GREEN AUDITTING

OF

ST. XAVIER'S COLLEGE, RANCHI,

DR. CAMIL BULCKE PATH, RANCHI-1

JHARKHAND, INDIA

ACADEMIC YEARS 2021-22

PREPARED BY

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Executive Summary

In the past, human beings were less concern with the protection and preservation of natural resources available on the earth but in recent time they are more concern with the conservation of natural resources because now humans have faced many natural disasters which threaten human future.

Economic development provides better facilities for life but it threatens human life as it causes pollution therefore it is essential for any educational institution which is the centre of learning to adopt the system of the Green Campus that students may know these issues and be careful. St. Xavier's College, Ranchi is deeply concerned and believes that there is an urgent need to address this fundamental problem and reverse the trend. Being a premier institution of higher learning, the college has initiated some programmes to keep college campus clean and green so that students may learn to take care of our mother earth and be eco sensitive and responsible persons.

The purpose of the audit was to ensure that the practices followed in the College Campus are in accordance with the green policy adopted by the College. The methodology includes: documentation of the initiatives, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations. It worked on the several facets of 'Green Campus' including **water use and management, energy use and conservation, alternative source**

of energy, waste management, e-waste management, green area management, mapping of biodiversity and eco consciousness level of the students of the institution. With this in mind, the specific objectives of the audit was to evaluate the adequacy of the management control frame work of environment sustainability as well as the degree to which the departments are in compliance with the applicable regulations, policies and standards. It can make a tremendous impact on students' health and learning, college operational costs and the environment. The criteria, methods and recommendations used in the audit were based on the identified risks.

1. Introduction

Green Audit is systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. It aims to analyze environmental practices within and outside the college campus, which will have an impact on the eco-friendly ambience. It was initiated with the motive of inspecting the work conducted within the college campus and departments whose exercises can cause risk to the health of inhabitants and the environment. Green Audit gives a direction to improve the condition of environment. It also tells whether the campus is green or not and indicates the threatening area of risk. Green audit is assigned to the criteria 7 of NAAC, National Assessment and Accreditation Council which is a self governing organization of India

which declares the institutions as Grade A, B++, B+ or B according to the scores assigned during the accreditation.

1.1 About the College

St. Xavier's College, Ranchi is a NAAC (A) Grade college. It was established in 1944. College celebrated platinum jubilee in 2019. College has - Arts, Commerce, Science and Vocational courses faculties and more than 10,000 students are studying here.

The college is located on a beautiful campus of 6445.24 M^2 in the heart of Ranchi city. The latitude and altitude of college is 23.3680 N, 85.3263 E

Campus has following buildings

Main building
PG buildings
Auditorium
Gymnasium
Canteen
Jesuit residence
Chapel
Hostel buildings

College runs following

Science subjects

UG	**PG**
Botany	Botany
Chemistry	Chemistry
Geology	Geology
Mathematics	Mathematics
Physics	
Zoology	Zoology
Statistic	

Arts subjects

UG	PG
Economics	Economics
Geography	Geography
Sociology	
Political science	Political science
History	History
Hindi	Hindi
English	English

Commerce subjects

UG	PG
B.Com Accounts	M.COM

Vocational subjects

Commerce Vocational Self Finance (B.Com)

Advertising & Marketing (Adv & Mkt)

Office Management and Secretarial Practice (OMSP)

Banking & Insurance (Bnk & Ins)

International Accounting and Finance (IAF)

Arts Vocational Self Finance (B.A.)

English Language and Literature (ELL)

Journalism and Mass Communication (BJMC)

Animation & Interior Design (AID)

Science Vocational Self Finance (B.Sc.)

B.Sc. Bio Technology

B.Sc. Information Technology

B.Sc. Computer Application

B.Voc Self Finance

Building Construction Management (BCM)

Fashion Technology (BFT)

Management Vocational Self Finance

Business Administration Department (BBA)

Retail Management Department (BRM)

Financial Market Operation (BFMO)

The college has adopted the 'Green Campus Clean Campus' system for environmental conservation and sustainability as MDG and SDG also aim for sustainable development and educational

institutions have to play a vital role to achieve these goals. The college aims to manage efficient use of energy, water, waste and to reduce CO_2 level while creating an atmosphere where students can learn to be eco sensitive and healthy. The 'Green Campus' imitative has been active for last many years by different committees like **(Green campus committee, Eco Task Force, Geography, B.Ed Environment Club, Rotoract Club and Individual department, students and staff members)** that actively promote the various activities, projects. The college administration works on the several facets of 'Green and Clean Campus' including Water Conservation, Tree Plantation, Waste Management, Paperless Work, Alternative Energy and Mapping of Biodiversity.

2. Objectives of the Study

The main objective of the green audit is to promote the Environment Management and Conservation in the College Campus and to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards. The main objectives of carrying out Green Audit are:

- To introduce and make students aware of real concerns of environment and its sustainability
- To secure the environment and cut down the threats posed to human health by analyzing the pattern and extent of resource use on the campus.

- To establish a baseline data to assess future sustainability by avoiding the interruptions in environment that are more difficult to handle and their corrections requires high cost.
- To bring out a status report on environmental compliance

3. Methodology

The methodology included different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations. The study covered the following areas to summarise the present status of environment management in the campus:

- Water use and management
- Energy use and Conservation
- Alternative source of energy
- Waste management
- E-waste management
- Green area management
- Mapping of Biodiversity
- Cleanliness of the Campus
- Green initiatives

4. Observations and Recommendations

4.1. Water management

This indicator addresses water consumption, water sources, irrigation, storm water appliances and fixtures. A water audit is an

on-site survey and assessment to determine the water use and hence improving the efficiency of its use.

a) Observations

The study observed that well, bore well; pond and supply water are the four major sources of water. For storing roof water three rain water harvesting units and to collect ground water one pond is functional. Water is used for drinking purpose, canteen, toilets, laboratory and gardening and domestic purpose. Gardens are watered by using pipe/sprinkler irrigation system to save water. This is one of the unique steps towards greening practices. For drinking water Kent RO system, water cooler and water ATM have been installed.

During the survey, no loss of water was observed, neither by any leakages, or by over flow of water from overhead tanks. There is a person in charge who runs water pumps and sees that there is no wastage of water. The data collected from all the departments is examined and verified.

On an average the total use of water in the college is 75,000 L/day,

Which include 12,000 L/day for drinking
15, 000 L/day for toilets and urinals
23,000L/day for domestic purposes,
10,000 L/day for canteen

10, 000 L/day for gardening

5,000 L/day for different laboratories.

One of the water harvesting systems

b) Recommendations

- Need of monitoring is essential. In campus small scale/medium scale/large scale reuse and recycle of water system is necessary.
- Minimize wastage of water and use of electricity during water filtration process.
- Ensure that all cleaning products used have a minimal detrimental impact on the environment, i.e. are biodegradable and non-toxic.

4.2. Energy Use and Conservation

This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliance, natural gas and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment.

a) Observations

Energy sources utilized by all the departments and common facility centre are supply electricity, generator, solar, invertors.

Total energy consumption is determined 245 KWH/Year by major energy consuming equipments. This data is obtained from electricity bill of the college. Electricity is used for tube light, fan, ACs, lab instruments, water cooler, freezers, computers, projectors, sound system, Xerox machine, wielding and cutting Iron, CCTV and Camera, running water pumps and Elevators etc

Many place tube light, CFL, LED lamps are installed. All the departments and common facility centres are equipped with LED tube lights.

Approximately

Tube lights

627

Fans

715

Bulbs

252

LED bulbs

259

PL lights

325

Vapour light

9

Water motor

6

Lift

4

Centralized AC in the Jim and auditorium

15

ACs

180

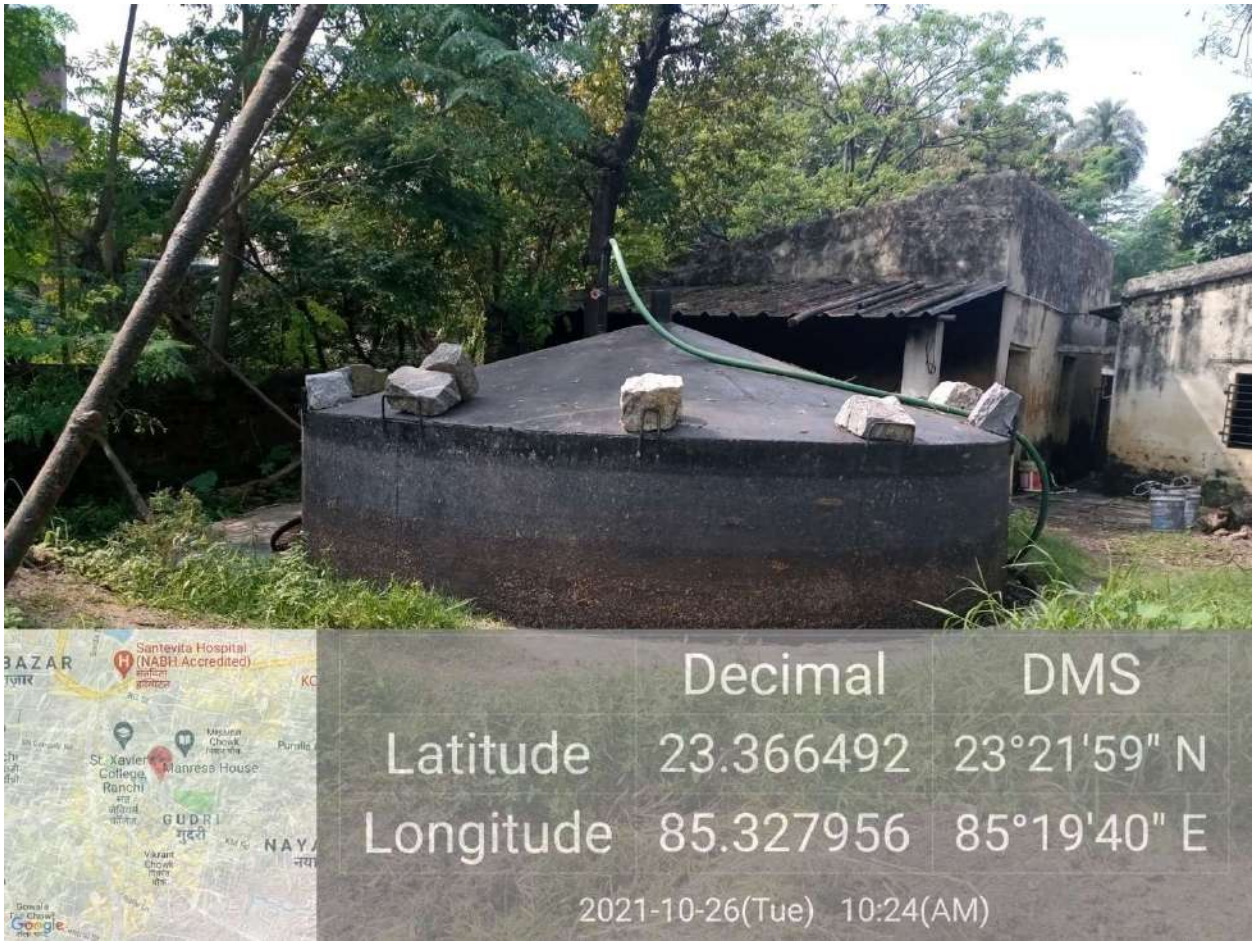
Water cooler

16

are counted during survey. Besides these, photovoltaic cells are also installed in the campus as an alternate renewable source of energy. Equipments like Computers are used with power saving mode. Also, campus administration runs switch-off drill on regular basis. In science department like Physics, Chemistry, Mathematics, Botany and Zoology electricity is shut downed after occupancy time is one of the green practices for energy conservation.

Alternative source of energy

Biogas plant is installed to generate fuel for the kitchen use for one of the building where about 60 students of the college stay and do their studies.



Biogas plant

Biogas used kitchen purpose

College has installed solar of 100kb power which reduces electricity bill.

Solar panel, capacity 100kb installed on the roof top of main building

Five solar street lights have been installed which gives light during night.

Mushroom cultivation: Botany students cultivate mushrooms during rainy season in the green house of the college.

Mushroom cultivation in the green house

b) Recommendations

- Support renewable and carbon-neutral electricity options on any energy purchasing consortium, with the aim of supplying all college properties with electricity that can be attributed to renewable and carbon-neutral sources.
- Appreciate that it is preferable to purchase electricity from a company that invests in new sources of renewable and carbon-neutral electricity.
- Installation of LED lamps instead of CFL.

4.3. Waste Generation

This indicator addresses waste production and disposal of different wastes like paper, food, plastic, biodegradable, construction, glass, dust etc and recycling. Furthermore, solid waste often includes wasted material resources that could otherwise be channelled into better service through recycling, repair, and reuse. Solid waste generation and management is a burning issue. Unscientific handling of solid waste can create threats to everyone. The survey focused on volume, type and current management practice of solid waste generated in the campus. The different solid wastes collected as mentioned above. Physics and chemistry lab were using kerosene to produce fuel for the lab but they shift kerosene to LPG gas. Zoology lab now does not use animals for practical.

a) Observations

The total solid waste collected in the campus is 110 Kg/day. Waste generation from tree droppings is a major solid waste generated in the campus. Fallen leaves are collected separately. Food waste is given to piggery. Some food waste, fallen leaves and vegetable waste are recycled using machine or by vermicomposting method in the campus itself. The waste is segregated at source by providing separate dustbins for Bio-degradable and non biodegradable waste. Segregation of chemical waste generated in the science laboratories especially in the chemistry lab is channelized into soak pit where chemical waste get neutralised. Single sided used papers reused for writing and printing in all departments. Important and confidential reports/ papers are sent for pulping and recycling after completion of their preservation period. Very less plastic waste mainly plastic water bottles (2 kg/day) are generated by some departments, office, canteen etc they are separated and given to kabadiwalas. Metal waste and wooden waste is stored and given to authorized scrap agents for further processing. Few glass bottles are reused in the laboratories.

The main purpose of this is to reduce disposable waste in the college campus. After complete process of vermicomposting, it is used as manure in the garden. Awareness program among farmers is also conducted in the village nearby.

Machine to recycle vegetable waste vermicomposting

b) Recommendations

- Reduce the absolute amount of waste that it produces from campus.
- Make full use of all recycling facilities provided by City Municipality and private suppliers, including glass, cans, white, coloured and brown paper, plastic bottles, batteries, print cartridges, cardboard and furniture.
- Provide sufficient, accessible and well-publicized collection points for recyclable waste, with responsibility for recycling clearly allocated.
- Single sided papers to be used for writing and photocopy

- Important and confidential papers after their validity to be sent for pulping.

4.4. E-Waste Generation

E-waste can be described as consumer and business electronic equipment that is near or at the end of its useful life. This makes up about 5% of all municipal solid waste worldwide but is much more hazardous than other waste because electronic components contain cadmium, lead, mercury, and Polychlorinated biphenyls (PCBs) that can damage human health and the environment.

a) Observations

E-waste generated in the campus is very less in quantity. The cartridges of laser printers are refilled outside the college campus. Administration conducts the awareness programmes regarding E-waste Management with the help of various departments. The E-waste and defective item from computer laboratory is being stored properly. E-waste is given to some approved E-waste management groups.

b) Recommendations

- Recycle or safely dispose of white goods, computers and electrical appliances.
- Use reusable resources and containers and avoid unnecessary packaging where possible.
- Always purchase recycled resources where these are both suitable and available.

4.5. Green Area

This includes the plants, greenery and sustainability of the campus to ensure that the buildings conform to green standards This also helps in ensuring that the Environmental Policy is enacted, enforced and reviewed using various Environmental awareness programmes.

a) Observations

Campus is located in the vicinity of approximately 75 types (species) trees. Various tree plantation programs are being organized during the month of July and August at college campus and surrounding villages through NSS, Eco Task Force, Retroact club and various departments. This program helps in encouraging eco-friendly environment which provides pure oxygen within the institute and awareness among villagers. The plantation program includes various types of indigenous species of ornamental and medicinal wild plant species. College also has green house. There are about 25 species of birds in the campus.

Birds in the college campus

You Tube Link:

https://www.youtube.com/watch?v=iJIeup0xG0Q&t=58s

Pied Starling

Bryophytes	*Riccia, Marchantia, Funaria, Cyathodium*	
Pteridophytes	*Nephrolepics, Ophioglossum, Asplenium, Pteridium, Pteris, Lygodium, Adiantum, Hemionitis Selaginella, Polypodium, Psilotum*	
Gymnosperms	*Cycas, Zamia, Cuppress, Araucaria, Thuja, Pinus*	
Angiosperms	***D*** ***I*** ***C*** ***O*** ***T*** ***S***	***Trees:*** *Schleichera oleosa, Shorea robusta, Pterocarpus marsupium, Litsea sebifer, Atrocarpous integrifolia, Bassia Latifolia, Butea Monosperma, Coffea arabica, Psidium quajave, Tectona grandis, Mangifera indica,, Artocarpus integrifolia, Ficus religiosa, Ficus bengalensis, Ficus glomerata, Ficus cunia, Anacardium occidental, Dalbergia sisoo, Litchi sinensis, Michelia champaca, Jaccaranda, Annona squamosa, Polyalthia longifolia, Saraca indica, Adina cordifolia, Albezzia lebbek, Delonix regia, Pongamia pinnata, Aegle marmelos, Alstonia scholaris, Azadirachta indica, Melia Azedarach, Cassia fistula, Diospyros melanoxylon, Emblica officinalis, Gmelina arborea, Tamarindus indica, Peltophorum pterocarpum, Tabebuia, Cedrela toona, Citrus, Thavetia, Nerium,Calophyllum inophyllum, Carica papya, Cinnamomum, Lagerstroemia, Moringa oleifera, Swietenia*

		mahogoni, Syzygium cuminii,Grevillea robusta, Persea Americana, Prunus persica, Michaelia champaca
		***Shrubs**: Tecoma, Nyctanthus, Bogainvillea, Duranta, Vitex negundo, Crotton, Barleria, Bigonia, Euphorbia pulcherima, Jatropha, Acalipha, Lantana camara, Justicia, Calotropis gigantean, Hibiscus-rosa-sinensis, Murraya Koengi, Mussaenda, Woodfordia fruticosa*
		***Climbers:** Aristolochia, Quiscalis indica, Ipomea palmeta, Alamanda cathartica, Tinospora, Hemidesmus, Clerodendrum, Dioscoria bulbelifera, Thunbergia, Pasiflora edulis*
		***Herbs**: Boerhaavia, Muhlenbekia, Diphanbakia, Oxalis, Achyranthus aspara, Desmodium, Euphobia hirta, Sonchus aspera, Oldenlandia, Lindenberzia, Majus, Solanum nigram, Coleus, Ageratum conyzoides, Synedrella nodiflora, Sida, Gamochaetia, Erigeron*
		***Flowers:** Euphorbia milli, Salvia, Tagets, Petunia, Dahlia, Antrhinum majus, Adenum obessum, Ixora, Tropiolum, Bauhinia purpuria, Callistemon, Taberna Montana, Climatis, Jasmin, Celosia, Chrysanthemum*
		***Medicinal plants:** Centella asiatica, Catharanthus roseus, Andrographis paniculata,*

		phyllanthus niruri, Occimum sanctum, Celastrus paniculata, Rauvolfia, Emblica officinalis, Scoparia dulcis, Eclipta alba, Vernonia
	M O N O C O T S	***Trees:*** *Yucca, Agave, Dracaena, Pandanus, Travellers palm, Royal palm, Bamboo, Phoenix acaulis, Cocos nucifera, Areca*
		Shrubs: *Tradscantia,*
		Climbers: *Asparagus racemosa,*
		Herbs: *Cynodon dactylon, Cyperus rotundus, Commolina, Cyanotis*
		Flowers*: Easter Lily, Vanda, Canna indica, Acorus calamus, Rhynchostylis retusa*
		Medicinal plants*: Gloriosa superba, Aloe vera,*
Birds	*Pigeon-Columba livia, House sparrow-Passer domestcus, Crow-Corvus splendens, Common myna- Acridotheres tristis, Parrot-Psittacula eupatria, Bulbul-Molpastes cafter, Cuckoo-Eudynamis scolopaccus, Indian black drogo, Night heron, Kingfisher-Halcyon smymensis, Cormorant little-Phalacrocrax niger, Sparrow-Ploceidae passer, Owl-Nocturnalis stigiformes, Hawk-Diurnus accipitridae, Falcon-falconidae falco, Turtle dove-Columbidae colombiformes, Muhkal-Saxicola macrohyncha, Bhurlunga, Indian Robin bird*	

Plants

RANCHI, JHARKHAND, INDIA

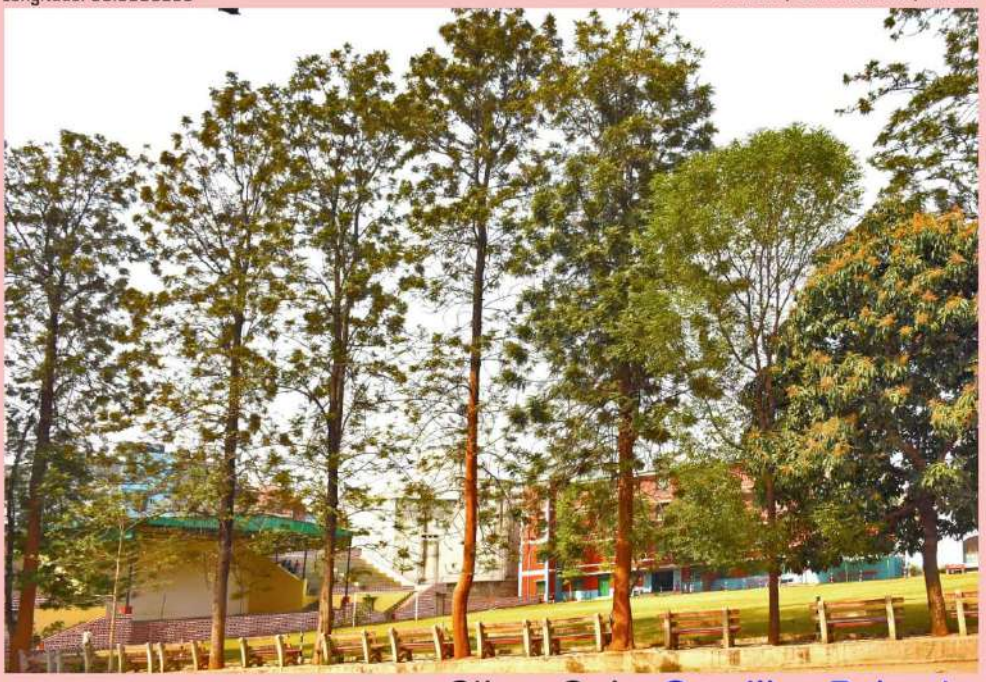
CYCAS, CYCADACEAE

Ranchi, Jharkhand, India

KUSUM, SCHLEICHERA OLEOSA

Latitude: 20.951665800000004
Longitude: 85.0985236

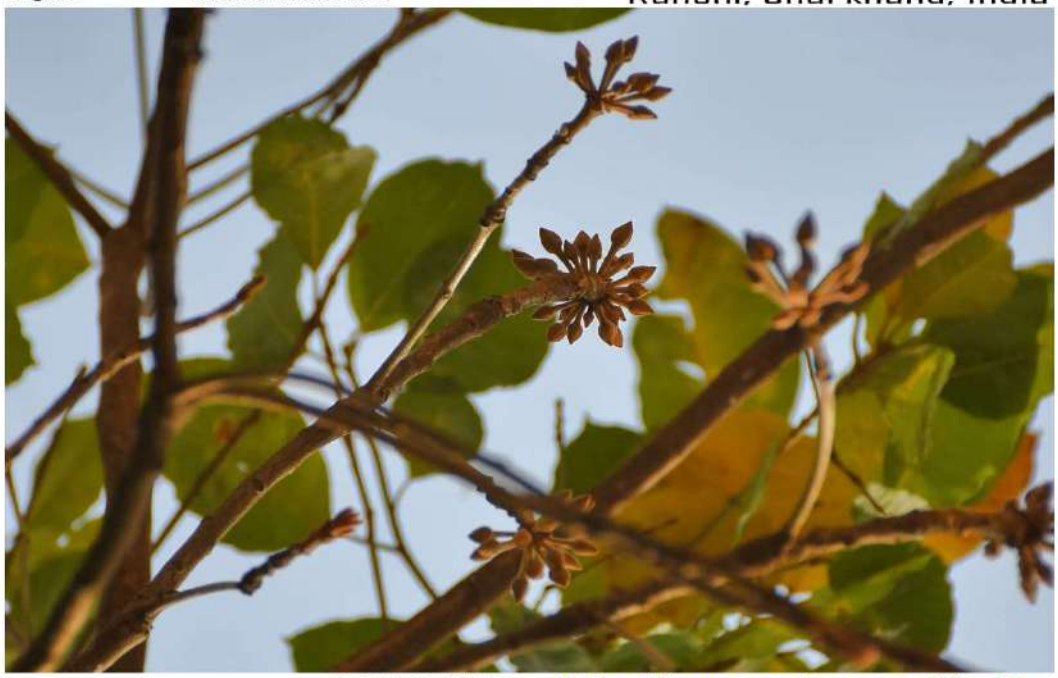
Ranchi, Jharkhand, India



Silver Oak, Grevillea Robusta

Latitude 20; 57; 6.00000000000008...
Longitude 85; 5; 54.679999999993015

Ranchi, Jharkhand, India



MAHUA, Madhuca Longifolia

RANCHI, JHARKHAND, INDIA

SWAMP ORCHID, PHAIUS WALLICHII

Mushroom (wild mushroom) flora of the college campus.

You tube link :

https://www.youtube.com/watch?v=_hUE6fWFYY4&t=8s

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11
12

13 14 15

1.Macrolepiota procera 2. Termitomyces clypeatus 3.T. heimii 4.Lycoperdon 5. Calvatia 6. Geastrum appears first7. Geastrum appears later 8. Boletus edulis 9. Russula 10. Termitomyces 11.Amanita 12. Clitocybe 13. Armillaria 14. Termitomyces (sand mushroom) 15. Stages in the breaking of outer peridium of Geastrum

Buttererflies in the Campus

You Tube link: https://www.youtube.com/watch?v=Se-iQe6hOi4&t=46s

Green Area of the College

St. Xavier's College, Ranchi
PATHALKUDWA
Total of IT solutions
Decimal DMS
Latitude 23.367345 23°22'2" N
Longitude 85.326238 85°19'34" E
2021-10-18(Mon) 02:44(PM)
GUDRI
Anjuman hospital
Decimal DMS
Latitude 23.366446 23°21'59" N
Longitude 85.326812 85°19'36" E
2021-10-18(Mon) 12:42(PM)

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwihyeaRm_HzAhXLT30KHbcBDmEQwqsBegQIAxAB&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3D-XluIHkL3oE&usg=AOvVaw1n4KqTuhvjx-lKgrh5-Yab

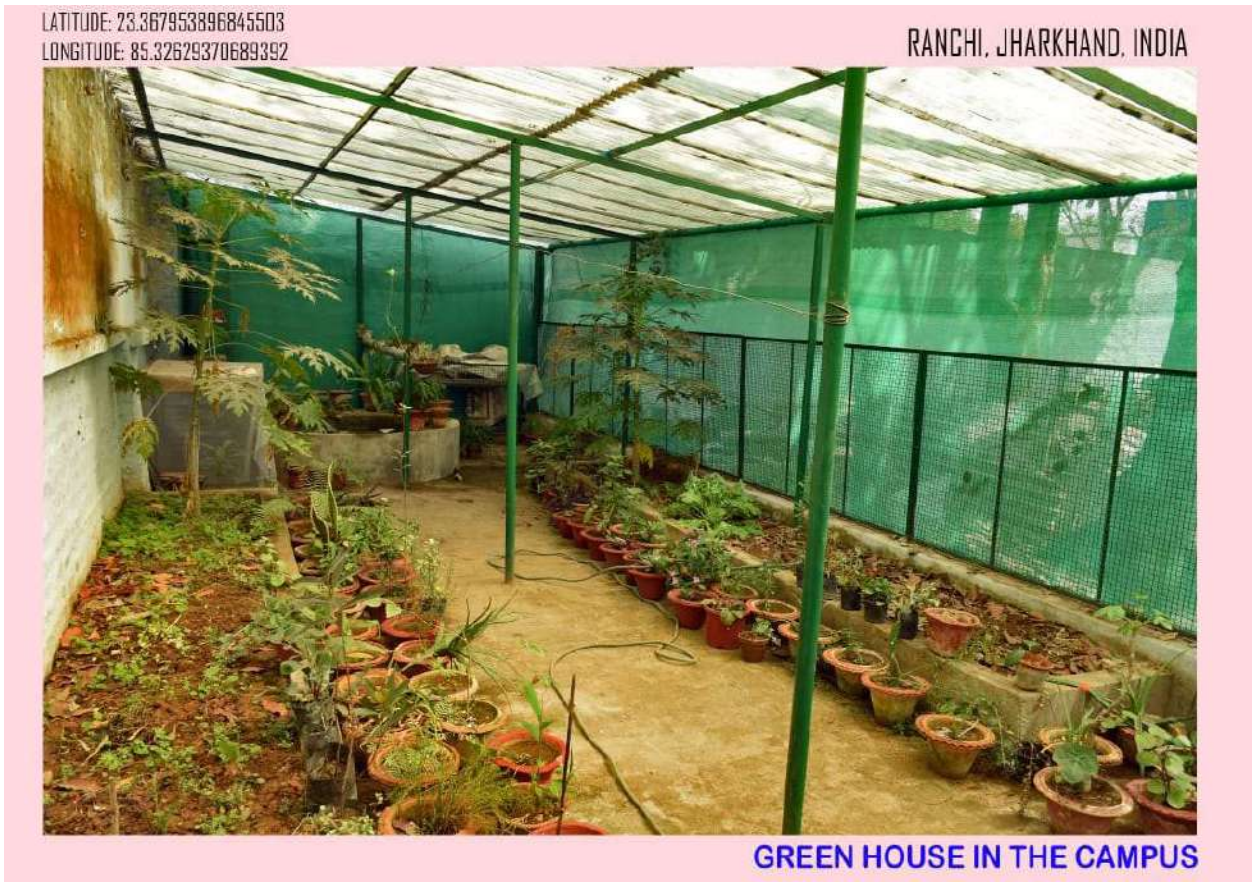
RANCHI, JHARKHAND, INDIA

DESERT ROSE, ADENIUM OBESUM

Nursery practice on the terrace

Naming of the plants,

Lac Culture on *Kusum* and *Litchi* Tree



Green house

World Environment Day tree Plantation

Fr. Principal and Vice principal Planting trees

Van Mahotsav 2021

Tree Plantation by Rotaract Club

3 JHARKHAND BN NCC
RANCHI

Plantation drive by NCC

GREEN CAMPUS SLOGANS

CLEAN CAMPUS GREEN CAMPUS

GO GREEN, GO PLASTIC FREE CAMPUS

GREEN GROVE ZONE-I

GREEN GROVE ZONE-II

LAVISH GREEN GROVE & CREEPERS ZONE

b) Recommendations

- Reviews periodically the list of trees planted in the garden, allot numbers to the trees and keep records. Give scientific names to the trees.
- Promote environmental awareness as a part of course work in various curricular areas, independent research projects, and community service.
- Create awareness of environmental sustainability and takes actions to ensure environmental sustainability.
- Establish a College Environmental Committee that will hold responsibility for the enactment, enforcement and review of the Environmental Policy. The Environmental Committee shall be the source of advice and guidance to staff and students on how to implement this Policy.
- Ensure that an audit is conducted annually and action is taken on the basis of audit report, recommendation and findings.

- Celebrate every year 5th June as 'Environment Day' and plant trees on this day to make the campus more Green.

5. Conclusions

Both teachers and students of the college are deeply conscious of environmental problems and their solution. The environmental awareness initiatives are substantial. The installation of solar panels, paperless work system and waste recycling machine, vermicomposting and water ATM practices are note worthy. Besides, environmental awareness programmes initiated by the administration shows how the campus is going green. Few recommendations are added to curb the menace of waste management using eco friendly and scientific techniques.

This may lead to the prosperous future in context of Green Campus & thus sustainable environment and community development. As part of green audit of campus, I carried out the environmental monitoring of campus includes Illumination, Noise level, Ventilation and Indoor Air quality of the class room. It was observed that Illumination and Ventilation is adequate considering natural light and air velocity present. Noise level in the campus well is within the limit i.e. below 50 dB at day time.

6. Acknowledgement

I am grateful to the Principal of St. Xavier's College for giving me this prestigious project to carry it out and allowing me to enter the new era of Green Audit in the College Campus. Further 1 sincerely thanks the college staff and students for providing me necessary facilities and co-operation during the audit. This helped me in making the audit, a success. Further I hope, this will boost the new generation to take care of Environment and propagate these views for many generations to come.

Prepared by Dr. Prabhat Kennedy Soreng

Department of Botany