



GREEN AUDIT REPORT

GOVT. HRANGBANA COLLEGE



ECO-MANAGEMENT SERVICES.



Preface

The Green Audit report of Government Hrangbana College was prepared by an audit team consisting of Dr. Lalmuansangi, Zohmangaiha and Vanlalhuma from Eco-Management Services, Aizawl, Mizoram. Sufficient and appropriate audit procedures were completed and evidence gathered to support the accuracy of the conclusion reached and contained in this report. The conclusion is based on a comparison of the situations as they existed at the time of the audit with the established criteria.

This report covers a significant matter which includes base assessment of the existing Green Infrastructure (GI) in the campus such as land, trees, green spaces, management and conservation of energy, water, solid wastes. The contribution of the college to climate change was also included.

This report is divided into seven chapters – Introduction, Objectives, Criteria for Green Audit, Methodology, Findings, Conclusion and Recommendations. The findings of the Audit is further divided into three sections viz., Section I – Govt. Hrangbana College Main Building/Campus; Section II – Women’ Hostel, Govt. Hrangbana College and Section III – Boyd’ Hostel, Govt. Hrangbana College.

The main findings of the audit show that, in general, all departments and students are aware about the need for environmental protection at a general level. It also observed that a number of best practices such as maintaining potted plants, introducing plastic free zones, adoption of rain water harvesting technique and compost pit and use of energy efficient LED/ CFL bulbs and tubes for minimizing energy consumption are followed in the college campus. However, on detailed review, it was observed that the college is implementing Green Policy for the first time and certain aspects would benefit from further review in order to improve their efficiency, fairness and consistency.

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Chapter – 1

Introduction

1.1. Outline of Green Audit

The process of green audit was begun on the 1970s with an intention of identifying the activities carried out in a given institution or company. This was initiated against the background of growing concern over changing climate and related aspects. Green audit is a tool to identify the range of environmental impacts and assess the compliance of the operations on the development and regular activities within an organisation. It may also assess the compatibility of the operations within an organisation or a company with existing applicable laws and regulations and the expectations of their various stakeholders. It further assesses the possible implications and effect of pollution due to the operations within the organisation. The audit also seeks to identify possible means and methods to save investments, enhance work quality, improve health and safety of their employees, reduce liabilities and reduce the rate of environmental pollution. A continuous process of such audit might result in maintaining the quality of these aspects within the premises of any organisation.

1.2. Aims and Objectives

Most companies, government and non-government bodies and other institutions conduct green audit aiming:

- To ensure that the performance of the institution with respect to environmental activities they are involved in, is in compliance with existing laws and regulations.
- To check the functionality and their operating success including water supply, energy related matters and other similar matters that are related to green operations in the campus
- To formulate or update the institution's environmental policy, if warranted.
- To measure the environmental impact of operational process related to green activities in the campus.
- To measure the performance of each green related operations and actions in the campus.

- To generate a database of green activities for continuous monitoring to assess the success of each of them.
- to identify future potential liabilities.
- to align the institution's developmental and day to day activities with the stated vision, mission, strategies, etc.
- to identify possible ways to reduce expenditure and running costs on equipments, appliances, etc. or try enhance revenue income.
- to improve process and materials efficiency, and in response to stakeholder requests for increased disclosure.

The process of green audit based on operational activities within an institution happens not necessarily based on laws and regulations. It might be largely based on awareness and concerns on environmental performances within and outside the institute's premises. This further strengthens the fact regarding social responsibilities of the organisation. Majority of the institutions that conducted green audits in the recent past has realised the importance of the same as they could easily manage their operational costs and provide good atmosphere to their stakeholders. The green audit also provides opportunities to identify full range of operations within an organisation, the impacts of maintaining and functioning of its operational goods and services, the actual source of raw materials for different activities within the organisation, the costs of operations of its offices, functional units, and other facilities. It also provide chances to understand the relationship with employees, material suppliers, stakeholders, etc. The recommendations, findings and suggestions that emerge during green audit would certainly help the management of the organisation to set up future action plan that best suits to them.

1.3. General steps involved in Green Audit

1. Systematic and exhaustive data collection.
2. Evidence based documentation of activities.
3. Regular monitoring.
4. Provide standards and methods for improvement by establishing cost effective green action plan.

Chapter – 2

Government Hrangbana College- An Information

2.1. General Information of the college

Government Hrangbana College was established in July, 1980. The College is named after Mr. Hrangbana (L), a prominent businessman and a visionary who believed that the state's economic growth directly depend on the growth of higher education. He donated a sum of Rs One lakh to start the College from scratch as a private College. With a modest strength of 305 Pre- University Arts and Bachelor of Arts students comprising of six departments the College has grown manifold and has won a prominent position on the academic map of Mizoram University since its inception. The College now has 10 departments, which are constituent of Arts and Commerce stream.

The College was given government recognition on 6th November, 1980 and upgraded to deficit Grant- in- Aid Status with effect from 1st September, 1985 and finally to Government College with effect from 1st April, 2003. The College has secured permanent affiliation in 1995 and has been listed under 2(f) and 12 (B) of the UGC Act on 23rd February, 1998. The college was accredited by NAAC in 2006 with a 'B++' grade and in the 2nd Cycle Assessment and Accreditation it was awarded 'A' grade in 2011 .In the third cycle it was accredited with a B++ with a CGPA of 2.76 on 2018. It is registered under section 2(f) and 12(B) of the UGC Act. It has also score grade A and A+ for the college campus and hostel respectively during the year 2017. It has its College building at Chanmari, Aizawl occupying 1410.57 sq.m of land, with residential Women Hostel situated at Durtlang, Aizawl and Boys' Hostel at Muthi Village, Aizawl which is under construction. At present, the the total number of students enrolled for the academic session 2017-2018 is 1758 Nos. carefully nurtured by 92 nos of distinguished academicians, administrators and dedicated faculty. The motto of the College "Truth Prevails" is a guiding light that truth prevails in the hearts and minds of all students past and present and other stakeholders, ceaselessly throughout the institution and the community at large. This is reflected in the following vision, " Providing holistic and quality education within the reach of all, "which is reflected in the mission, " To mold the students to be intellectually competent, morally upright, socially committed and spiritually inspired and

capable of building a more human social order within the context of the nation's religious and cultural pluralities and diversities.

2.2. Previous Green Audit

The previous green audit of Government Hrangbana College was done during the year 2017 by Mizoram Pollution Control Board and score Grade A and A+ for college campus and Women Hostel respectively. The report of the green audit was a comprehensive evaluation after thorough evaluation of all aspects related to concerned green activities of the campus. It identified the green activities in the campus involving, management, teachers and students. It also identified lacunas in green practices of the campus and recommended a few practices to be implemented for it to become a green campus. The following were the common recommendations posted in the previous audit.

1. The wastes generated from the institution (College and Hostel) must be segregated properly and in a scientific manner i.e., into degradable and biodegradable.
2. Free Plastic zone must be maintained in the campus as well as the other College infrastructure.
3. The institution must ensure small scale/medium scale reuse and recycle of water system.
4. Safe and scientific disposal through authorized agents for computers and electrical wastes.
5. Improvement is required in terms of energy consumption by introduction of Solar panels.
6. Acoustic enclosures must be constructed around the Diesel Generator to reduce the level of noise.
7. Water harvesting structure must be constructed in the Boys' Hostel.
8. Awareness programmes with regards to environmental protection and sustainability must be initiated by the College. This may be carried out with the participation

and involvement of staff and students in pertinent days such as World Environment Day, Earth Day, Green Mizoram etc.

9. Regular checking and maintenance of pipelines be done to control water wastage.

10. Plantation programmes must be encouraged for creating awareness and maintaining the greenery of the institution.

11. Infrastructure on firefighting and emergency exit needs to be reviewed.

12. First-aid room must be maintained in a proper condition.

13. As the College Canteen is located at the ground floor and adjacent to a City Bus stand, entering of particulate matter inside the College Canteen is evident which is unhealthy as well as unhygienic. As such, provisions are made either by shifting the College Canteen or by preventing the particulates from entering the Canteen.

14. Water logging at the Women Hostel must be rectified.

The college has apparently tried their level best to implement these recommendations within the stipulated time period. It also adopted other policies and practices that help them to achieve a green campus. The previous audit also suggested criteria wise recommendations such as water management and energy management. Most of the recommendations were dealt with by the college authority.

2.3. Role of Management in Green Management

The part played by the college management in bringing the campus to a green one is adorable.

The following were the initiatives by the college authorities in green management:

1. The management developed separate teams for implementing green policy in the campus.

2. Regular evaluation system has been established with monitoring cells for green activities in the campus.

3. The management has allotted budget for implementing green policies in the campus.

4. The green monitoring cell evaluates developmental and functional activities and makes recommendations for improvement of the green aspects.

5. These recommendations are implemented without delay and fail.

6. Clubs that are related to green activities are encouraged to conduct programs in and around the campus.

7. The management is keen on the social commitments and tries to reach out to the general public through teachers and students.

8. The management is keen in conducting awareness programs based on its green policies.

9. The support and part played by management is vital in the green campus related activities.

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Chapter – 3

Audit Preparations

3.1. Management

The Government Hrangbana College management was very keen in taking up the recommendation of conducting a green audit after five years after the previous audit. In the light of this, the college management approached Eco-Management Services, which is a consultancy firm offering services like green audit of institutions. The **Eco-Management Services Team** agreed to conduct the green audit of Hrangbana College. After this, there was a visit to the campus to set up different criteria and questions that are necessary for an updated green audit.

The following were different criteria set forth for the present green audit.

- a) Green Practices
- b) Water Management
- c) Energy Management
- d) Carbon Footprint

3.2. The Green Audit Process:

1. Selection of area/activities/parts of the campus.
2. Scope of audit process was identified in consultation with the auditee.
3. Data pertaining to identified parameters for green auditing of the campus were collected directly through an on-site visit.
4. Available background information on the identified activities and other parameters were collected.
5. The role of each stakeholder in green related activities has been collected.

6. Historical aspects of green activities in the campus including water usage and waste generation, etc. were collected.

7. Visit to the campus by audit team.

8. Data analysis and evaluation.

9. Discussion on the findings.

10. Report preparation.

3.3. Onsite audit activities

1. The onsite visit and meeting with the campus authorities was the first step between the audit team and auditee.

2. Site inspection for determining parameters for audit.

3. Site visit and evaluation of collected information of the audit team.

4. Meeting with the Principal, teachers, non-teaching staff.

5. Meeting with the in-house audit team for evaluation and clarifications.

Chapter – 4 Green Audit

Criteria adopted for Green Audit

In this audit the following criterion are adapted to study or assess the environmental management and conservation practices within the campuses.

4.1 Land & Other Infrastructure

Land use means utilization of land in a particular area. Land use pattern includes types of land and how much land is being utilized under different uses. Land is basic resource of human society and land use is the surface utilization of all developed and vacant land on specific point at a given time and space. It is a systematic arrangement of various classes of land on the basis of certain similar characteristics mainly to identify and understand their fundamental utility, intelligently and effectively in satisfying the needs of human society. Land use is very vital to understand the geographical adjustment of various resources. It is also very important resource for man, so it should be put for right use according to its capability and according to its type. Land capability depends upon factors such as relief features, climate, Soil, vegetation, socio- economic and institutional factors. Today, as the population is increasing at a faster rate the land is put under tremendous pressure to fulfill the growing demands of the population.

Mizoram is a beautiful state with rich biodiversity. Perching on the high hills of the North Eastern corner, Mizoram is a storehouse of natural beauty with its endless variety of landscape, hilly terrains, meandering streams deep gorges, rich wealth of flora and fauna. The state has a mild and very pleasant climate of 110 C in winter and 30°C in summer. The entire area is under the direct influence of south west monsoon. A special feature of the climate is the occurrence of violent storm during March- April. Mizoram is blessed with a literate population, a hard working people with a rich culture and a strong and cohesive civil society with no class distinction and no discrimination on grounds of sex.

Due to urbanization and the growing population of a city, availability of free land for various purposes decreases so utilization of limited land resources in an economically, sustainably and eco-friendly manners are vital.

Infrastructure is the basic physical and organizational structure needed for the operation of a society or enterprise or the services and facilities necessary for an economy to function. It is a set of interconnected structural elements that provide framework supporting an entire structure of development and is an important criterion for judging the regions development.

4.2 Air Quality

Air pollution is the introduction of chemicals, particulates, or biological materials into the atmosphere causing discomfort, disease, or death to humans, damage other living organisms such as food crops, or damage the natural or built environment.

Indoor air pollution and urban air quality are regarded as two of the World's Worst Toxic Pollution Problems. Indoor air quality is a term which refers to the air quality within a home, buildings, an institutions or commercial facilities especially as it relates to the health and comfort of building occupants. IAQ can be affected by gases (including carbon monoxide, radon, volatile organic compounds), particulates, microbial contaminants (mold, bacteria), or any mass or energy stress or that can induce adverse health conditions. Indoor air pollution is a concern in the developed countries, where energy efficiency improvements sometimes make houses relatively airtight, reducing ventilation and raising pollutant levels. Indoor air problems can be subtle and do not always produce easily recognized impacts on health. Different conditions are responsible for indoor air pollution in the rural areas and the urban areas. Source control, filtration and the use of ventilation to dilute contaminants are the primary methods for improving indoor air quality in most buildings. Residential units can further improve indoor air quality by routine cleaning of carpets and area rugs.

4.3 Water

Water is the prime natural resources and indispensable component for sustenance of all forms of life in the earth. Adequate availability of water is the prerequisite for sustainable socio-economic development. Of the water resources on Earth only three percent of it is fresh and two-thirds of the freshwater is locked up in ice caps and glaciers. Of the remaining one percent, a fifth is in remote, inaccessible areas and much seasonal rainfall in monsoonal deluges and floods cannot easily be used. As time advances, water is becoming scarcer and having access to clean, safe, drinking water is limited among countries. At present only about 0.08 percent of all the world's fresh water is exploited by mankind in ever increasing demand for sanitation, drinking, manufacturing, leisure and agriculture. Due to the small percentage of water remaining, optimizing the fresh water we have left from natural resources has been a

continuous difficulty in several locations worldwide. As a limited resource, water supply sometimes supposes a challenge.

Water is so common that we often do not think about where it comes from or where it is managed. As water becomes scarcer, the importance of how it is managed grows vastly. Finding a balance between what is needed by humans and what is needed in the environment is an important step in the sustainability of water resources. Water management means dealing with water in the best possible way. This can be done by local authorities (municipal water management) or it can be done by individuals (when we manage how we use our own water supplies). Good water management will involve organizing water so that everyone has enough, and controlling water supplies and water treatment centers (and other equipment and logistics relating to water) so that they work in the best possible way. Water management affects many aspects of our lives. A fundamental strategy in sustainable water management is to integrate water management goals into physical, social and economic planning.

4.4 Energy Management and Administration

Energy management includes planning and operation of energy production and energy consumption units. Objectives are resource conservation, climate protection and cost savings, while the users have permanent access to the energy they need. It is connected closely to environmental management, production management, logistics and other established business functions. One of initial steps for an effective energy cost control program is the base line energy assessment, which examines the pattern of existing energy usage by the government or any sub-entity of the government or private organization. This program will set the reference point for improvements in energy efficiency. Energy efficiency can improve the existing energy usage and benchmark of every individual section.

It is important to integrate the energy management in the organizational structure, so that the energy management can be implemented. The central task of energy management is to reduce costs for the provision of energy in buildings and facilities without compromising work processes. Especially the availability and service life of the equipment and the ease of use should remain the same

4.5 Waste Management

Waste can take any form that is either solid, liquid, or gas and each have different methods of disposal and management. Waste management normally deals with all types of

waste whether it was created in forms that are industrial, biological, household, and special cases where it may pose a threat to human health. It is produced due to human activities.

Solid Waste management is the process of treating solid wastes and offers variety of solutions for recycling items that don't belong to trash. It is about how garbage can be used as a valuable resource. Waste management is something that each and every household and business owner in the world needs. Waste management disposes of the products and substances that you have use in a safe and efficient manner. Waste management is intended to reduce adverse effects of waste on health, the environment or aesthetics. *“Waste management or disposal is the activities and actions required to manage waste from its inception to its final disposal. This includes amongst other things, collection, transport, treatment and disposal of waste together with monitoring and regulation. It also encompasses the legal and regulatory framework that relates to waste management encompassing guidance on recycling etc.”*

4.6. Inspection

The preliminary visit in connection with the pre-audit process to the campus had identified criteria for audit, parameters to be evaluated and time schedule of green audit of Hrangbana College. It included meeting with the Principal, IQAC teachers in charge of different green audit and Green activities of the campus and students representing different departments, clubs and fora. This enabled the auditing to gather all necessary information that is useful in preparing audit report. The on-site audit team collected information-based observation and secondary data/previous data.

4.7. Evaluation of documents and reports

The audit visit to the campus evaluated documents and reports (departments, clubs) that are necessary for the audit process. This further strengthened the claims made by the campus authority on green operations in the campus. To generate future action plan, the audit team had a detailed site inspection with different in house team in the institute.

Chapter 5 Findings and Analysis

The findings of the Audit are divided into three sections viz., Section-I and Section – II which are as follows:

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FINDINGS

SECTION I GOVT. HRANGBANA COLLEGE MAIN BUILDING/ CAMPUS

- A. Land & Other Infrastructure**
 - Task I : Land Survey
 - Task II : Other Infrastructure

- B. Air Quality**
 - Task I : Mode of Transportation to College Campus
 - Task II : Contribution to Climate Change
 - Task III : Ambient Air Quality around the campus
 - Task IV : Ventilation of the rooms

- C. Water**
 - Task I : Sources of Water
 - Task II : Water harvesting/ Storage

- D. Energy Management & Administration**
 - Task I : Sources of Energy in the college?
 - Task II : Energy Consumption
 - Task III : Energy Conservation

- E. Waste Management**
 - Task I : Solid Waste Management
 - Task II : Liquid Waste Management
 - Task III : Electronic Waste Management
 - Task IV : Drainage system



A. LAND & OTHER INFRASTRUCTURE

Govt. Hrangbana College, located in Chanmari in the city of Aizawl, was established in July, 1980. The College was upgraded to the Deficit Grant-in-Aid Status in 1985 and finally has become a Government College in 2003. It was affiliated to NEHU, Shillong and at present is under the Mizoram University. Data on land availability and its uses are collected through the data collection format and from records.

The college is a co-ed college with Commerce & Arts faculty. At present, the college offers B.A. with subjects English, Mizo, History, Geography, Education, Political Science, Economics, Public Administration and Psychology. UG and PG commerce subject are also offered. The college has adequate infrastructural facilities – class rooms, library, computer laboratory, Language lab etc. Apart from the regular teaching learning activities, the college strives for the overall development of the adopted village where students can conduct various extra-curricular activities.

The college has conducted a good number of extension activities to strengthen college neighborhood network. The NSS unit is an asset to the college which allows 600 volunteers. This unit conducts various extension activities to help our students become aware of their social responsibilities. The college has been working sincerely for the betterment of the students. Apart from various government scholarships, the college is attempting to implement Earn & Learn scheme for the poor and needy students.

TASK I: LAND SURVEY

The Govt. Hrangbana College lies within 23°44'26.59"N latitude and 92°42'58.80"E longitude. It occupies an area of 1410.57 Sq.m with no green area provided within the College campus. However, indoor plantations are carried out in the College campus to maintain the greenery of the College. The College has its Women's Hostel at Durtlang, Aizawl and Boys' Hostel at Muthi Village, Aizawl, Mizoram, the details of which are discussed in Section II and III respectively.

The College receive Infrastructure grant of Rs 400 lakhs from State Project Directorate (SPD) and Rashtriya Uchchattar Shiksha Abhiyan (RUSA) and the amount is to be spent as under:

- i. 35% i.e Rs 140 lakhs for creation of different facilities.

- ii. 35% i.e Rs 140 lakhs for renovation & up- gradation of New Facilities
- iii. 30% i.e Rs 120 lakhs for New Equipments/ Facilities.
- iv. Regarding the utilization of the Infrastructure Grants all civil works are executed by Mizoram Technocrats (Private) Company (MTC) which has signed a MoU with SHEC/SPD, RUSA.

At present the College has 10 departments, which are constituent of Arts & Commerce streams. The different departments are stated as below:

Name of School

1. Department of English
2. Department of Mizo
3. Department of Political Science
4. Department of Education
5. Department of History
6. Department of Psychology
7. Department of Economics
8. Department of Public Administration
9. Department of Geography
10. Department of Commerce

The College has withstood all odds to gain the desired academic and administrative standards. It is still continuing to witness all-round development. Development projects viz., thirty two seated Women Hostels situated at Durtlang and Conference Hall (1109 sq. ft) & Golden Hall (6492.46 sq ft) equipped with proper facilities within the College building is completed. Aluminum partitions are also constructed in the teaching and non- teaching staff rooms. Hi- tech laboratory equipments are also acquired for Geography & Psychology laboratories. The College has also provided Gym facility within the building.

The College has also formed Board of Governors and Project Monitoring Committee to look after the Up gradation and infrastructural development of the College. The Project Monitoring Committee consisting of different teaching and non- teaching staff are assigned to be in charge of the Infrastructure development of the College.

There are 1758 students, 19 non-teaching staff, 73 faculty members which includes 1 Professors, 5 Associate Professors and 9 Asst Professors, 1 Librarian and 17 part time lecturers.

TASK II: OTHER INFRASTRUCTURE

As stated earlier, the College is situated at the commercial area of Chanmari and came into existence three decades back. The area during its inception was surrounded with green areas, however, due to infrastructural development activities and urbanization the College is now being surrounded with institutional buildings and shopping complexes. Nevertheless, the greenery of the College is maintained by plantation of indoor/ potted plants within the College Building, and the adoption of the rain water harvesting technique by the College. Cleanliness and Beautification Cell to overlook the task of maintaining the greenery and cleanliness of the College is also formed by the College. The class representatives are responsible for overlooking the cleanliness of each classroom. The College undertakes various activities through N.S.S. and eco-club for maintaining the greenery of the College.

All Departments are located within the College Building with different rooms allotted for each department. Information technology system adopted in the College is found to be quite good. The campus has Computer Centre with its own server and computerization of the College Library is on the verge of completion. The Library is currently implementing the advanced technology in the field of identification, security, tracking and automated handling of Library materials **using Electro-magnetic and Radio Frequency Identification (RFID) Library management system** in order to improve the efficiency of Library operations. Digital Scanner and shelves are bought and College website hbclibrary.mizoram.gov.in has been created. Free *wifi* and computer with internet connections are provided within the College Building thus providing accessibility of the digital data to the students and staff.

NELIT has also established a study centre within the College and provides computing facilities to students, teaching and Non-teaching staff of the College as well as imparting technical knowledge to students and staff alike. Computerization is also supervised by the Centre.

The College Library holdings have been available in machine readable catalogue since 2010; and the computerized bibliographic information of the library holdings have also been available for users " searching throughout the campus Network (intranet) using web OPAC. Automated circulation system using barcode technology has been used since 2006 which provides easy and prompt service. Library has been providing *lending* and *reprographic services*, for newly admitted students of various Academic Departments.

Each room in the College is provided with power point presentation facilities to improve the learning skills of the students. One drawback of the location is the creation of

outside noise by the traffic. In order to tackle this problem teaching is done with the help of P.A system and in some cases under closed windows.

An alumnus of the college has set up a beautiful memory lane inside the college building with free wifi where they have kept the trophy won in different disciplines in the past. They also hang a banner with top 10 rank holders in the university exams.

Land availability is reproduced in the table below:

Land		
	Area (in Sq. m)	Percentage
Occupied	1410.57	100
Unoccupied/green areas	0	0
Developed	1410.57	100
Total	1410.57	100

Table1: Land availability in the College

The total points gained under this category may be summarized as below:

TASK	POINTS	
	ALLOTTED	GAINED
1) Land use	10	9.00
2) Other Infrastructure	10	8.5
TOTAL	20	17.50

Table 2: Total points gained under Land & Infrastructure

B. AIR QUALITY

The Air quality around the campus has been studied by considering four (4) points like transport survey, CO2 emission, Ambient Air quality, and Ventilation provided in the room.

Data Collection Method:

A walk through surveys and interviews were conducted to find out the number of students coming & going by vehicles, survey of rooms to ensure area of ventilation provided, number of vehicles and distance covered used for transport to find CO2 emissions, ambient air quality and other information needed for the air audit.

TASK I: MODE OF TRANSPORTATION TO COLLEGE CAMPUS

From the survey results it was concluded that 9.9 % of students and staff come by 2-wheelers and the remaining 90.1% come on foot or other public transport such as city bus, taxi as the college is situated at the heart of the city.

Assuming that, each two-wheeler, car travels and Bus 5 km, 10 km, 15 km every day respectively. This implies that for the 9.9 % (220 two - wheelers) coming by 2- wheelers, about 220 km is travelled and 50 km is travelled by car (1 cars)and 55km is travelled by Bus.

Therefore the total number of kilometers travelled by all vehicles is

$$= 220 + 50 + 55 = 305 \text{ km}$$

The survey can be summarized in the table below:

Mode of travel	No.s of Km covered	Points allotted	Points gained
Bus	55	6.25	6
LMV	50		
2 wheeler	220		
TOTAL	305		

Table 3: Points gained for mode of Travel

TASK II: CONTRIBUTION TO CLIMATE CHANGE

Carbon Dioxide (CO₂) is one of most common Greenhouse Gas emitted into our environment. Global emissions of carbon dioxide (CO₂) - the most important heat-trapping gas in the atmosphere are the main cause of global warming. India being a developing country does not yet adopt binding emission that is decreasing global emissions to 50% by 2050. However, owing to global warming and climate change issues, efforts must still be given by all officials so that community plans and regional growth strategies include greenhouse gas emission reduction strategies and targets.

The main source of CO₂ of the College is from the combustion of fossil fuels such as gasoline and diesel to transport people and goods which in short may be called as vehicular

emission. In certain cases, LPG is also used in Canteen and diesel generators of 15 KV used during shortage of electric supply. The amount of CO₂ from these sources is considered negligible as compared to vehicular emissions.

CO₂ emissions:

1) Diesel run vehicles:

In plain areas average diesel consumption is rated as 21.1 liter per 100 km or 4.7 km per liter. Owing to the hilly terrain, huge traffic jam and use of adulterated fuel, the average diesel consumption is assumed at 25 liters per 100 km or 4 km per liter. Therefore, on average, the College bus consumed 7 litres of diesel to cover 28 km per day. The amount of CO₂ emission is given in table 5.

2) Petrol run Vehicles:

i) Consumption by car or LMV:

In plain areas, the average petrol consumption by car is assumed at 1 liter per 12 km. Owing to the hilly terrain and huge traffic jam the average petrol consumption is assumed at 8 km per liter. Therefore, on average, 5 cars consumed 6.25 litres of petrol everyday to cover 50 km. The amount of CO₂ emission is given in table 4.

ii) Consumption by 2-wheelers:

Similarly, petrol consumption by 2-wheelers is assumed at 20 Km per liter. Then average consumption of petrol by 37 two wheelers is 9.25 litres everyday to cover 185 km. The amount of CO₂ emission is given in table 5 below:

The emissions of CO₂ are calculated as shown in the table 5 below:

Mode of travel	Distance travelled (in km)	CO ₂ emission(g/km)	Grams of CO ₂ /vehicle	Grams of CO ₂ /passenger	Points allotted	Points gained
Bus	50	659.77	32,988.5	1099.6	6.25	6
LMV	50	287.94	14,397	3,599.25		
2 wheeler	220	115.17	25,337.4	12,668.7		
Total	305	659.77	72,722.9	17,367.55		

Table 4. CO₂ Emission Chart

From the table above, a good score is observed in this task due to the large number of people coming on foot and by two wheelers, thus decreasing the number of vehicles. On the other hand, it is rarely noted that a car greater than 15 years old are plying. All the vehicles used for transportation by the students and faculties of the College also comply with the Central Motor Vehicle Acts and Rules by obtaining valid Pollution under Control Certificates (PUC). The practice of turning off lights and electronics appliances like computers when not in use reduces electricity demand.

TASK III: AMBIENT AIR QUALITY AROUND THE CAMPUS:

The ambient air quality of the college was taken for continuous eight hours in the college campus. Analysis report for monitoring conducted for three parameters like Respiratory Particulate Matter of size less than or equal to 2.5µ (PM2.5), Particulate Matter of size less than or equal to 10µ (PM10), Sulphur dioxides (SO2), Carbon Monoxide (CO) and Nitrogen Oxides (NOx) during June 2023 is shown in **table 5**.

Table 5. Ambient Air Quality on 22nd June 2023

Pollutants monitored	National Standard (µg/m³)	Measured (µg/m³)	Points allotted	Points gained
PM2.5	60	4	6.25	6.00
PM10	100	44		
NOx	80	10.2		
SO2	80	1		
CO	50	27		

TASK IV: VENTILATION OF THE ROOMS

Because of the effects it has on health, comfort, and serviceability, indoor air quality in our homes is becoming of increasing concern to many people. The Environmental Protection Agency lists poor indoor air quality as the fourth largest environmental threat to America. Mechanical ventilation can improve many of the problems arising from poor indoor air quality.

This task was already done in the previous green audit report and no change was made in the building, so, the finding was re-use for this task. To find out whether the indoor air is sufficient in all rooms, data on the area of classrooms and mechanical ventilation system was collected through measurements and the administration files. Apart from the already documented length and width of classrooms, the height was physically taken by Measuring Tape.

The table below is a summary of the data collection and calculations done.

Room	Floor area (Sq. ft.)	Area of Vent (Sq. ft.)	Opening size (%)	Points allotted	Points gained
Faculty Rooms	1536.00	450	29.30	6.25	5.00
Class rooms	8843	3146	35.57		
Library	4102	483	11.77		
Conference Hall	1109	270	24.35		
Golden Hall	6492.46	162	2.50		
Total	22082.46	4511	20.42		

Table 6: Ventilation chart

According to standards adopted in America, a room having 4% of the floor area as operable openings is considered to meet requirement of natural ventilation. Taking this consideration in the table above, **Golden Hall with 2.50% opening size falls short of the required ventilation** while rooms of other buildings have enough provision for natural ventilation and air circulation.

TABLE 7: OVERALL RANKING UNDER AIR QUALITY

TASK	POINTS	
	ALLOTTED	GAINED
1) Transport	6.25	6.00
2) CO2 emissions	6.25	6.00
3) Ambient air Quality	6.25	6.00
4) Ventilation	6.25	5.00
TOTAL	25.00	23.00

C. WATER

TASK I: SOURCES OF WATER

Study was conducted in various ways like sources of water, its uses and disposal. Like other aspects, data were collected through questionnaire, walk through and interviewing the person concerned in each Department.

The College has 5 nos. of water connection from the Public Health Engineering Department, Government of Mizoram which is the main source of water in the College along with rain water. During dry season, when rain pour and public water supply is less, the College utilizes the water from the large tank which is used for storing the rain water. Water bills for three consecutive months were obtained through the authority concerned and the average quantity supplied per month was calculated. Although the water supplied is now known for each month throughout the year, the average was taken in order to determine the requirement per capita per day. On average the College received 109,9403.45 liters of water per month from public supply which is 3646.78 l/day.

Assuming monsoon period to last for 4 months during which rain water is harvested in full capacity. It would therefore be approximated that amount of rain water harvested per months is 5667 liters.

TASK		Amount of water received per month (in L)	POINTS	
			ALLOTTED	GAINED
Sources of Water	1) Public Supply	109,9403.45	7.5	6.5
	2) Rain Water	11,153.00		
TOTAL		1,110,556	7.5	6.5

Table 8. Sources of Water

TASK II: WATER HARVESTING/ STORAGE

The College has five plastic tank of two 2000L, two 4000L, 1500, capacity each which stores water from public supply and two water tanks (concrete) of 11017L, 22442L capacity respectively where all rain water are stored. Thus, a total of 46,969 L capacity of water tanks is available within the College.

Although the water supply received by the College seems adequate, however, as per WHO, a higher quantity of about 20 litres per capita per day should be assured to take care of basic hygiene needs and basic food hygiene. As such, the water requirement per capita per day is taken as 20 l, it is estimated that the total requirement of water in the campus is 45040 liter/capita/day while 3646.78 liter/day is supplied; hence, a deficit of 41393.22 l/day occurred. Further, the water tanks of the College could not store the per capita water requirement. However, as the college not a boarding residence, water consumption is only for drinking and cleaning toilets only, it is sufficient for their daily needs.

Though great efforts have been given for the conservation of water, the water harvesting storage needs to be enlarged and a provision for harvesting more rain water needs consideration.

Water Tank Type	Nos.	Capacity (L)	Total (L)	Points allotted	Points gained
Large	2	11017+22442	33469	7.5	6
Medium	5	2000x2, 4000x2, 1500	13,500		
Total	7		46,969		

Table 9: Capacity of Water harvesting facility in the College:

TABLE 10: OVERALL RANKING UNDER WATER SOURCES

TASK	POINTS	
	ALLOTTED	GAINED
1) Sources	7.5	6.5
2) Water harvesting/ Storage	7.5	6
TOTAL	15	12.5

D. ENERGY MANAGEMENT AND ADMINISTRATION

An assessment of energy consumption, energy sources used, energy management, lighting devices used and other appliances used by the campus community is an important aspect of sustainability of the community. Hence this is a relevant aspect of the assessment. Sources, consumption pattern and mode of conservation of Energy being practiced in the College was studied and related data were collected through inspection, office records and by interacting with the person in charge.

TASK I: SOURCES OF ENERGY IN COLLEGE

The College mainly depends on two sources of energy which are as follows:

Renewable Source:

- a) Electricity through public supply
- b) Solar energy

Non-Renewable Source:

- a) Gas: Merely for cooking in College canteen.
- b) Diesel: For college buses
- c) Petrol: For staff and student cars/ vehicles and generator.

The College greatly depends on public electricity supply and but the college have solar power for backing up the public electricity supply. **Hence, 4 points out of 5 is credited.**

TASK II: ENERGY CONSUMPTION

Electricity bills for the previous month were obtained through the authority concerned, and the value of electric consumption in kilowatts per hour for some months was obtained from the charts in the bills. The average quantity consumed per month was calculated. Although the energy consumption is now known for each month throughout the year, the average was taken in order to determine the consumption per capita per day. It was observed that though the College depends much on public electricity supply, the average monthly consumption is low.

In terms of the consumption of non-renewable energy such as petrol, diesel, gas etc. it was found that petrol and diesels were mainly used for vehicles. Gas amounts consumed are very insignificant as the school uses it only for a few in College canteen.

The total energy consumption per capita i.e.22.75 MJ is low as compared to the per capita consumption in Mizoram during 2011 census which is 788 MJ (2.88%). As such a good score is credited.

Type	Sources	Amount (KWH)	per capita consumed	Points allotted	Points gained
Renewable	Electricity	3058	1.357	5	4
Non- renewable	Petrol (L/Month)	408.3	10.28		
	Diesel (L/Month)	359	10.55		
Total		3325.3	22.18		

Table 11: Energy Consumption

TASK III: ENERGY CONSERVATION:

Through interview among staff & students, it was found that though the College does have any policy statement on energy conservation, each department was found to practice energy conservation on a large scale by turning off the lights when not required, turning off other electrical appliances and computer monitors when they are not in use.

Since, the College relies on electric supply from municipal connection; the College utilizes large quantity of energy however, the usage it greatly reduced by using LED bulbs and tubes in almost all the rooms in the campus and hostel. Besides, it was also found that most staffs and students (97.63%) commuted via on foot and by public transport and while 1.72% of the population resided in the College hostel which has greatly reduced the quantity of the energy consumed. **Therefore, 4 out of 5 points is credited to these the tasks.**

TABLE 12: OVERALL RANKING UNDER ENERGY MANAGEMENT AND ADMINISTRATION

TASK	POINTS	
	ALLOTTED	GAINED
1) Sources	5	4
2) Consumption	5	4
3) Conservation	5	4
TOTAL	15	12

E. WASTE MANAGEMENT

Wastes management in the College campus is studied by considering four aspects solid, liquid, electronic wastes management and drainage system. Like other parts, information was obtained through walk-through and interview.

TASK I: SOLID WASTE MANAGEMENT:

Solid wastes generated by the College consist of all types of wastes like left-over food from school canteens, bio-degradable and non-biodegradable wastes from classrooms, and administrative offices. These wastes are segregated at the point of generation and are disposed through PPP mode. Biodegradable wastes are kept in decompose bin and used to fertilize plants. E-wastse are segregated form other waste and are collected by public partner separately.

During the survey, it was found that efforts were given for maintaining the cleanliness of the campus by providing separate dust bins for biodegradable and non-biodegradable waste, brooms, etc., in each classroom. Garbage bins are provided in each classroom and segregation

were found to be good enough. All kinds of wastes are thrown altogether including waste paper, plastic bottle, tin container which are separated for recycling or reuse.

Status of solid waste generation, collection, treatment and disposal are summarized in the table below:

Quantity of waste generated/month (Kg)	Per capita/day generation (Kg)	Segregation & Treatment/ recycling	Points allotted	Points gained
456 kg	0.202 kg	28kg	6.25	5.5

Table 13: Status of solid waste

Amount of solid wastes generated per month = 456 kg Solid waste generated per day basis = 15.2 kg Amount of waste treated & segregated= 28 kg **College points gained= 5.5.**

The survey shows that the college students and staff participate in waste management by segregation the waste. The eco-club of the college set up their own compost bin for decomposing their bio-degradable waste. Therefore, **5.5 out of 6.25 points is credited to these the tasks.**

TASKS II: LIQUID WASTES MANAGEMENT

The main source of waste water discharge is from cleaning and sanitary purposes in all Departments and offices and cooking and cleaning from Canteen.

The total water supply into the Campus as calculated in the Water Chapter is about 67403.33 l/month. Due to high water consumption in canteen, the percentage of wastes water discharged is averaged at 80% of the supply which is 54402.664 l/m. Thus, the per capita per day waste water discharge is

1.47 l which is very less as compare to the per capita per day requirement outlined by WHO.

During the survey, **Waste water arising from various sources except for lavatory was found to be discharged into drains untreated.**

The Summarized status of liquid waste management is shown below:

Quantity of waste water (liter/month)	Reused/ recycled (liter)	Points allotted	Points gained
54402.664	0	6.25	4

Table 14: Points allocated for liquid wastes

TASKS III: ELECTRONIC WASTES MANAGEMENT:

During the physical inspection no- e waste were stored in the college campus.

Though the E- waste generated was disposed off with the public partner, the E- waste and defective item from Computer Laboratory is being stored properly and were collected as per requirement. The discarded/ written off computers, if repairable, are given at the servicing station and donated to schools in rural area.

Hence, 6 out of 6.25 is credited

TASKS IV: DRAINAGE SYSTEM:

During the inspection, no overflow of water was found in the College. However, the drainage system is found to be not properly maintained especially in the toilets of the first floor. All the waste water is being discharge directly to public drainage system using pipeline on the other side of the College. Some of the pipes were found to be old and crack. Therefore, **improvement is required in the drainage system.**

Therefore, 4.5 out of 6.25 is credited.

TABLE 15: OVERALL RANKING UNDER WASTE MANAGEMENT

TASK	POINTS	
	ALLOTTED	GAINED
1) Solid waste management	6.25	5.5
2) Liquid waste management	6.25	4
3) E- Waste Management	6.25	6
4) Drainage System	6.25	4.5
TOTAL	25	20

B. CARBON FOOTPRINT

The most common greenhouse gases are carbon dioxide, water vapour, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most prominent greenhouse gas, comprising 402 ppm of the Earth’s atmosphere. Each human being is contributing towards adding green-house gases to the atmosphere depending upon his day to day activities and usage of instruments and machineries for different purpose. Release of carbon dioxide gas into the Earth’s atmosphere through human activities is commonly known as carbon footprint. An understanding about the same of any institute where large number of anthropogenic activities are happening is important to assess the contribution of emission of gases that are responsible for Green House Effect. Auditing for carbon footprint of Hrangbana College Campus was done using their detailed information, so that the impact of the community on global environment can be assessed.

4.4.4.1. Major Findings

1. Total number of Students – 2179
2. Total number of Teachers – 73
3. Number of persons using cars - 1 (1.8L fuel per day)
4. Number of persons using two wheelers - 104 (50L fuel per day)
6. Number of persons using public transport – 1539, 21 km per day, average (180L of fossil fuel per day)-50
7. Number of cycles used in the campus– 0

8. LPG usage - 3 Cylinders per month
9. Total fossil fuel usage per day - 260 L, apart from LPG and fuel for generators

It is evident that majority of the campus community are relying on public transport system for commutation leading to the expense of 180 L of fuel per day. This shall be considered as a very conservative approach. Assuming that 20 persons travel together combined with number of motorcycles and cars lead to the usage of 260L of fuel per day. This causes the emission of about 702kg of CO₂ per day. This measurement is excluding the natural emission of Co₂ by human by breathing (ie. 1140g/day). Consumption of one litre LPG releases about 1.5kg of CO₂. At the rate of 77.5 cylinders per month the college is using about 3 L of LPG that releases 30kg CO₂ per month. The estimated carbon footprint is about 3299 kg per day.

Hence, for this task the college gain 9 out of 10

ECOMS



TABLE 16: OVERALL RANKING OF THE COLLEGE

TASK	POINTS		OVERALL RANKING
	ALLOTTED	GAINED	
Land & other infrastructure	20	17.50	A+
Air Quality	25	23	
Water	15	12.50	
Energy Management	15	12.00	
Waste management	25	20	
Carbon Footprint	10	9	
TOTAL	110	94	



Dust Bin



Water Cooler/Filter



Faculty Room



Toilet



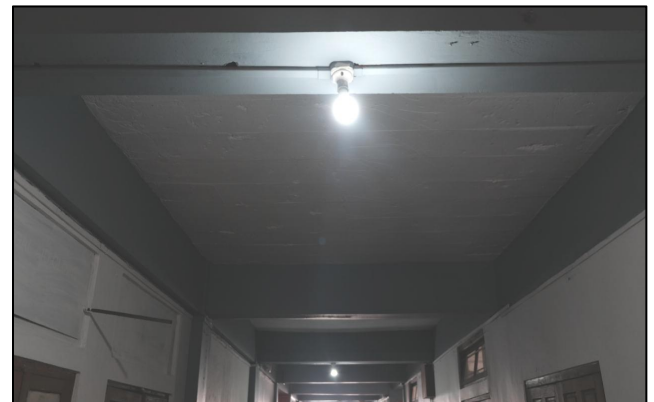
Wash Basin



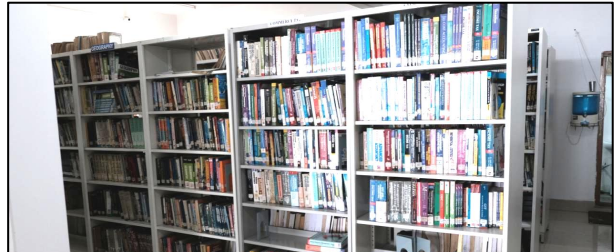
Fire Emergency



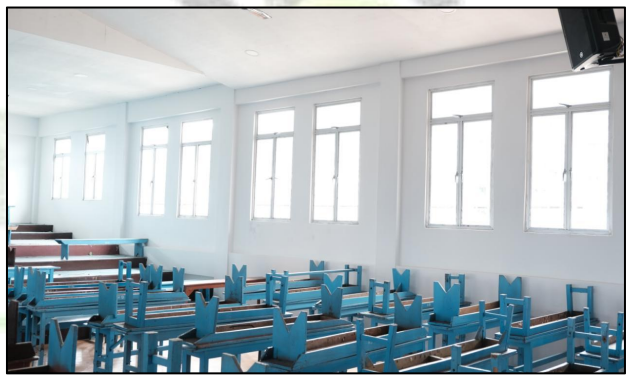
Sick Room



Hallway LED light



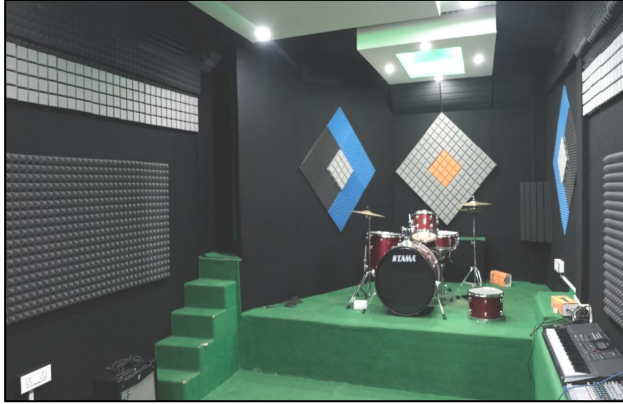
Library



Golden Hall



Classroom



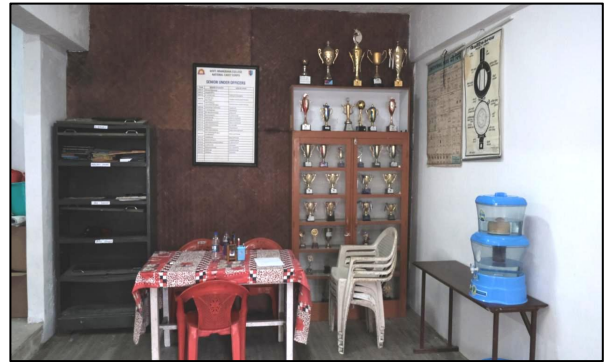
Jam Room



Gym Room



NCC Room



Rooftop Solar Panel



Rooftop Water Storage Tank



FINDINGS

SECTION II GOVT. HRANGBANA COLLEGE WOEMENS' HOSTEL

- A. Land & Other Infrastructure**
 - Task I : Land Survey**
 - Task II : Other Infrastructure**

- B. Air Quality**
 - Task I : Mode of Transportation**
 - Task II : Contribution to Climate Change**
 - Task III : Ambient Air Quality**
 - Task IV : Ventilation of the rooms**

- C. Water**
 - Task I : Water harvesting/ Storage**

- D. Waste Management**
 - Task I : Solid Waste Management**
 - Task II : Liquid Waste Management**
 - Task III : Drainage system**

- E. Energy Management & Administration**
 - Task I : Sources of Energy in the hostel**
 - Task II : Energy Consumption**
 - Task III : Energy Conservation**



A. LAND & OTHER INFRASTRUCTURE

TASK I: LAND SURVEY

The Women Hostel for Govt. Hrangbana College is located in the northern side of the Aizawl city at Durtlang. The Hostel lies within 23°46'53.41"N latitude and 92°43'44.28"E longitude. The Women Hostel was constructed in 2011-2012 at Durtlang with the financial assistance from UGC and MP LAD Fund. Womens Hostel was occupied by the students from the academic session 2012 – 2013. There are at present 32 seats for the students and Quarters for Hostel Superintendent, Hostel Cook and Chowkider, Visitors Room, Meeting Hall, Dining Hall and Bus Shed. In addition to this, inmates are provided with the indoor games facilities like – Table Tennis, Carrom Board, Chess, Chinese Checker, Drought Board etc. and Television. Each rooms are designed to accommodate two students. The Hostel is a five storied building.

The green audit began with the teams walking through all the different facilities of the Hostel (Dining Hall, Hostel Rooms, Common Room, lavatory etc), as well as measuring the usage per item and identifying the relevant consumption patterns and the impact they have. The staff and students were interviewed to get details around usage, frequency or general characteristics of certain appliances. Data collection was done in sectors such as Energy, Waste, Greening and water uses.

Comments on Site Inspection:

Site inspection was done along with the staff. It was quite interesting and fascinating experience, as it was ever green auditing experience for the staff and team.

Findings of the Green Audit:

The Hostel Building is a five storied building, extending to an area of 2448 sq. ft and 1800 sq. ft green area. The Hostel is well fenced with concrete wall of about 12 ft high with arrow - head iron bars at the top. The ground floor was allocated for Drivers Room and parking for vehicle. Each floor in the building is provided with a corridor of about 10 ft wide excluding

the ground floor. Each Room in the Hostel is well ventilated for proper circulation of air around the rooms.

The first floor consists of 4 rooms of which can accommodate 2 students each and a bathroom and 2 toilets were shared among eight students. The Rooms were well furnished with 2 nos of single bed (3 X 6 ft), table and a chair. A water harvesting tank of capacity about 28316 L is constructed adjacent to the Hostel Room.

The second floor was allocated for 4 rooms, one Visiting Room, Dining Hall and Common Room. The Dining Hall cum Kitchen extended to an area of 864 sq. ft and furnished with 4 nos of dining tables. The area of the Common Room is 144 sq. ft, with Table-Tennis board.

The third floor was allocated for 8 rooms and a Warden Room. The area of the Warden Room is 264 sq. ft, well furnished with television set and 3 Nos of windows. Water harvesting tank of capacity 71358.45 L is constructed opposite to the Hostel Rooms on the hill side and a plastic water storage tank of capacity 4000 L was also available.

The fourth floor was allocated for 1 room used as Chapel. The area of the Chapel is 408 sq. ft, with 6 Nos of windows.

A Green belt or Home Garden was maintained by the staff and hostellers. A compost pit of 5ft. diameter with 2 ft depth was constructed near the garden where all the bio-degradable wastes are disposed. The manure from the compost pit was utilized in the garden. An closed waste disposal area was maintain where non-biodegradable was are burnt off.

The green audit finding show that the Hostel performs fairly well on sustainability issues. The staff and students of the Hostel do consider the environmental impacts of most of its actions and makes a concentrated effort to act in an environmentally responsible manner.

TASK II: OTHER INFRASTRUCTURE

The audit team also give emphasize on other infrastructures available in the Hostel during walk through inspection and the following were the findings.

Infrastructure		
	Accessibility within the campus	2
	Building materials	2.5
	Natural water Sources	2
	Beautification	2
	Points gained	8.5

Table 17: Points allotted to other infrastructure

The total points gained under this category may be summarized as below:

TASK	POINTS	
	ALLOTTED	GAINED
1) Land use	10	9
2) Other Infrastructure	10	8.5
TOTAL	20	17.5

Table 18: Total points gained under Land & Infrastructure

B. AMBIENT AIR QUALITY

TASK I: MODE OF TRANSPORTATION

The students and warden in the Women Hostel do not rely on any means of transportation. The students commuted to and from the College by the College bus only. Hence, a high score of 6 is credited in this task.

TASK II: CONTRIBUTION TO CLIMATE CHANGE

During the green audit it was found that the students commuted with the College bus to the Hostel. After classes the College bus would drop the hostellers to the Hostels. No Hostel students owned any means of transportation. The staff also commuted via city buses or on foot to the Hostel.

Mode of travel	Distance travelled (in km)	CO₂ emission (g/km)	Grams of CO₂/bus	Grams of CO₂/passenger	Points allotted	Points gained
Bus	28	659.77	18473.56	543.34		

LMV	0	0	0	0	6.25	6
2 wheeler	0	0	0	0		
Total	28	659.77	18473.56	543.34		

Table 19: CO2 emissions chart

TASK III: AMBIENT AIR QUALITY IN THE WOMEN HOSTEL:

As the Hostel is located in the serene area of Durtlang, the Ambient Air Quality of the area was below detection level. Ambient Air Quality was monitored for on 22nd June 2023. The following results were obtained from the monitoring.

Table: Ambient Air Quality during 01.11.2017 and 01.12.2017

Pollutants monitored	Air Quality data	National Standard	Points allotted	Points gained
PM _{2.5} (µg/m ³)	8	60	6.25	6
PM ₁₀ (µg/m ³)	15	100		
NO ₂ ppb	2	80		
SO ₂ ppb	1	80		
CO	12	50		

Table 20 :Air Quality chart

TASK IV: VENTILATION OF THE ROOM:

To find out whether the indoor air is sufficient in all rooms, data on the area of classrooms and mechanical ventilation system was collected through measurements and the administration files. Since, all the Hostel rooms are of equal size, an area of a single room with area of vent is taken into account for assessing opening size. The ventilation or opening size of each type of rooms is given in the table below:

Room	Floor area (Sq. ft.)	Area of Vent (Sq. ft.)	Opening size (%)	Points allotted	Points gained
Double Room	144	72	50		
Common cum Dining room	864	270	31.25		

Warden	264	126	47.73	6.25	6
Chapel	408	162	39.71		
Driver	576	108	18.75		
Total	2256	736	32.74		

Table 21 :Ventilation chart

According to standards adopted in America, a room having 4% of the floor area as operable openings is considered to meet requirement of natural ventilation. Taking this consideration in the table above, all the rooms of the buildings have enough provision for natural ventilation and air circulation.

TABLE 22: OVERALL RANKING UNDER AIR QUALITY

TASK	POINTS	
	ALLOTTED	GAINED
1) Transport	6.25	6
2) CO2 emissions	6.25	6
3) Ambient air Quality	6.25	6
4) Ventilation	6.25	6
TOTAL	25	24

Table 22: Overall Air Quality Ranking

C. WATER

TASK I: SOURCES OF WATER

The main sources of water for the Hostel are public water supply and rain water. On average the College received 27699.00 liters of water per month from public supply.

As per Central Public Health and Environmental Engineering Organisation (CPHEEO) the water requirement per capita per day is taken as 70 litre per capita per day (lpcd), hence, it is estimated that the total requirement of water in the Hostel is 2660 liter/day while 923.00 liter/ day is supplied; hence, a deficit of 1736.7 l/day occurred, which is met through harvesting rain water. Thus, out of the total points allocated only **6** points were gained in terms of water source available.

The points were given based upon the readings of the previous water bills and the consumption per person.

TASK II: WATER HARVESTING/ STORAGE

The Hostel has one plastic tank of 4000L capacity and two water tanks (concrete) of 71358.45L and 28316 L capacity respectively which stores water from public supply and all rain water. During the inspection, the concrete water tank is nearly full which shows that the Hostel has harvested plenty of rain water apart from the average monthly public supply received. Thus, the Hostel does not face water scarcity at the time of inspection. Hence, a good score of 7 is credited out of 7.5 allotted.

TABLE 23. OVERALL RANKING UNDER WATER SOURCES

TASK	POINTS	
	ALLOTTED	GAINED
1) Public Supply	7.5	6.25
2) Rain water harvesting	7.5	7.25
TOTAL	15	13.5

D. WASTE MANAGEMENT

TASK I: SOLID WASTE MANAGEMENT:

Solid Waste Management in the Hostel was found to be satisfactory. Compost pit was utilized for composing the biodegradable solid wastes. However, segregation for plastic and other recyclable wastes was not done. All the dry solid wastes were segregated at a common point and disposed via PPP mode in the dumping ground. At an average the daily solid waste generated by the Hostel was found to be 21 kg/ day with about 70% being bio- degradable solid wastes which are being compost.

Quantity of waste generated /month (Kg)	Per capita/day generation (Kg)	Segregation & Treatment/ recycling	Points allotted	Points gained
630 kg	0.011 kg	441kg	9	6.5

Table 24: Points allocated for solid wastes

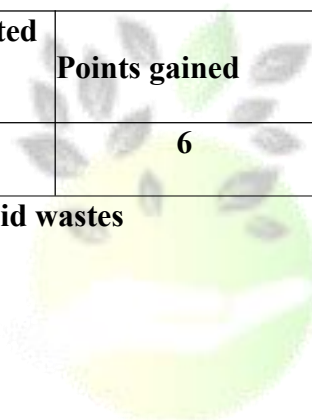
Amount of solid wastes generated per month = 630 kg Solid waste generated per day basis
 = 21 kg Amount of waste treated & segregated = 441 kg **College points gained**
 = **6.5**

TASK II: LIQUID WASTE MANAGEMENT:

The main source of waste water discharge is from cooking, cleaning, washing, gardening and sanitary purposes. On average, 61200 l of waste water per month was discharged which is equal to 53.68 lpcd which is less than the per capita per day requirement as outlined by CPHEED. During the survey, no loss of water is observed, neither by any leakages or by over flow of water from overhead tanks.

Quantity of waste water (liter/month)	Reused/ recycled (liter)	Points allotted	Points gained
61200	0	9	6

Table25: Points allocated for liquid wastes



TASK III: DRAINAGE SYSTEM

It was observed that all the waste water from the bathrooms, toilets and kitchen was disposed through pipeline to the public drainage system. A garland drain is well constructed besides the building, it is not properly managed or maintained. **Therefore, 5.5 out of 7 is credited.**

TABLE 26: OVERALL RANKING UNDER WASTE MANAGEMENT

TASK	POINTS	
	ALLOTTED	GAINED
Solid waste management	9	6.5
Liquid waste management	9	6
Drainage System	7	5.5
TOTAL	25	18

Table 26: Overall Ranking in Waste Management

E. ENERGY MANAGEMENT AND ADMINISTRATION

Sources, consumption pattern and mode of conservation of Energy being practiced in the Hostel was studied and related data were collected through a inspection, office records and by interacting with the person in charge.

TASK I: SOURCES OF ENERGY

The only source of electricity in the Women Hostel was that of the supply from Power & Electricity Department. No solar powered supply or backup system was made available in the Hostel which may to an extent hinder the study environment of the students. However, efforts were made by the College administration by using energy efficient CFL/LED bulbs and tubes. Further during inspection, the audit team were informed that a power back up in the form of solar or online ups system will be install shortly to curb power shortage especially during rainy seasons. The main sources of energy are:

Renewable Source:

a) Electricity through public supply

Non-Renewable Source:

- a) Gas: Merely for cooking in College Canteen.
- b) Diesel: For school buses (already mentioned in Section I)

The Hostel greatly depends on public electricity supply and does not have solar power panels. However, as reported to the audit team, a provision for installing solar panel or home ups system is being made and will be installed shortly. **Hence, 3.5 points out of 5 is credited.**

TASK II: ENERGY CONSUMPTION

Electricity bills for the previous month were obtained through the authority concerned, and the value of electric consumption in kilowatts per hour for some months was obtained from the charts in the bills and converted to mega joules (MJ). The average quantity consumed per month was calculated. It was observed that as though the Hostel depends only on public electricity supply, the average monthly consumption is very high.

In terms of the consumption of non-renewable energy such as diesel and gas, it was found that diesels were mainly used for College bus. Gas amounts consumed are insignificant.

The total energy consumption per capita i.e., 64.21 MJ is very low as compare to the per capita consumption in Mizoram during 2011 census which is 788 MJ.

Type	Sources	Amount (MJ)	per capita consumed	Points allotted	Points gained
Renewable	Electricity	2440.8	64.21	5	4
Non- renewable	Petrol (L/Month)	0	0		
	Diesel (L/Month)	Already included in Section I			
Total		2440.8	64.21		

Table 27: Energy Consumption

TASK III: ENERGY CONSERVATION:

Through interview among staff & students, it was found that though each student was found to practice energy conservation on a large scale by turning off the lights when not required, turning off other electrical appliances when they are not in use.

Since, the Hostel relies on electric supply from municipal connection; the Hostel utilizes large quantity of energy however, the usage is greatly reduced by using LED bulbs and CFL tubes in almost all the rooms. Besides, it was also found that all staffs and students commuted by College bus from Hostel to College to and fro which has greatly reduced the quantity of the energy consumed.

Therefore, 4 out of 5 points is credited to these the tasks.

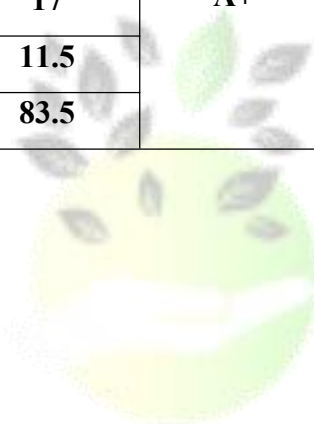
TABLE 28: OVERALL RANKING UNDER ENERGY MANAGEMENT AND ADMINISTRATION

TASK	POINTS	
	ALLOTED	GAINED
1) Sources	5	3.5
2) Consumption	5	4
4) Conservation	5	4
TOTAL	15	11.5

TABLE 29: OVERALL RANKING OF THE WOMEN HOSTEL

TASK	POINTS		OVERALL RANKING
	ALLOTTED	GAINED	
Land & other infrastructure	20	17.5	A+
Air Quality	25	24	
Water	15	13.5	
Waste management	25	17	
Energy management	15	11.5	
TOTAL	100	83.5	

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FINDINGS

SECTION III GOVT. HRANGBANA COLLEGE BOYS' HOSTEL

- A. Land & Other Infrastructure**
 - Task I : Land Survey
 - Task II : Other Infrastructure

- B. Air Quality**
 - Task I : Mode of Transportation
 - Task II : Contribution to Climate Change
 - Task III : Ambient Air Quality
 - Task IV : Ventilation of the rooms

- C. Water**
 - Task I : Water harvesting/ Storage

- D. Waste Management**
 - Task I : Solid Waste Management
 - Task II : Liquid Waste Management
 - Task III : Drainage system

- E. Energy Management & Administration**
 - Task I : Sources of Energy in the hostel
 - Task II : Energy Consumption
 - Task III : Energy Conservation



A. LAND & OTHER INFRASTRUCTURE TASK I: LAND SURVEY

The facility or Boys’ Hostel is located at Muthi village, Aizawl which is about 13 kms from Aizawl. The location for the facility is quite good as Muthi village is one of the most remote village within Aizawl and no disturbances from the urban activities. It is well covered with forests vegetations. Fencing of the land is being carried on and the proposed infrastructure is under construction. During the survey, it was informed that planning for development of compost pit for segregation of wet solid wastes and the rain water harvesting is implemented in new building that is under construction. Also, plantation is suggested to be carried out for maintaining the greenery of the facility. Adequate ventilation was provided in the building for proper circulation of air. ETP was also proposed to be constructed for waste water treatment.

TASK II: OTHER INFRASTRUCTURE

The building is three storied extending to an area of 2738 sq feet. The facility is a three storied building with each floor consisting of a corridor or open area of about 344 sq feet. There are at present 17 nos of rooms consisting of various sizes and thus differentiated into Type I, II and III respectively with Warden room, Common room, Dining room etc. The Hostel building is constructed to accommodate about 24 nos. of student. The rooms are provided with adequate number of windows and ventilators to provide the circulation of air and light into the rooms. A basket ball court for recreational purpose is constructed and a football playground is located at the vicinity of the Boys’ Hostel.

Grading for the facility was given based on the present observation, which includes the following criteria *i.e*, building material, and infrastructure, ventilation, maintaining the greenery of the facility, water conservation and drainage system.

TABLE 30: OVERALL RANKING UNDER LAND & OTHER INFRASTRUCTURE

TASK	POINTS	
	ALLOTTED	GAINED
1) Land	10	9

2) Infrastructure Development	20	16
TOTAL	30	25

B. AMBIENT AIR QUALITY TASK I: AMBIENT AIR QUALITY:

As the facility is under construction the air quality was monitored on 22nd June 2023 and taken as a base line for calculating the ambient air quality of the facility and grading was given based on the result of the ambient air quality days during the above days.

Table 31: Ambient Air Quality during 18.12.2017 and 23.12.2017

Pollutants monitored	National Standard (µg/m³)	Measured (µg/m³)	Points allotted	Points gained
PM 2.5	100	21	10	8
PM10	100	41		
NO ₂	80	4		
SO ₂	80	6		
CO	11	50		

From the analysis report and the table above, the ambient air quality around the Hostel is below National Standard even during construction stage. As such a good score of **8 out of 10 is credited.**

TASK II VENTILATION:

As stated in the previous sections data on the area of various rooms such as Warden room, Hostel rooms, Dining rooms, Reading room, Common room etc and mechanical ventilation system was collected through measurements in order to find out whether the indoor air is sufficient in all the room.

Table 32 : Ventilation chart			
ROOMS	Floor Area (sq. ft)	Vent area (sq.ft)	Opening size (%)
Reading room	192	36	18.75

Warden Room	480	72	15.00
Hostel Room I	150	36	24.00
Hostel Room II	180	36	20.00
Hostel Room III	240	54	22.50
Kitchen & Dining Room	512	108	21.09
Common Room	320	54	16.88
Cook room	120	36	30.00
Total	2194	432	19.69

As stated earlier, the opening size of all the rooms are greater than 4%, therefore a score of **8 out of 10 is credited.**

TABLE 33 : OVERALL RANKING UNDER AIR QUALITY

TASK	POINTS	
	ALLOTTED	GAINED
1) Ambient air Quality	10	8
2) Ventilation	10	8
TOTAL	20	16

C. WATER

TASK: WATER HARVESTING/ STORAGE

As the facility is under construction, data on the quantity of water supplied via public supply could not be calculated. Two plastic water tank of 4000 L capacity each is installed and a 1000 L capacity tank is proposed to be installed. However it was found that a rain water harvesting tank of 1680 cu.ft i.e. about 47,572 L capacity is under construction. **Hence, a score of 12 out of 15 is credited.**

D. WASTE MANAGEMENT

TASK I: SOLID WASTE MANAGEMENT:

It was reported that a compost pit is to be constructed for the facility for disposal of wet solid wastes within the premises. However, **it is recommended that a proper and scientific segregation and disposal method be adopted for disposal of dry sold waste.**

Points were allotted taking into consideration the construction of the compost pit only.

TASK II: LIQUID WASTE MANAGEMENT & DRAINAGE SYSTEM:

The drainage system was not constructed at the time of the survey. It was found that a soak pit/ septic tank were available for treatment of waste sanitary water. **It is recommended that proper drainage system may be constructed along with Effluent Treatment plant for treatment and disposal of the waste water.**

OVERALL RANKING UNDER WASTE MANAGEMENT

TASK	POINTS	
	ALLOTTED	GAINED
Solid waste management	9	6
Liquid waste management	9	6
Drainage System	7	4
TOTAL	25	16

Table 34 : Overall Ranking in Waste Management.

E. ENERGY / ENVIRONMENTAL MANAGEMENT

As stated earlier, the facility is under renovation hence the amount of energy supplied and consumed cannot be calculated. However, it was reported that solar power panels are to be installed in the facility to reduce the consumption of electricity vide public supply. Also, the amount of renewable and non- renewable energy consumed could not be calculated as the facility is not inhabited.

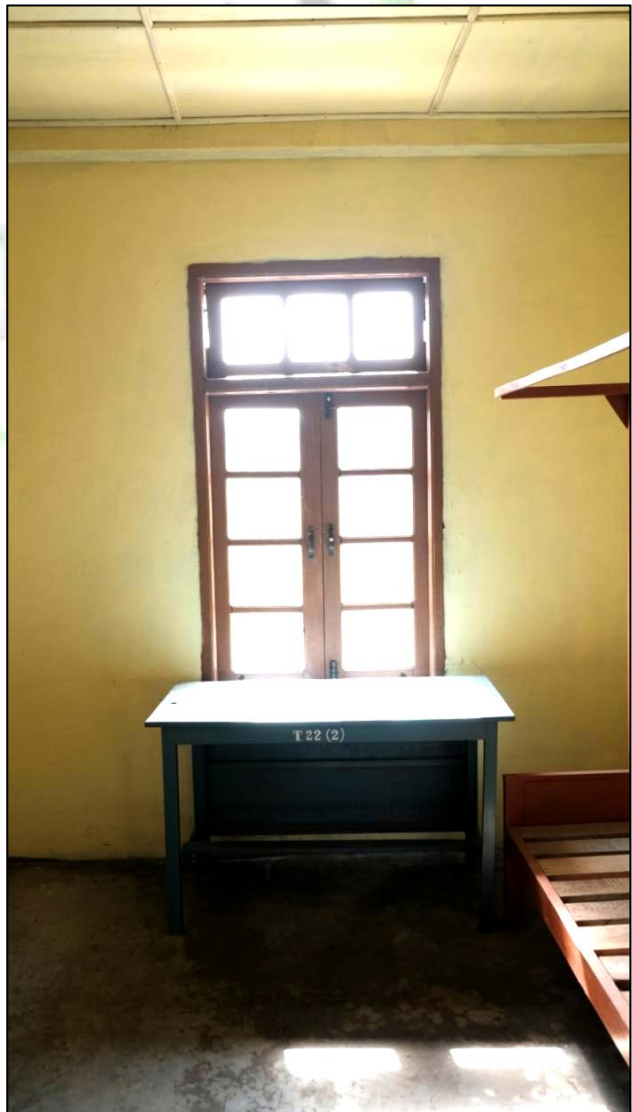
During the survey, it was reported that a garden will be developed around the facility to maintain the greenery of the facility. However, at present only natural vegetation covers were found. The Audit team found the land use and infrastructure development of Boys' Hostel at Muthi very satisfactory. As a result, the following points were allotted to each tasks based on physical inspection.

TABLE 35: OVERALL RANKING OF THE FACILITY AT MUTHI

TASK	POINTS		OVERALL RANKING
	ALLOTTED	GAINED	
1) Land & Infrastructure Development	30	25	A
2) Ambient Air Quality	20	16	
3) Water	15	12	
4) Waste Management	25	16	
5) Energy & Environmental Management	10	5	
TOTAL	100	74	







CONCLUSIONS

1. The management and other authorities are keen to make the campus a green campus
2. Government Hrangbana College is making learning process by practical approach. This is fulfilled by setting different types of plants planted in the available spaces, rain water harvesting, introduction of solar energy and conservation of water and energy.
3. Staff and students are aware about the commitment of the institute towards the society.
4. Green audit at times makes the campus authority to understand the effect of implications towards greenness and conservation of water and energy.
5. The evaluation process proved that the authorities have applied implications suggested in the previous audit.
6. The campus community functions are oriented with an eco-friendly approach that enables the student community to develop a genuine approach on conservation of nature, and natural resources.
7. The results presented in the present report would be helpful for the authorities to make future action plans to develop more sophisticated ideas in bringing more values in future efforts towards conservation of biodiversity, water and energy.
8. We, the Eco-Management Services Audit team, submitting the comprehensive audit report to the authorities of Government Hrangbana College Campus and Hostels. We hope the audit finding would help them implement better management plan to achieve a complete green campus, save maximum water and energy for a better future.

We suggest the college management to conduct the next audit after five years, ie. June 2028. This would help them understand whether they are heading forward by achieving the set forth plans and goals.

As Green Audit is the most efficient & ecological way to solve environmental problem. Green Audit is one kind of professional care which is the responsibility of each individual who are the part of economic, financial, social, environmental factor. The Green

Audit is a requirement of NAAC Committee to the college. It is necessary to conduct a green audit in college campus because student becomes aware of the green audit, its advantages to save the planet & become a good citizen of the country. Thus, Green Audit becomes necessary at the college level.

As per the professional judgment of the Green Audit Team, sufficient and appropriate audit procedures were completed and evidence gathered to support the accuracy of the conclusions reached and contained in this report. The conclusions are based on a comparison of the situations as they existed at the time of the audit with the established criteria.

Further, the Audit Team would also suggest that the recommendations be followed so as to maintain the greenery of the campus and create a framework for Environmental sustainability.

Thus, based upon the findings the following grading are given

- 1. Govt. Hrangbana College Main Building/ Campus - Grade A+**
- 2. Women Hostel, Govt. Hrangbana College, Durtlang - Grade A+**
- 3. Boys Hostel, Govt. Hrangbana College, Muthi - Grade A**

RECOMMENDATIONS

1. Composting of bio degradable waste should be continue.
2. Waste water need to be collected and treated before dispose.
3. Plan for green belt development to be prepared
4. Water harvesting structure must be constructed in the Boys' Hostel.
5. Regular checking and maintenance of pipelines be done to control water wastage.
6. The institution needs to ensure small scale/medium scale reuse and recycle of water system.

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TABLE	2: TOTAL POINTS GAINED UNDER LAND & INFRASTRUCTURE
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TABLE 29: OVERALL RANKING OF THE WOMEN HOSTEL

TABLE 30: OVERALL RANKING UNDER LAND & OTHER INFRASTRUCTURE

TABLE 31: AMBIENT AIR QUALITY DURING 18.12.2017 AND 23.12.2017

TABLE 32 : VENTILATION CHART

TABLE 33 : OVERALL RANKING UNDER AIR QUALITY

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TABLE 35: OVERALL RANKING OF THE FACILITY AT MUTHI

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