



BIRLA INSTITUTE OF TECHNOLOGY

A Deemed University u/s 3 of UGC Act, 1956
MESRA : RANCHI – 835 215 (INDIA)

Phone : (EPBX) 0651-2275444/2275896, 2276002/2276006 FAX: 0651-2275401/2276052 Website: www.bitmesra.ac.in

Metric 7.1.6

Department/Section: IQAC

The Institutional environment and Energy initiatives are confirmed through the following
(5)

No.	Initiatives	Yes / No
1.	Green Audit	YES
2.	Energy Audit	YES
3.	Environment Audit	YES
4.	Clean and green campus recognitions/awards	NO
5.	Beyond the campus environmental promotional activities	YES

Options:

- A. Any 4 or all the above
- B. 3 of the above
- C. 2 of the above
- D. 1 of the above
- E. None of the above

DIRECTOR, IQAC
Birla Institute of Technology
Mesra, Ranchi-835 215

Table of Content

S. No.	Description of Evidence	Page No.
1.	IGBC GREEN CAMPUS RATING SYSTEM A STUDY ON BIT MESRA CAMPUS – May 2018 (B.Tech Project)	3
2.	GREEN BUILDING RATING (GRIHA-EB) FOR MAIN BUILDING, BIT MESRA – May 2018 (B.Tech Project)	7
3.	WATER RESOURCE ASSESSMENT AND WATER AUDIT OF BIT MESRA CAMPUS – May 2015 (M.Tech Project)	15
4.	ASSESSMENT OF CARBON FOOTPRINT FOR BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI – May 2017 (M.Tech Project)	24
5.	Energy Audit	30
6.	Save Trees Rally – 9 th Sep 2015	31
7.	Awareness campaign against water borne diseases – 7 th Aug 2016	32
8.	Anti Plastic Abhiyan – 20 th Nov 2018	33
9.	World Environment Day – 5 th June 2019	34



DIRECTOR, IQAC
Birla Institute of Technology
Mesra, Ranchi-835 215

IGBC GREEN CAMPUS RATING SYSTEM

A STUDY ON BIT MESRA CAMPUS

EXECUTIVE SUMMARY

Conducted by:

ANISH BAGGA (BE/10455/2014)
ASHWINI KUMAR (BE/10544/2014)
MAYANK (BE/10668/2014)

Supervised by:
Kirti Avishek
Emp.Code: 08721

Year: 2017-18

May 2018

Kirti

Background

The construction sector for the last 10 years has done extremely well in embracing the Green concepts. Though initially it started with individual buildings, green is now penetrating into other forms of environment such as Administrative campuses, Convention Centres, Educational campuses, Healthcare campuses, Hospitality campuses, IT parks, Industrial parks, Leisure & Recreational campuses, Military campuses, Religious Campuses, etc.

The green concepts and techniques in campuses can help address National issues like Water efficiency, energy efficiency, reduction in fossil fuel use in commuting, handling of Consumer waste and conserving natural resources. Most importantly, these concepts can Enhance occupant health, happiness and well-being.

Against this background, the Indian Green Building Council (IGBC) has launched 'IGBC Green Campus rating system to address the National priorities. This rating programme is a tool which enables the designer to apply green concepts and reduce environmental impacts that are measurable.

Benefits of Green Campuses

Green Campuses can have tremendous benefits, both tangible and intangible. The most tangible benefits are the reduction in water and energy consumption right from day one of Occupancy. The energy savings could range from 20 - 30 % and water savings around 30 - 50%. Intangible benefits of green campus include health & well-being of the Occupants, enhancing air quality & promoting biodiversity, safety benefits and Conservation of scarce national resources.

KEY FINDINGS

The report presents the rating of BIT Mesra campus as per the guidelines of Indian Green Building Council (IGBC) Green campus rating system. According to the findings, BIT could have been awarded the recognition of "Outstanding performance" but it doesn't fulfil one of the Mandatory requirement i.e. "To facilitate segregation of dry and wet waste and also collection of



e-waste”. So as to achieve the IGBC rating, the project must satisfy all the mandatory requirements. As per our investigation BIT Mesra campus has a wastewater treatment system setup but unfortunately, it is not in working condition. Thus in order to achieve the rating, the setup must be made workable as soon as possible.

Threshold criteria for certification level and BIT Mesra results:-

Certification Level	Existing Campus	Recognition	BIT Mesra Campus score
Certified	36-44	Best Practices	50.35
Silver	45-53	Outstanding Performance	
Gold	54-66	National Excellence	
platinum	67-90	Global Leadership	

These ratings are based on following results:

- Top soil within campus is fertile with OC within range of 0.7-1.09.
- Base line water consumption within limits as prescribed by IGBC.
- Green Cover more than 25%
- Minimum number of trees per acre is more than 25 thus fully satisfying the criteria.
- Open area more than 75%
- Parking under cover gains zero score thus needs to be implemented.
- Natural Tree Shading across the campus is observed.
- Pedestrian path and Bicycle lane is required.
- Fully functional public transport for student and staff.
- CNG and electric vehicles to be initiated
- Rainwater harvesting criteria achieved but can improve.
- Drought tolerant species to be planted.
- Inadequate Centralised irrigation system
- Inadequate wastewater treatment and Reuse system.



- No Water metering
- Increase in solar systems and other renewable technologies
- Functional Health and Well being center
- Green campus Guidelines to be developed.
- Partial innovative design observed.

Recommendations:

1. Water Metering
2. Increase in renewable technologies
3. Parking to be partially covered
4. Footpath to be delineated
5. Bicycle path to be delineated
6. Electric vehicles or solar vehicles to be used for in campus transportation.
7. Reuse of treated wastewater

elkut

GREEN BUILDING RATING (GRIHA-EB) FOR MAIN BUILDING, BIT MESRA

Executive Summary

Study Conducted by:

DUDDU JAGADEESH (BE/10681/14)

RAJNISH KUMAR (BE/10699/14)

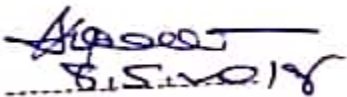
Under Supervision of:

Dr. Manjari Chakraborty, Professor, Department of Architecture

**Dr. Anand Kumar Sinha, Professor, Department of Civil & Environmental
Engineering**

Year: 2017-18

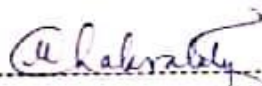
Month: May 2018


.....S. S. Sinha

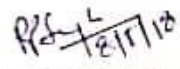
CERTIFICATE OF APPROVAL

The project entitled "Green Building Rating System (GRIHA-EB) For Main Building, BIT Mesra" is hereby approved as a creditable study of research topic and has presented in satisfactory manner to warrant its acceptance as pre-requisite to the degree for which it has been submitted.

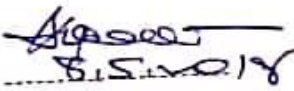
It is understood by this approval; the undersigned do not necessarily endorse any conclusion drawn or opinion expressed therein but approved the project for which it is submitted.



(Internal Examiner) 8/5/18

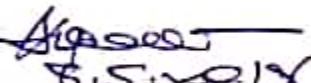


(External Examiner)



(Head of Department)

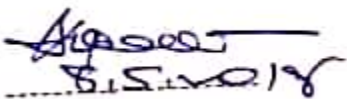
**Civil & Env. Engg. Department
Birla Institute of Technology
Mesra, Ranchi-835215
Jharkhand**



INTRODUCTION

Today's world, is using its very limited renewable resources in thoughtless manner and producing tones of pollution causing disturbance to the health of the natural environment and in return human health is also disturbed in doubled magnitude. This man-made mistake has no end, rather only way is to limit the usage of natural resources by using it efficiently and effectively. Researcher's had found that along with the factories and industries, the major source of pollution and aggressive utilisation of renewable resources is in construction industry i.e. the buildings we live in. Buildings have major environmental impacts during their life. Resources such as ground cover, forests, water, and energy are dwindling to give way to buildings. Resource-intensive materials provide structure to a building and landscaping adds beauty to it, in turn using up water and pesticides to maintain it. Energy-consuming systems for lighting, air conditioning, and water heating provide comfort to its occupants. Globally, buildings are responsible for at least 40% of energy use. An estimated 42% of the global water consumption and 50% of the global consumption of raw materials is consumed by buildings when taking into account the manufacture, construction, and operational period of buildings. In addition, building activities contribute an estimated 50% of the world's air pollution, 42% of its greenhouse gases, 50% of all water pollution, 48% of all solid wastes and 50% of all CFCs (chlorofluorocarbons) to the environment. As the population is increasing, we need more and more buildings to fulfil our needs. As mentioned earlier, with our limited resources and major impact of buildings on the environment, we need buildings that are 'sustainable', which consume less energy, less carbon emissions and have less impact on the surrounding environment. Hence, a modern concept of eco-friendly buildings termed as "Green Buildings" is emerging rapidly. It has proved itself to lessen the maintenance costs has tremendous environmental benefits and provides a better place for the occupants to live and work in. Thus, the challenge of a green building is to achieve all its benefits at an affordable cost.

A "Green Building" is a building consciously designed, constructed and operated to be as environment-friendly as possible. A 'green' building is a building that, in its design, construction or operation, reduces or eliminates negative impacts, and can create positive impacts, on our climate and natural environment. Green buildings preserve precious natural resources and improve our quality of life.

A handwritten signature in black ink, appearing to read 'S. S. V. V.' with a horizontal line above it.

The common objective is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:

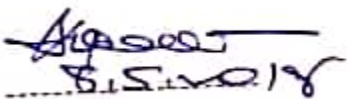
- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation. Why do we need GREEN Buildings? • To use the natural resources like energy, water and other available in a proper manner and efficiently.
- To minimize the overall maintenance cost of the building in long term.
- To create healthy and sound environment that improves the quality of living, employee productivity etc.
- Reducing waste, pollution and environmental degradation and ensuring least impact on the environment
- Sustain and improve the quality the human life whilst maintaining the capacity of the ecosystem at local and global levels.

Green Building Rating Systems in INDIA:

Green Rating for Integrated Habitat Assessment (GRIHA): Green Rating for Integrated Habitat Assessment (GRIHA) is India's own rating system jointly developed by TERI and the Ministry of New and Renewable Energy, Government of India. It is a green building design evaluation system where buildings are rated in a three-tier process. The process initiates with the online submission of documents as per the prescribed criteria followed by on site visit and evaluation of the building by a team of professionals and experts from GRIHA Secretariat.

Criteria and their weightage:

GRIHA for Existing Buildings rating is a performance-oriented system where points are earned for meeting the intent (appraisals) of the criteria. Each criterion has a number of points assigned to it. GRIHA for Existing Buildings rating system is a 100-point system consisting of 12 criteria categorized under seven sections such as Site Parameters, Maintenance & Housekeeping, Energy, Water, Human Health & Comfort, Social Aspects, and Bonus points. Six of these 12 criteria are mandatory, while the rest are optional. Each criterion, except from the six mandatory

A handwritten signature in black ink, followed by the date '8.5.2018' written below it.

criteria, has a number of points assigned to it. It means that a project intending to meet the criterion would qualify for the points. Different levels of certification (one star to five stars) are awarded based on the number of points earned. The minimum points required for certification is 25.

Threshold	GRIHA for Existing Buildings
25-40	★
41-55	★★
56-70	★★★
71-85	★★★★
86 and above	★★★★★

Table 1: Criteria and their weightage

Section	Criterion Name	Intent	Max. Points
Section I. Site Parameters	Criterion 1 <i>Accessibility to Basic Services</i>	Promote walking, cycling, and public transport	2
	Criterion 2 <i>Microclimatic Impact</i>	Lower the impact of Urban Heat Island Effect (UHIE), and promote plantation of trees	4
Section II. Maintenance & Housekeeping	Criterion 3 <i>Maintenance, Green Procurement and Waste Management</i>	Ensure good practices for safety, waste management, and green procurement	7
	Criterion 4 <i>Metering & Monitoring</i>	Promote reliable metering and monitoring	10
Section III. Energy	Criterion 5 <i>Energy Efficiency</i>	Ensure energy efficiency	20
	Criterion 6 <i>Renewable Energy Utilization</i>	Promote use of renewable energy	15
Section IV. Water	Criterion 7 <i>Water Footprint</i>	Implement potential water conservation strategies	15
	Criterion 8 <i>Reduction in Cumulative Water Performance</i>	Reduce overall water demand of the habitat	10
Section V. Human Health & Comfort	Criterion 9 <i>Achieving Indoor Comfort Requirements</i>	Ensure that building spaces provide for thermal, visual, and acoustical comfort	8
	Criterion 10 <i>Maintaining Good IAQ</i>	Ensure good indoor air quality	4
Section VI. Social Aspects	Criterion 11 <i>Universal Accessibility & Environmental Awareness</i>	Promote accessibility for the persons who are differently-abled & the elderly and to increase environmental awareness amongst the building users & visitors	5
Section VII. Bonus Points	Criterion 12 <i>Bonus Points</i>	Adoption and implementation of innovative strategies in improving the sustainability of the project.	4

Handwritten signature and date: 8.5.2018

RESULTS

Rating Table: Criteria and their weightage plus awarded points

Section	Criterion Name	Max. Points	Awarded Points
Section I. Site Parameters	Criterion 1 <i>Accessibility to Basic Services</i>	2	2
	Criterion 2 <i>Microclimatic Impact</i>	4	4
Section II. Maintenance & Housekeeping	Criterion 3 <i>Maintenance, Green Procurement and Waste Management</i>	7	2
	Criterion 4 <i>Metering & Monitoring</i>	10	0
Section III. Energy	Criterion 5 <i>Energy Efficiency</i>	20	13
	Criterion 6 <i>Renewable Energy Utilization</i>	15	15
Section IV. Water	Criterion 7 <i>Water Footprint</i>	15	5
	Criterion 8 <i>Reduction in Cumulative Water Performance</i>	10	0
Section V. Human Health & Comfort	Criterion 9 <i>Achieving Indoor Comfort Requirements</i>	8	8
	Criterion 10 <i>Maintaining Good IAQ</i>	4	2
Section VI. Social Aspects	Criterion 11 <i>Universal Accessibility & Environmental Awareness</i>	5	5
Section VII. Bonus Points	Criterion 12 <i>Bonus Points</i>	4	4
Total points			60/100

Threshold	GRIHA for Existing Buildings
25-40	★
41-55	★★
56-70	★★★
71-85	★★★★
86 and above	★★★★★

Handwritten signature and date:
 8.5.2018

RECOMMENDATIONS

Criterion 1. Accessibility to Basic Services

Satisfactory

Criterion 2. Microclimatic Impact

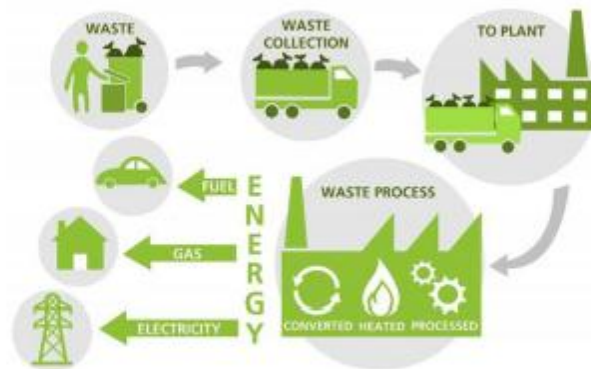
Satisfactory

Criterion 3. Maintenance, Green Procurement & Waste Management

- Provide infrastructure (multi-coloured dustbins/ different garbage chutes) to building occupants to ensure segregation of waste at source.



- Provide dedicated, segregated and hygienic storage spaces in the project site to store different wastes before treatment /recycling.
- Provide contractual tie-ups with waste recyclers for safe recycling for recyclable wastes, like metal, paper, plastic, glass, e-waste, etc.



- Implement strategies to treat all organic (kitchen and landscape) waste on-site and to convert it into a resource (manure, biogas, etc.) and reuse.

Sub-meters are to be installed to track electricity, water consumption at point sources and ensure regular monitoring and open display of Indoor air quality parameters.

In Renovated Washrooms, water efficient fixtures, sensor-based urinals, Water efficient dual flush toilets are installed. But only, 3 out of 12 washrooms of Main building are fixed with water efficient fixtures. Water efficient fixtures, urinals, flush system are to be installed in all washrooms, for much decrease in water consumption.

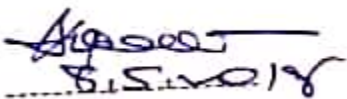
[Handwritten signature]
S. S. V. V. V.

- Water efficient irrigation systems like Sprinklers, Drip are to be used to reduce landscape water demand.
- On-site sewage water treatment system is to be provided to treat waste water

CONCLUSION

The Main Building of Birla Institute of Technology was constructed way back in the 1960s when the concept of Green buildings was just an idea. The building incorporated very innovative design strategies like:

- 375mm thick walls of Main Building provides thermal insulation, which keeps indoor temperatures lesser in Daytime and also these thick walls provide Acoustic insulation, which reduces the intensity of external noise levels.
- Single loaded corridors in Main Building: Rooms in these corridors receive good sunlight at all times of the day. There is no need for artificial lightening at most places.
- Large size transparent windows with ventilators provide good daylight and ventilation.
- High ceiling heights.
- Surrounding area has large number of trees, therefore transpiration increases the humidity, which so decreases temperatures, as this region has dry climate. Hence, this historical building is awarded a respectable 3 stars under the GRIHA-EB Rating system.


S. S. V. O. I. Y.

**WATER RESOURCE ASSESSMENT AND WATER AUDIT
OF
BIT MESRA CAMPUS**

EXECUTIVE SUMMARY

**Study Conducted by:
Ms. Mala Kumari
(MT/ENV/10010/2013)**

**Under Supervision of:
Dr. Kirti Avishek
(Emp. Code: 08721)**

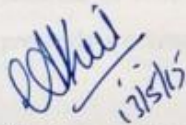
**Year: 2014-15
Approval Month: May 2015**



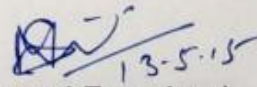
CERTIFICATE OF APPROVAL

The foregoing thesis entitled "**WATER RESOURCE ASSESSMENT AND WATER AUDIT OF BIT MESRA CAMPUS**" is here by approved as a credible study of research topic and has been presented in satisfactory manner to warrant its acceptance as prerequisite to the degree for which it has been submitted.

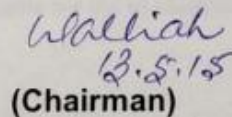
It is understood that by this approval, the undersigned do not necessarily endorse any conclusion drawn or opinion expressed therein, but approve the thesis for the purpose for which it is submitted.


13.5.15

(Internal Examiner)


13.5.15

(External Examiner)


13.5.15
(Chairman)



Background

Water is essential natural resource for life and environment. The supply of this key natural resource in adequate quantity, quality and time is of utmost importance for survival of mankind and other living things. The geographical coordinates of BIT Mesra is 23⁰25'N Latitudes & 85⁰26'E longitude. The main campus is located at 16 kilometers from Ranchi in a 780 acre (3.2km²) area. The Mesra campus is entirely residential, providing accommodation to 4,500 undergraduate and postgraduate student and 2500 members of faculty and staff. The water demand of the campus including hostels, residential area and academic complex is estimated as 1400000 liters/day at the rate of 135 liters/capita/day. Currently water supply by department is 1100000 liters/day. This is the large gap between supply and demand. The most important problem faced at BIT is scarcity of water during summer session between March to July that indirectly affects the academic session. There are two sources of water supply in BIT, rivers (Jumar and Subarnarekha) and 20 bore wells out of which 8 bore wells are dried. Thus the objectives of the study are, i. To assess water availability and demand by water auditing, ii. To identify the gaps in the water supply system, and iii. To suggest water resource plan. Thus the study involves in analysis of the water supply data available and various data to be collected during the study to generate the outcome which will be used for further planning of rainwater harvesting/conservation of water resources. Also the study emphasizes in treatment of the waste water and their usage for better purposes. The study concentrates in the reduction of the gap between water demand and supply. A water audit is a systematic review of a site that identifies the quantities and characteristics of use of water. The overall objective of conducting a water audit is to assess the process of water usage and gaps in water distribution system for overall improvement. Refer to the full thesis report for details of the findings.



Table 3.1 Bore- well location inside the BIT Mesra campus

S.No	Location of Bore Well	Operation Time	Flow Rate (L/hr)	Total Water Withdrawal (L/day)	Supply Location	Latitude	Longitudes
1	Hostel no. 7	8	1500	12000	H-7	23° 25' 27.86"N	85° 25' 53.76"E
2	Hostel no. 8	16	4800	76800	H-8	23° 24' 56.58"N	85° 26' 28.95"E
3	Hostel no. 9	16	8400	134400	H-8 & H-9	23° 24' 58.09"N	85° 26' 40.27"E
4	Hostel no. 10	16	6600	105600	H-10	23° 25' 08.88"N	85° 26' 05.32"E
5	Hostel no. 12	18	7200	129600	Qtrs. behind H-5 & H-6	23° 24' 08.06"N	85° 26' 03.27"E
6	Water supply	16	4500	72000	Residential /Institutional Area	23° 24' 40.39"N	85° 26' 20.52"E
7	Rocketry dept.	6	1500	9000	Rocketry dept.	23° 24' 36.08"N	85° 26' 39.89"E
8	Medicinal plant	10	3000	30000	RS hostel & Qtrs.	23° 25' 30.73"N	85° 26' 13.79"E
9	Pump house jungle	16	10800	172800	Pump house jungle	23° 24' 39.72"N	85° 26' 20.96"E
10	Doctor colony	8	1800	14400	Qtrs.	23° 24' 59.52"N	85° 26' 02.96"E
11	Durga puja pandal	10	1800	18000	H-8	23° 24' 56.46"N	85° 26' 34.13"E
12	Hostel 7 behind kitchen	6	1500	9000	H-7	23° 24' 28.32"N	85° 25' 55.97"E
	Total			783600 lit/day			

(Source: Water supply department BIT Mesra)

Table 3.2 Jumar River Withdrawal Water at BIT Mesra Campus

Month	Water withdrawal per hours (Liters)	Water withdrawal per day (Liters)
January	30,000	600000
February	30,000	600000
March	30,000	600000
April	30,000	600000
May	20,000	400000
June	20,000	400000
July	30,000	600000
August	30,000	600000
September	30,000	600000
October	30,000	600000
November	30,000	600000
December	20,000	400000

(Source: water supply department BIT Mesra)

4.4 Water Demand Assessment

Hostel Water Requirement: It was based on per capita water demand.

Table 4.2: Water Requirement At Hostel

S.no	Hostel	Total population	Water Requirement(No of person x Per capita water demand)
1	H-1	135	18225
2	H-2	135	18225
3	H-3	150	20250
4	H-4	150	20250
5	H-5	305	41175
6	H-6	300	40500
7	H-7	325	43875
8	H-8	620	83700
9	H-9	750	101250
10	H-10	780	105300
11	H-11	500	67500
12	H-12	220	29700
13	H-13	220	29700
14	H-14	100	13500
Total		4690	633150 L/D

Key Observations and Results

Based on questionnaire survey conducted within the campus during August 2014 to April 2015 the following were the key observations:



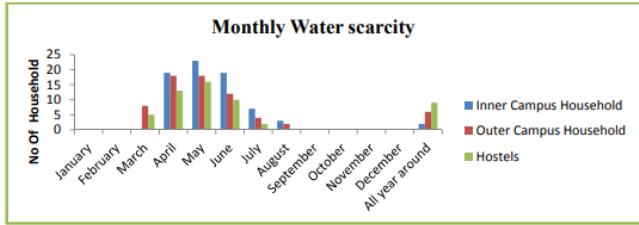


Fig 4.5: Monthly Water scarcity

As per Fig 4.6 the majority of people are not satisfied with the quality of water. It is observed that most of inner campus population appears to be satisfied with the quantity of water, but even they are not satisfied with the quality of water.

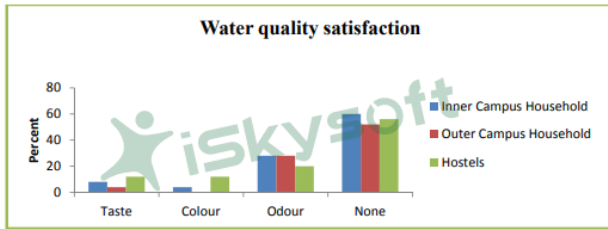


Fig 4.6: Water quality satisfaction

Opinions and Expectations of Campus Dwellers

Remarks based on household questionnaire survey

- Good and efficient water treatment plant should be installed in BIT.
- Periodically water quality should be analyzed and adequate measure should be taken to lower down the iron content as well as quality.
- Proper maintenance of pump. Install the new purifiers for drinking water. Proper and regular maintenance of water purifier is needed.
- Treatment (post chlorination), pipe network, quality control.
- Tank need to be cleaned at least once a year. Increase the size of OHT to provide sufficient quantity of water.
- Rusted pipe lines to be changed.

Handwritten signature in blue ink.

- Improvement in the distribution system. Change in overall management related to water supply.
- Water harvesting should be provided at possible place.

Pre Audit conclusions are: Questionnaire survey shows that water problem persists in the campus and the residents are unsatisfied with the quality and quantity of water. It is also concluded that water problem is more in summer seasons and in outer campus. Water facilities are inadequate.

Audit Phase conclusions are:

Being a closed campus water demand can be accurately estimated which lagging in the campus.

Based on laboratory analysis it was observed that the turbidity of the outgoing water after sand filtration is 8 NTU thereby signifying that the rapid sand filtration unit is not working adequately. It should be backwashed because it undergoes loads of water capacity for filtration in this Institute campus.

Based on questionnaire survey it was found that most of people are unsatisfied with quality of water regard to colour, taste and smell. Rapid sand filtration has very little effect on taste and smell and dissolved impurities of drinking water, unless activated carbon is included in the filter medium.

Rainwater harvesting potential is high in the area based on built up, and non built up area estimation.

Water storage capacities in hostels are less than what is required and thus power failures result in water scarcity during peak hours.

Water flow to outer campus is low and thus poses water problems.

Water supply systems are weak. Water supply department have the willingness to work but manpower skill is a major issue.

Key Findings:

Deteriorating quality and quantity of River water: The plant was designed at the time when the quality of river water was adequately good. Also with increasing land use and land cover the



catchment area for Jumar River has drastically decreased leading decline in the level of water in the river.

No provision for separate treatment of water for drinking purpose and other purposes: At present the water supply system has no separate provision for providing drinking water. For all purposes, same water is supplied to all hostels and quarters. This water should be treated separately in each hostel for the purpose of drinking. This decentralized system for drinking water supply has become a grave concern.

Inefficient Water Treatment plant: It has been observed from various chemical and physical tests conducted on water that the quality of water is below average even after the treatment. This clearly highlights the inefficiency of present technique of water treatment in terms of quantity.

Life of Pressure filters in Treatment Plant: The Rapid sand filters that are being used for treatment of water are more than 55years old. Generally these filters work for only about 25 years and then these have to be replaced.

Supply line contamination: It has been observed both by physical and chemical tests that the quality of water at the end of the supply line is worse compared to that water just after the treatment. This clearly explains effect of supply line contamination.

Lobby wise water problem exists in hostel 9. Intake storage tank capacity is the major issue in all the hostels.

Post Audit Phase: (Recommendations)

→ Rain water harvesting can be a good option to recharge the lowering water table of the region. This may be effective only in long term. But for sustainable future it will be an effective mechanism.

→ Water treatment needs to be improvised and maintained regularly.

→ Wastewater treatment facilities should be improved as the reuse of treated wastewater will be the future of the country. → Increasing water storage tanks in hostels and outer campus can be beneficial.



- Strengthening of water facilities is mandatory. It includes water supply pipelines, storage systems, and maintenance.
- Deep bore well is required in outer campus.
- Formal trainings to manpower can be beneficial.
- Grey water from kitchens and wash basins can be used for watering the gardens at individual homes. → Water meter should be installed in all houses/hostels and other premises for estimating exact water demand.
- Sensor based system to be installed for assessing the pipeline water losses.
- Changing filter media with regular back washing and maintenance.
- For Hostel no. 8, 10 and 11 required intake storage capacity of 30,000 and 50,000 litres.

alkut

**ASSESSMENT OF CARBON FOOTPRINT
FOR
BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**

(EXECUTIVE SUMMARY)

Study Conducted by:
Mr. Nishant Gaurav
(MT/ENV/10006/2015)

Under Supervision of:
Dr Kirti Avishek
(Emp.Code: 08721)

Year: 2016-17

Approval Month: May 2017



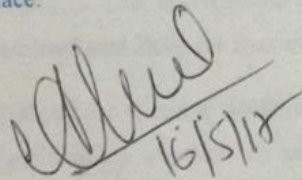


THESIS APPROVAL CERTIFICATE

This is to certify that the work embodied in this thesis entitled "Assessment of Carbon Footprint of Birla Institute Of Technology, Mesra, Ranchi " is carried out by Mr. Nishant Gourav (Roll No. MT/ENV/10006/15) is approved for the degree of Master of Technology in Environmental Science and Engineering of Birla Institute of Technology; Mesra, Ranchi.

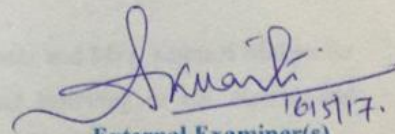
Date:

Place:


16/5/18

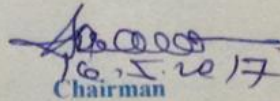
Internal Examiner(s)

Name & Signature


16/5/17.

External Examiner(s)

Name & Signature


16.5.17
Chairman

(Head of the Department)

Professor and Head
Deptt. of Civil and Environmental Engineering
B.I.T., Mesra, Ranchi-835215



Background

Carbon accounting is often called as carbon footprint. The amount of CO₂ released into the atmosphere as a result of the activities of an individual, organization, or community. It is not just about carbon concentration but about identifying the sources of emission, carbon sinks, and its control. The carbon footprint measures the total GHG emissions that caused directly and indirectly by an individual, organization or product. Due to a wide range of natural and anthropogenic activities, a very large number of contaminants are released into the environment. That is the cause of climate change. Climate change is one of the major problems facing by the mankind today. This is evident from observations of increment in the global average air and ocean temperatures, melting of snow and ice, and the rising global average sea level. It is projected to have significant impacts on conditions affecting agriculture, including precipitation, temperature and glacial run-off. The most valuable resources in our daily life is air, which is always under constant threat due to rapid industrialization, either population growth or simply due to indiscriminate use of natural resources.

This study was carried out in two phases: The first phase the sampled sites were indoor areas in BIT campus; and the second phase sampled sites were outdoor areas in BIT campus. This was followed by preparing Case Study on the two phases to keep track of the progress, and make necessary changes in the approach, if required. **The study aims to analyse the concentration of CO₂, temperature and relative humidity in indoor and outdoor area using Lutron Handheld CO₂ Meter- having Non-dispersive Infrared Sensor (NDIR sensor).** The concentration of CO₂ is measured in different indoor locations such as classrooms, labs, hostel's room and kitchens. For the outdoor concentration of CO₂ places like forest, near river etc are considered. Based on the study, it was found that the concentration of CO₂, temperature and relative humidity varies in different places.

The Scope focuses on the indoor and outdoor carbon dioxide concentrations within BIT Mesra campus in Ranchi.



The Instrument: Handheld CO₂ Meter by Lutron



Key Observations and Results

In case of **Hostel rooms** the concentration of carbon dioxide is higher (**up to 567ppm**) in afternoon and in the evening time of some hostel. Because of poor ventilation system as well as the number of peoples present in the room. The temperature also increases in the afternoon period of all hostels. Relative Humidity is less in morning and night time in the room but in afternoon and night time it was found higher. In case of Hostel's Corridor, the concentration of carbon dioxide is higher (up to 501ppm) in some hostel due to closed corridor. But in the corridor of hostel's 1 to 5 the concentration of carbon dioxide is lower (up to 332ppm) due to semi closed corridor. The temperature also increases (up to 27°C) in the afternoon period of all hostels corridor. Relative Humidity is less in morning and night time in the corridor but in afternoon and night time it was found higher. It is increased from 35% to 42%.

akshat

In case of **Hostel's Kitchen** the concentration of carbon dioxide is higher (up to 610ppm) during cooking period. The temperature also increases from 25°C to 29.5°C during cooking period. Relative Humidity is also increased from 36 % to 42 % in all hostel's kitchen.

In case of **BIT Labs and Classrooms** the concentration of carbon dioxide is much higher (up to 1800ppm). The concentration of CO₂ increased in some cases due increased number of students and air tight air conditioning Labs. The temperature remains constant approx 25°C in air conditioning Labs. But in the normal classrooms the temperature rises up to 30°C. Relative Humidity has found constant in air conditioning rooms at all time.

In the **outdoor locations** like near river, OC forest, sports complex etc. the readings were noted. The concentration of carbon dioxide found higher up to 490ppm in shade of transport office due to transportation of college bus and other vehicles. But other outdoor locations, the concentration of carbon dioxide varies from 320ppm to 450ppm all the time. The temperature and Relative Humidity percentage get higher at 12:00 PM and 3:00 PM at all locations.

Thus, it was found that the concentration of Carbon dioxide and Relative Humidity in the indoor locations were higher than the outdoor locations. The Temperature was found high in afternoon period of outdoor locations. The indoor locations have more concentration of carbon dioxide in comparison to outdoor locations. In some cases the concentrations of CO₂ was found higher in outdoor locations like near vehicle traffic areas, and sources of fire burning.

- The average concentration of Carbon dioxide in Hostel's Room in the morning period was 458ppm, in afternoon 479ppm, in evening and at night 476ppm.
- The average concentration of Carbon dioxide in Hostel's Corridor in the morning period was 393ppm, in afternoon 409ppm, in evening 408ppm and at night 415ppm.
- The average concentration of Carbon dioxide in Hostel's Kitchen in the morning period was 573ppm, in afternoon 591ppm, in evening 580ppm and at night 566ppm.

akul

- The average concentration of Carbon dioxide in BIT Labs in the morning period was 813ppm, in afternoon 835ppm and in evening 931ppm.
- The average concentration of Carbon dioxide in BIT Classroom in the morning period was 552ppm, in afternoon 625ppm and in evening 592ppm.
- The average concentration of Carbon dioxide in Outdoor Locations in the morning period was 374ppm, in afternoon 404ppm and in evening 405ppm.

Recommendations

- The importance of carbon accounting is to assess the carbon dioxide emissions from an organization. It reflects the carbon sources from an organization that will help in identifying the control measures. Thus Carbon accounting should be an annual monitoring activity.
- The indoor locations should have proper ventilation system to maintain the healthier life of individuals. Thus, hostels and rooms with inadequate **ventilations** should be checked and necessary actions should be taken.
- Workers, students, employees, teachers spend about half their waking hours at work or school/college. Therefore, maintaining adequate indoor air quality (IAQ) in schools, colleges and the workplace is becoming a top priority for facility managers and building operating engineers.
- Current technology allows us to easy and relatively inexpensive measurement of the carbon dioxide (CO₂) as an indicator to help ensure the ventilation systems are delivering the recommended minimum quantities of outside air to the building's occupants.
- Today, the measurement of carbon dioxide (CO₂) is an important tool to help ensure adequate indoor/outdoor air ventilation while simultaneously saving energy by reducing the number of over-ventilated buildings. Technological breakthroughs have made it possible to use relatively inexpensive CO₂ sensors to continuously monitor the CO₂ in buildings.

akul



Energytech Management Consultant

A Trusted Name in Energy Management and Energy Audit

Main off. 35, Kaibarta Para, P.O. Bhatpara 24 Pgs.(N), Pin- 743 123.Tel.: (033) 2581 8083, M - 9748135478

EMC/EA/19-20/R76

Date: 9.02.2020

Birla Institute of Technology,

Meshra, Ranchi,

Jharkhand- 835215

EPBX-6512275444

dir.iqac@bitmesra.ac.in

dkmohanta@bitmesra.ac.in

hod.eee@bitmesra.ac.in

prthakura@bitmesra.ac.in

rsmanitripathi1964@gmail.com

manishkhanna@bitmesra.ac.in

gksinha@bitmesra.ac.in

dy.fo@bitmesra.ac.in

**Attn.: Prof. Sudip Das-Director (IQAC)
Prof. D. K. Mohanta-(EEE)**

Dear Sir,

Sub: Quotation for Energy Audit for the years 2017 & 2019 at your Institute at above address

This is reference to our telephonic discussion had with you on 19/01/2020 and filled up questionnaires. Thanking you for showing interest of doing energy audit of your **Institute** at **Meshra**, Ranchi, Jharkhand. This is reference to our discussion had with you in your chamber on that day. We are pleased to submit our best techno commercial offer for conducting **Energy** Audit of the **years 2017 & 2019** study at your above addressed **Institute** on energy using pattern.

We hope that a properly conducted audit at your facility will bring forth avenues where substantial energy and monetary savings can be achieved. This Audit identifies the opportunities for financial savings by elimination of wasteful / inefficient use of electricity, Fuel oils, etc. without affecting the required parameters for production.

The following areas will be covered in our study to identify Energy Conservation Measures.

- **Power Distribution and Management (Transformers 6 nos.)**
- **Pumps and Distribution (11 Nos.)**

***Reduce Bill of Energy, Increase Productivity, Increase Profit
By Energy Audit***

Branch off.: Flat no. S-3, 3rd floor, 4 Purbachal Canal South Road, P.O. Haltu, Kolkata – 700 078
Mobile: 9836926681 email nrgtec@yahoo.com



BIRLA INSTITUTE OF TECHNOLOGY MESRA, RANCHI

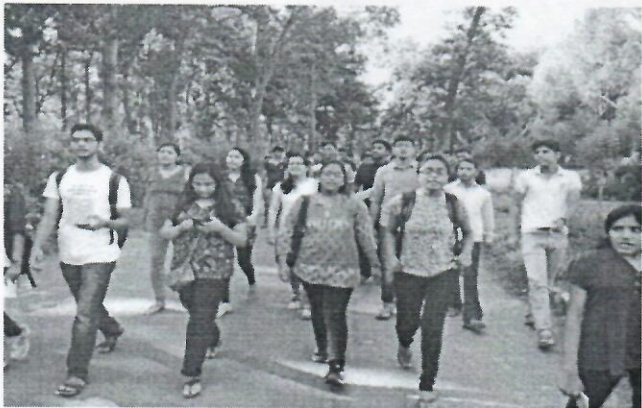

NAME OF THE EVENT:

SAVE TREES RALLY

(09.09.2015)

Organized under Program/Bodies/Club/etc.	NATIONAL SERVICE SCHEME (N.S.S)
Venue/Place/Visit	B.I.T CAMPUS & Nearby villages
Duration	3 hours
No of Student Volunteers	08
No of Participant/Beneficiary/etc.	100
No of Certificate/Award Distribution (If Any)	NA

PHOTOGRAPHS/MEDIA REPORT (WITH LEGEND/ABOUT PHOTOGRAPH):

	
N.S.S volunteers during Save Trees Rally.	N.S.S volunteers reciting slogans to make people aware about the importance of trees.

DESCRIPTION:

N.S.S B.I.T Mesra organized a "Save Trees Rally" on 9th September 2015 which was mainly aimed at creating awareness regarding the importance of trees for our survival. Around 100 N.S.S volunteers rallied with pamphlets and posters.

[Handwritten Signature]

Dean (Student Welfare)
Birla Institute of Technology
Mesra, Ranchi-835215, India

[Handwritten Signature]

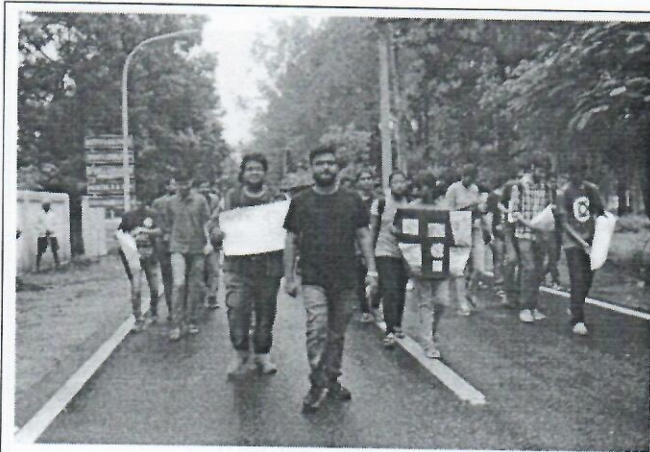


BIRLA INSTITUTE OF TECHNOLOGY MESRA, RANCHI

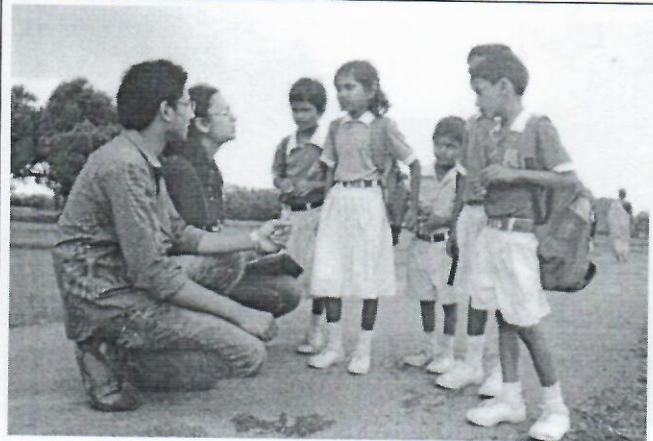
NAME OF THE EVENT: AWARENESS CAMPAIGN AGAINST WATER BORNE DISEASES (07.08.2016)

Organized under Program/Bodies/Club/etc.	NATIONAL SERVICE SCHEME (N.S.S)
Venue/Place/Visit	Nearby villages around B.I.T Mesra
Duration	3 hours
No of Student Volunteers	22
No of Participant/Beneficiary/etc.	200
No of Certificate/Award Distribution (If Any)	NA

PHOTOGRAPHS/MEDIA REPORT (WITH LEGEND/ABOUT PHOTOGRAPH):



N.S.S volunteers with posters on water-borne diseases on 07/08/16.



N.S.S volunteers explaining children on how to keep themselves safe from water-borne diseases on 07/08/16.

DESCRIPTION:

An awareness campaign against water-borne diseases was organized by N.S.S B.I.T Mesra on 7th August 2016, in which about 200 students participated and made the villagers aware about the infectious diseases that can be caused due to water logging.

Dean (Student Welfare)
Birla Institute of Technology
Mesra, Ranchi-835215, India

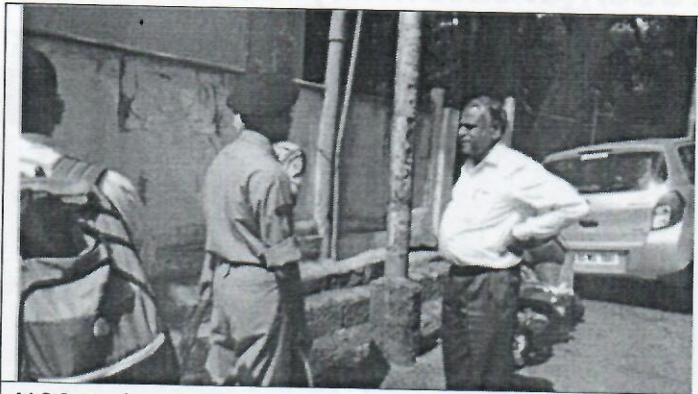


BIRLA INSTITUTE OF TECHNOLOGY MESRA, RANCHI

NAME OF THE EVENT:
ANTI PLASTIC ABHIYAN
(20.11.2018)

Organized under Program/Bodies/Club/etc.	National Cadet Corps (NCC)
Venue/Place/Visit	BIT Campus, Rudiya Village
Duration	3.5 Hours
No of Student Volunteers	2
No of Participant/Beneficiary/etc.	14
No of Certificate/Award Distribution (If Any)	NA

PHOTOGRAPHS/MEDIA REPORT (WITH LEGEND/ABOUT PHOTOGRAPH):



NCC Cadets taking it to the streets & interacting with the local citizens for the need to discourage the use of plastic in our day-to-day activities.

DESCRIPTION:

The Anti-Plastic campaign was organized by the NCC unit of BIT Mesra in Rudiya village. The aim of this massive exercise was to raise awareness among the community, collect plastic waste and make the surroundings clean. The slogan for this event was 'Plastic Se Raksha – Swachhata Hi Suraksha'.

Dean (Student Welfare)
Birla Institute of Technology
Mesra, Ranchi-835215, India



BIRLA INSTITUTE OF TECHNOLOGY MESRA, RANCHI

NAME OF THE EVENT:
WORLD ENVIRONMENT DAY (05.06.2019)


Organized under Program/Bodies/Club/etc.	NATIONAL SERVICE SCHEME (N.S.S)
Venue/Place/Visit	Nearby village of Nawatoli
Duration	3 hours
No of Student Volunteers	04
No of Participant/Beneficiary/etc.	30
No of Certificate/Award Distribution (If Any)	NA

PHOTOGRAPHS/MEDIA REPORT (WITH LEGEND/ABOUT PHOTOGRAPH):

	
Students during World Environment Day.	Students making people aware about the importance of healthy environment.

DESCRIPTION:

On the occasion of World Environment Day, N.S.S B.I.T Mesra organized an awareness programme in the adopted village of Nawatoli. The campaign included awareness on emerging environmental issues such as water pollution, soil pollution, air pollution and deforestation.


Dean (Student Welfare)
Birla Institute of Technology
Mesra, Ranchi-835215, India

