48 KW
 Average use per day = 4 Hrs
 No of days that are in use/year = 200 days
 Total consumption = 16.48 x 4 x 200 = 13184 KWH
 Total consumption in LED items = 5.360 KW
 70% of total provision is considered as to be used at a time = 3.75 KW
 Average use per day = 4 hrs
 No of days that are in use/year = 200 days
 Total LED consumption = 3.75 x 4 x 200 = 3000 KWH

Electricity consumption of Hostel campus for lighting

Total wattage as per provision = 7.014 KW
 90% of total provision is considered as to be used at a time = 6.3126 KW
 Average use per day = 8 Hrs
 No of days that are in use/year = 270 days
 Total consumption = 6.3126 x 8 x 270 = 13635 KWH
 Total consumption in LED items = 1.614 KW
 90% of total provision is considered as to be used at a time = 1.453 KW
 Average use per day = 8 Hrs
 No of days that are in use/year = 270 days
 Total LED consumption = 1.453 x 8 x 270 = 3138 KWH

Summary:

Total Annual lighting requirement = (13184 + 13635) KWH = 26819 KWH

Total lighting requirement met through LED installations = (3000 + 3138) KWH = 6138 KWH


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