Dated: 24th June 2024

To,
The IQAC Director,
CUJ, Cheri – Manatu
Ranchi - 835222

Subject: Submission of Five years' Green / Environment Audit Report

Respected Sir,

With reference to letter number CUJ/IQAC/2024/273/02 dated 10th of June 2024, please find enclosed the completed Green/Environment Audit Report covering the last five years for the Central University of Jharkhand.

This comprehensive report encapsulates our university's efforts and achievements in promoting and sustaining environmentally friendly practices on campus. The key areas of focus include Air Quality monitoring and control, waste management, water conservation, biodiversity, and sustainable practices, alongside our engagement with the campus community in fostering an eco-conscious environment.

Key Highlights of the Report:

1. **Air Quality Monitoring:**
   - Enhancing green space in the University Campus.
   - Well ventilated rooms.
2. **Waste Management:**
   - Introduction of a robust waste segregation system.
   - Recycling initiatives for paper, plastic, and electronic waste.
3. **Water Conservation:**
   - Installation of rainwater harvesting systems.
   - Initiatives to reduce water wastage, including low-flow fixtures and regular maintenance checks.
4. **Biodiversity and Green Spaces:**
   - Preservation and expansion of green spaces, including the establishment of a botanical garden.
   - Annual tree plantation drives involving students and staff.
5. **Sustainable Practices:**
   - Promotion of carpooling and use of bicycles within the campus.
   - Conducting workshops and seminars to raise awareness about sustainability issues.
6. **Community Engagement:**
   - Regular environmental awareness programs and activities involving students, faculty, and local communities.
   - Collaboration with environmental NGOs and local bodies for various green initiatives.

The report provides a detailed analysis of our current status, identifies areas for improvement, and outlines strategic recommendations to further enhance our green initiatives in the future.

We would like to extend our gratitude to the IQAC team for their unwavering support and guidance throughout the auditing process. I am confident that this report will significantly

contribute to our collective efforts towards achieving environmental sustainability goals and enhancing our campus's ecological footprint.

Please find the attached Green/Environment Audit Report for your review and necessary action. I look forward to discussing the findings and recommendations in detail during our upcoming meeting.

Thank you for your attention to this important matter.

Sincerely,

24th June 2024

Dr. Anurag Linda
(Member)

24/06/24

Dr. S.K. Shukla,
(Member)

24-06-2024

Dr. Bhaskar Singh,
(Member)

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Sh. Mukesh Kumar
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Prof. Ajay Singh
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Prof. A.K.Padhy
(Member)

S.R.Kumar 24/6/2024

Prof. S.R. Kumar
(External Member)

Dr. Jaipal Singh
(External Member)

24.06.2024

Prof. Manoj Kumar
(Chairman)

Environmental Audit Report

CENTRAL UNIVERSITY OF JHARKHAND

Village- Cheri-Manatu
P.O.- Kamre, P.S.- Kanke
Ranchi- 835222, Jharkhand

CONTENTS

1. Introduction

The environmental audit of Central University of Jharkhand (CUJ) was conducted to assess its compliance with environmental regulations, identify areas for improvement, and promote sustainable practices in air quality, water management, green spaces, environmental conditions and waste management. For conducting an air quality audit at our campus involves a systematic approach to assess, monitor, and evaluate the air quality within the premises. This process aims to identify sources of air pollution, measure pollutant levels, and recommend mitigation strategies to ensure a healthy environment for all occupants. Similarly, a comprehensive soil and water audit aims to evaluate the usage, quality, and management practices related to soil and water resources within a campus. The steps necessary to conduct an effective audit, ensuring sustainable and efficient resource management. Likewise, an environment audit systematically examines the environmental practices, policies, and performance of a university. Establish the scope and objectives of the green audit, it is mainly focused on energy consumption, water usage, waste management, transportation, and biodiversity. In addition, if we are focusing on to identify the specific goals of the waste management audit e.g., reducing waste, improving recycling rates, ensuring compliance with regulations that should be determine the areas to be audited including academic buildings, dormitories, dining areas.

2. Objectives of Audit

a) To evaluate the institute's environmental performance.
b) To ensure compliance with relevant environmental regulations.
c) To identify opportunities for environmental sustainability improvements.
d) To provide actionable recommendations for enhancing environmental practices.

3. Methodology

The methodology involved several stages, each tailored to gather comprehensive data, ensure accuracy, and provide actionable insights. The audit involved site inspections, data collection, interviews with staff, and analysis of existing records.

4. Results

Different results of Air Quality, Water and Soil Quality are discussed further.

4.1. Air quality audit

4.1.1. Introduction

The Central University of Jharkhand (CUJ), situated in Brambe, Ranchi, Jharkhand, India, operates on two campuses: the temporary Brambe campus and the permanent Cheri-Manatu campus. The Brambe campus, approximately 25 kilometers from Ranchi city center, covers 45 acres and includes 70 classrooms and teaching labs, a 450-seat auditorium, research labs, engineering workshops, a computer lab, and student accommodations for 1,000 individuals in gender-segregated hostels. The Cheri-Manatu campus, located about 17 km from central Ranchi, spans 510 acres and features rapidly developing infrastructure, housing administrative activities, undergraduate classes, and non-laboratory departments, along with separate hostels and a library. Both campuses are designed to blend with their natural surroundings, with the Brambe campus nestled in a mango orchard hostels by tall Sal trees. The university provides transportation services to complement public conveyance between the city and campuses. Ranchi, the capital city of Jharkhand, located at latitude 23.23° N and longitude 85.23° E, has an average elevation of 650 meters above sea level, with winter temperatures ranging from 5°C to 25°C, summer temperatures from 20- 42°C, and an annual rainfall of 1400 mm.

Table 1. Measurement of Oxygen (O_2) in air using O_2Meters at Brambe and Manatu Campus of Central University of Jharkhand.

Cheri-Manatu Campus				
Name of the Place	**R1 (%)**	**R2 (%)**	**R3 (%)**	**Average (%)**
Classroom	21.1	20.8	20.5	20.8
Auditorium	20.7	21.0	20.4	20.7
Library	20.9	20.6	21.2	20.9
Laboratory	20.6	20.9	20.3	20.6
Canteen	20.7	20.4	21.0	20.7
Hostel	21.1	20.8	20.5	20.8
Open Area	19.7	20.7	21.0	20.5
Car Parking Area	20.8	20.5	20.2	20.5
Brambe Campus				
Classroom	20.9	21.2	20.6	20.9
Auditorium	21.1	20.8	20.5	20.8
Library	21.0	21.3	20.7	21
Laboratory	20.7	21.0	20.4	20.7
Canteen	20.8	21.1	20.5	20.8
Hostel	20.6	20.9	21.2	20.9
Open Area	21.1	21.4	20.8	21.1
Car Parking Area	20.6	20.9	20.3	20.6

The Central University of Jharkhand, located in Ranchi, undertook an air quality audit to monitor oxygen (O_2) levels on its 510-acre campus. This initiative was part of the

university's commitment to environmental sustainability, amidst rapid urbanization and industrialization in Ranchi, which had heightened air pollution concerns. The audit involved using oxygen meters across various campus locations, including classrooms, laboratories, offices, residential buildings, and outdoor spaces to capture variations in O_2 levels. The collected data was analyzed by the university's Environmental Sciences Department, comparing the findings with standards set by the Central Pollution Control Board (CPCB) and the World Health Organization (WHO). The results guided the development of an action plan to improve air quality, potentially involving enhanced ventilation, increased green space utilization, sustainable transportation promotion, and community awareness programs. The findings and action plan were shared with the university community and stakeholders to encourage collective responsibility and serve as a model for other institutions. Through this audit, the university reaffirmed its dedication to maintaining a healthy environment and supporting sustainable development.

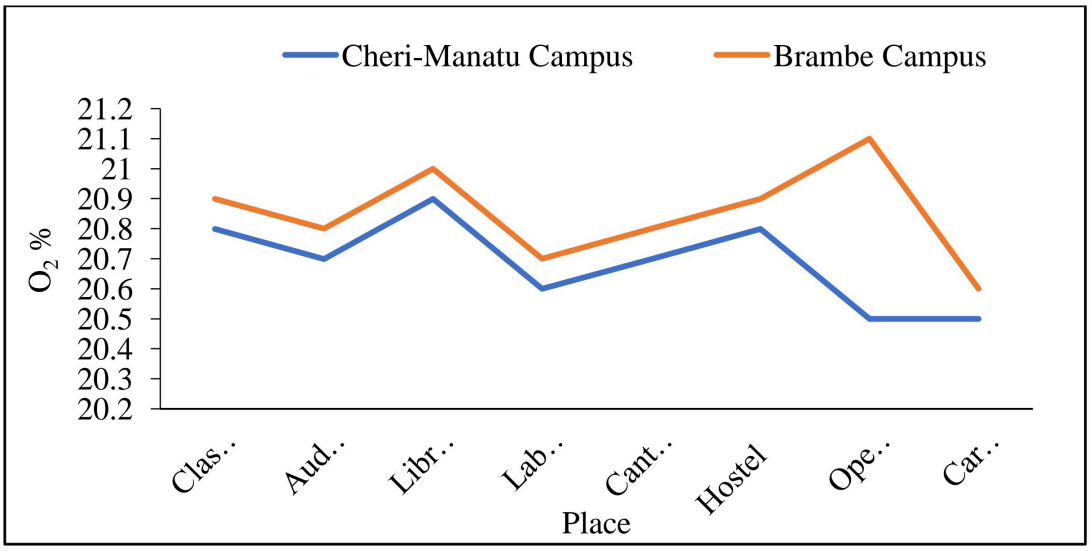


Figure 1. Graphical representation of O_2% variation at both the campuses of Central University of Jharkhand, Ranchi.

Overall, the oxygen levels in both campuses fall within the acceptable range of 19.5% to 23.5% for Earth's atmosphere. This indicates that the air quality, in terms of oxygen content, is generally healthy and suitable for human activities in both campuses.

However, there are slight variations in the O_2 levels between the two campuses:

1. The Brambe campus consistently shows slightly higher oxygen levels compared to the Cheri-Manatu campus across all locations except for the open area.
2. The most significant difference is observed in the open area, where the Brambe campus has an average O2 level of 21.1%, while the Cheri-Manatu campus has a

lower level of 20.5%. This difference may be attributed to the Brambe campus's more rural setting and proximity to natural green spaces, which can contribute to higher oxygen levels through photosynthesis.

3. The library in both campuses has the highest oxygen levels among the indoor locations, with 20.9% in the Cheri-Manatu campus and 21% in the Brambe campus. This may be due to factors such as better ventilation, lower occupancy, or the presence of indoor plants.
4. The laboratory and car parking areas have the lowest oxygen levels in both campuses, which may be attributed to the nature of activities in these locations, such as the use of chemicals or the presence of vehicular emissions.
5. The classrooms, auditorium, canteen, and hostel show similar oxygen levels across both campuses, with the Brambe campus having slightly higher values. This consistency suggests that the indoor air quality management practices are comparable in both locations.
6. While the oxygen levels are within the acceptable range, it is important to continue monitoring and maintaining air quality through regular audits, ensuring proper ventilation, and promoting green spaces. The slightly higher oxygen levels in the Brambe campus can be seen as a positive indicator, showcasing the potential benefits of a more rural setting and proximity to nature.

4.1.2. Recommendations

Based on the air quality audit conducted at the Central University of Jharkhand, comparing the oxygen levels between the Cheri-Manatu campus and the Brambe campus, the following recommendations can be made:

1. Maintain and Enhance Green Spaces:

- Preserve and expand green spaces, particularly in the Cheri-Manatu campus, to promote oxygen production through photosynthesis and improve overall air quality.
- Encourage the planting of native and oxygen-rich plant species in both campuses.
- Develop green corridors and parks to create a healthier environment for students, faculty, and staff.

2. Optimize Indoor Ventilation:

- Regularly assess and improve the ventilation systems in classrooms, auditoriums, laboratories, canteens, and hostels to ensure adequate fresh air circulation.
- Implement a schedule for regular maintenance and cleaning of air filters and ducts to maintain optimal indoor air quality.
- Consider installing air purifiers in areas with lower oxygen levels, such as laboratories and car parking areas.

3. Promote Sustainable Transportation:

- Encourage the use of eco-friendly transportation options, such as bicycles and electric vehicles, to reduce vehicular emissions on both campuses.
- Develop a comprehensive transportation management plan to minimize traffic congestion and idling of vehicles in car parking areas.
- Provide incentives for carpooling and the use of public transportation to reduce the overall carbon footprint.

4. Conduct Regular Air Quality Audits:

- Establish a routine air quality monitoring program to track oxygen levels and other pollutants in both campuses.
- Use the data collected to identify trends, potential issues, and areas for improvement.
- Share the findings with the university community to raise awareness and encourage participation in maintaining a healthy environment.

5. Implement Green Building Practices:

- Incorporate green building principles in future construction and renovation projects to optimize energy efficiency and improve indoor air quality.
- Utilize natural ventilation and day lighting techniques to reduce the reliance on artificial systems and promote a healthier indoor environment.
- Adopt the use of low-emission materials and finishes to minimize the release of harmful substances that can impact air quality.

6. Raise Awareness and Engage the Community:

- Develop educational programs and campaigns to raise awareness about the importance of air quality and the role of individual actions in maintaining a healthy environment.
- Engage students, faculty, and staff in eco-friendly initiatives and encourage their participation in environmental stewardship activities.
- Collaborate with local communities and organizations to promote air quality improvement efforts beyond the university campuses.

7. Leverage the Brambe Campus as a Model:

- Use the Brambe campus, with its slightly higher oxygen levels, as a model for showcasing the benefits of a more rural and green setting.
- Study the factors contributing to the higher oxygen levels in the Brambe campus and explore ways to replicate these conditions in the Cheri-Manatu campus, where feasible.
- Encourage research and projects that investigate the relationship between green spaces, air quality, and human well-being in educational institutions.

By implementing these recommendations, the Central University of Jharkhand can take proactive steps towards maintaining and improving air quality across both campuses, promoting a healthier and more sustainable environment for its community. Regular monitoring, ongoing improvements, and community engagement will be key to the success of these initiatives.

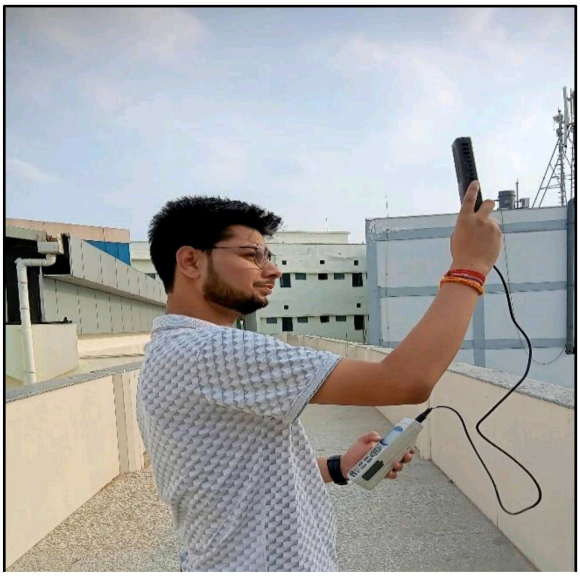


Figure2. Monitoring oxygen levels on campus: A Central University of Jharkhand student uses an O_2 meter to measure air quality as part of the university's Air Quality Audit.

4.2. Water and soil quality audit

4.2.1. Introduction

Conducting a soil and water audit at the Central University of Jharkhand is a crucial step towards promoting sustainable resource management within the campus. This audit aims to systematically evaluate the current conditions of soil and water resources by examining their quality, usage patterns, and management practices. By collecting and analysing soil samples and water sources, we will gain valuable insights into their physical, chemical, and biological properties. The findings will help identify areas of degradation, inefficiency, and potential contamination, providing a foundation for informed decision-making. The ultimate goal is to develop actionable recommendations that enhance soil health, optimize water usage, and ensure the long-term sustainability of the university's natural resources. Engaging with university departments and the local community, this initiative underscores the university's commitment to environmental stewardship and sustainable development.

4.2.2. Details of aspects discussed in the soil and water audit conducted as per industry norms and regulations:

a) Dual Piping System for effective water conservation

The Central University of Jharkhand's dual piping system is a pivotal initiative for effective water conservation. This system separates potable water from non-potable

water, using two distinct pipelines: one for clean, treated water for drinking and sanitation, and another for greywater for non-potable uses like irrigation and toilet flushing. This approach significantly reduces the demand for treated water, saving resources and energy linked to water treatment and distribution. Particularly in water-scarce regions, it ensures sustainable and efficient water use.

Moreover, by recycling greywater, the system enhances sustainability and provides additional nutrients to plants, cutting down on the need for chemical fertilizers. It also boosts the resilience of the university's water infrastructure, maintaining essential services during water shortages or disruptions. This ensures operational continuity and community well-being.

In summary, the dual piping system at the Central University of Jharkhand achieves substantial water and energy savings, supports sustainable practices, and enhances the resilience of the water management system. It reflects the university's commitment to environmental stewardship and serves as a model for comprehensive water conservation strategies in educational institutions.

b) Availability of low flow fittings like wash basin taps, sink taps and shower head, bath faucet and other faucet, sensor taps to reduce the water consumption

The Central University of Jharkhand has effectively incorporated low flow fittings and sensor taps across its campus, including wash basin taps, sink taps, shower heads, bath faucets, and other fixtures. These installations are pivotal in reducing water consumption and promoting sustainability.

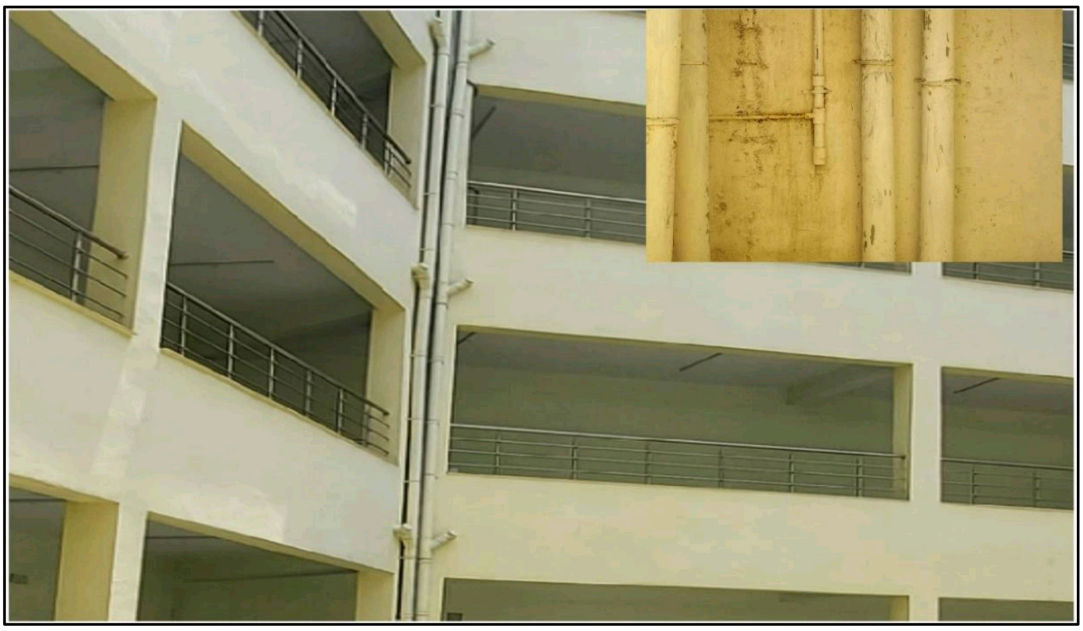


Figure 3. Dual Piping System Installed at Science Building, Cheri- Manatu Campus

Low flow fittings are designed to use significantly less water than conventional fixtures while maintaining sufficient pressure and flow for daily use. By limiting the amount of water released, these fixtures help in reducing overall water usage without compromising functionality. This is particularly beneficial in high-traffic areas such as dormitories, cafeterias, and public restrooms, where water conservation can lead to substantial savings.

Sensor taps, like the one installed in the Vice Chancellor's office restroom, further enhance water efficiency. These taps automatically control water flow, activating only when hands are detected and stopping immediately after use. This eliminates unnecessary water wastage, common with manual taps that may be left running inadvertently. Additionally, sensor taps contribute to improved hygiene by reducing contact with the tap surface, thereby minimizing the spread of germs and bacteria.

The integration of these water-saving technologies underscores the university's commitment to environmental sustainability. By implementing low flow fittings and sensor taps, the university not only conserves water but also sets a precedent for other institutions to follow. These measures contribute to significant water and energy savings, lower utility costs, and promote a culture of responsible water usage on campus. Overall, the adoption of these fixtures reflects the university's proactive approach to resource management and environmental stewardship.

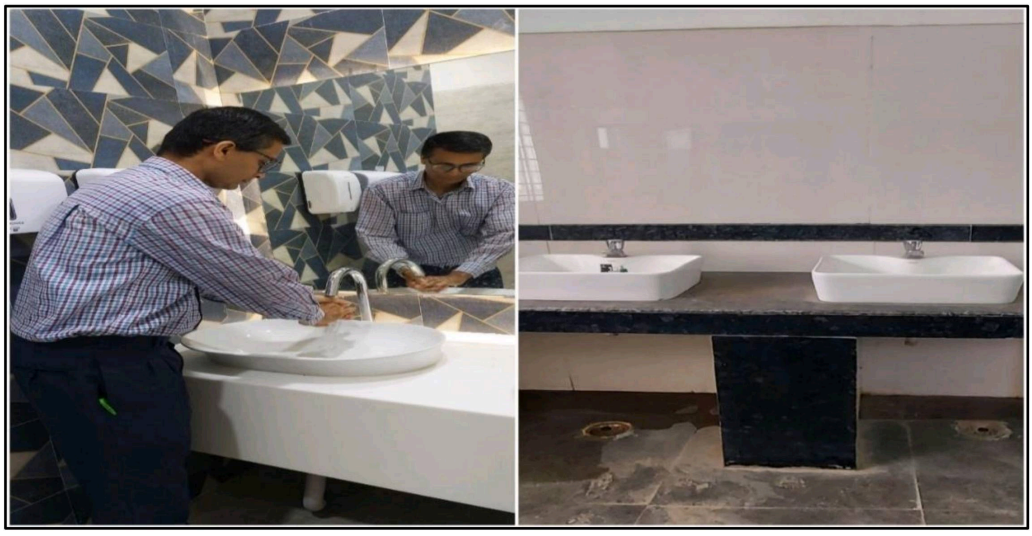


Figure 4. Installation of Sensor Taps (VC's Office, Admin Building) and Low Flow Fittings at Various Restrooms across the Cheri-Manatu Campus to promote water efficiency.

c) Sign boards like "Save water, Save life" towards water conservation

The management at Central University of Jharkhand has strategically placed sign boards with messages like “Save Water, Save Life” to promote water conservation across the campus. These signs serve as constant reminders to students, faculty, staff, and visitors about the importance of conserving water and the role each individual plays in this effort.

The presence of these sign boards contributes significantly to raising awareness about water conservation. They are placed in high-visibility areas such as restrooms, cafeterias, lecture halls, and common areas, ensuring that the message reaches a wide audience. By repeatedly encountering these reminders, individuals are more likely to adopt water-saving habits in their daily routines, such as turning off taps when not in use, taking shorter showers, and reporting leaks promptly.

Moreover, these signs reinforce the university's commitment to environmental sustainability and responsible resource management. They help foster a culture of conservation, encouraging everyone on campus to take personal responsibility for reducing water usage. This collective effort not only helps in conserving water but also instils a sense of community and shared purpose in protecting vital natural resources.

In summary, the sign boards with conservation messages at the Central University of Jharkhand are an effective tool for promoting water-saving behaviours. They play a crucial role in educating the campus community, reinforcing sustainable practices, and supporting the university's broader environmental goals.

Figure 5. Sign Boards to raise awareness and to promote water-saving behaviours

d) Usage of instruments like pH and TDS meters &water analysis kit to check water quality parameters such as pH, TDS, Chloride. Turbidity and Dissolved Oxygen

The Central University of Jharkhand demonstrates a strong commitment to maintaining high water quality standards through the regular use of instruments such as pH and TDS meters, water analysis kits, and other equipment to monitor water quality parameters. This quarterly monitoring process includes assessing critical metrics such as pH, Total Dissolved Solids (TDS), Chloride, turbidity, and dissolved oxygen levels. Regular monitoring of these parameters is essential for several reasons. Firstly, it ensures that the water used across the campus whether for drinking, cooking, irrigation, or laboratory use meets health and safety standards. By keeping track of the pH levels, the university can prevent corrosion of pipes and ensure that water remains within a safe range for consumption and use. TDS measurements help in assessing the concentration of dissolved substances, which can affect both the taste and safety of water.

Monitoring Chloride and turbidity provides insights into potential sources of contamination and helps in managing water treatment processes effectively. High Chloride can indicate the presence of pollutants, while turbidity, or the cloudiness of water, can signal the presence of suspended particles that may harbour pathogens. Dissolved oxygen levels are crucial for maintaining the health of aquatic ecosystems on campus and ensuring the effectiveness of water used in laboratories and other facilities. Conducting these tests quarterly allows the university to identify and address any issues promptly, ensuring that corrective actions can be taken before problems escalate. This proactive approach helps in maintaining consistent water quality and safeguarding the health of the university community. In summary, the Central University of Jharkhand's regular use of pH and TDS meters, along with comprehensive water analysis kits, underscores its dedication to water quality management. By systematically monitoring and evaluating key water quality parameters on a quarterly basis, the university ensures the safety and reliability of its water resources, promoting a healthy and sustainable campus environment.

Figure 6. Regular Monitoring & Quality Check is conducted to ensure availability of safe drinking water in the university campus

e) Availability of potable and non-potable water facilities towards the suitability of domestic and other irrigation purposes

The Central University of Jharkhand has effectively established separate facilities for potable and non-potable water, enhancing the suitability of water for various purposes. Below is a summary of the details provided in the report, presented in a tabular format.

Table 2. Total number of different water supply types

Sl. No.	Type	Campus	
		Brambe	Cheri-Manatu
1.	RO Water Purifier	12	18
2.	Bore Wells	9	10
3.	Open Wells	01	00
4.	Percolation Pond (Groundwater Recharge & Rain Water Harvesting)	01	03

Figure 7. Availability of multiple borewells etc, at both the campuses to provide water for both potable and non-potable uses.

f) Availability of rainwater harvesting unit, ground water recharging facilities, percolation pond, water reservoirs, etc. for storage of water to maintain the ground water level

The Central University of Jharkhand demonstrates a proactive approach to water management by providing various facilities for rainwater harvesting, groundwater recharging, and water storage across both the Brambe and Cheri-Manatu campuses. These facilities play a crucial role in maintaining groundwater levels and ensuring sustainable water usage.

Table 3. Different types of facilities employed for water conservation

Sl. No.	Facility	Purpose
1.	Rainwater Harvesting Units	Rainwater harvesting units are strategically installed across both campuses to capture and store rainwater.
2.	Groundwater Recharging Units	Groundwater recharging units facilitate the infiltration of rainwater into the ground, replenishing aquifers.
3.	Percolation Ponds	Percolation ponds are designed to capture and allow rainwater to percolate slowly into the ground, promoting groundwater recharge.
4.	Water Reservoirs	Water reservoirs are constructed to store harvested rainwater, providing a reliable source of water for various campus activities.

Figure 8. Rainwater harvesting unit, Ground water recharging facilities, Percolation Pond, Water Reservoirs, etc. for storage of water to maintain the ground water level.

g) Availability of Bore wells and Open wells for supply of waters to the stakeholders without harming the environment.

The Central University of Jharkhand ensures access to water for stakeholders through the availability of bore wells and open wells, presented in tabular form. These wells serve as essential sources of water without causing harm to the environment. Bore wells tap into underground aquifers, providing a reliable supply of groundwater, while open wells harness water from surface sources. Both types of wells are strategically managed to meet the water needs of the university community while maintaining environmental sustainability. This approach not only ensures access to water but also safeguards the surrounding ecosystem, aligning with the university's commitment to responsible resource management.

h) RO Water Plant facilities to supply quality with safe water to the stakeholders.

The Central University of Jharkhand prioritizes the delivery of quality and safe drinking water to its stakeholders by strategically placing various RO filtration units cum water purifiers throughout both campuses. While a centralized RO water plant facility may not be available, these decentralized units play a pivotal role in ensuring the provision of high-quality drinking water. By utilizing advanced filtration technology, these units effectively remove impurities, contaminants, and harmful substances from the water supply, guaranteeing that stakeholders have access to safe and clean drinking water at multiple locations across the university premises. This decentralized approach not only enhances convenience and accessibility but also underscores the university's dedication to promoting the health and well-being of its community members. Through the

deployment of these RO filtration units, the Central University of Jharkhand demonstrates its commitment to maintaining stringent quality standards and safeguarding the welfare of its stakeholders.

Table 4. Per capita water consumption calculated in the buildings (litres/person/day)

Sl. No.	Building/ Campus	Per capita consumption (litres/person/day) Annual Year 2022-2023	Per capita consumption (litres/person/day) Annual Year 2023-2024
1.	Brambe Campus	42	38
2.	School Building (Manatu Campus)	34	37
3.	Science Building (Manatu Campus)	45	51
4.	Boy's Hostel (Manatu Campus)	146	151
5.	Girl's Hostel (Manatu Campus)	165	172

4.2.3. Water Management plan and procedure

Water is a critical resource essential for sustaining life and supporting various activities within our esteemed institution, the Central University of Jharkhand. Recognizing the importance of responsible water management, we propose the development and implementation of a comprehensive Water Management Plan and Procedure. This plan aims to optimize water usage, ensure sustainability, and promote environmental stewardship across our campuses.

Objectives

1. To assess and understand our water resources comprehensively.
2. To establish clear goals and targets for water management.
3. To develop and implement effective strategies for water conservation, efficiency, and reuse.
4. To promote community engagement and education on water conservation practices.
5. To ensure regular monitoring and evaluation of water usage and quality.

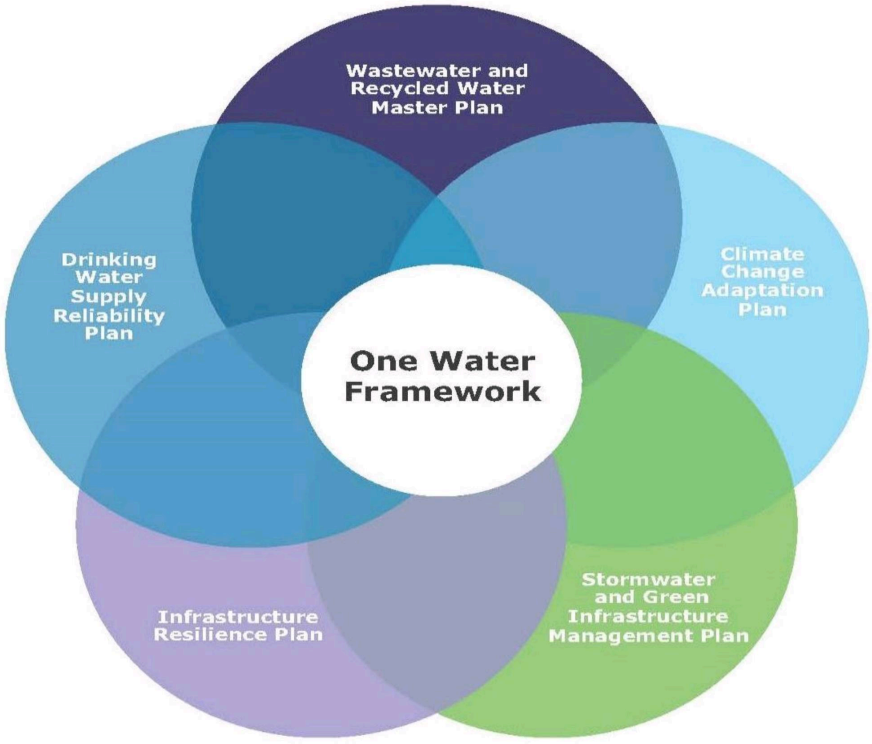


Figure 9. One Water Framework for Sustainable Water Management Plan & Procedure

a) Water Resource Assessment:

Conduct a thorough assessment of available water resources, including surface water bodies, groundwater aquifers, and rainwater potential. This assessment will provide crucial data to inform our management strategies.

b) Goal Setting:

Define clear objectives for water management, considering conservation, sustainability, and stakeholder needs. Set measurable targets to track progress and evaluate the effectiveness of our measures.

c) Strategy Development:

Implement a combination of conservation, efficiency, and reuse measures to optimize water use. Prioritize strategies such as leak detection and repair, irrigation optimization, and installation of water-saving fixtures.

d) Infrastructure Development:

Upgrade and maintain water distribution infrastructure to minimize losses and ensure reliable water supply. Install decentralized RO filtration units cum water purifiers to provide safe drinking water at various locations.

e) Community Engagement:

Conduct outreach programs to raise awareness about water conservation and responsible usage practices. Provide training on water-saving techniques and encourage behavioural changes among stakeholders.

f) Monitoring and Evaluation:

Establish a monitoring system to track water usage, identify trends, and detect anomalies. Regularly evaluate the effectiveness of implemented measures and adjust strategies as needed based on performance data.

g) Implementation Timeline:

1. Phase 1 (3 months): Initial Assessment and Goal Setting
2. Phase 2 (6 months): Strategy Development and Planning
3. Phase 3 (12 months): Infrastructure Development and Installation
4. Ongoing: Community Engagement and Education Programs, Continuous Monitoring and Evaluation

Conclusion

Implementing a Water Management Plan and Procedure is crucial for ensuring the sustainability and efficiency of our water resources. By adopting a systematic approach to water management, we can not only meet our institutional needs but also contribute to environmental conservation and community well-being. We urge the university administration to consider and support the implementation of this proposal for the benefit of our institution and future generations.

a) Implementation of drip sprinkler irrigation systems in the campus to reduce the operation cost under energy conservation methods

Water is a precious resource, and its efficient use is essential for sustainable operations within our institution, the Central University of Jharkhand. In line with our commitment to environmental stewardship and energy conservation, we propose the implementation of drip sprinkler irrigation systems across our campus. These systems will not only reduce water usage but also minimize operational costs associated with traditional irrigation methods.

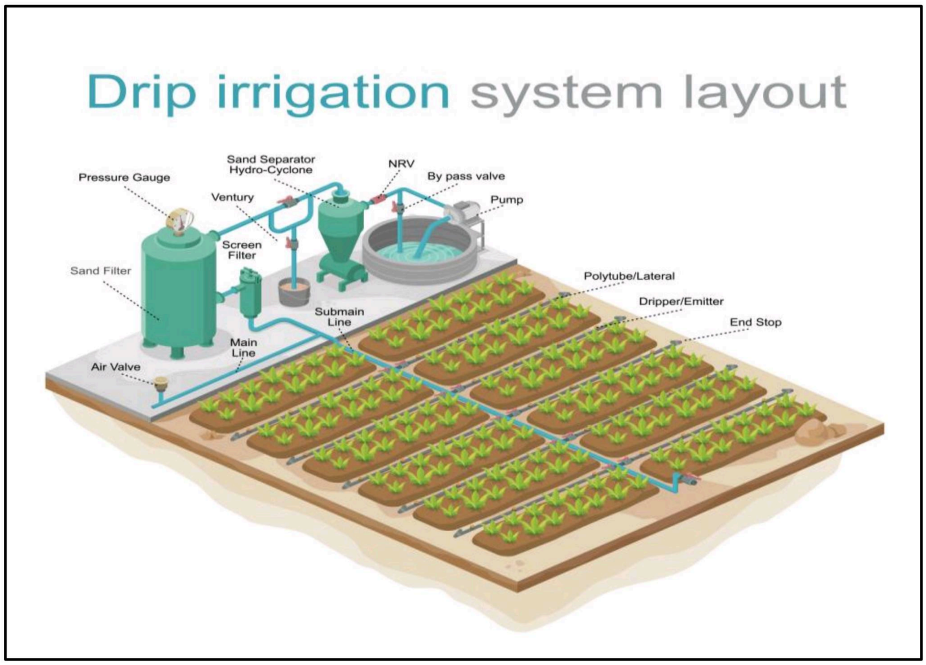


Figure 10. Proposed Drip Irrigation System Layout

Objectives

1. To reduce water consumption for irrigation purposes.
2. To minimize energy usage and operational costs associated with irrigation.
3. To promote sustainable water management practices on campus.
4. To enhance the health and aesthetics of campus landscapes through efficient irrigation.

a) Site Assessment: Conduct a thorough assessment of current irrigation practices and water usage patterns across the campus to identify areas for improvement.

b) Technology Selection: Select appropriate drip sprinkler irrigation systems based on the specific needs and landscape characteristics of different campus areas.

c) Installation: Implement drip sprinkler irrigation systems in identified areas, including lawns, gardens, and green spaces, ensuring proper placement and coverage.

d) Training and Education: Provide training sessions for grounds maintenance staff on the operation, maintenance, and troubleshooting of drip sprinkler systems. Additionally, educate campus community members on the importance of water conservation and the benefits of drip irrigation.

e) Monitoring and Maintenance: Establish a monitoring program to regularly assess the performance and efficiency of drip sprinkler systems. Conduct routine maintenance to ensure proper functioning and address any issues promptly.

f) Evaluation: Evaluate the effectiveness of drip sprinkler systems in reducing water consumption and operational costs. Gather feedback from stakeholders and make adjustments as necessary to optimize system performance.

g) Implementation Timeline

1. Phase 1 (3 months): Site Assessment and Technology Selection
2. Phase 2 (6 months): Installation of Drip Sprinkler Systems
3. Phase 3(Ongoing): Training and Education, Monitoring and Maintenance, Evaluation

Conclusion

Implementing drip sprinkler irrigation systems in our campus landscape is a proactive step towards water conservation and energy efficiency. By embracing this technology, we not only reduce water usage and operational costs but also demonstrate our commitment to sustainable practices. We urge the university administration to support and prioritize the implementation of this proposal for the benefit of our institution and the environment.

Use of recycled water, gray water, captured rainwater for irrigation, domestic and outdoor watering purposes towards effective water utilization.

Effective water utilization is crucial for the sustainability of our institution, the Central University of Jharkhand. While some provisions, such as capturing rainwater, are already in place, we propose enhancing our water management practices by incorporating the use of recycled water and gray water for irrigation, domestic, and outdoor watering purposes. This proposal outlines the necessary steps to fully implement these practices, promoting sustainability and efficient water use across our campuses.

Objectives:

1. To optimize the use of available water resources through recycling and reusing water.
2. To reduce reliance on freshwater sources for non-potable uses.
3. To promote sustainable water management practices on campus.
4. To enhance the environmental and economic benefits of water use.

Recycled Water Use

a) **Water Treatment:** Set up facilities for treating wastewater to a level safe for non-potable uses, such as irrigation and landscape maintenance.
b) **Distribution System:** Develop a separate pipeline network to distribute treated recycled water to designated areas across the campus.
c) **Signage and Education:** Clearly mark recycled water usage points and educate the campus community on the benefits and safety of using recycled water.

Enhanced Rainwater Utilization:

a) **Storage Expansion:** Increase the capacity of rainwater storage systems to capture more rainwater during wet seasons.
b) **Integration with Other Systems:** Integrate captured rainwater with grey water and recycled water systems for a more efficient overall water management strategy.

4.2.4. Implementation Timeline

Table 5. Implementation Timeline

Sl. No.	Stage	Duration	Details
1.	Initial Assessment and Planning	3 months	Conduct assessments for grey water sources and potential recycled water applications. Develop a detailed plan outlining the scope, budget, and timeline for the project.
2.	Infrastructure Development	6-9 months	Install grey water recycling systems and expand rainwater storage capacities. Develop a distribution network for recycled water.
3.	Training and Community Engagement	Ongoing	Train maintenance staff on new systems. Conduct awareness programs for students and staff.
4.	Monitoring and Evaluation	Continuous	Establish a monitoring program to track water usage and system performance. Regularly evaluate and adjust strategies based on performance data.

Conclusion:

By enhancing our existing water management practices to include the use of recycled water and grey water, the Central University of Jharkhand can significantly improve its water utilization efficiency. This proposal not only supports sustainable water management but also aligns with our commitment to environmental stewardship and resource conservation. We urge the university administration to support the implementation of these enhancements to achieve a more sustainable future for our campus.

4.2.5. Soil management audit

Soil health management by analysing the physical and chemical properties of soil towards the suitability of building construction and cultivation of native and wild type plant species.

Effective soil health management is crucial for ensuring the suitability of soil for building construction and the cultivation of native and wild-type plant species. Despite regular soil quality monitoring at Central University of Jharkhand, a comprehensive soil health management plan is currently lacking. This proposal outlines a strategy to implement such a plan, aiming to enhance soil quality, support sustainable construction, and promote biodiversity on campus.

Figure 11. Analysis of soil quality parameters

Figure 12. Plantation of different native and exotic species at School Building, Cheri-Manatu Campus, CUJ

Objectives

1. Assess and improve the physical and chemical properties of soil.
2. Ensure soil suitability for building construction.
3. Support the cultivation of native and wild-type plant species.
4. Establish a sustainable soil health management system.

Key Components

a) Soil Assessment and Monitoring

Soil Sampling: Conduct systematic soil sampling across various campus locations.

Analysis Parameters: Measure soil pH, total organic carbon, electrical conductivity, water holding capacity, total nitrogen, available phosphorus, and exchangeable potassium.

Frequency: Perform assessments bi-annually to monitor changes and trends in soil quality.

b) Soil Improvement Strategies

Organic Amendments: Incorporate organic matter, such as compost, to improve soil structure and fertility.

pH Adjustment: Use lime or sulfur to adjust soil pH to optimal levels for both construction and plant growth.

Nutrient Management: Apply fertilizers based on soil test results to balance nutrient levels.

c) Erosion Control and Soil Conservation

Ground Cover: Plant cover crops and native grasses to prevent soil erosion.

Terracing and Contouring: Implement terracing and contour plowing on slopes to reduce runoff and soil loss.

d) Suitability for Building Construction

Compaction Testing: Assess soil compaction and stability for construction purposes.

Soil Bearing Capacity: Test the bearing capacity of soil to ensure it meets the requirements for planned structures.

e) Cultivation of Native and Wild-Type Plant Species

Species Selection: Identify and select native and wild-type plant species suitable for local soil conditions.

Habitat Restoration: Create habitats and planting zones that support biodiversity and the growth of selected species.

Implementation Plan

a) Phase 1: Initial Assessment

Conduct baseline soil sampling and analysis.

Develop detailed maps of soil properties across campus.

b) Phase 2: Soil Improvement

Apply organic amendments and pH adjustments.

Implement erosion control measures.

c) Phase 3: Continuous Monitoring and Adjustment

Conduct bi-annual soil assessments.

Adjust soil management practices based on monitoring results.

d) Phase 4: Biodiversity Promotion

Establish planting zones for native and wild-type species.

Monitor the success and health of planted species.

4.3.4. Expected Outcomes

1. Improved soil health and fertility.
2. Enhanced suitability of soil for construction projects.
3. Increased biodiversity through the cultivation of native and wild-type plants.
4. A sustainable, long-term soil health management system.

Conclusion

Implementing this soil health management plan will ensure the Central University of Jharkhand maintains optimal soil conditions for construction and ecological sustainability. By addressing both physical and chemical soil properties, the university can support its infrastructure needs and promote a thriving natural environment.

Table 6. Measurement of pH and TDS in water samples using pH and TDS Meters in Cheri-Manatu campus (2022-2023)*(NA: not applicable).*

Sl. No.	Type of Water	pH				TDS (mg/L)			
		S_1	S_2	S_3	Average	S_1	S_2	S_3	Average
1.	**RO Water**	6.4	6.7	6.9	6.67	15	18	22	18.33
2.	**Tap Water**	7.2	7.4	7.7	7.43	255	310	274	279.67
3.	**Well Water**	NA	NA	NA	NA	NA	NA	NA	NA
4.	**Pond Water**	NA	NA	NA	NA	NA	NA	NA	NA
5.	**Waste Water**	7.6	8.2	8.4	8.07	774	859	963	865.33
6.	**Treated Water**	NA	NA	NA	NA	NA	NA	NA	NA
7.	**Any Other (Specify)**	NA	NA	NA	NA	NA	NA	NA	NA

Table 7. Measurement of pH and TDS in water samples using pH and TDS Meters in Cheri-Manatu campus (2023-2024)*(NA: not applicable).*

Sl. No.	Type of Water	pH				TDS (mg/L)			
		S_1	S_2	S_3	Average	S_1	S_2	S_3	Average
1.	**RO Water**	6.2	6.4	7.1	6.57	16	22	24	20.67
2.	**Tap Water**	7.14	7.42	7.7	7.42	241	287	315	281.00
3.	**Well Water**	NA	NA	NA	NA	NA	NA	NA	NA
4.	**Pond Water**	NA	NA	NA	NA	NA	NA	NA	NA
5.	**Waste Water**	7.3	7.9	8.7	7.97	663	814	857	778.00
6.	**Treated Water**	NA	NA	NA	NA	NA	NA	NA	NA
7.	**Any Other (Specify)**	NA	NA	NA	NA	NA	NA	NA	NA

Table 8. Measurement of Chloride, Turbidity, Dissolved Oxygen in water samples using Digital Deluxe Water & Soil Analysis Kit in Cheri-Manatu campus (2022-2023) *(NA: not applicable).*

Sl. No.	Type of Water	Chloride (mg/L)				Turbidity (NTU)				Dissolved Oxygen [DO] (mg/L)			
		S_1	S_2	S_3	Average	S_1	S_2	S_3	Average	S_1	S_2	S_3	Average
1.	RO Water	1.2	2.1	1.7	1.66	1	1.2	1.4	1.2	5.4	6.2	5.1	5.56
2.	Tap Water	12.4	13.2	14.7	13.43	3.5	5.2	6.8	5.1	6.8	7.4	7.7	7.3
3.	Well Water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.	Pond Water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5.	Waste Water	36	38	42	38.66	10.2	12.24	14.5	12.31	3.1	4.5	3.8	3.8
6.	Treated Water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7.	Any Other (Specify)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 9. Measurement of Chloride, Turbidity, Dissolved Oxygen in water samples using Digital Deluxe Water &Soil Analysis Kit in Cheri-Manatu campus (2023-2024) *(NA: not applicable)*

Sl. No.	Type of Water	Chloride (mg/L)				Turbidity (NTU)				Dissolved Oxygen [DO] (mg/L)			
		S_1	S_2	S_3	Average	S_1	S_2	S_3	Average	S_1	S_2	S_3	Average
1.	RO Water	1.2	1.3	1.8	1.43	1.2	1.4	1.8	1.46	5.2	5.6	5.8	5.53
2.	Tap Water	10.2	11.4	11.7	11.1	3.2	3.9	4.1	3.73	6.1	6.7	7.3	6.7
3.	Well Water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.	Pond Water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5.	Waste Water	28	31.1	32.2	30.43	11.2	13.4	15.1	13.23	3.4	4.3	4.1	3.93
6.	Treated Water	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7.	Any Other (Specify)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 10. Measurement of pH and TDS in water samples using pH and TDS Meters in Brambe campus (2022-2023) *(NA: not applicable).*

Sl. No.	Type of Water	pH				TDS (mg/L)			
		S_1	S_2	S_3	Average	S_1	S_2	S_3	Average
1.	RO Water	6.6	6.8	6.9	6.76	15	18	22	18.33

2.	**Tap Water**	7.1	7.6	7.8	7.5	255	310	274	279.66
3.	**Well Water**	NA	NA	NA	NA	NA	NA	NA	NA
4.	**Pond Water**	NA	NA	NA	NA	NA	NA	NA	NA
5.	**Waste Water**	7.4	7.9	8.2	7.83	774	859	963	865.33
6.	**Treated Water**	NA	NA	NA	NA	NA	NA	NA	18.33
7.	**Any Other (Specify)**	NA	NA	NA	NA	NA	NA	NA	NA

Table 11. Measurement of pH and TDS in water samples using pH and TDS Meters in Brambe campus (2023-2024) *(NA: not applicable).*

Sl. No.	**Type of Water**	**pH**				**TDS (mg/L)**			
		S_1	**S_2**	**S_3**	**Average**	**S_1**	**S_2**	**S_3**	**Average**
1.	**RO Water**	6.1	6.5	7.1	6.56	16	22	24	20.66
2.	**Tap Water**	7.2	7.6	7.9	7.56	241	287	315	281
3.	**Well Water**	NA	NA	NA	NA	NA	NA	NA	NA
4.	**Pond Water**	NA	NA	NA	NA	NA	NA	NA	NA
5.	**Waste Water**	7.5	7.6	8.1	7.73	663	814	857	778
6.	**Treated Water**	NA	NA	NA	NA	NA	NA	NA	NA
7.	**Any Other (Specify)**	NA	NA	NA	NA	NA	NA	NA	NA

Table 12. Measurement of Chloride, Turbidity, Dissolved Oxygen in water samples using Digital Deluxe Water & Soil Analysis Kit in Brambe campus (2022-2023) *(NA: not applicable).*

Sl. No.	**Type of Water**	**Chloride (mg/L)**				**Turbidity (NTU)**				**Dissolved Oxygen [DO] (mg/L)**			
		S_1	**S_2**	**S_3**	**Average**	**S_1**	**S_2**	**S_3**	**Average**	**S_1**	**S_2**	**S_3**	**Average**
1.	**RO Water**	1.3	1.8	2.1	1.73	1.1	1.5	1.4	1.33	5.1	5.7	6.1	5.63
2.	**Tap Water**	12.4	12.7	14.5	13.2	3.2	4.4	5.2	4.26	6.8	6.5	7.3	6.86
3.	**Well Water**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.	**Pond Water**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5.	**Waste Water**	32	37	41	36.66	11.2	12.4	11.4	11.66	3.7	4.1	4.8	4.2
6.	**Treated Water**	NA	NA	NA	1.73	NA	NA	NA	1.33	NA	NA	NA	5.63
7.	**Any Other (Specify)**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 13. Measurement of Chloride, Turbidity, Dissolved Oxygen in water samples using Digital Deluxe Water & Soil Analysis Kit in Brambe campus (2023-2024) *(NA: not applicable).*

Sl. No.	**Type of Water**	**Chloride (mg/L)**				**Turbidity (NTU)**				**Dissolved Oxygen [DO] (mg/L)**			
		S_1	**S_2**	**S_3**	**Average**	**S_1**	**S_2**	**S_3**	**Average**	**S_1**	**S_2**	**S_3**	**Average**

1.	**RO Water**	1.3	1.8	2.0	1.7	1.3	1.8	1.9	1.66	4.7	5.4	5.6	5.23
2.	**Tap Water**	9.2	10.7	11.4	10.43	3.5	3.6	4.2	3.76	6.5	6.8	7.1	6.8
3.	**Well Water**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.	**Pond Water**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5.	**Waste Water**	33	35.1	37.2	35.1	9.8	12.4	14.1	12.1	3.8	4.2	4.5	4.16
6.	**Treated Water**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7.	**Any Other (Specify)**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 14. Water Consumption for various purposes in the university campus

Sl. No.	**Types of consumption**	**Consumption Normal range (L/capita/day)**	
		2022-2023	**2023-2024**
1.	Per capita domestic consumption at hostel and canteen	41	47
2.	Industrial and commercial demand at laboratories	53	59
3.	Public uses including fire demand, transport, washes	34	46
4.	Losses and waste as routine consumption	40	49
5.	Daily use (day-to-day use)	31	37

Note- Values indicate combined consumption at both the campuses including all offices, departments, laboratories, hostels etc.

Table 15. Soil health parameters of the different locations within the university campus

Sl. No.	**Details of Soil Parameters**	**Values**									
		Brambe Campus		**School Building (Manatu Campus)**		**Science Building (Manatu Campus)**		**Boy's Hostel (Manatu Campus)**		**Girl's Hostel (Manatu Campus)**	
		2022 – 23	**2023-24**	**2022-23**	**2023-24**	**2022-23**	**2023-24**	**2022-23**	**2023-24**	**2022-23**	**2023-24**
1.	**Soil pH**	7.1	7.4	7.3	7.5	7.2	7.5	7.1	7.4	7.4	7.6
2.	**Total Organic Carbon (ppm)**	4.3	5.12	6.61	7.23	4.84	4.93	5.22	5.31	5.43	5.58
3.	**Electrical Conductivity (micromhos/cm)**	234	198	284	352	273	288	241	304	279	293
4.	**Water Holding Capacity (w/v)**	86	82	77	88	73	81	72	79	69	64
5.	**Available Nitrogen (%)**	135	158	144	166	123	174	165	152	146	151
6.	**Available**	2.3	2.6	1.2	2.1	1.8	2.2	1.5	1.9	2.2	2.6

	Phosphorous (%)										
7.	**Available Potassium (%)**	21	26	19	24	18	19	21	24	21	27

Conclusion

The comprehensive soil and water audit conducted at the Central University of Jharkhand has provided a detailed and nuanced understanding of the current state of the campus's natural resources. This audit has highlighted both strengths and areas for improvement in the management of soil and water, presenting a clear picture of the environmental health of the university. Our analysis of soil samples from various parts of the campus has revealed a range of soil types and conditions. While some areas exhibit healthy, nutrient-rich soil suitable for diverse vegetation, other sections suffer from issues such as compaction, low organic matter content, and contamination by heavy metals and other pollutants. These problematic areas are often the result of historical land use practices, construction activities, or inadequate soil management techniques. Addressing these issues is essential for improving plant growth, reducing erosion, and enhancing the overall ecosystem services provided by the soil.

Water quality assessments have similarly revealed a mixed picture. The campus benefits from several clean and reliable water sources, essential for drinking, irrigation, and laboratory use. However, there are also significant challenges, including high levels of certain contaminants in some water bodies, inefficient water use practices, and areas where water conservation measures are urgently needed. For instance, high levels of nitrates and phosphates in some samples indicate potential contamination from agricultural runoff or improper waste disposal, which can lead to eutrophication in local water bodies.The audit also uncovered inefficiencies in water usage, particularly in irrigation and domestic consumption. Many irrigation systems are outdated or poorly maintained, leading to excessive water use and wastage. Similarly, leakages in the water distribution network and inefficient fixtures in buildings contribute to unnecessary water loss. By addressing these inefficiencies, the university can significantly reduce its water footprint, leading to cost savings and more sustainable water use.The audit’s findings underscore the importance of implementing a series of targeted interventions. For soil health, recommendations include adopting practices such as crop rotation, the use of cover crops, and the application of organic fertilizers to enhance soil fertility and structure. For areas affected by contamination, soil remediation techniques such as phytoremediation or bioremediation should be considered. Regular soil testing and

monitoring will ensure that these measures are effective and that soil health is maintained over time.

4.3. Green Audit

4.3.1 Introduction

The Green Audit of CUJ, offers a comprehensive assessment of environmental sustainability practices across its campuses in Brambe and Cheri-Manatu, spanning a total of 45 acres in Brambe and 319.28 acres in Cheri-Manatu. The flora and fauna diversity at CUJ campuses enriches its ecosystem. This report also evaluates CUJ's efforts towards disability accessibility, featuring facilities such as ramps, lifts, and wheelchairs that ensure inclusive campus access for all students. This report provides a detailed overview of CUJ's environmental stewardship, highlighting achievements, areas for improvement, and recommendations to further advancement in its commitment to sustainability.

The Green Audit Report of the Central University of Jharkhand (CUJ) aims to assess and document the institution's sustainability practices across its Brambe and Cheri-Manatu campuses. This evaluation is crucial in highlighting CUJ's efforts in biodiversity conservation, disability accessibility, indoor climate control, and sustainable landscape management. By analyzing these aspects, the report provides insights into CUJ's environmental stewardship and guides future initiatives towards fostering a greener and more inclusive campus environment.

The concept of the Green Audit Report revolves around evaluating CUJ's commitment to environmental sustainability. It focuses on documenting the diversity of flora and fauna, ensuring accessibility for individuals with disabilities, improving indoor air quality through vegetation strategies, and optimizing landscape management practices. By emphasizing these aspects, the report aims to promote awareness, guide sustainable practices, and enhance CUJ's role as a leader in integrating environmental responsibility into its educational mission and operational framework.

4.3.2 Campus Details

a) Total Campus area – 45 acres (Brambe) and 319.28 acres (Manatu)
b) Total Built-up Area - 189000 m^2(Brambe) and 103042 m^2 (Manatu)
c) Total Car Parking Area – 350 m^2(Brambe) and 280 m^2 (Manatu)

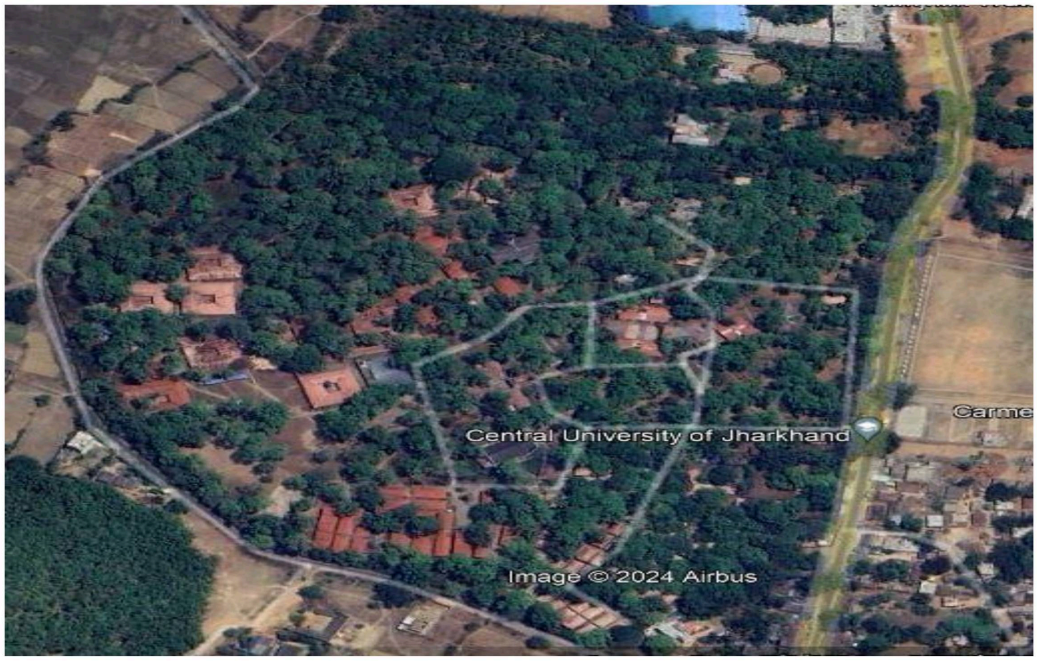


Figure 13. Aerial view of CUJ Brambe campus

Figure 13. Aerial view of CUJ Cheri – Manatu campus

4.3.3 Flora and Fauna Details

List of Flora (Plant species)

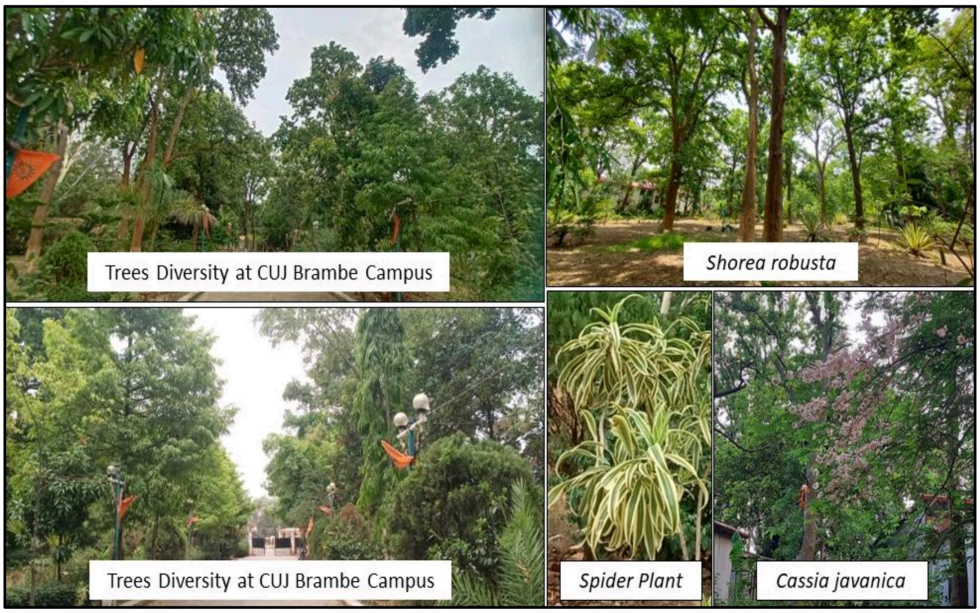
A. CUJ Brambe Campus

Table 16. Plants diversity in CUJBrambe campus		
Sl. No.	**Common Name**	**Scientific Name**
1.	Mango	*Mangifera indica*
2.	Ashoka	*Saracaasoca*
3.	Jamun	*Syzygiumcumini*
4.	Shisham	*Dalbergia sissoo*
5.	Beach Sheoak	*Casuarina equisetifolia*
6.	Mahua	*Madhuca longifolia*
7.	Jackfruit	*Artocarpus heterophyllus*
8.	Guava	*Psidium guajava*
9.	Sal	*Shorea robusta*
10.	Banyan	*Ficus benghalensis*
11.	Kaner (Yellowoleander)	*Cascabelathevetia*
12.	Gulmohar	*Delonix regia*
13.	Crepe Myrtle	*Lagerstroemia indica*
14.	Eucalyptus	*Eucalyptus teriticornis*
15.	Peepal	*Ficus religiosa*
16.	Sangwan	*Tectona grandis*
17.	Litchi	*Litchi chinensis*
18.	Kadam	*Neolamarckiacadamba*
19.	Kusum	*Schleichera oleosa*
20.	Bakain	*Melia azedarach*
21.	Tree of Heaven	*Ailanthus excelsa*
22.	Fishtail Palm	*Caryota mitis*
23.	Ber	*Ziziphus mauritiana*
24.	Chir Pine	Pinus roxburghii
25.	Amla	*Phyllanthus emblica*
26.	Golden dewdrop	*Durantaerecta*
27.	Champa	*Plumeria* spp.
28.	Banana	*Musa* spp.
29.	Papaya	*Carica papaya*
30.	Bamboo	*Bambusa vulgaris*
31.	Acacia	*Acacia auriculiformis*
32.	Bael	*Aegle marmelos*

Table 17. Shrubs Diversity in CUJ Brambe campus		
Sl. No.	**Common Name**	**Scientific Name**
1.	Lantana (Putus)	*Lantana camara*
2.	Hibiscus	*Hibiscus rosa-sinensis*
3.	Oleander	*Nerium oleander*
4.	Bougainvillea	*Bougainvillea glabra*
5.	Jasmine	*Jasminum sambac*
6.	Ixora	*Ixora coccinea*
7.	Rangoon Creeper	*Combretum indicum*
8.	Tamarind	*Tamarindus indica*
9.	Lemon	*Citrus limon*
10.	Pomegranate	*Punica granatum*
11.	Mussaenda	*Mussaendaerythrophylla*
12.	Crape Jasmine	*Tabernaemontanadivaricata*

Table 18. Herbs Diversity in CUJ Brambecampus		
Sl. No.	**Common Name**	**Scientific Name**
1.	Stinging Nettle	*Urtica dioica*
2.	Broadleaf Plantain	*Plantago major*
3.	Purslane	*Portulaca oleracea*
4.	Yarrow	*Achillea millefolium*
5.	Wood Sorrel	*Oxalis corniculata*
6.	Goldenrod	*Solidago canadensis*
7.	Mullein	*Verbascum thapsus*
8.	Carrot grass	*Parthenium hysterophorus*
9.	Touch me not	*Mimosa pudica*


Jacaranda sp.
Artocarpus heterophyllus
Polyalthia longifolia


Trees Diversity at CUJ Brambe Campus
Shorea robusta
Trees Diversity at CUJ Brambe Campus
Spider Plant
Cassia javanica

B. CUJ Cheri-Manatu Campus

Table 19. Tree Diversity in CUJ Cheri-Manatu Campus		
Sl. No.	**Common Name**	**Scientific Name**
8.	Mango	*Mangifera indica*
9.	Champak	*Magnolia champaca*
10.	Siris	*Albizia lebbeck*
11.	Argentine cedar	*Cedrela fissilis*
12.	Golden shower	*Cassia fistula*
13.	Avocado	*Persea americana*
14.	Leopard Tree	*Libidibia ferrea*
15.	Hagenia	*Pterocarpus erinaceous*
16.	Caucasian alder	*Ainus subcordata*
17.	Palash	*Butea monosperma*
18.	Shisham	*Dalbergia sissoo*
19.	Bamboo	*Bombax ceiba*
20.	Neem	*Azadirachta indica*
21.	Banyan	*Ficus benghalensis*
22.	Christmas Tree	*Araucaria columnaris*
23.	Palm Tree	*Foxtail Palm*
24.	Indian Rubber Tree	*Ficus elastic*
25.	Plumeria	*Plumeria rubra*
26.	Jackfruit	*Artocarpus heterophyllus*
27.	Peepal	*Ficus religiosa*
28.	Jamun	*Syzium cumini*
29.	Tree of Heaven	*Ailanthus excelsa*
30.	Date Palm	*Phoenix dactylifera*
31.	Karum	*Milletia pinnata*
32.	Mahua	*Madhuca longifolia*
33.	Sangwan	*Tectona grandis*
34.	Imli	*Taramindus indica*
35.	Ber	*Zizipus marituana*
36.	Ashoka	*Saraca asoca*
37.	Bael	*Aegle marmelos*

38.	Gulmohar	*Delonix regia*
39.	Papaya	*Carica papaya*
40.	Tendu	*Diospyros melanoxylon*
41.	Kadam	*Neolamarckia cadamba*
42.	Red Cedar	*Toona ciliate*

Table 20. Shrubs Diversityin CUJ Cheri-Manatu Campus

Sl. No.	Common Name	Scientific Name
1.	Horehound	*Mesosphaerum suaveolens*
2.	Tulsi	*Ocimum tenuiflorum*
3.	Castor oil plant	*Ricinus communis*
4.	Litchi Tomato	*Solanum sisymbriifolium*
5.	Congo Jute	*Urena lobate*
6.	Catmint	*Anisomeles indica*
7.	Akwan	*Calotropis procera*
8.	Bhat	*Clerodendrum infortunatum*
9.	Sickle pod	*Cassia tora*
10.	Cassia indico glory	*Indigofera cassioides*
11.	Pink morning	*Ipomoea carnea*
12.	Ratanjot	*Jatropha curcas*
13.	Lantana (Putus)	*Lantana camara*

Table 21. Herbs Diversity in CUJ Cheri-Manatu Campus		
Sl. No.	**Common Name**	**Scientific Name**
1.	Eyeball	*Acmella paniculata*
2.	Blanket grass	*Axonopusconpressus*
3.	Arbi (Kacchu)	*Colocasia esculenta*
4.	Goose grass	*Eleusine indica*
5.	Rattlebox	*Crotalaria pallida*
6.	Chaff flower	*Achyranthes aspera*
7.	Cocklebur	*Xanthium strumarium*
8.	Bean	*Phaseolus vulgaris*

List of Fauna (Mammals, Birds and Insects)

A. CUJ Brambe Campus

Table 22. Mammal Diversity in CUJ Brambe Campus		
Sl. No.	**Common Name**	**Scientific Name**
1.	Cat	*Felis catus*
2.	Dog	*Canis lupus familiaris*
3.	Bat	*Chiroptera* sp.
4.	House Mouse	*Mus musculus*

Table 23. Bird Diversity in CUJ Brambe Campus		
Sl. No.	**Common Name**	**Scientific Name**
1.	Common Myna (Mynah)	*Acridotheres tristis*
2.	Rock Pigeon	*Columba livia*
3.	Black Drongo	*Dicrurus macrocercus*
4.	Rose-ringed Parakeet	*Psittacula krameri*
5.	Asian Koel	*Eudynamys scolopaceus*
6.	House Crow	*Corvus splendens*
7.	Spotted Dove	*Spilopelia chinensis*

8.	Greater Coucal	*Centropus sinensis*
9.	Indian Pied Starling	*Gracupica contra*
10.	Woodpecker	*Dinopium benghalense*
11.	Indian Golden Oriole	*Oriolus kundoo*
12.	Spotted Owlet	*Athene brama*
13.	Purple Sunbird	*Cinnyris asiaticus*
14.	Black Kite	*Milvus migrans*
15.	Oriental Magpie-Robin	*Copsychus saularis*
16.	Warbler	*Orthotomus sutorius*
17.	Common Hawk-Cuckoo	*Hierococcyx varius*
18.	Red-wattled Lapwing	*Vanellus indicus*
19.	Brown-headed Barbet	*Psilopogon zevlanicus*
20.	Coppersmith Barbet	*Psilopogon haemacephalus*
21.	White-throated Kingfisher	*Halcyon smyrnensis*
22.	Rufous Treepie	*Dendrocitta vagabunda*
23.	Common Tailorbird	*Orthotomus sutorius*
24.	Red-vented Bulbul	*Pycnonotus cafer*
25.	White-browed Wagtail	*Motacillia maderaspatensis*
26.	Asian Green Bee-eater	*Merops orientalis*
27.	Indian Robin	*Copsychus saularis*
28.	White-broweed Wagtail	*Motacilla maderaspatensis*
29.	Yellow-footed Green-Pigeon	*Treron phoenicopterus*
30.	Laughing Dove	*Spilopelia senegalensis*
31.	Paddyfield Pipit	*Anthus rufulus*
32.	Red-whiskered Bulbul	*Pycnonotus jocosus*
33.	Indian Gray Hornbill	*Ocyceros birostris*
34.	Black-rumped Flameback	*Dinopium benghalense*
35.	Small Minivet	*Pericrocotus cinnamomeus*

36.	Alexandrine Parakeet	*Psittacula eupatria*
37.	Purple-rumped Sunbird	*Leptocoma zeylonica*
38.	House Sparrow	*Passer domesticus*
39.	Jungle Babbler	*Argya striata*
40.	Greater Flameback	*Chrysocolaptes guttacristatus*
41.	Asian Brown Flycatcher	*Muscicapa dauurica*

Insect Diversity

Moths, Cockroaches, Grasshoppers, Crickets, Centipedes, Millipedes, Scorpions, Beetles, Fireflies, Honey bees, Asian Weaver Ant, Mantis, Platycorynus peregrinus, Common Indian Cricket Frog, Cocoa Branch Borar, Mosquito, Garden Cross Spiders, Spiders, Giant Wood Spiders, Termites, Bees, Wasps, Snaile, Bumblebee, Butterflies, Spiders, Flies, Wolf Spiders, Grass Spiders, Ladybird Beetle, Ants, Perchers, Aphids, Skimmers, Earthworms and many more unidentified insect species can be easily observed in the university campus.

Mammal Diversity

A. CUJ Cheri-Manatu Campus

Table 24. Mammal Diversity in CUJ Cheri-Manatu Campus

Sl. No.	Common Name	Scientific Name
1.	Cat	*Felis catus*
2.	Dog	*Canis lupus familiaris*
3.	Cow	*Bos taurus*
4.	Goat	*Capra aegagrus hircus*
5.	House Mouse	*Mus musculus*

Table 25. Bird Diversity		
Sl.No.	**Common Name**	**Scientific Name**
1.	Common Myna (Mynah)	*Acridotheres tristis*
2.	Yellow-footed Green-Pigeon	*Treron phoenicopterus*
3.	Black Drongo	*Dicrurus macrocercus*
4.	Rose-ringed Parakeet	*Psittacula krameri*
5.	Asian Koel	*Eudynamys scolopaceus*
6.	House Crow	*Corvus splendens*
7.	Spotted Dove	*Spilopelia chinensis*
8.	Common Kestrel	*Falco tinnunculus*
9.	Indian Pied Starling	*Gracupica contra*
10.	Woodpecker	*Dinopium benghalense*
11.	Golden Oriole	*Oriolus kundoo*
12.	Spotted Owlet	*Athene brama*
13.	Purple Sunbird	*Cinnyris asiaticus*
14.	Black Kite	*Milvus migrans*
15.	Oriental Magpie-Robin	*Copsychus saularis*
16.	Warbler	*Orthotomus sutorius*
17.	Common Hawk-Cuckoo	*Hierococcyx varius*
18.	Red-vented Bulbul	*Pycnonotus cafer*
19.	Brown-headed Barbet	*Psilopogon zevlanicus*
20.	Coppersmith Barbet	*Psilopogon haemacephalus*
21.	White-throated Kingfisher	*Halcyon smyrnensis*
22.	Indian Robin	*Copsychus saularis*
23.	Laughing Dove	*Spilopelia senegalensis*
24.	Rock Pigeon	*Columba livia*
25.	Swallow sp.	*Hirundo* sp.

Vegetation to maintain the indoor climate by planting trees, herbs, shrubs, grass, aquatic plants

There has been no such initiative, but vegetation should be done to maintain the indoor climate. Indoor plants can greatly enhance the environment of a university campus, providing both aesthetic and health benefits. Here are some indoor plants that are particularly useful for university settings:

1) Spider Plant (*Chlorophytum comosum*): It is easy to care for, doesn't require frequent watering and efficient in cleaning formaldehyde, xylene and toluene. Improves indoor air quality and reduces stress and is among the top varieties for removing volatile organic carbon (VOC) and other pollutants from indoor air.

2) Snake Plant (*Sansevieria trifasciata*): survives on low water and light, regulates indoor humidity levels, improves air quality by removing toxins such as formaldehyde and absorbs carbon dioxide and releases oxygen.

3) Peace Lily (*Spathiphyllum*): Known for its air-purifying qualities and attractive white flowers, it thrives in low light.

4) Aloe Vera: Not only does it have air-purifying properties, but the gel from its leaves can also be used to treat minor cuts and burns.

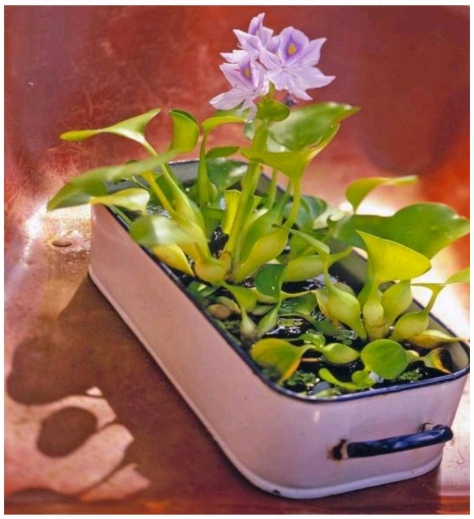
5) Pothos (*Epipremnumaureum*): Hardy and versatile, it can grow in various lighting conditions and is known for filtering out harmful chemicals from the air.

6) Philodendron: Easy to grow and maintain, it comes in various species that can adapt to different indoor environments.

7) Chinese Evergreen (*Aglaonema*): Prefers low light conditions and helps in removing toxins such as benzene and formaldehyde from the air.

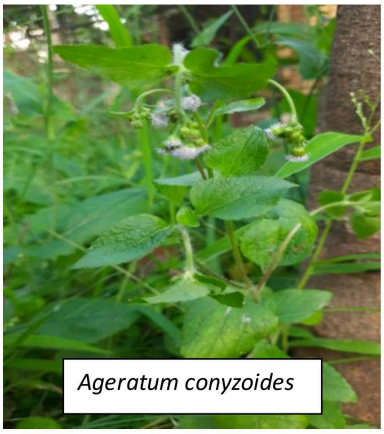
8) Money plant (*Epipremnumaureum*): Acts as a natural air purifier and removes environmental toxins.

9) Water hyacinth (*Eichhornia crassipes*): Improves indoor air quality by absorbing toxins like benzene and formaldehyde, regulating humidity through transpiration, and increasing oxygen levels. Its lush foliage adds aesthetic appeal and reduces stress, while its ability to filter water enhances overall indoor environmental quality



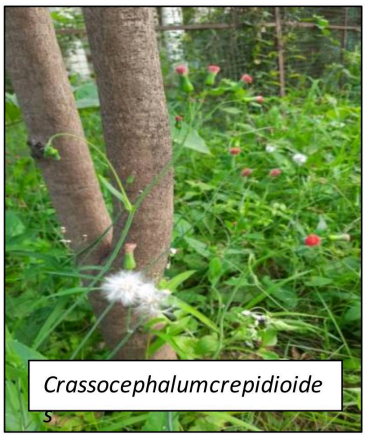
Presence of any non-native plants (invasive species), endangered plants (if any) in the campus ecosystem

Invasive plant species are those that have been introduced to an area where they do not naturally occur. While some non-native species can coexist without significant harm, others become invasive, spreading rapidly and outcompeting native species. Non-Native (Invasive) Plants such as *Lantana camara*, *Parthenium hysterophorus*, *Solanum virginianum*, *Crassocephalumcrepidioides,Ageratum conyzoides, Leucaena leucocephala, Stachytarphetaurticifolia*and *Bidets pilosa* are present in the Brambe campus while *Lantana camara, Parthenium hysterophorus*,*Mesosphaerumsuaveolens*, *Ageratum conyzoides,Solanum virginianum* and*Bidets pilosa* are present in the Cheri-Manatu campus.



Ageratum conyzoides

Leucaena leucocephala



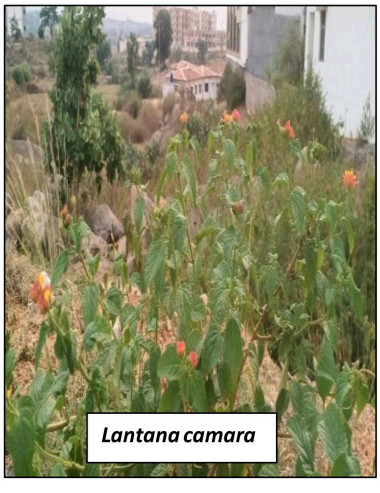
Crassocephalumcrepidioide

Mesosphaerumsuaveolens

Solanum virginianum

***Parthenium hysterophorus* L.**

Stachytarphetaurticifolia



Lantana camara

4.3.4. Landscape designed based on the shading pattern of the building to maintain micro climate and to control soil erosion without disturbing the biodiversity

Unfortunately, the university's landscape is not designed based on the shading pattern of the building to maintain the microclimate and to control soil erosion without disturbing the biodiversity.

4.3.5. Establishment of Gardens like Herbal, Vertical, Terrace, Kitchen, Ornamental

At the university level, establishing diverse types of gardens can offer numerous educational, environmental, and community benefits. Each garden type—Herbal, Vertical, Terrace, Kitchen, and Ornamental—serves unique purposes that contribute to the campus's sustainability. Herbal gardens provide valuable educational and research opportunities in botany, traditional and alternative medicine, and ethnobotany. They support health and wellness by supplying fresh herbs and promote sustainability by reducing the need for transported produce. Vertical gardens are ideal for universities with limited ground space, as they efficiently use vertical areas on walls and structures. They enhance urban greening by increasing green cover in densely built environments. Benefits include improved air quality, reduced energy costs through natural building insulation, and support for biodiversity by providing habitats for various plant species, insects, and birds. Terrace gardens are highly suitable for universities as they optimize underused rooftop spaces, manage storm water runoff, and reduce flooding risks. They enhance energy efficiency by insulating buildings, offer social and recreational areas for campus life, and provide hands-on learning opportunities in urban agriculture and sustainability and ornamental gardens enhance campus aesthetics, creating attractive and inviting spaces that appeal to prospective students and visitors while offering serene areas that promote mental well-being. Many universities have set up similar gardens, and CUJ should consider creating such gardens as well.

4.3.6. Sign Boards of green campus, go green, Eco-friendly campus, etc. to create awareness among the stakeholders.

Currently, the university lacks sign boards with messages such as "Green Campus," "Go Green," and "Eco-Friendly Campus," which are crucial for fostering environmental awareness. Introducing these signboards could significantly enhance our community's commitment to sustainable practices by providing constant visual reminders to adopt eco-friendly habits. We recommend installing these signs to promote and support our university's green initiatives.

4.3.7. Building plan and design document to verify whether the building is constructed without disturbing the endangered species, HVAC system.

Unfortunately, the university currently does not possess the building plan and design documents regarding the impact on endangered species and HVAC systems.

4.3.8. Training, outreach and Awareness programmes conducted for Green initiatives and sustainable development.

While the university itself does not currently organize such programs, the Environmental Sciences department does conduct events on environmental awareness and related days. These programs are crucial in fostering a culture of environmental responsibility, educating our community on sustainable practices, and encouraging active participation in preserving our natural resources.

4.3.9. Any biodiversity conservation activities initiated among the stakeholders.

The university currently does not organize biodiversity conservation activities, but they can initiate such activities in near future. Activities such as establishment of native plant gardens and wetland restoration projects to support local wildlife; biodiversity surveys and initiatives such as bird counts; integration of sustainable landscaping with rain gardens and green roofs; and collaboration with local and global conservation partners could be initiated.These efforts will promote biodiversity conservation and engagement across the university community.

4.3.10. Traffic survey carried out for continuous 24 hours (to measure number and type of vehicles passing on the existing main roads giving access to the campus) to minimize the carbon emission to the environment.

The traffic survey was conducted for 24 hours aimed to minimize carbon emissions by monitoring the number and type of vehicles. It was observed that buses, cars, motorcycles, autorickshaw, ambulance, lorries and e-vehicles were the primary types of vehicles passing through the roads, with varying numbers at both Brambe and Manatu campuses. At brambe, numbers were 7, 30, 50, 10, 01,02 and 5 respectively, and at manatu the numbers were found to be 7, 70, 100, 30, 02, 05, and 10 respectively. The higher numbers of cars and motorcycles at both Brambe and Manatu is contributing significantly to carbon emissions. To reduce this, encouraging the use of buses and e-vehicles through improved public transport options and incentives for e-vehicle adoption would be effective strategies.

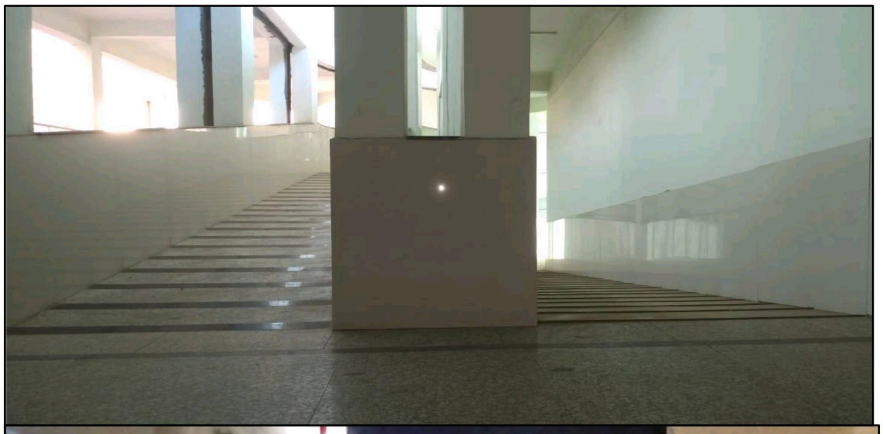
4.3.11. Details of Documents, Records & Photos

a. Disability facilities like Ramp, Lift, Wheelchair, etc available in the campus.

Disability-friendly facilities such as lift, ramp and wheelchairs are available in the university campus. These facilities ensure accessibility for students with mobility impairments, enabling

independent movement and full participation in campus life. These facilities promote inclusivity and equal educational opportunities, fostering autonomy and self-reliance among students with disabilities.

- Lift facility in the university
- Ramp facility in the university
- Wheelchairs in the university



Conclusion

The Green Audit Report of CUJ underscores the university's proactive steps towards environmental sustainability while highlighting areas for further improvement. CUJ's

expansive campuses in Brambe and Cheri-Manatu serve as dynamic ecosystems supporting a diverse range of flora and fauna. The report acknowledges CUJ's efforts towards disability accessibility, featuring facilities such as ramps, lifts, and wheelchairs that ensure inclusive campus access for all students. However, opportunities exist for further improvement through vegetation planning and the introduction of indoor plants, which can significantly improve air quality and contribute to a healthier learning environment. CUJ's landscape management practices reveal potential for improvement in aligning with sustainable principles to mitigate soil erosion and preserve biodiversity. Initiatives such as establishing various types of gardens could not only beautify the campus but also provide educational and community benefits. While the university has initiated programs in environmental awareness through academic endeavors, the introduction of signboards promoting green initiatives, organization of biodiversity conservation and awareness programs could further enhance campus-wide participation in sustainability efforts. CUJ is encouraged to continue fostering a culture of environmental responsibility through targeted initiatives such as biodiversity conservation projects and sustainable landscaping. By leveraging its resources and engaging stakeholders, CUJ can further strengthen its position as a regional leader in integrating green practices into its education and campus operations. Ultimately, the Green Audit Report serves as a roadmap for CUJ to strengthen its commitment to sustainability, ensuring a greener, more inclusive, and environmentally conscious future for its students, faculty, and surrounding communities.

4.4. Environmental audit

4.4.1. Introduction

Environmental audit is a general term that reflects various kinds of evaluations intended to identify environmental compliance and management system, implementation gaps, along with related corrective actions. It is a tool to assess general practices implemented by organization towards conservation of environment and function in a manner to minimize its harmful environmental impact.

An environmental audit is of paramount importance in the context of effective environmental governance. The trust of this audit report is to highlight the adequacy and effectiveness of interventions and approaches made by the Central University of Jharkhand (CUJ) to tackle some important environmental issues in the campus. The findings and recommendations made in this audit report will enable the administration to take corrective measures and to frame policies in order to improve the environmental efficiency and governance. Being a premier

institution of higher learning, CUJ is aware of its responsibilities towards environmental issues and therefore has resolved to play a major role in the education, research, policy formation and information exchange necessary for a sustained environmental campaign.

The objective of this report is to evaluate the activities being carried in the campus and provide the suggestions and recommendation for incorporation of environmental concerns in the university policies and planning. This report is based on the survey and the records maintained by the administration of the University and different departments. A questionnaire was framed and employed in collection of information and data. The audit was conducted by a team of faculty and students with support from various stake holders of CUJ. The current environmental audit represents the first stage in university efforts to build environmental sustainability on the campus. It is indeed the reflection of CUJ's endeavor to exercise leadership in promoting sustainability and an institutional obligation to instill among all students and each of us, and those in the broader community a sense of environmental stewardship. This commitment of CUJ has lead to actions whose reflection is visible remarkably on ground. This environmental audit conducted is not only significant for the institution, but also for the other institutions to emulate and adopt as a model and therefore contribute regionally as well as nationally in this endeavour of sustainable environment for all.

4.4.2. Need for environmental audit

If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Thus, it is imperative that CUJ evaluates its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background, it becomes imperative to adopt the system of the "**Green Campus**" for the Institutes which will lead to sustainable development and at the same time reduces a sizable amount of atmospheric carbon dioxide from the environment. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all higher educational institutions should submit an annual environmental audit report. Moreover, it is part of Corporate Social Responsibility (CSR) of the higher educational institutions to ensure that they contribute towards the reduction of global warming through carbon footprint reduction measures.

4.4.3. Objectives of environmental audit

Concern about environmental degradation and realization of values of environment are logical consequences of scholarly research, teaching and learning process. In its pursuit for improving environmental quality and to maintain a pristine environment for the future generations of students, CUJ has made a self-inquiry on environmental quality of the campus with the following objectives to achieve:

i. To undertake baseline survey regarding implementation of green practices in the university campus.
ii. To identify and analyses significant environmental issues in campus.
iii. To generates awareness among students concerning real issues of environment and its sustainability.
iv. To examine the current practices which can have impact on the environment such as resource utilization, waste management, energy conservation, etc.
v. To provide alternative eco-friendly practices to meet the needs of the campus without affecting the environment of the campus.
vi. To improve resource use through reduction in material use, to minimize waste and to identify recycling opportunities.
vii. To prepare environmental audit report and listing the green practices followed by University.

4.4.4. Benefits of environment audit to educational institutions

There are many advantages of environment audit to an educational Institute:

i. It would help to protect the environment in and around the campus.
ii. Recognize the cost saving methods through waste minimization and energy conservation.
iii. Empower the organization to frame a better environmental performance.
iv. It portrays good image of institution through its clean and green campus.
v. Finally, it will help to build positive impression for through green initiatives the upcoming NAAC visit.

4.4.5. Methodology

The present study is based on survey by questionnaire and the records maintained by the administration of the university and different departments. The survey was carried out by using a set of questionnaires (Table 1).

Survey by questionnaire

The data regarding various practices that are carried out in the campus was collected using a questionnaire survey. With the help of questionnaires some data related to environmental audit was collected from students, employees by interaction with them.

Evaluation of the data

A considerable amount of data and information was gathered during the audit procedure. It consists of the audit protocol, documentation supplied by the administration of the University, the auditor's own notes and observation, results of sampling and monitoring, photographs, records, plans. maps, audit findings and reviewing documentation against standards, policies and action plans and gathering evidence to support the answer to the questions.

Analysis and reporting

The tabulated data from questionnaires was used for further analysis. For better understating of the results and to avid complications, average and percentage of the tables were calculated. The obtained data was assessed by the faculty members of the Department of Environmental Sciences, CUJ.

4.4.6. Data Analysis

a) Campus Details

CUJ came into being under the Central Universities Act, 2009 on 1st of March 2009. The above Act envisages establishing and incorporating Universities for teaching and research in various states. Central University of Jharkhand started with a vision to specially focus on relevant present age educational drives with an emphasis on research in cutting-edge technologies. The University has two operational campuses (temporary campus and permanent campus).The Brambe campus (temporary) is a 45acre transit campus located about 25 kms from the heart of Ranchi city. It includes 70 independent class rooms and teaching labs, a 450-seat auditorium, research labs for sciences, engineering workshops and computer lab. The university provides on-campus accommodation to students (total capacity 1000 boys and girls in separate hostels). The Cheri-Manatu campus (permanent) is a 510 acre campus located 17 kms from the epicenter of Ranchi city. Its infrastructure is developing rapidly. The administrative activities, undergraduate and postgraduate classes of various departments are operational from this campus. Separate hostel for boys/girls and library is also located in this campus. More details of facilities present in the University are given in table 1.

Table 26. Details of CUJ campus			
Sl.No.	**Details/Descriptions**	**Audit Findings**	
		Brambe Campus	**Manatu Campus**
1.	Total Strength of Students in the Educational Institutions	-	
2.	Total Strength of Employees in the Organization	-	
3.	Total Number of Buses in the campus	**7**	
4.	Number of Cars entering in the campus	**30**	**70**
5.	Number of Motorcycles entering in the campus	**40**	**100**
6.	Number of other Vehicles like Lorry, Ambulance, Jeep,Trucks, Cranes, Poclain, and etc. entering in the campus	**01**	**01**
7.	Number of E-Vehicles in the campus	**05**	**10**
8.	Number of RO Water Plants	**12**	**18**
9.	Number of Bore wells	**09**	**10**
10.	Number of Open wells	**01**	**-**
11.	Number of Percolation Ponds/Water reservoirs	**01**	**03**
12.	Number of Waste water treatment facility	**-**	**-**
13.	Number of Rain harvesting system	**-**	**04**
14.	Number of Composting pits and Vermicomposting units	**01**	**-**

4.4.7. Details of aspects discussed in the environmental audit conducted as per norms and regulations:

a) Availability of Waste water/Sewage treatment unit

Currently, at both campuses the university does not have an on-site wastewater/sewage treatment unit. Wastewater generated on campus is managed through an agreement with the local municipal treatment facility, which handles and treats the sewage according to regional standards. The university ensures that all wastewater is channelled to this facility, adhering to local environmental regulations and guidelines. Despite the absence of an on-site treatment unit, the university is committed to minimizing its environmental impact and is exploring sustainable wastewater management solutions.

Recommendations

When a university does not have an on-site wastewater/sewage treatment unit, several steps can be taken to manage wastewater more sustainably and to plan for future improvements. Here are some recommendations:

i. University should conduct a thorough assessment of the current wastewater generation and disposal methods and identify key sources of wastewater on campus.

ii. University should maintain detailed records of wastewater volumes and disposal practices. This will aid in monitoring and future planning.

iii. University should launch initiatives to reduce water usage on campus, such as installing low-flow fixtures, promoting water-saving practices among students and staff, and repairing leaks promptly.

iv. University should promote the reuse and recycling of treated wastewater for non-potable purposes, such as irrigation, cooling systems, and toilet flushing.

v. University should integrate green infrastructure practices, such as rain gardens and permeable pavements, to manage stormwater and reduce the burden on sewage systems.

b) Parking areas under the trees or shades with high albedo materials to maintain eco-friendly atmosphere

At Brambe campus, university has taken several steps to create eco-friendly parking areas that contribute to a sustainable campus environment. Many of CUJ parking areas, particularly those near the main academic buildings and hostel areas, are shaded by mature trees. Approximately 80% of the parking spaces are under tree cover. The trees include native species such as Sal and Mango, which provide extensive canopy coverage and enhance biodiversity. The university has applied reflective coatings on parking lot surfaces to increase their albedo. This helps in reflecting more sunlight and reducing heat absorption. Vehicles parked in shaded areas require less air conditioning when they start, leading to lower fuel consumption and reduced emissions. However, the Manatu campus lacks parking areas with tree cover or shaded by materials with high albedo, which are important for maintaining an eco-friendly atmosphere.

Figure 1. Parking areas under the trees or shades in CUJ campus

Recommendations

i. University should install solar panel canopies over parking areas to provide shade and generate renewable energy.
ii. University should consider using pergolas, shade sails, or other shading structures where tree planting is impractical.
iii. University should establish green buffers and strips within and around parking lots to provide natural shade and enhance air quality.

c) Zebra Crossing to make crossing the road safer for everyone

Zebra crossings, marked by distinct white stripes on the road, are crucial for ensuring the safety of pedestrians, particularly in a university setting where there is a high volume of foot traffic. They legally give pedestrians the right of way, reducing the risk of accidents and conflicts between pedestrians and vehicles. Unfortunately, in both campus of CUJ lacks zebra crossing.

Recommendations

i. University should identify high-traffic areas and install zebra crossings at key locations such as near school building, science building, admin building, libraries, hostels etc.,
ii. University should ensure that zebra crossings are well-maintained and clearly visible. Regular repainting and prompt repairs are essential for maintaining their effectiveness.
iii. University should install proper lighting around zebra crossings to ensure they are visible during night time and poor weather conditions, improving safety at all times.

d) Eco- friendly path for pedestrians

Developing an eco-friendly pedestrian path on a university campus can greatly enhance sustainability, promote health, and ensure safety for students, staff, and visitors. In both campus of CUJ, university has taken several steps to create pedestrian path to make eco-friendly foot path for pedestrians. For creating pedestrian paths, CUJ has used permeable paving materials such as porous asphalt, concrete, or interlocking pavers to allow rainwater to seep through. This approach reduces runoff and promotes groundwater recharge.

Figure 2. Pedestrian path in CUJ campus.

e) Biogas plant facility

CUJ has student mess and cafeterias at both campus, which generates organic waste such as food waste, green and other biodegradable materials. Unfortunately, there is a lack of biogas plant facilities at both campus of CUJ. When a university lacks a biogas plant facility, it misses out on a sustainable method to manage organic waste and generate renewable energy.

Recommendations

i. University should conduct a thorough assessment of the campus's organic waste generation and analyse the technical and financial aspects of installing a biogas plant.
ii. University should identify and apply for grants, subsidies, and partnership opportunities to secure the necessary funding for the project.
iii. University should choose an appropriate biogas plant design and technology based on the campus's specific needs and conditions.
iv. University should develop a detailed project plan and engage professional consultants for the installation and commissioning of the biogas plant.

f) Implementation of recycling processes through vermicompost, composting pit, farmyard, organic and green manures for degradation of bio wastes to avoid the practice of chemical fertilizers for maintaining soil health

Implementing recycling processes through vermicomposting, composting pits, farmyard manure, and the use of organic and green manures can significantly enhance soil health and reduce reliance on chemical fertilizers. CUJ has its own vermicomposting facilities at the Brambe campus. Waste generated from student messes and cafeterias is used as feedstock for

making vermicompost. Additionally, CUJ provides hands-on training programs on vermicomposting processes to students and nearby villagers.

Figure 3. Vermicomposting facilities at CUJ campus.

g) Availability of safety measures like fire extinguisher and the fire safety sand buckets in the campus.

Ensuring the availability of safety measures like fire extinguishers and fire safety sand buckets on campus is crucial for protecting lives and property in the event of a fire. Adequate number of fire extinguishers and fire safety sand buckets are available across both campus of CUJ. All fire safety equipment in CUJ is regularly inspected, serviced, and in good working condition. In the CUJ, all fire extinguishers are strategically placed in easily accessible locations, especially in high-risk areas such as laboratories, kitchens, and mechanical rooms.

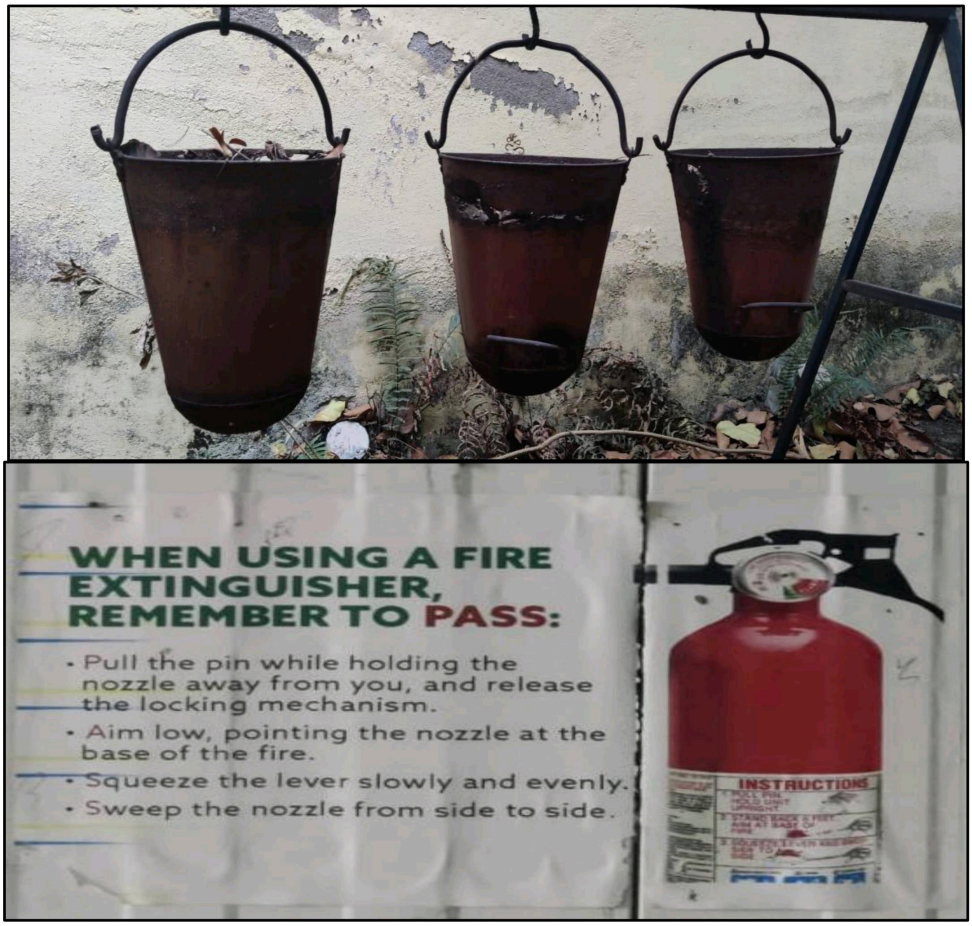


Figure 4. Availability of safety measures like fire extinguisher and the fire safety sand buckets in the campus.

h) Environment Impact Assessment for the life cycle of building to maintain sustainability

There is a lack of Environment Impact Assessment (EIA) forth e life cycle of building to maintain sustainability at both campus of CUJ. The absence of an EIA for the life cycle of buildings can hinder sustainability efforts. The university acknowledges the importance of conducting an EIA for the life cycle of buildings to maintain sustainability. To address this, the university has initiated a comprehensive Life Cycle Assessment (LCA) for all new and existing buildings. The LCA evaluates the environmental impacts of buildings from construction to demolition, considering factors such as energy use, materials, water consumption, and waste generation. Sustainable practices, including adherence to green building standards, energy efficiency, and waste management, are being implemented to reduce environmental impacts.

Recommendations

i. University should perform an LCA to evaluate the environmental impacts of a building throughout its life cycle, from construction to demolition.

ii. University should define the scope and methodology of the assessment, considering factors such as energy use, materials, water consumption, and waste generation.
iii. University should incorporate energy-efficient systems and renewable energy sources to reduce the building's carbon footprint.
iv. University should use environmentally friendly materials with low embodied energy and high recyclability.

i) Availability of disaster management plan

Having a comprehensive disaster management plan is essential for ensuring the safety and well-being of everyone on campus during emergencies. Unfortunately, there is a lack of disaster management plan at both campus of CUJ. The absence of a disaster management plan poses significant risks to the safety and well-being of individuals on campus.

Recommendations

i. University should begin the process of developing a comprehensive disaster management plan tailored to the university's specific needs and risks.
ii. University should implement temporary measures to address immediate safety concerns, such as establishing emergency evacuation procedures and communication protocols.
iii. University should conduct a thorough assessment to identify potential hazards and risks specific to the university's location, infrastructure, and operations.
iv. University should develop policies and procedures for emergency response, evacuation, sheltering, communication, and resource management.

j) Emergency preparedness-Mock drill for disaster management (Fire safety) for creating awareness to the stakeholders.

Conducting a mock drill for disaster management (fire safety) is an excellent way to create awareness among stakeholders and prepare them for emergencies. Adequate numbers of fire extinguishers are available across both campus of CUJ which are in operational. University provides additional training and awareness sessions based on the drill's outcomes to enhance stakeholders' preparedness for emergencies. By conducting regular mock drills for fire safety, the university can enhance stakeholders' awareness, preparedness, and response capabilities in the event of a real emergency, ultimately ensuring a safer campus environment for all.

k) Irrigation (drip and sprinkler irrigations, etc.,) for water &energy conservation purpose

The availability of irrigation systems such as drip and sprinkler irrigation can significantly contribute to water and energy conservation efforts. Unfortunately, there is a lack of Irrigation (drip and sprinkler irrigations, etc.,) for water &energy conservation purpose at both campus of CUJ. The absence of irrigation systems such as drip and sprinkler irrigation can hinder water and energy conservation efforts. In line with commitment to environmental stewardship and energy conservation, CUJ propose the implementation of drip sprinkler irrigation systems across campus.

Recommendations

i. University should develop a plan to install drip and sprinkler irrigation systems in the future, considering budgetary and logistical constraints.
ii. University should explore alternative water conservation methods, such as rainwater harvesting, to mitigate the lack of irrigation systems.
iii. University should implement energy-efficient practices in other areas of campus operations to offset the lack of energy-saving irrigation systems.
iv. University should consider using renewable energy sources for other campus activities to reduce overall energy consumption.

l) Any bicycles, electric bikes and battery-operated electric car, Golf Cart vehicles for internal mobility for the stakeholders to maintain an eco-friendly campus to minimize the carbon emission.

The availability of bicycles, electric bikes, battery-operated electric cars, and golf cart vehicles for internal mobility can significantly contribute to maintaining an eco-friendly campus, minimizing carbon emissions, and promoting sustainable transportation practices among stakeholders. Unfortunately, there is a lack of bicycles, electric bikes and battery-operated electric car, Golf Cart vehicles for internal mobility for the stakeholders at both campus of CUJ. Without these eco-friendly transportation options in University, stakeholders may rely more heavily on traditional vehicles, leading to higher carbon emissions and contributing to air pollution. It can hinder the university's efforts to achieve its sustainability goals, including reducing carbon footprint and promoting eco-friendly practices.

Recommendations

i. University should consider acquiring bicycles, electric bikes, battery-operated electric cars, and golf cart vehicles to provide sustainable transportation options for stakeholders.
ii. University should implement a fleet management program to ensure the efficient use and maintenance of these vehicles.

iii. University should develop or update transportation policies to include provisions for eco-friendly transportation options.
iv. University should create dedicated bicycle lanes and parking areas to promote cycling on campus.

m) Public transport, low-carbon emitting vehicles, battery operated vehicles, biofuel use to control of car smokes and exhaust.

Public transport and low-carbon-emitting vehicles produce fewer emissions per passenger compared to traditional cars, leading to improved air quality and reduced health risks from pollutants.Overall**,** the use of public transport, low-carbon-emitting vehicles, battery-operated vehicles, and biofuels can play a significant role in controlling car smoke and exhaust emissions, leading to a cleaner and more sustainable campus environment.CUJ has its own public transport facilities, with a total of 7 buses available on campus. These buses continuously move to pick up and drop off university students and staff**.** Unfortunately, there is a lack of low-carbon emitting vehicles, battery operated vehicles, biofuel use vehicles at both campus of CUJ. The non-availability of these cleaner transportation options in university can have significant negative impacts on air quality, public health, environmental sustainability, and compliance with regulations.

Recommendations

i. University should consider introducing hybrid vehicles that combine traditional fuel engines with electric motors to reduce emissions.
ii. University should Launch awareness campaigns to educate stakeholders about the benefits of using low-carbon emitting vehicles and bio fuels.
iii. University should install electric vehicle charging stations on campus to support the use of battery-operated vehicles.
iv. University should explore public-private partnerships for funding and implementing sustainable transportation initiatives on campus.
v. University should support research initiatives focused on developing and improving low-carbon emitting vehicles and biofuel technologies.

n) Resting places-Stone benches for the stake holder

CUJ is committed to providing a comfortable and eco-friendly environment for its stakeholders, including students, faculty, staff, and visitors. One of the key elements of this commitment is the availability of resting places, such as stone benches, across the campus. The university currently has several stone benches strategically placed throughout the Brambe

campus. These benches are located in key areas, including: main walkways, gardens and green spaces, near academic buildings, around recreational areas, near parking lots,bus stop and sport complex. The university plans to increase the number of stone benches at Manatu campus in response to stakeholder feedback and growing campus population. Additional stone benches will be integrated into new and existing green spaces to further promote outdoor activities and environmental consciousness.

Figure 5. Resting places for the stake holders to provide eco-friendly environment at CUJ.

o) Rain water harvesting system and water recharging facilities to save every drop of rain water

The university is dedicated to sustainable water management practices to conserve water resources and promote environmental sustainability. A key aspect of this commitment is the implementation of rainwater harvesting systems and water recharging facilities to save and efficiently use every drop of rainwater. The university has installed 4 rainwater harvesting systems across various buildings and areas on Manatu campus. There are 4 (1 in Brabme and 3 in Manatu campus) water recharging facilities strategically located to maximize groundwater replenishment. The rainwater harvesting systems are designed to capture and store rainwater from rooftops and other surfaces. Collected rainwater is stored in underground tanks or cisterns and is used for non-potable purposes. Water recharging facilities enhance groundwater levels, contributing to the long-term sustainability of local water resources. The university plans to expand the rainwater harvesting and water recharging infrastructure to cover additional buildings and areas.

Figure 6. Rain water harvesting system and water recharging facilities in CUJ campus.

p) Sign boards like plastic free campus, automobiles restricted area, save water, don't waste food, turn off tap water after use etc., to create awareness

The management at CUJ has strategically placed sign boards with messages like Save Water, Save Life, plastic free campus etc., to create awareness among the stakeholders across the campus. These signs serve as constant reminders to students, faculty, staff, and visitors about the importance of conserving environment and the role each individual play in this effort. The presence of these sign boards contributes significantly to raising awareness about water conservation. They are placed in high-visibility areas such as restrooms, cafeterias, lecture halls, and common areas, ensuring that the message reaches a wide audience. By repeatedly encountering these reminders, individuals are more likely to adopt water-saving habits in their daily routines, such as turning off taps when not in use, taking shorter showers, and reporting leaks promptly. Moreover, these signs reinforce the university's commitment to environmental sustainability and responsible resource management. They help foster a culture of conservation, encouraging everyone on campus to take personal responsibility for reducing water usage. This collective effort not only helps in conserving water but also instils a sense of community and shared purpose in protecting vital natural resources.

Figure 7.Sign boards with messages to create awareness among the stakeholders in CUJ campus.

q) Planting of Tree species implemented for all streets /roads to provide shade to pedestrians and reduce solar gain

The CUJ is committed to creating a comfortable and sustainable campus environment. One of the key initiatives towards this goal is the planting of tree species along streets and roads to provide shade for pedestrians and reduce solar gain. The university has implemented a comprehensive tree planting initiative covering all major streets and roads on campus. Recently, on the eve of World Environment Day 2024, CUJ, in collaboration with L&T Pvt. Limited, committed to planting a total of ten thousand plants across the campus. The selected tree species include *Mangifera indica, Saracaasoca, Syzygiumcumini, Dalbergia sissoo, Madhuca longifolia, Shorea robusta*, etc., which are known for their broad canopies, fast growth, and suitability to the local climate. The planted trees provide essential shade for pedestrians, making walking on campus more comfortable, especially during hot weather. The presence of trees enhances the visual appeal of the campus, creating a more inviting and pleasant environment.

Figure 8. Plantation drive at CUJ campus.

r) Environment sustainability courses like environmental science & engineering, environmental management, environmental monitoring, green skill development, climate change, global warming, etc.) to the stakeholders

The CUJ is dedicated to promoting environmental sustainability and equipping stakeholders with the knowledge and skills necessary to address environmental challenges. This commitment is reflected in the range of environment sustainability courses offered across various departments. CUJ offers environment sustainability courses to students in all departments as a major or minor paper. This course provides a comprehensive understanding of the principles of environmental science and engineering, focusing on sustainable practices, pollution control, and environmental technologies. This course also covers the strategies and techniques for managing environmental resources effectively, including environmental policy, planning, and sustainable development. These courses equip students, faculty, and staff with a deep understanding of environmental issues and the skills needed to address them. The university employs highly qualified faculty members with expertise in environmental sciences and sustainability. Courses are supported by state-of-the-art laboratories, research centers, and field stations for hands-on learning and research. The university collaborates with industry partners to provide practical training and real-world experience through internships, projects, and workshops. The university plans to continuously update and enhance the curriculum to reflect the latest advancements in environmental science and sustainability.

Code	Paper	Credit (L+T+P)
ENV/M/411010	Ecology and Ecosystem	2+1+0
ENV/M/411020	Basics of Meteorology and Climatology	2+1+0
ENV/M/411030	Environmental Pollution and Monitoring	2+1+0
ENV/M/411040	Environmental Chemistry	2+1+0
ENV/M/411050	Environmental Laws and Legislation	2+1+0
ENV/M/412060	Ecology Lab & Field visit	0+0+2
ENV/M/412070	Environmental Chemistry Lab	0+0+2
ENV/M/421010	Introduction to Glaciology	2+1+0
ENV/M/421010	Environmental Microbiology and Biotechnology	2+1+0
ENV/M/421020	Environmental Toxicology and Industrial Safety	2+1+0
ENV/M/421030	Instrumentation and Analytical Techniques	2+1+0
ENV/M/426040	Forestry and Wildlife management	2+1+0
ENV/M/426050	Biodiversity Conservation	2+1+0
ENV/M/426060	Aerosol and Environment	2+1+0
ENV/M/426070	Air pollution monitoring and control	2+1+0
ENV/M/426080	Renewable energy Resources	2+1+0
ENV/M/426090	Water and Waste water treatment	2+1+0
ENV/M/4220100	Toxicology Lab	0+0+2
ENV/M/4220110	Environmental Microbiology and Biotechnology Lab	0+0+2
ENV/M/511010	Environmental Geology	2+1+0
ENV/M/511020	Environment Impact Assessment and Auditing	2+1+0
ENV/M/511030	Environmental Modelling and Statistics	2+1+0
ENV/M/511040	Fundamentals of Remote Sensing and GIS	2+1+0
ENV/M/516050	Carbon Sequestration and Agro-management	2+1+0
ENV/M/516060	Restoration Ecology	2+1+0
ENV/M/516070	Solid Waste Management	2+1+0
ENV/M/516080	Land Surface processes and micro meteorology	2+1+0
ENV/M/516090	Environmental Agriculture meteorology	2+1+0
ENV/M/5160100	Soil Sciences	2+1+0
ENV/M/5120110	Remote Sensing and GIS Lab	0+0+2
ENV/M/5130120	Field Visit	0+0+2
ENV/M/524010	Synopsis Presentation	0+0+4
ENV/M/524020	Mid Term Evaluation (Report and Presentation)	0+0+2
ENV/M/524030	Dissertation (Both soft and hardcopy)	0+0+10
ENV/M/524040	Seminar (PPT presentation)	0+0+4

Figure 9. Environment sustainability courses offered by CUJ to the student of various departments.

Conclusion

CUJ, Ranchi, Jharkhand is a well-established Institute in India in terms of academic activities, efforts are continuously made in providing an eco friendly atmosphere to the students, research scholars, parents and staff members. The environmental protection initiatives are substantial by means of implementation of recycling processes through vermicompost, sanitation, rainwater harvesting system, water recharging facilities and natural vegetation in the CUJ Campus without harming the environment. A campus ecosystem is supported a rich biodiversity of flora and fauna which is making a sustainable environment and eco-friendly campus. CUJ offers environmental sustainability courses to students in all departments as either a major or minor subject. These courses provide a comprehensive understanding of environmental science and engineering principles, emphasizing sustainable practices, pollution control, and environmental technologies. To conclude an environment audit report, the CUJ is an eco-friendly campus and providing pure atmosphere to the stakeholders and supports the nation as a whole in future generations.

4.4.8. Waste Management Audit

a) Different coloured dust bins (Red, Yellow, Blue, and Black & Green Bins) and eco friendly trashes to provide a dust free atmosphere to the stakeholders and without harming the environment.

Figure: Implementing a system of different colored dustbins, each designated for a specific type of waste, is an effective way to promote waste segregation and ensure an eco-friendly environment.

i. **Red Bin**: For hazardous waste such as batteries, medical waste, chemicals, and other potentially dangerous materials. This ensures these items are handled and disposed of properly without causing harm to the environment or human health.
ii. **Yellow Bin**: For recyclable plastics, metals, and glass. This helps in diverting waste from landfills and promoting recycling practices.
iii. **Blue Bin**: For paper and cardboard waste. Segregating these items helps in recycling paper products and reducing deforestation.
iv. **Black Bin**: For general non-recyclable waste. This includes items that do not fit into the other categories and are destined for landfill.
v. **Green Bin**: For organic waste such as food scraps and garden waste. This waste can be composted and turned into nutrient-rich soil, promoting a circular economy.

Benefits:

- **Dust-Free Environment**: Proper waste segregation minimizes the risk of contamination and reduces the presence of dust and other pollutants in the environment.

- **Environmental Protection**: By separating waste, recyclable and biodegradable materials can be processed accordingly, reducing the impact on landfills and decreasing pollution.
- **Health and Safety**: Proper disposal of hazardous waste ensures that it does not pose a risk to human health or the environment.
- **Resource Efficiency**: Recycling materials conserves natural resources, saves energy, and reduces the carbon footprint associated with producing new materials.

b) Collection, segregation and disposal of solid wastes

Collection

- **Campus-wide Collection**: Solid wastes are collected from various locations across both campuses of the university.
- **Segregation at Source**: Waste bins are strategically placed for different types of solid wastes including organic, recyclable, and non-recyclable materials.

Segregation

- **Organic Wastes**: Food scraps, garden waste, and other organic materials are separated for composting or vermicomposting.
- **Recyclable Wastes**: Materials such as paper, cardboard, plastics, and metals are segregated for recycling purposes.
- **Non-Recyclable Wastes**: Waste that cannot be recycled is categorized separately for proper disposal.

Disposal

- **Composting and Vermicomposting**: Organic wastes are processed into compost and vermicompost for use in campus gardens and landscaping.
- **Recycling**: Recyclable materials are sent to authorized recycling facilities to minimize waste and promote resource recovery.
- **Landfill or Incineration**: Non-recyclable wastes are disposed of responsibly, either through landfill disposal or incineration where feasible and compliant with environmental regulations.

Collection, segregation and disposal of agricultural wastes

a) Brambe Campus

Located in a saal-dominated forest area with rich biodiversity, the Brambe campus prioritizes sustainability and ecosystem preservation.

- **Diverse Ecosystem**: The campus boasts a diverse ecosystem with numerous fruit trees and natural vegetation.

- **Tree Conservation**: No trees were cut during the university's construction, preserving the natural habitat.
- **Waste Utilization**:
- **Grass Collection**: Freshly mowed grass is collected and provided to nearby villagers as cattle feed, promoting community engagement and sustainable resource use.
- **Seasonal Fruits**: Villagers collect seasonal fruits for consumption, fostering a symbiotic relationship with the local community.
- **Foliage**: Remaining foliage is utilized for vermicompost production, contributing to organic farming practices and soil enrichment.

b) Cheri-Manatu Campus

Situated in a rocky terrain with limited flora, the Cheri-Manatu campus adopts practical waste management practices.

- **Limited Flora**: The campus environment consists of rocky terrain with minimal vegetation.
- **Waste Disposal**:
- **Garden Waste**: Garden wastes from this campus are disposed of in designated pits, ensuring proper containment and decomposition.
- **Environmental Responsibility**: Despite challenges posed by the rocky terrain, the university maintains responsible waste disposal practices to minimize environmental impact.

Through tailored waste management strategies, each campus addresses local environmental conditions while promoting sustainability and community involvement. The Brambe campus exemplifies resource efficiency and community collaboration, while the Cheri-Manatu campus demonstrates conscientious waste disposal practices in challenging terrain. Together, these efforts contribute to a cleaner and ecologically balanced campus environment.

c) Collection, segregation and disposal of organic / degradable (food, paper, wood, yard, etc.,) and inorganic / non-degradable (fertilizers, glass, aluminum, metal, etc.,) wastes

Organic and Degradable Wastes

Collection and Segregation

- **Source Segregation**: Organic wastes including food scraps, paper, wood, and yard waste are separated at the point of generation.
- **Collection Bins**: Dedicated bins labeled for organic waste are strategically placed across campus facilities.

Disposal Methods

- **Vermicomposting**: Some organic wastes are processed through vermicomposting using earthworms to enhance decomposition.


Inorganic/Non-Degradable Wastes

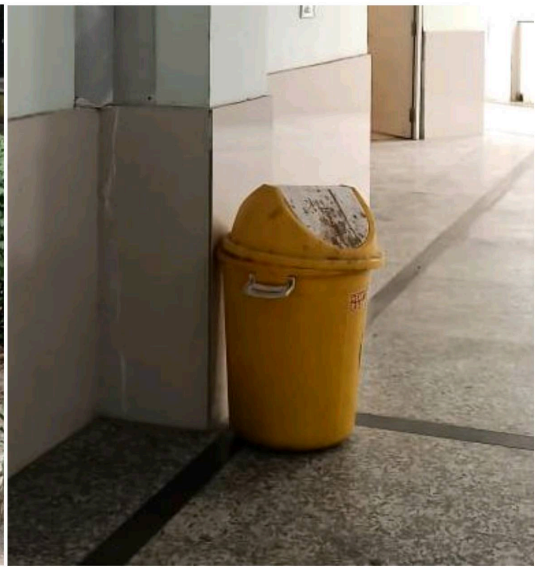
Collection and Segregation

- **Source Segregation**: Inorganic wastes such as glass, aluminum, and metal are segregated at the source.
- **Collection Bins**: Separate bins labeled for recyclables and non-recyclable inorganic waste are provided.

Disposal Methods

- **Recycling**: Inorganic recyclables like glass, aluminum, and metal are collected and sent to authorized recycling facilities.
- **Non-Recyclable Disposal**: Non-recyclable inorganic wastes are stored securely and disposed of in accordance with municipal regulations.

By implementing effective collection, segregation, and disposal strategies for both organic/degradable and inorganic/non-degradable wastes, the university promotes environmental sustainability and reduces its ecological footprint. These practices align with regulatory requirements and contribute to a cleaner and healthier campus environment.



d) ***Wastewater / Sewage treatment facility for recycling***

Currently, the university does not have a dedicated wastewater/sewage treatment facility for recycling. However, ongoing research focuses on the treatment of greywater from university mess/canteen areas using artificial wetland and vermin filtration techniques as a pilot study.

4.4.9. Pilot Study Overview

Greywater Treatment

- **Location**: Department of Environmental Sciences.
- **Techniques**: Utilization of artificial wetland and vermifiltration.
- **Objective**: To explore sustainable methods for treating greywater and recycling it for non-potable purposes.

Research Initiative

- **Artificial Wetland**: Mimics natural wetland processes to filter and purify greywater.
- **Vermifiltration**: Uses earthworms to enhance the filtration and nutrient removal process.

Benefits

- **Environmental Sustainability**: Reduces water consumption and waste.
- **Resource Optimization**: Recycles greywater for irrigation or other non-potable uses.

4.4.10. Future Plans

- **Expansion**: Depending on the success of the pilot study, plans may include scaling up the treatment facility.
- **Implementation**: Integration of sustainable wastewater management practices across campus facilities.

- This research initiative underscores the university's commitment to sustainable practices and environmental stewardship by exploring innovative solutions for wastewater management and recycling.

4.4.11. Waste Management Plan and Disposal Procedure

The university's waste management plan is designed to ensure efficient and sustainable handling of all types of waste generated on campus. This comprehensive plan encompasses the collection, segregation, disposal, and recycling of various waste streams, aligning with environmental regulations and promoting sustainability.

Waste Collection

Solid Waste**:**

- Segregated at source into organic, recyclable, and non-recyclable categories.
- Collection bins placed strategically across campus.

Biomedical and Hazardous Waste**:**

- Collected in labeled, color-coded bins.
- Monthly collection by Medicare, a licensed waste disposal contractor.

Segregation

Organic Waste**:**

- Segregated for composting and vermicomposting.
- Used to produce organic manure for gardening and landscaping.

Recyclable Waste**:**

- Collected separately and sent to authorized recycling facilities.

Non-Recyclable Waste**:**

- Safely stored and disposed of as per municipal regulations.

Biomedical and Hazardous Waste**:**

- Segregated into appropriate categories (e.g., sharps, infectious waste, chemical waste) and disposed of through certified channels.

Disposal and Recycling

Composting and Vermicomposting**:**

- Organic waste processed in composting pits and the vermicompost unit.
- Vermicompost used as soil amendment for gardening.

Construction and Demolition Waste**:**

- Used to fill uneven ground and support construction of new roads and pavements.
- Research initiatives convert cement waste into a catalyst for biodiesel production.

Chemical Neutralization**:**

- Acids neutralized using sodium bicarbonate before disposal.
- Safe storage and periodic disposal by licensed contractors.

Incineration Facility

- Available in girls' hostels for the disposal of sanitary napkins.

Training and Community Engagement

Staff Training**:**

- Regular sessions on waste segregation, handling, and disposal.

Community Outreach**:**

- Educational events on sustainable practices, such as vermicomposting and organic farming.

Compliance and Monitoring

Regulatory Compliance**:**

- Adherence to government pollution control board regulations.
- Regular audits to ensure compliance and improve practices.

Documentation

- Detailed records of waste generation, segregation, disposal, and recycling processes.

By implementing this waste management plan, the university ensures responsible waste handling, promotes sustainability, and maintains a clean and safe campus environment.

4.4.12. Construction & Demolition of waste and its reuse

Reuse and Recycling

- **Ground Filling**: Construction and demolition waste is used to fill uneven ground on the campus, enhancing landscape uniformity and preventing erosion. Additionally, leftover construction materials are repurposed to create border stone tree rings, contributing to sustainable landscaping practices.
- **Infrastructure Support**: Waste materials are repurposed for the construction of new roads and pavements, reducing the need for new raw materials.

Research Initiatives

- **Innovative Use**: Under the guidance of Dr. Bhaskar Singh, research has demonstrated the use of cement construction and demolition waste as a transesterification catalyst for producing biodiesel from Karanja oil.
- **Sustainable Solution**: This innovative approach converts waste into a valuable resource, promoting sustainability by creating wealth from waste.
- Through these practices, the university effectively manages construction and demolition waste, supporting environmental sustainability and innovative research.

Collection, segregation and disposal of biomedical and hazardous wastes.

Collection and Segregation**:**

- Biomedical and hazardous wastes are segregated at the source.
- Wastes are collected in labeled, color-coded bins to ensure proper identification and handling.

- Separate bins are used for different types of waste (e.g., sharps, infectious waste, chemical waste).

Disposal**:**

- The university has an agreement with Medicare, a licensed waste disposal company.
- Medicare is responsible for the monthly collection and disposal of biomedical waste.
- The disposal process complies with government pollution control board regulations, ensuring safe and environmentally responsible waste management.

By following these procedures, the university ensures the safe handling and disposal of biomedical and hazardous wastes, reducing potential health risks and environmental impact.

4.4.13. Standard Operating Procedure to discard the chemicals and methodology for acid neutralization

At the university, the disposal of chemicals and toxic wastes is managed through well-defined procedures to ensure safety and compliance.

Standard Operating Procedure to Discard Chemicals

Chemical Inventory and Segregation**:**

- An accurate inventory of all chemicals is maintained.
- The inventory is check before ordering new chemicals and segregate based on compatibility and hazard class.

Safe Storage**:**

- The chemicals are stored in appropriately labeled containers with secure lids in designated areas.
- Regular inspection is done to prevent leaks and contamination.

Waste Collection and Labeling**:**

- Chemical waste is collected in designated, labeled containers.
- All waste containers are labeled according to their contents, hazard classification, and date.

Temporary Storage and Disposal**:**

- Waste is stored in a secure area until collection by a licensed waste disposal contractor.
- Training and Compliance**:**
- Regular training sessions is conducted for laboratory personnel on waste disposal procedures.
- Periodic audits are done to ensure compliance with the SOP and regulatory requirements.

Methodology for Acid Neutralization

Preparation and Safety**:**

- PPE is worn by the personnel and work is done in a well-ventilated area or fume hood.
- Acid waste is placed in a large, chemical-resistant container.

Neutralizing Process:

- Sodium bicarbonate is slowly added to the acid in small increments while stirring.
- The reaction for bubbling due to carbon dioxide gas release is monitored.

pH Monitoring**:**

- pH paper or a pH meter is used to test the solution.
- Sodium bicarbonate is added until the pH reaches neutral (6-8).

Documentation and Disposal**:**

- Neutralization process is recorded, including amounts used and final pH.
- Disposal of the neutralized solution is done according to the university's chemical waste disposal procedures.

By following these procedures, the university ensures the safe and compliant disposal of chemicals and toxic wastes, promoting environmental sustainability and regulatory adherence.

4.4.14. Collection, segregation and disposal of plastic wastes.

Collection

- Source Collection: Plastic wastes are collected from various points across the campus, including academic buildings, residential areas, and outdoor spaces.

Segregation

- The university does not have a specific system in place for segregating different types of plastic waste. Plastic waste is collected in general waste bins without differentiation based on plastic type.

Disposal

- **Recycling**: Plastic wastes suitable for recycling are collected separately and sent to authorized recycling facilities.
- **Non-Recyclable Disposal**: Plastics that cannot be recycled are disposed of responsibly in accordance with municipal regulations and environmental guidelines.

4.4.15. Education and Awareness

- **Campus Awareness**: Regular campaigns and educational programs inform students, faculty, and staff about the importance of plastic waste reduction and responsible disposal practices.

By implementing effective collection and disposal measures for plastic wastes, the university demonstrates its commitment to environmental sustainability and responsible waste management. These practices not only reduce the environmental impact of plastic waste but also contribute to a cleaner and healthier campus environment for all stakeholders.

4.4.16. Procurement / purchase policy to ensure the use of sustainable materials.

The university's procurement/purchase policy emphasizes the use of sustainable materials to promote environmental responsibility and support sustainable practices across campus operations.

Key Principles

Preference for Sustainable Materials:

- Prioritize the procurement of materials that are certified as sustainable or eco-friendly.
- Give preference to products with recognized environmental certifications (e.g., Energy Star).

Minimization of Environmental Impact:

- Avoid purchasing materials that contribute to deforestation, habitat destruction, or excessive carbon footprint.
- Opt for materials that are sourced responsibly and have minimal environmental impact throughout their lifecycle.

Recyclability and Reusability:

- Select materials that are easily recyclable or reusable to promote a circular economy.
- Encourage suppliers to provide products with packaging that is minimal and recyclable.

Local Sourcing:

- Give preference to locally sourced materials to reduce transportation-related emissions and support the local economy.
- Consider the environmental impact of transportation when evaluating suppliers.

Compliance with Environmental Standards:

- Ensure that all purchased materials comply with environmental laws, regulations, and standards.
- Verify suppliers' adherence to environmental best practices through sustainability audits and certifications.

Promotion of Innovation:

- Encourage suppliers to innovate and offer sustainable alternatives to conventional materials.
- Support research and development initiatives that aim to improve the sustainability of materials used on campus.

The procurement/purchase policy for sustainable materials at the university underscores its commitment to environmental stewardship and sustainability. By integrating these principles into procurement decisions, the university contributes to reducing its environmental footprint and fostering a sustainable campus environment for current and future generations.

4.4.17. Collection, segregation and disposal of electrical wastes such as wires, switches, fans, AC, coils, lights, batteries

Collection

- **Identification**: Electrical wastes including wires, switches, fans, AC units, coils, lights, batteries, and other electronic devices are identified and collected from various campus locations.
- **Designated Collection Points**: Collection points are designated for electrical waste to ensure proper segregation and handling.

Segregation

- **Type Segregation**: Different types of electrical wastes are segregated based on their components and materials (e.g., metals, plastics, hazardous components).
- **Labeling and Identification**: Items are identified to facilitate appropriate handling and disposal processes.

Disposal

- **Recycling**: Electrical wastes suitable for recycling, such as wires, metal components, and batteries, are collected separately and sent to authorized recycling facilities.
- **Disposal of Hazardous Components**: Hazardous components like batteries are disposed of in accordance with environmental regulations to prevent contamination.

Handling Procedures

- **Safe Handling**: Trained personnel handle electrical wastes to prevent injuries and ensure safety during collection and disposal.
- **Storage**: Wastes are stored in secure areas to prevent environmental hazards and facilitate organized disposal.

The university's systematic approach to the collection, segregation, and disposal of electrical wastes underscores its commitment to environmental sustainability and regulatory compliance. By adhering to best practices in waste management and promoting awareness among its community, the university ensures the safe handling and responsible disposal of electrical wastes, contributing to a cleaner and healthier campus environment.



4.4.18. Collection, segregation and disposal of electronic wastes such as computer, laptop, CD, pen drive, keyboard, mouse, printer, etc.,

Collection

- **Identification**: Electronic wastes including computers, laptops, CDs, pen drives, keyboards, mice, printers, and other electronic devices are identified and collected from various campus locations.
- **Designated Collection Points**: Specific collection points are designated for electronic waste to ensure proper segregation and handling.

Segregation

- **Type Segregation**: Different types of electronic wastes are segregated based on their components and materials (e.g., metals, plastics, hazardous components).
- **Data Sanitization**: Before disposal, data-containing devices such as computers and pen drives undergo data sanitization to ensure data security and privacy compliance.

Disposal

- **Recycling**: Electronic wastes suitable for recycling, such as metal components and circuit boards, are collected separately and sent to authorized recycling facilities.

- **Disposal of Hazardous Components**: Hazardous components like batteries and toner cartridges are disposed of in accordance with environmental regulations to prevent contamination.

Handling Procedures

- **Safe Handling**: Trained personnel handle electronic wastes to prevent injuries and ensure safety during collection and disposal.
- **Storage**: Wastes are stored in secure areas to prevent environmental hazards and facilitate organized disposal.

4.4.19. Disposal of chemicals and toxic wastes like acids, salts and solvents.

The disposal of chemicals and toxic wastes such as acids, salts, and solvents is managed through a combination of safe storage, neutralization, and source reduction techniques.

Safe Storage and Disposal Practices

- **Safe Storage**:
  - Chemical wastes are stored safely in clearly labeled, secure containers until the end of the year when they are disposed of properly.
  - Regular inspections ensure the integrity of storage containers to prevent leaks and contamination.
- **Neutralization**:
  - Chemicals that can be safely neutralized, such as acids with bases, are neutralized under controlled conditions by trained personnel.

Source Reduction Techniques

We prioritize source reduction to minimize the generation of hazardous wastes. This involves changing practices and processes to reduce or eliminate hazardous waste production:

- **Chemical Inventory Management**:
    - An accurate inventory of all laboratory chemicals is maintained.
    - Departments are encouraged to check the inventory for available chemicals before ordering new supplies, promoting the sharing of excess chemicals across the campus.
- **Optimal Ordering Practices**:
    - Only the necessary quantity of materials is ordered to avoid excess storage and potential waste.
    - Bulk purchasing is discouraged unless absolutely necessary.
- **Chemical Substitution**:
    - Whenever possible, non-hazardous or less hazardous materials are substituted for more dangerous chemicals.
    - Less toxic cleaning agents are used to reduce hazardous waste.
- **Waste Stream Segregation**:
    - Hazardous and non-hazardous waste streams are kept separate to prevent increasing the volume of hazardous waste.
    - For example, gasoline waste is never mixed with non-flammable "non-hazardous" waste motor oil.
- **Proper Labeling**:
    - All containers are properly labeled to avoid the costly and regulatory penalties associated with unlabeled chemicals.
    - Proper labeling also prevents the need for expensive analytical screening tests to determine disposal categories.

Micro Scale Chemistry

- **Implementation**: The science departments use "Micro" or "Mini Scale" laboratory chemistry, performing chemical processes with very small quantities of chemicals.
- **Benefits**: This method reduces the amount of hazardous waste generated and lowers disposal costs without compromising the quality of laboratory applications.

Substitution and Recycling

- **Substitution**: The use of less hazardous or non-hazardous chemicals is actively implemented wherever feasible.
- **Recycling**: Materials are recycled within the campus whenever possible to minimize waste generation.
- By carrying out these safe storage practices, source reduction methods, and waste minimization techniques, our university ensures the responsible disposal of chemicals and toxic wastes like acids, salts, and solvents. This aligns with environmental regulations and promotes sustainability across the campus.

4.4.20. Incineration facility for the disposal of sanitary napkins

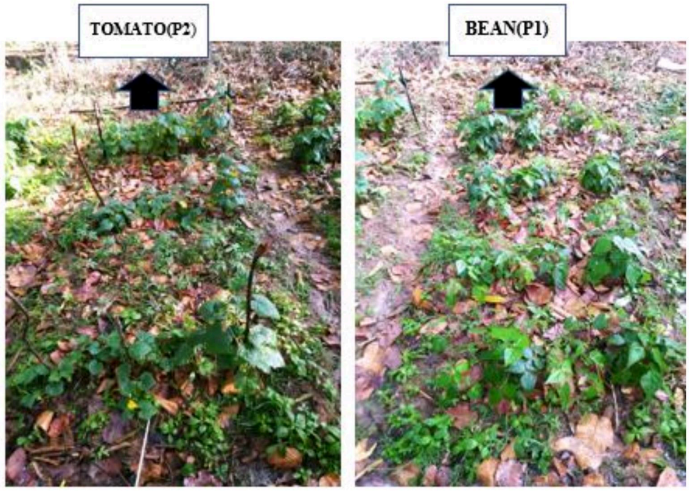
The university provides incineration facility in each hostel specifically for the disposal of sanitary napkins. This facility is located in the bathrooms of girls' hostels, ensuring a hygienic

and convenient method for managing menstrual waste. The incinerators are regularly maintained and operated following safety and environmental standards, ensuring effective and eco-friendly disposal. This initiative underscores the university's commitment to providing a clean and supportive living environment for its students, while also addressing waste management issues responsibly.

4.4.21. Recycling processes through Vermicompost, composting pit, Farm yard, Organic and Green manures for degradation of bio wastes to avoid the practice of chemical fertilizers for maintaining soil health.

At the Brambe campus, the university has implemented various recycling processes to manage bio wastes and maintain soil health without relying on chemical fertilizers. A vermicompost unit has been established where farm yard waste and foliage are converted into vermicompost. This vermicompost is used as a soil amendment for gardening purposes, enhancing soil fertility and structure.

Additionally, research on permaculture has been conducted as a pilot study, utilizing Saal (predominant plant species in Brambe campus) leaves as mulch. This study explores sustainable agricultural practices that promote soil health and biodiversity. These initiatives reflect the university's commitment to sustainable waste management and environmental stewardship.



4.4.22. Sign Boards (Use appropriate Dustbins for waste disposal, Save Environment and etc.,)

4.4.23. Training needs and workforce training carried out related to wastes management activities on regular basis.

Effective waste management is crucial for maintaining a sustainable environment and ensuring regulatory compliance. At the university, regular training programs are conducted to equip the workforce with necessary skills and knowledge in waste management activities. Additionally, outreach programs extend these practices to the local community, promoting broader environmental stewardship. Below is an example of such an initiative.

Examples of Event: Vermicomposting Training and Outreach Program

a) Event Overview**:**

- **Date**: June 1st, 2023
- **Location**: Central University of Jharkahnd, Brambe
- **Target Audience**: Villagers and local community members

b) Objective**:**

The event was organized as part of the run-up to World Environment Day on June 5th, 2023. It aimed to educate the local community about vermicomposting and its significance in waste management and organic farming. This initiative was part of the Ministry of Environment, Forest & Climate Change's efforts to promote outreach and advocacy activities for mass mobilization in Mission LiFE.

c) Activities**:**

- **Interactive Sessions**:
    - The program aimed to bridge the gap between scientific knowledge and the local community by disseminating valuable information about vermicomposting and its advantages.
    - Detailed explanation of the science behind vermicomposting, its role in waste management, and benefits for organic farming.
- **Practical Demonstrations**:
    - Practical demonstrations of setting up vermicomposting units, showcasing the simplicity and ease of adopting this sustainable practice.

Engagement and Impact:

- **Community Involvement**: The program aimed to bridge the gap between scientific knowledge and the local community by providing hands-on training and valuable information about vermicomposting.

- **Interactive Q&A**: Attendees actively engaged with the facilitators, asking questions and participating in practical demonstrations.
- **Empowerment**: The initiative empowered the local community with skills and knowledge to implement vermicomposting, thereby promoting environmental sustainability and enhancing local livelihoods.

4.4.24. Whether any licensed company signed MoU with Organization for waste collection and disposal as per the Government pollution control board regulation?

Memorandum of Understanding (MoU) with Licensed Waste Disposal Company

As part of the university's commitment to proper waste management and compliance with government pollution control regulations, it is crucial to establish formal agreements with licensed waste disposal companies. This ensures that all waste, especially hazardous and biomedical waste, is handled, transported, and disposed of according to regulatory standards.

Case Study: Central University of Jharkhand

The Central University of Jharkhand has a formal arrangement with Medicare, a licensed waste disposal company, for the collection and disposal of biomedical waste. This partnership ensures that the university's biomedical waste management practices comply with the regulations set by the government pollution control board.

Key Details of the MoU

- **Parties Involved**:
  - **University**: Central University of Jharkhand
  - **Biomedical Waste Disposal Company**: Medicare
- **Scope of the MoU**:
  - **Waste Type**: Biomedical waste produced by various departments within the university, including medical facilities, laboratories, and research centers.
  - **Collection Frequency**: Weekly collection of biomedical waste by Medicare.
  - **Compliance**: Adherence to government pollution control board regulations for the handling, transportation, and disposal of biomedical waste.
- **Responsibilities**:
  - **University**:
    - Proper segregation and storage of biomedical waste in designated containers.
    - Maintenance of waste generation records.
    - Ensuring waste is ready for collection at agreed times.
  - **Medicare**:
    - Regular collection of biomedical waste from the university.
    - Safe transportation of collected waste to disposal facilities.
    - Environmentally compliant disposal of waste, including incineration and other approved methods.
    - Providing disposal certificates to the university.
- **Regulatory Compliance**:
  - The MoU ensures that the university's biomedical waste management practices comply with the Bio-Medical Waste Management Rules, as stipulated by the government pollution control board.
  - Regular audits and inspections by both parties to ensure compliance and address any issues.
- **Documentation and Reporting**:
  - Detailed records of waste collected, transported, and disposed of.
  - Regular reports submitted by Medicare to the university, summarizing the waste management activities and compliance status.

Benefits of the MoU

- **Regulatory Compliance**: Ensures that the university adheres to all legal requirements for biomedical waste management.

- **Environmental Protection**: Proper disposal of biomedical waste minimizes environmental contamination and public health risks.
- **Efficiency**: Regular collection schedules and professional handling improve the overall efficiency of waste management at the university.
- **Accountability**: Clear responsibilities and documentation enhance accountability and transparency in waste management practices.

24.06.2024

Prof. Manoj Kumar
(Chairman)