

2017

# GREEN AUDIT REPORT OF GOVERNMENT HRANGBANA COLLEGE AIZAWL



Prepared by:  
Mizoram Pollution Control Board

## ***Preface***

The Green Audit Report of Government Hrangbana College (HBC) is an outcome of the analysis and research conducted by an audit team selected by the Mizoram Pollution Control Board. The team was headed by Mr. Lalremsiama Varte, M.Sc (Chemistry) and assisted by Dr. Alfred Malsawmsanga, Ph.D. (Environmental Science) and Ms. Lucy Ngurkhumi Sailo, M.Sc (Environmental Science) under the supervision and guidance of Er. C. Lalduhawma, Supervisor, Green Audit & Member Secretary, Mizoram Pollution Control Board and Er. P.C. Lalmuanpuii, Co-Ordinator, Green Audit & Assistant Environmental Engineer, Mizoram Pollution Control Board. As a supervising agency, the MPCB has analyzed and scrutinized the report so submitted and has deemed it for submission and certification.

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 and 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 & Section III – Boys' 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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## 1. INTRODUCTION

Colleges and Universities can have broad impacts on the environment around them, both negative and positive. The lifestyle or activities pursued by Colleges can create a variety of adverse environmental impacts but at the same time Colleges are also in a unique position as educational institutions to be leaders in pursuing environmentally sustainable solutions. In order to know how the activities and management of the College campus have impacts on its environment, an assessment has to be done. Green Audit aims to analyse environmental practices within and outside the College campus, which will have an impact on the eco-friendly ambience. Green Audit is assigned to criterion 7 of National Assessment and Accreditation Council (NAAC).

On the request of the Principal, Govt. Hrangbana College vide letter No. A.45012/1/03-HBC/3625 Dt. 28<sup>th</sup> February 2017, the Mizoram Pollution Control Board has committed to conduct 'Green Audit' for the College with the help of outside expert/ research team, with Er. P.C. Lalmuanpuii, Asst. Environmental Engineer, Mizoram Pollution Control Board as Coordinator. As the College has not been previously audited, pre- audit conference was made on 28.09.2017 under the chairmanship of Prof. Lalrinawma, Principal, Govt. Hrangbana College. Three (3) more visits were made thereafter.

### 1.1 About Government Hrangbana 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 6<sup>th</sup> November, 1980 and upgraded to deficit Grant-in-Aid Status with effect from 1<sup>st</sup> September, 1985 and finally to Government College with effect from 1<sup>st</sup> 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 23<sup>rd</sup> February, 1998. The College was accredited Grade 'B++' in May, 2006 and Grade 'A' in September, 2011 by NAAC.

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 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. OBJECTIVES**

The objectives of the audit is to aware and promote the environmental management and conservation in the College. The purpose of the audit is to assess, identify, quantify and prioritize the framework of environmental management with the applicable policies, rules and regulations and standards. The main objectives of this audit are:

- 1) To position the campus of the Govt Hrangbana College as an epitome towards its contribution to sustainable community.

- 2) To provide a pattern for self-adapting programme in respect of water conservation, air quality, transportation and energy efficiency to ensure environmental sustainability.
- 3) Raise awareness of environmental issues to the students and College faculty
- 4) Develop an audit to assess environmental practices in in the College campus and Hostel building as a whole.
- 5) Deliver feedback and suggestions to improve practices relating to energy efficiency, composting, water consumption, waste reduction and general environmental responsibility.

### **3. CRITERIA ADOPTED FOR GREEN AUDIT**

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

#### **3.1 Land & Other Infrastructures**

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 11<sup>o</sup> C in winter and 30<sup>o</sup>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.

### 3.2 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 stressor 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.

### 3.3 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.

### **3.4 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 benchmarking 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.

### **3.5 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. METHODOLOGY

In order to meet its objectives and the criteria adopted, this audit combined physical inspection with a review of relevant documentation and interview with various stakeholders and data analysis.

#### 5. FINDINGS

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

# FINDINGS

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### GOVT. HRANGBANA COLLEGE MAIN BUILDING/ CAMPUS

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## SECTION I

### A. LAND & OTHER INFRASTRUCTURE

Govt. Hrangbana College is situated at Chanmari, Aizawl and was established on July, 1980. Data on land availability and its uses are collected through the data collection format and from records.



Photo 1: Government Hrangbana College

### TASK I: LAND SURVEY

The Govt. Hrangbana College lies within  $23^{\circ}44'26.59''$ N latitude and  $92^{\circ}42'58.80''$ 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' 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 is yet to 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 new 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.

Regarding the utilization of the Infrastructure Grants all civil works are to be executed by Mizoram Technocrats (Private) Company (MTC) which has signed a MoU with SHEC/SPD, RUSA.



**Photo 2: College at a glance**

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

<b>Sl. No</b>	<b>Name of School</b>
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

**Table1: List of Departments in Govt. Hrangbana College**

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.



**Photo 3: Golden Hall**



**Photo 4: Conference Hall**

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 green club for maintaining the greenery of the College.



Photo 5. Indoor Plantation



Photo 6. Banner by Cleanliness & Beautification Cell

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.



Photo 7. The Computer Centre



Photo 8. Language Laboratory

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.



Photo 9. College Library

Land availability is reproduced in the table below:

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

**Table2: Land availability in the College**

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

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

**Table 3: 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, CO<sub>2</sub> 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 CO<sub>2</sub> emissions, ambient air quality and other information needed for the air audit.

**TASK I: HOW DO PEOPLE COMMUTE IN YOUR SCHOOL?**

From the survey results it was concluded that 2 % of students and staff come by 2-wheelers and 0.37% by cars and the remaining 97.63% come on foot or by College bus or other public transport such as city bus, taxis as the College is situated at the heart of the city.

Based on the interviews held with the students and faculties who came with vehicles, it is approximated that each two-wheeler and car travels 5 km and 10 km every day respectively, while each College bus covers 28 km every day. This implies that for the 2 % (37 two - wheelers) coming by 2- wheelers, about 185 km is travelled, 50 km is travelled by cars (5 cars) and 40 km by one College bus every day.

Therefore the total number of kilometers travelled by all vehicles is 263 kms.

**Table 4: Points gained for mode of Travel:**

Mode of travel	Nos. of Km covered	Points allotted	Points gained
Bus	28	<b>6.25</b>	<b>6.00</b>
LMV	50		
2 wheeler	185		
<b>Total</b>	<b>263</b>		

**TASK II: CONTRIBUTION TO CLIMATE CHANGE**

Carbon Dioxide (CO<sub>2</sub>) is one of most common Greenhouse Gas emitted into our environment. Global emissions of carbon dioxide (CO<sub>2</sub>) - 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 CO<sub>2</sub> 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 CO<sub>2</sub> from these sources is considered negligible as compared to vehicular emissions.

***CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> emission is given in **table 5**.

***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 CO<sub>2</sub> emission is given in table 5 below:

**The emissions of CO<sub>2</sub> are calculated as shown in the table 5 below:**

Mode of travel	Distance travelled (in km)	CO <sub>2</sub> emission (g/km)	Grams of CO <sub>2</sub> /vehicle	Grams of CO <sub>2</sub> /passenger	Points allotted	Points gained
Bus	28	659.77	<b>18473.56</b>	<b>543.34</b>	<b>6.25</b>	<b>6</b>
LMV	50	287.94	<b>2879.40</b>	<b>411.34</b>		
2 wheeler	185	115.17	<b>575.85</b>	<b>15.56</b>		
<b>Total</b>	<b>28</b>	<b>659.77</b>	<b>18473.56</b>	<b>543.34</b>		

Table 5. CO<sub>2</sub> 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 (PUCC). 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 College is not equipped with Air sampler and monitoring is not done within the College area. However, the Ambient Air Quality data is taken based on the two nearest monitoring area, i.e. Laipuitlang and Dawrpui. Analysis report for monitoring conducted for three parameters like Particulate Matter of size less than or equal to 10 $\mu$  (PM<sub>10</sub>), Sulphur Oxides (SO<sub>2</sub>) and Nitrogen Oxides (NO<sub>2</sub>) during August to November, 2017 is shown in **table 6**.

**Table 6. Ambient Air Quality during 01.03.2017 and 01.12.2017**

Pollutants monitored	National Standard ( $\mu\text{g}/\text{m}^3$ )	Measured ( $\mu\text{g}/\text{m}^3$ )	Points allotted	Points gained
PM <sub>10</sub>	100	44	<b>6.25</b>	<b>6.00</b>
NO <sub>2</sub>	80	10.2		
SO <sub>2</sub>	80	BDL		

BDL = Below Detection Limit

Table 6. Air Quality chart

### 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.

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.



Photo 10: Classroom

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		
<b>Total</b>	<b>22082.46</b>	<b>4511</b>	<b>20.42</b>		

Table7: 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 8: OVERALL RANKING UNDER AIR QUALITY**

TASK	POINTS	
	ALLOTTED	GAINED
1) Transport	6.25	6.00
2) CO <sub>2</sub> emissions	6.25	6.00
3) Ambient air Quality	6.25	6.00
4) Ventilation	6.25	5.00
<b>TOTAL</b>	<b>25.00</b>	<b>23.00</b>

### 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 67403.33 liters of water per month from public supply which is 3370.16 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	67403.33	<b>7.5</b>	<b>6</b>
	2) Rain Water	5667.00		
<b>TOTAL</b>		<b>73070.33</b>	<b>7.5</b>	<b>6</b>

Table 9. Sources of Water

**TASK II: WATER HARVESTING/ STORAGE**

The College has five plastic tank of 2000L capacity each which stores water from public supply and two water tanks (concrete) of 8,500L capacity respectively where all rain water are stored. Thus, a total of 27,000 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 37000 liter/capita/day while 3653.5 liter/day is supplied; hence, a deficit of 33346.48 l/day occurred. Further, the water tanks of the College could not store the per capita water requirement.

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	8,500	17,000	<b>7.5</b>	<b>5.5</b>
Medium	5	2000	10,000		
<b>Total</b>	<b>7</b>		<b>27,000</b>		

Table 10: Capacity of Water harvesting facility in the College:

TABLE 11: OVERALL RANKING UNDER WATER SOURCES

TASK	POINTS	
	ALLOTTED	GAINED
1) Sources	7.5	6
2) Water harvesting/ Storage	7.5	5.5
<b>TOTAL</b>	<b>15</b>	<b>11.5</b>

#### D. ENERGY MANAGEMENT AND ADMINISTRATION

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 SCHOOL

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

###### Renewable Source:

- a) Electricity through public supply

###### Non-Renewable Source:

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

The College greatly depends on public electricity supply and does not have solar power panels. **Hence, 3 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 (MJ)	per capita consumed	Points allotted	Points gained
Renewable	Electricity	1323.612	0.715	<b>5</b>	<b>4</b>
Non-renewable	Petrol (L/Month)	505.3	11.48		
	Diesel (L/Month)	359	10.55		
<b>Total</b>		<b>2187.912</b>	<b>22.75</b>		

**Table 12: Energy Consumption**

**TASK III: ENERGY CONSERVATION:**

Through interview among staff & students, it was found that though the College does not 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 13: OVERALL RANKING UNDER ENERGY MANAGEMENT AND  
ADMINISTRATION

TASK	POINTS	
	ALLOTTED	GAINED
1) Sources	5	3
2) Consumption	5	4
3) Conservation	5	4
<b>TOTAL</b>	<b>15</b>	<b>11</b>

## 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, laboratories and administrative offices. These wastes are not segregated at any point of generation and are disposed through PPP mode.

During the survey, it was found that efforts were given for maintaining the cleanliness of the campus by providing dust bins, brooms etc in each classroom. However, garbage bins provided in each classroom were not covered and few in numbers and segregation were found to be poor. All kinds of wastes are thrown altogether including waste paper, plastic bottle, tin container which could be separated for recycling or reuse.

The survey also showed that there are no students, teachers as well as the administrative staff's participation in segregation of waste, which shows a low level of awareness. **To improve this, the awareness of students, teachers and administrators needs to be increased.**



Photo11: Dust bin at the corridor



Photo12: Dust bin and broom inside classroom

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
324 kg	0.008 kg	10kg	6.25	4

Table 14: Status of solid waste

Amount of solid wastes generated per month = 324 kg

Solid waste generated per day basis = 16.2 kg

Amount of waste treated & segregated = 10 kg

**College points gained = 4**

## 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:

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

**Table 15: Points allocated for liquid wastes**

**TASKS III: ELECTRONIC WASTES MANAGEMENT:**

During the physical inspection, the following e- wastes like Computer monitor (13 Nos.), UPS (5Nos), CPU (3Nos) and Scanner (1Nos), Speaker (2 sets), Cyclostyle (1No) were found generated by the institution.

Though the E- waste generated was not disposed scientifically, the E-waste and defective item from Computer Laboratory is being stored properly. The discarded/ written off computers, if repairable, are mended at the servicing station and donated to schools in rural area.

**Hence, 4.5 out of 6.25 is credited**



**Photo13: E- Waste generated by the institution**

**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 16: OVERALL RANKING UNDER WASTE MANAGEMENT**

<b>TASK</b>	<b>POINTS</b>	
	<b>ALLOTTED</b>	<b>GAINED</b>
1) Solid waste management	<b>6.25</b>	<b>4</b>
2) Liquid waste management	<b>6.25</b>	<b>4</b>
3) E- Waste Management	<b>6.25</b>	<b>4.5</b>
4) Drainage System	<b>6.25</b>	<b>4.5</b>
<b>TOTAL</b>	<b>25</b>	<b>17</b>

**TABLE 17: OVERALL RANKING OF THE COLLEGE**

<b>TASK</b>	<b>POINTS</b>		<b>OVERALL RANKING</b>
	<b>ALLOTTED</b>	<b>GAINED</b>	
Land & other infrastructure	<b>20</b>	<b>17.50</b>	<b>A</b>
Air Quality	<b>25</b>	<b>23</b>	
Water	<b>15</b>	<b>11.50</b>	
Energy Management	<b>15</b>	<b>11.00</b>	
Waste management	<b>25</b>	<b>17.00</b>	
<b>TOTAL</b>	<b>100</b>	<b>80</b>	

# FINDINGS

## SECTION II

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**SECTION II****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  $23^{\circ}46'53.41''$  N latitude and  $92^{\circ}43'44.28''$  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 students.

**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 students. A compost pit of 5ft. diameter and 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.

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.



Photo14: Women Hostel at a glance



Photo15: Hostel Room



Photo16: Fencing with garland drain & Plantation



Photo17: Home Garden



Photo18: Compost Pit

**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.

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

Table 18: Points allotted to other infrastructure

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

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

Table 19: Total points gained under Land & Infrastructure

**B. AMBIENT AIR QUALITY**

**TASK I: HOW DO PEOPLE COMMUTE**

The students and warden in the Women Hostel do not rely no owned any means of transportation. The students commuted to and fro to 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 students 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)	CO <sub>2</sub> emission (g/km)	Grams of CO <sub>2</sub> /bus	Grams of CO <sub>2</sub> /passenger	Points allotted	Points gained
Bus	28	659.77	18473.56	543.34	6.25	6
LMV	0	0	0	0		
2 wheeler	0	0	0	0		
<b>Total</b>	<b>28</b>	<b>659.77</b>	<b>18473.56</b>	<b>543.34</b>		

Table 20: CO<sub>2</sub> 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 a period of one month *i.e* 01.11.2017-01.12.2017. The following results were obtained from the monitoring.

**Table: Ambient Air Quality during 01.11.2017 and 01.12.2017**

Pollutants monitored	National Standard (µg/m <sup>3</sup> )	Measured (µg/m <sup>3</sup> )	Points allotted	Points gained
RSPM	100	38	6.25	6
NO <sub>2</sub>	80	BDL		
SO <sub>2</sub>	80	BDL		

BDL = Below Detection Limit

Table 21 :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	6.25	6
Common cum Dining room	864	270	31.25		
Warden	264	126	47.73		
Chapel	408	162	39.71		
Driver	576	108	18.75		
<b>Total</b>	<b>2256</b>	<b>736</b>	<b>32.74</b>		

Table 22 :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 23: OVERALL RANKING UNDER AIR QUALITY**

TASK	POINTS	
	ALLOTTED	GAINED
1) Transport	6.25	6
2) CO <sub>2</sub> emissions	6.25	6
3) Ambient air Quality	6.25	6
4) Ventilation	6.25	6
<b>TOTAL</b>	<b>25</b>	<b>24</b>

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.



Photo19 : Water harvesting tank (Concrete)

TABLE 24. OVERALL RANKING UNDER WATER SOURCES

TASK	POINTS	
	ALLOTTED	GAINED
1) Public Supply	7.5	6.25
2) Rain waster harvesting	7.5	7.25
<b>TOTAL</b>	<b>15</b>	<b>13.5</b>

## 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 25: 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.





Photo20: Water Cooler at Women Hostel

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

Table26: 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. Though a garland drain is well constructed besides the building, it is not properly managed or maintained. During inspection, water from the drain was found logging besides the ground floor of the building which could attract flies and mosquitoes. Proper sewerage/ effluent treatment plant must be constructed in order to minimize the ground water pollution. **Therefore, 4.5 out of 7 is credited.**



Photo 21. Water logging

**TABLE 27: OVERALL RANKING UNDER WASTE MANAGEMENT**

TASK	POINTS	
	ALLOTTED	GAINED
Solid waste management	9	6.5
Liquid waste management	9	6
Drainage System	7	4.5
<b>TOTAL</b>	<b>25</b>	<b>17</b>

Table 27: 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:

- b) Electricity through public supply

##### Non-Renewable Source:

- d) Gas: Merely for cooking in College Canteen.
- e) 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	<b>5</b>	<b>4</b>
Non-renewable	Petrol (L/Month)	0	0		
	Diesel (L/Month)	Already included in Section I			
<b>Total</b>		<b>2440.8</b>	<b>64.21</b>		

**Table 28: 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 29 : OVERALL RANKING UNDER ENERGY MANAGEMENT AND  
ADMINISTRATION**

TASK	POINTS	
	ALLOTTED	GAINED
1) Sources	5	3.5
2) Consumption	5	4
4) Conservation	5	4
<b>TOTAL</b>	<b>15</b>	<b>11.5</b>

**TABLE 30: 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	
<b>TOTAL</b>	<b>100</b>	<b>83.5</b>	

# FINDINGS

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Task I : Solid Waste Management	45
Task II : Liquid Waste Management & Drainage system	45
<b>E. Energy Management &amp; Administration</b>	45-46

### SECTION III

#### 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.



Photo 22 : Boys' Hostel (Under Construction)



Photo 23: Basket ball court (to be renovated)

**TABLE 31: OVERALL RANKING UNDER LAND & OTHER INFRASTRUCTURE**

TASK	POINTS	
	ALLOTTED	GAINED
1) Land	10	9
2) Infrastructure Development	20	16
<b>TOTAL</b>	<b>30</b>	<b>25</b>

## B. AMBIENT AIR QUALITY

### TASK I: AMBIENT AIR QUALITY:

As the facility is under construction the air quality for 5 days i.e from 18.12.2017 - 23.12.2017 was monitored 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 32 : Ambient Air Quality during 18.12.2017 and 23.12.2017**

Pollutants monitored	National Standard ( $\mu\text{g}/\text{m}^3$ )	Measured ( $\mu\text{g}/\text{m}^3$ )	Points allotted	Points gained
RSPM	100	41	<b>10</b>	<b>8</b>
NO <sub>2</sub>	80	BDL		
SO <sub>2</sub>	80	BDL		

Table 32 :Air Quality chart

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 rooms.

**Table 33 : 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
<b>Total</b>	<b>2194</b>	<b>432</b>	<b>19.69</b>

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 34 : OVERALL RANKING UNDER AIR QUALITY**

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

**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.**



**Photo24: Water Harvesting Structure (Under Construction)**

## 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 solid 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
<b>TOTAL</b>	<b>25</b>	<b>16</b>

Table 35 : Overall Ranking in Waste Management

## E. ENERGY / ENVIRONMENTAL MANAGEMENT

As stated earlier, the facility is under construction 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 36: 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	
<b>TOTAL</b>	<b>100</b>	<b>74</b>	

## 6. CONCLUSION

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 economical, financial, social, environmental factor. The Green Audit is a requirement of NACC 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  |

**7. RECOMMENDATIONS:**

Based on the survey and the report the following recommendations are suggested by the Audit Team:

1. The wastes generated from the institution (College and Hostel) must be segregated properly and in a scientific manner i.e into degradable and bio-degradable.
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.