

SDG 7

Affordable and Clean Energy

7.1 Research on clean energy

7.1.1 Affordable and Clean Energy: CiteScore

Proportion of MMMUT's publications appeared in the top 10% of journals according to the citescore metric is displayed as per **SCOPUS database**.

7.1.2 Affordable and Clean Energy:FWCI

Quality of MMMUT's output in the area of energy and energy efficiency research using the number of citations received as metrics is displayed as per **SCOPUS database**.

7.1.2 Affordable and Clean Energy: publications

The number of publications looked at the scale of research output from MMMUT around energy and energy efficiency is shown as per **SCOPUS database**.

7.1.3 Affordable and Clean Energy: publications

The number of publications looked at the scale of research output from MMMUT around energy and energy efficiency is displayed as in **SCOPUS database**.

7.2 University measures towards affordable and clean energy

7.2.1 Energy-efficient renovation and building

Year in place by 2024

MMMUT has a policy in place to renovate or new builds are following energy efficiency standards as per the guidelines/policies described by the Energy Conservation & Sustainable Building Code (BCSBC), Government of India, Ministry of Power.

Link: https://beeindia.gov.in/sites/default/files/BEE_ECSBC_2024.pdf

7.2.2 Upgrade buildings to higher energy efficiency

Year in place by 2024

MMMUT has plans to upgrade existing buildings to higher energy efficiency as per guidelines/policies described by the Energy Conservation & Sustainable Building Code (BCSBC), Government of India, Ministry of Power.

Link: [https://beeindia.gov.in/sites/default/files/BEE ECSBC 2024.pdf](https://beeindia.gov.in/sites/default/files/BEE_ECSBC_2024.pdf)

7.2.3 Carbon reduction and emission reduction process Year: in place by 2024

MMMUT, Gorakhpur has been a lush green campus that spreads over a vast area of 354 acres, is committed in preserving natural resources such as energy, water, and air. We provide a pollution-free environment that enhances the educational experience. Our campus is full of greenery with more than 1,48,949 number of plants of more than 47 different varieties covering 270.82 Acre as green area. MMMUT green campus serves as a platform to educate, train, and uphold the requirements and standards of sustainability. Our green policy also includes indicators for carbon and emission reduction processes with AQI lying below 80 throughout the year.

Link: <https://www.mmmut.ac.in/pdf/greenreport.pdf>

- MMMUT campus observes a vehicle-free day on the last Saturday of every month. Vehicles may enter only up to the designated initial checkpoint, after which movement is permitted on foot only.
- Four environment-friendly, bio-CNG-based buses (each with a seating capacity of 52) were procured in the 2024–2025 session. The procurement of additional buses of this type is currently in the pipeline.
- Solar panel of capacity 620 KWH is installed in the MMMUT campus.
- Dustbins are provided at all blocks and cafeterias, to dispose the solid waste regularly.
- Apart from existing plants, Tree plantations initiatives are ongoing from students as well as faculty/staff for more sustainable green campus.
- All the street lights in the MMMUT campus are sensor based energy conversion.



7.2.4 Plan to reduce energy consumption Year in place by 2024

Considering daily 12 Hours consumption and present billing rate following suggestions are made for savings in monthly energy bills as per energy audit conducted.

1. To improve the power factor, the new capacitors to be provided as mentioned water pumps, this will reduce the consumption.
2. The bills charged at commercial rates should be considered for reduction of load on priority by arranging the load consumption by LED lights.
3. Use 5 Star rating equipment (AC, geyser and so on etc.) in place old equipment in university campus.
4. Use solar light for reduction of power consumption.
5. The A.C. should be operated in temperature range 22 to 26 degree centigrade for low power consumption.

6. Currently, one third installed ceiling fans are of Brushless Direct Current (BLDC) motor for improved energy efficiency. Future efforts are ongoing to improve the ratio.
7. Reduction in excess load of connection to save the excess payment against fix charges of excess demand.
8. Monitor the undue use of light and fans. Especially in boys and girls' hostels, the power cut can be implemented in university working hours. The use of fans for soaking of clothes should be watched. Every person in the campus should take care to switchoff the light, fans, computers, A/c etc wherever not needed.

Link: <https://www.mmmut.ac.in/pdf/energyreport.pdf#page=4.56>

7.2.5 Energy Wastage Identification Year: in place 2024

1. Currently, in the hostel, one third installed ceiling fans are of Brushless Direct Current (BLDC) motor for improved energy efficiency. Future efforts are ongoing to improve the ratio.
2. The tube lights and CFLs energized at other windows may be put off when sufficient daylight is available.
3. Although a smaller number of fluorescent tube lights are provided, while chock type CFLs are provided at some places. (e.s. Bathroom etc.). These tubes and CFLs can be replaced with high lumen LEDs to minimize the lighting consumption and to reduce the amount of monthly bills.
4. Solar energy installation capacity is recommended to improve as per directive of government.

7.2.6 Divestment Policy Year in place by 2024

MMMUT recognizes the urgent need to address climate change and reduce greenhouse gas emissions. As an institution committed to sustainability, the MMMUT acknowledges the environmental impact of carbon-intensive energy industries. This policy reflects the MMMUT's dedication to responsible investment practices and its commitment to supporting a transition to cleaner and renewable energy sources.

1. MMMUT follows investment practices that prioritize responsible environmental sustainability and commitment in reducing carbon emissions. In view of that, environment friendly bio-CNG based four buses (each 52 seated capacity) were procured in 2024-2025.
2. Future investments will be evaluated based on the sustainable and renewable energy viewpoint.

3. MMMUT will actively engage with stakeholders, including investment managers, to promote the divestment from carbon intensive energy industries. The university will advocate for sustainable investment practices and encourage other institutions to follow suit.

4. Monitoring and Reporting: The university will establish mechanisms to monitor and assess the progress of divestment efforts. Regular reports will be prepared to track the divestment process and communicate the university's commitment to stakeholders.

5. MMMUT shall periodically review the divestment from Carbon-Intensive Energy Industries Policy to ensure its effectiveness and alignment with evolving sustainability goals. Updates will be made as necessary to address emerging challenges and opportunities.

7.3.1 Indicator: Energy usage per sqm

Data Collected	Definition	
Total energy used	Total energy used in Gigajoule (GJ) for the year 2024	7.812 GJ
University floor space	Floor space of the university in square metre (m ²) in 2024	73855.49 sq.m

7.4 Energy and the Community

7.4.1 Local community outreach for energy efficiency Year:2024

National Service Scheme (NSS) at MMMUT, is spearheading many community engagement initiatives in the field of environment and sustainability specifically with a focus on energy efficiency along with solid waste management, road safety, cleanliness, environment pollution awareness, career counseling, and skill enhancement. School students of nearby districts do visit our campus on regular basis.

MMMUT has adopted five villages in the Gorakhpur district: Jungle Ayodhya Prasad, Jungle Belwar, Jungle Ram Lakhana, Dumari Khurd, and Ranigunj. The MMMUT's efforts focus on the overall development of these villages through social and educational programs, as part of initiatives like the 'Unnat Bharat Abhiyan'.

The MMMUT undertakes various initiatives, such as training in education, health, and cleanliness, conducting tree plantations and blood donation drives, and providing aid during disasters. These efforts are a part of the 'Unnat Bharat Abhiyan,' a government initiative aiming to develop villages into model villages. Such efforts of MMMUT reflect its commitment to inclusive development. As part of this initiative, regular sessions and outreach activities are

organized for the nearby villages and school students to create awareness for increasing energy efficiency and adopting clean energy.

NSS volunteers successfully guide nearby village students (underprivileged) at Malaviya Shiksha Niketan, MMMUT campus. NSS volunteers give free tuition to these students and their family members also. Total 100 students are participating in this free service to improve their lifestyle, social awareness, understanding of human rights, and safeguards their basic rights.

Some pictures of NSS activity and Malaviya Shiksha Niketan MMMUT campus, are given below as:





Link:

https://drive.google.com/file/d/1WbIM_urPHE46su9b0yhWv0jRN9dnoKnD/view?ts=691c704b

https://www.google.com/search?q=malaviya+shiksha+niketan+mmmut&rlz=1C1CHBD_en-GBIN1183IN1183&oq=malaviya+shiksha+niketan+mmmut&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIJCAEQIRgKGKABMgkIAhAhGAoYoAEyCQgDECEYChigATIHCAQQIRiPAjIHCAUQIRiPAiBCTMyNjIyajBqN6gCALACAA&sourceid=chrome&ie=UTF-8

7.4.2 100% Renewable energy Pledge Year 2024

MMMUT reaffirms its commitment to sustainability and environmental stewardship through a bold vision for a greener future. As part of these initiatives, we pledge to achieve 100% renewable energy in upcoming future. The key components of this commitment include:

Water Management: Green lush campus of MMMUT has a total rain harvesting capacity of 14920000 litre. The implementation of rainwater harvesting, water-efficient technologies, and water recycling measures aims to enhance the conservation of water resources.

Green and Clean Environment: MMMUT campus has 148949 numbers of trees of more than 50 different varieties. Various other initiatives such as “one plant for mother”, over the years have promoted the MMMUT campus greenery by planting trees, and creating more sustainable green spaces.

Pollution Reduction: Targeting reductions in air and noise pollution while advancing clean energy use and limiting waste generation. AQI of the campus remains below 80, is the indicator of our serious efforts.

7.4.3 Energy efficiency services for industry

Year 2024

The incubation centre at MMMUT is called the Design Innovation and Incubation Centre (DIIC). It serves as a facilitator for faculty, staff, and students to develop and support new ideas, innovations, and startups.

MMMUT provides The "Idea Lab", is a facility being established with a ₹1.1 crore grant from the All India Council for Technical Education (AICTE) to foster innovation and entrepreneurship among students. This lab provides students with the resources and equipment to ideate, create prototypes, and develop their own projects in a hands-on environment.

Impact: It is expected to boost startup culture and provide students with hands-on experience to translate their ideas into reality under the aegis of DIIC and Idea lab.

MMMUT is organizing an International conference on “Green Technologies and Sustainable Solutions (GTSS-2026)” <https://www.mmmut.ac.in/gtss2026/index.html>

The International Conference on Green Technologies and Sustainable Solutions (GTSS 2026) aims to drive innovation, research, and the implementation of sustainable solutions to address global environmental challenges. Its primary objective is to develop and promote cutting-edge sustainable technologies that seamlessly integrate environmental responsibility with modern advancements, ensuring a balance between technological progress and ecological conservation. GTSS 2026 will explore the core aspects of sustainability, green engineering, renewable energy, and eco-friendly systems that align with the evolving dynamics of nature and human societies. The conference will focus on the development of intelligent and adaptive green technologies that enhance efficiency, minimize environmental impact, and provide long-term solutions for climate change mitigation and resource management.

State of the art research facility is being generated “Centre of Excellence in Next-Gen Semiconductor and Nanodevices”. <https://www.bhaskar.com/local/uttar-pradesh/gorakhpur/news/a-centre-of-excellence-worth-rs-4-crore-will-be-built-in-mmmut-136253081.html>

7.4.4 Policy developments in clean energy and energy efficient technology policy development

A policy framework centered on clean technology and Sustainable Development Goal 7 is crucial for promoting environmental stewardship, encouraging technological innovation, and ensuring the availability of affordable, reliable, and sustainable energy.

1. MMMUT is committed to sustainability by investing in retrofitting and renovation efforts.
2. MMMUT prioritizes the integration of energy-efficient techniques and appliances in all new infrastructure projects, particularly in electrical components like lighting, fans, pumps, lifts, and HVAC systems.
3. MMMUT promotes sustainable mobility by adopting electric vehicles for internal shuttling and increasing the number of eco-friendly EV charging stations.
4. MMMUT allocates resources toward constructing environmentally sustainable buildings.
5. MMMUT extends its commitment to sustainability outside the campus through various clean and green environmental initiatives.
6. MMMUT makes substantial investments in research that contributes to sustainable development.
7. MMMUT strengthens awareness and capacity-building for sustainability across all academic programs
8. MMMUT extends its expertise to the public, educators, and students, enabling them to engage in our mission, promote innovation, and support a robust national economy and global sustainability.

7.4.5 Assistance to low carbon Innovations Year 2024

1. MMMUT Promotes low-carbon innovation through research, technological advancements, and knowledge dissemination.
2. MMMUT encourages faculty and student projects in clean technologies, renewable energy, waste-to-resource conversion, and eco-efficient solutions.
3. MMMUT Holds multiple patents and copyrights for sustainability-oriented research outcomes.
4. Department of Electronics & Communications Engineering, and Physics and Materials Science have published several high impact factor research articles to assist low carbon innovations (solar cells/thermoelectric devices): Some of them are as below
 - Boosting Crystallinity and Performance of Wide-Bandgap Tin-Based Perovskite Solar Cells through Bottom GeO_x Interfacial Engineering, Ajay Kumar Baranwal, Safalmani

Pradhan, Huan Bi, Jiaqi Liu, Liang Wang, Gaurav Kapil, Qing Shen, Shuzi Hayase, 2025, **ACS Applied Energy Materials**, 8, 14690-14696.

- Interfacial Dipole Engineering via Boronic Acid-Based Self-Assembled Monolayers in Inverted Tin–Lead Perovskite Solar Cells with Ideal Band Gap, **ACS Energy Letters**, Safalmani Pradhan, Huan Bi, Gaurav Kapil, Aruto Akatsuka, Ajay Kumar Baranwal, Dandan Wang, Dong Liu, Suraya Shaban, Takeshi Kitamura, Shahrir Razey Sahamir, Yasuhiro Fujiwara, Jiaqi Liu, Hiroshi Segawa, Hiroyuki Yoshida, Qing Shen, Shuzi Hayase, 2025, 10, 4983-4994.
- Thermally Stable Lead-free Tin Halide Perovskite Solar Cells Prepared from a Dimethyl Sulfoxide Free Perovskite Precursor Ink, **ACS Applied Energy Materials**, T. Kitamura*, S. Sasahara, S. Kani, J. Liu, H.Bi, SR Sahamir, G. Kapil, Y. Fujiwara, L. Wang, Ajay Kumar Baranwal, Q. Shen, S. Hayase, 2025, 8, 15, 10891–10898.
- Bottom Passivation of Sn–Pb Perovskites Using Ethylenediamine–Phosphonic Acids for Efficient HTL-Free Solar Cells, **ACS Applied Materials & Interfaces**, G. Kapil, SR Sahamir, S. Shaban, S. Pradhan, Ajay Kumar Baranwal, H.Bi, J. Liu, L. Wang, T. Kitamura, Q. Shen, H. Segawa, S. Hayase, 2025, 17, 31, 44608–44617.
- Thermally Induced Surface Self-Passivation in Tin Perovskite Solar Cells, **ACS Applied Materials & Interfaces**, J. Liu, H.Bi, Z. Zhang, Y. Fujiwara, T. Kitamura, G. Kapil, Ajay Kumar Baranwal, SR Sahamir, A. Hayat, S. Shaban, S. Pradhan, M. Yanagida, Y. Shirai, L. Wang, Q. Shen, S. Hayase*, **ACS Applied Materials & Interfaces**, 2025, 17, 28, 41304–41310.
- The effective thermal conductivity of a screen-printed thermoelectric film of Bi₂Te₃ and CsSnI₃, K. Miyazaki*, A. Mustafa, **Ajay Kumar Baranwal**, Saini S., K. Watanabe, A. Miura, T. Yabuki, M. Ishimaru, S. Kawano, Q. Wang, S. Iikubo, Q. Shen, S. Hayase, **International Journal of Heat and Mass Transfer**, 2025, 250, 127292.
- Lead- free PerovskiteTandem Solar Cells with Wide Bandgap Tin Perovskite and CIGS, H.Bi*, J.Liu, Z.Zhang, L. Wang, **Ajay Kumar Baranwal**, G. Kapil, Qing Shen, ShuziHayase:*, **ACS Energy Letters**, 2025, 10, 2133-2142.

4. Supports India’s green economy through research excellence, industry collaboration, and technology commercialization aligned with SDG 7.

7.5 Low-carbon energy use

7.5.1 Low-carbon energy use

Year 2024

Data Collected	Definition	
Total energy used	Total energy used in Gigajoule (GJ) for the year 2024	7.812
Total energy used from low-carbon sources	Energy used from low-carbon sources in 2024 in Gigajoule (GJ)	2.232

