



**राष्ट्रीय प्रौद्योगिकी संस्थान, अगरतला**  
**NATIONAL INSTITUTE OF TECHNOLOGY, AGARTALA**  
**BARJALA, AGARTALA - 799 046**  
**Civil Engineering Department**

**Dr. Umesh Mishra,**  
**Professor**

02-11-2023

**REF: F.TU/REG/IQAC/AUDIT/06/2023 Dated 10.08.2023**

**TO WHOMSOEVER IT MAY CONCERN**

This is to certify that the Energy Audit Report 2021-22 of Tripura University is an original internal audit work conducted by the Energy Audit Committee to monitor the environmental management practices adopted in the University which is in line with the terms of the International Standards of Internal Auditing.

After going through the report, it is obvious that adequate and appropriate audit procedures were followed for Energy Audit and the gathered evidences support the conclusions reached and conained in this report.

The suggestions and recommendations prescribed and the conclusions derived are quite genuine and within the achievable limits, and I understand that Tripura University is competent to fulfill those to meet the Sustainable Development Goals.

I recommend and firmly believe that this report meets the requirement prescribed for development of a Green Campus.

*Umesh*

**(Dr. Umesh Mishra)**

Professor  
Civil Engineering  
NIT, Agartala

---

Mobile-+919436926569 Email - [umishra123@rediffmail.com](mailto:umishra123@rediffmail.com), [umeshmishra2010@gmail.com](mailto:umeshmishra2010@gmail.com)

# ENERGY AUDIT REPORT

## 2021-2022



**TRIPURA UNIVERSITY**  
**Suryamaninagar | TRIPURA (W)- 799022 | TRIPURA |**  
**INDIA**



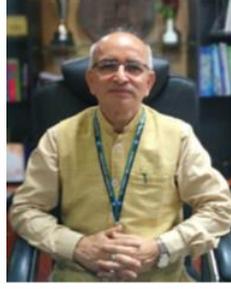


प्रो. गंगा प्रसाद प्रसाई  
कुलपति

**Prof. Ganga Prasad Prasain**  
Vice-Chancellor

त्रिपुरा विश्वविद्यालय  
(केन्द्रीय विश्वविद्यालय)  
सूर्यमणिनगर-799022, त्रिपुरा, भारत

**Tripura University**  
(A Central University)  
Suryamaninagar-799022, Tripura, India



### Foreword from Vice Chancellor

I have great pleasure to introduce the Green/Energy/Environmental Audit report-2021-22, a milestone achievement that underscores our unwavering dedication to environmental stewardship. This report signifies a momentous step forward as we, as an institute, take stock of our ecological impact and chart a course towards a more sustainable future.

In an era defined by the convergence of global challenges and shared responsibilities, this report embodies our commitment to transparency, accountability, and progress. It is a reflection of our institute's ongoing journey to align our practices with the principles of sustainability, echoing the sentiment that knowledge and awareness are pivotal agents of change.

The Green/Energy/Environmental Audit report-2021-22 encapsulates the meticulous efforts of our Green/Energy/Environmental Audit Committee which constitute a team of researchers and sustainability experts who have meticulously delved into our institution's operations. Their insights, derived from rigorous assessment and careful evaluation, offer a panoramic view of our environmental footprint - the good, the better, and the areas warranting improvement.

With a deep sense of responsibility and optimism we present this report to our stakeholders. We recognize that our actions today lay the foundation for the world we bequeath to future generations. The report's findings beckon us to embrace innovation, challenge conventions, and forge a path that reconciles our aspirations with the planet's health.

I extend my heartfelt appreciation to every individual who has contributed to the creation of this report. Your dedication to advancing sustainability is a testament to the spirit of collaboration and shared purpose that defines our institute.

May this Audit report (s) serve as a compass guiding us towards more eco-conscious practices, fostering a culture of environmental awareness and inspiring collective action. Let us seize this moment to galvanize change, secure in the knowledge that every positive step we take today reverberates for years to come.

Together, we embark on a transformative journey, driven by the profound belief that by nurturing nature, we nurture ourselves.

(Prof. Ganga Prasad Prasain)

## Acknowledgement

In the spirit of our commitment to environmental stewardship and sustainability, Tripura University has consistently led the way in organizing various initiatives, such as environmental campaigns, workshops, and extension programs, with the aim of driving positive societal change on both a national and global scale. We understand the critical importance of conducting an energy audit to ensure the sustainable development and progress of our esteemed institution. Tripura University remains resolute in its pursuit of excellence and is dedicated to improving environmental quality while safeguarding the pristine ecosystem of our campus, thus securing a promising legacy for future generations of students and campus residents.

This report, covering the period 2021-2022, represents our third formal effort to comprehensively document the outcomes of our investigative work and provide a thorough analysis of all relevant aspects of the Energy audit process. In alignment with the climate neutrality goals set by the Government of India, Tripura University aspires to play a significant role in preventing global ecological crises. To achieve this, we have taken a holistic approach, which includes the establishment of an Energy Audit Committee composed of faculty members specializing in this field. This committee is responsible for collecting essential environmental data within our campus, facilitating on-site solutions to environmental challenges.

The primary objective of the Energy Audit Committee is to identify existing and emerging environmental concerns, involving a detailed examination of our energy management practices and their impact on our campus environment. This report is the result of collective effort, driven by each dedicated member of the Tripura University Energy Audit Committee and its stakeholders. Through exhaustive evaluations of energy parameters, coupled with meticulous data collection and analysis, the committee has pinpointed immediate and pressing threats within our campus environment. The recommendations and suggestions in this report aim to establish a solid foundation for continuous improvement in our energy consumption standards and performance.

This report emphasizes the importance of engaging all stakeholders in our endeavour. By championing a bottom-up approach, we aim to collectively address the challenges that lie ahead. In this collaborative pursuit, the report serves as a vital resource to guide meaningful action and promote a lasting culture of environmental responsibility.

We extend our heartfelt gratitude for the invaluable encouragement and administrative support provided by Prof. Ganga Prasad Prasain, Hon'ble Vice Chancellor of Tripura University, throughout this study. His guidance has been our guiding light, and on behalf of the Energy Audit Committee-2021-2022, I express our profound appreciation for his benevolent support. Our gratitude extends to all teaching and non-teaching staff, as well as the Deans and Heads of Departments at Tripura University, for their generous assistance in gathering data for this report.

Special recognition is due to Er. Krishna Das, Executive Engineer, and his team for providing essential campus data.

We also extend our sincere appreciation to Prof. Umesh Mishra from the Department of Civil Engineering at NIT, Agartala, for his invaluable role as the External Expert for the Energy Audit 2021-22. His expertise and insights greatly enriched the audit process, and his dedication significantly contributed to the depth and quality of our findings.

A heartfelt acknowledgment is reserved for all committee members who played an integral role in the creation of this report. In particular, I extend special thanks to Dr. Thiru Selvan, the convener of the Tripura University Energy Audit Committee -2021-22, for his unwavering commitment to compiling this report.

It is our sincere belief that the collective efforts of the current Energy Audit Committee will greatly benefit Tripura University. We earnestly hope that embracing the management plan outlined in this report becomes a shared responsibility among all stakeholders of the university, as we strive to diminish our environmental footprint.

Prof. Badal K Datta  
Chairman

**Tripura University Energy Audit Committee  
2021-2022**

**Chairman**

Prof. B. K. Datta, Dean, Faculty of Science, Tripura University

**Members**

Prof. R.K. Nath, HoD, Dept. of Chemistry, Tripura University  
Prof. Y.V. Krishnaiah, Dept. of Geography & D.M., Tripura University  
Dr. B.K. Sharma, Dept. of Microbiology, Tripura University  
Dr. S.S. Singh, Dept. of Zoology, Tripura University  
Mr. N. Tripura, Electrical Engineer, Tripura University  
Mr. Rajesh Banik, Civil Engineer, Tripura University  
Mr. Krishna Das, Executive Engineer, Tripura University  
Campus In-charge, Tripura University

**External Expert**

Prof. Umesh Mishra, Department of Civil Engineering, NIT, Agartala.

**Convener**

Dr. Thiru Selvan, Dept. Forestry and Biodiversity, Tripura University

# CONTENT

<b>Title</b>	<b>Page No.</b>
<b>Foreword</b>	<b>-</b>
<b>Acknowledgement</b>	<b>-</b>
<b>Introduction</b>	<b>1</b>
<b>Energy Audit at Tripura University</b>	<b>1</b>
<b>Methodology adopted</b>	<b>2</b>
<b>Audit stage</b>	<b>4</b>
<b>Post audit stage</b>	<b>5</b>
<b>Land use and land cover</b>	<b>5</b>
<b>Energy Audit</b>	<b>8</b>
<b>Summary</b>	<b>13</b>

**Introduction**

Tripura University, established as a State University on October 2nd, 1987, emerged from the renowned Calcutta University. Situated in the North Eastern region of India, the university has been committed to achieving academic excellence. Nestled in a lush, semi-urban expanse of 75 acres along the National Highway at Suryamaninagar (23°45'40"N; 91°15'58"E), approximately 9 kilometers south of Agartala, the capital city, it originated from the former CUPGC.

Designated as one of the 49 Central Universities in India, Tripura University was founded on July 2nd, 2007, through a parliamentary act with the purpose of establishing a teaching and affiliating institution in the state. Notably, the university has made significant strides, enhancing both its infrastructure and academic landscape.

Presently, the university offers a diverse array of programs through its Science, Arts, and Commerce Faculty. Its academic portfolio comprises a total of 57 programs, encompassing Undergraduate, Postgraduate Diploma, and other Postgraduate Programs. Additionally, the university provides Ph.D. programs in 38 subjects. With an annual enrollment exceeding 4000 students, the campus serves as a hub of education and exploration. Moreover, Tripura University fosters pioneering research initiatives spanning various fields of arts, commerce, science and technology.

Despite its geographical remoteness and communication challenges, the university remains dedicated to competing nationally in academic accomplishments, research breakthroughs, innovation, and successful placements. This commitment is aptly reflected in its commendable NAAC Assessments and NIRF rankings.

The university boasts 46 well-equipped departments, each furnished with state-of-the-art classrooms, laboratories, continuous internet access, a computer center, library, free Wi-Fi campus-wide, sports facilities, an open-air theater, health services, banking amenities, a cafeteria, post office, food court, hostels, and a guest house. Its esteemed faculty is not only dynamic but also compassionate and approachable. Alongside regular academic sessions, the university promotes a variety of sports and socio-cultural activities, including film screenings, musical performances, art festivals, debates, university fairs, sports tournaments, and wellness walks.

Set against a backdrop of scenic beauty, the campus encompasses lakes, woodlands, hills, flower gardens, and fruit orchards, creating a tranquil environment. The abundance of trees, the fragrance of flora, the chorus of birds, fluttering butterflies, and local wildlife collectively provide a refreshing contrast to academic demands, nurturing and rejuvenating the minds of its student community.

**Energy Audit at Tripura University**

In a world where governments' worldwide champion policies aimed at enhancing labour productivity and economic growth through the cultivation of human capital, Tripura University has positioned itself as a catalyst for knowledge and skill enhancement. This commitment not only bolsters the nation's prosperity but also catalyses substantial economic growth. The university's unwavering dedication to raising educational standards signifies its profound commitment to transformative change.

As Tripura University embarks on ground-breaking research across diverse scientific and technological domains, this evolution inevitably ushers in an era of increased energy consumption and its accompanying ecological footprint. In alignment with the vision set forth by the Government of India, steered by the esteemed Prime Minister Shri Narendra Modi Ji, Tripura University recognizes the paramount importance of sustainable practices across all sectors. This ethos seamlessly aligns with the University Grants Commission's (UGC) mission, mandating "Environmental Consciousness" as a pivotal criterion (Criterion VII) in the evaluation of educational institutions.

In today's epoch of sustainable development, Tripura University fully embraces the principles of responsible resource utilization and environmental stewardship, with energy efficiency emerging as a cornerstone of campus management. Energy auditing, as the systematic assessment of practices, stands as a linchpin in ascertaining efficiency, identifying wastage, and unlocking optimization prospects. By dissecting energy consumption patterns, identifying inefficiencies, and proposing energy-saving measures, the university endeavours to minimize its carbon footprint and contribute to broader environmental imperatives.

Tripura University staunchly upholds its commitment to responsible resource stewardship and aspires to be at the forefront of sustainable academic practices. In consonance with the sustainability objectives outlined by the Government of India, the university undertakes a vigilant oversight of its research and educational missions, as spearheaded by the diligent efforts of the Energy Audit Committee.

The core policy objectives of Tripura University's Energy Audit are threefold:

**Identifying Strengths and Improvement Areas:** Our policy is geared towards conducting a holistic energy audit encompassing sustainable operations within administrative, academic, and research spheres. Through rigorous gap analysis, we aim to pinpoint our strengths while identifying areas ripe for enhancement. This, in turn, sets the stage for actionable strategies that propel us closer to our sustainability goals.

**Promoting Environmental Awareness:** We are resolutely committed to nurturing a culture of environmental awareness throughout our campus community. By actively engaging all stakeholders – from students and faculty to staff and administration – we seek to inspire and motivate responsible and optimized resource utilization. Our collective efforts are geared towards minimizing our ecological footprint.

**Proactive Environmental Management:** Our policy underscores the critical importance of proactive environmental management. By establishing baseline data on key environmental parameters, we stand prepared to identify potential issues in their infancy and address them before they escalate. This approach ensures a sustainable, ecologically balanced campus environment.

In pursuing these policy goals, Tripura University underscores its dedication to efficient resource utilization, environmental consciousness, and the proactive resolution of environmental concerns through the diligent implementation of energy audits.

To realize these lofty objectives, the Energy Audit Committee of Tripura University has pledged to:

- Identify existing and emerging energy-related challenges.
- Vigilantly monitor energy management practices.
- Evaluate existing practices that may impact energy consumption.
- Foster awareness among all university stakeholders.
- Compile a comprehensive Energy Audit Report detailing the energy-efficient practices adopted by various departments, support services, and administrative entities.

## METHODOLOGY ADOPTED

### The Energy Audit Journey

In our relentless pursuit of a more sustainable future, Tripura University embarked on a dynamic journey of energy auditing, employing a comprehensive and strategic methodology. Our commitment to minimizing our carbon footprint, optimizing resource utilization, and nurturing a greener campus ecosystem has led us to this critical juncture. Here, we unveil the methodology that underpins our

energy audit, a roadmap to a more energy-efficient and eco-conscious institution.

**Preliminary Assessment:**

Our methodology commences with a rigorous Preliminary Assessment. Here, we embark on an exhaustive data collection mission, delving deep into energy consumption patterns, utility bills, and a trove of energy-related data across our sprawling campus. We meticulously identify the major energy-hungry areas and equipment, including but not limited to lighting systems, HVAC (Heating, Ventilation, and Air Conditioning) systems, and various electrical appliances.

**Onsite Data Collection:**

With the groundwork laid, we move to the heart of the campus, conducting onsite visits to various buildings and facilities. This hands-on approach allows us to intimately assess energy usage, examining each piece of equipment, its specifications, operational hours, and energy consumption characteristics. We leave no stone unturned in our quest to grasp the nuances of energy usage across our diverse systems.

**Enquiries and Stakeholder Interviews:**

A crucial phase in our methodology involves engaging with our campus community. We initiate conversations and discussions with key stakeholders, including facility managers, maintenance personnel, and occupants of our campus spaces. These valuable interactions yield insights into operational practices, maintenance routines, and, critically, opportunities for energy conservation. It is through these conversations that the human element of energy management comes to life.

**Energy Use Analysis:**

Armed with a wealth of data, we roll up our sleeves and dive into the meticulous analysis of energy use. We crunch the numbers, calculate energy consumption for various equipment and areas, and uncover hidden trends, patterns, and anomalies in our energy landscape. This analytical phase is where the true story of our energy efficiency unfolds.

**Lighting Systems Analysis:**

One of the focal points of our audit methodology is the scrutiny of our lighting systems. Here, we evaluate existing lighting technologies and propose energy-efficient alternatives. The shift towards LED lighting, for instance, stands out as a beacon of potential energy savings.

**Renewable Energy Potential:**

As sustainability champions, we cast our gaze towards the sky and explore the immense potential of renewable energy sources. Solar panels, wind turbines, and other sustainable technologies become integral considerations in our audit. The sun and the wind, harnessed strategically, can supplement our energy needs while minimizing our carbon footprint.

**Energy Conservation Measures (ECMs):**

Every audit yields a treasure trove of energy conservation measures. Tailored to our university's specific needs and challenges, we propose a comprehensive set of energy-saving strategies. These measures encompass a wide spectrum, ranging from equipment upgrades to behavioral changes, all aimed at optimizing energy usage. Prioritization of these measures ensures a strategic and impactful approach to energy conservation.

**Cost-Benefit Analysis:**

In the world of sustainability, economics plays a pivotal role. We meticulously estimate the costs associated with implementing each energy-saving measure and forecast the potential energy and cost savings over time. The venerable return on investment (ROI) metric guides our decision-making, ensuring that every proposed measure aligns with our financial and sustainability goals.

**Report Preparation:**

Finally, we synthesize the entire audit journey into a comprehensive report. This document serves as a testament to our commitment to transparency and accountability. It encapsulates our findings, recommendations, and detailed analyses of energy consumption. Each proposed energy conservation measure finds its place in this report, complete with the expected benefits it brings to our institution.

In the end, this energy audit methodology stands as a testament to Tripura University's unwavering dedication to responsible resource stewardship, environmental consciousness, and proactive energy management. It is a roadmap that not only leads to a more energy-efficient campus but also towards a greener, more sustainable future for all.

**AUDIT STAGE**

At Tripura University, our commitment to sustainability and responsible energy management is unwavering. To chart our course towards a greener, more energy-efficient campus, we embarked on an audacious journey - the Energy Audit. This expedition commenced with meticulous planning and an ironclad methodology.

**Step 1: Data Gathering and Assessment**

Our voyage began with a robust data gathering and assessment phase. We delved deep into the intricate web of energy consumption within our university campus. Gathering data on energy consumption patterns, utility bills, and a treasure trove of energy-related information was our starting point. We aimed to understand our energy landscape in its entirety.

**Step 2: Identifying Energy Hotspots**

The auditors' torch then shone brightly on our campus, illuminating the major energy-consuming areas and equipment. We meticulously identified lighting systems, HVAC units, electrical appliances, and more. This inventory allowed us to pinpoint the key players in our energy consumption game.

**Step 3: Onsite Exploration and Engagement**

The audit team ventured into the heart of our campus. Onsite visits to various buildings and facilities were essential. Here, we assessed energy usage in real-time. We scrutinized equipment specifications, operational hours, and the energy consumption habits of our systems.

**Step 4: Stakeholder Engagement**

A vital element of our journey was engaging with our university community. Staff, students, and stakeholders were our guides in this quest. Structured questionnaires and interviews provided insights into usage patterns, appliance characteristics, and conservation strategies. The human dimension of energy management unfolded before our eyes.

**Step 5: Data Synthesis and Analysis**

With a trove of data in our possession, we undertook a rigorous analysis. Energy consumption for various equipment and areas was meticulously calculated. We searched for trends, patterns, and irregularities in our energy landscape. This analytical phase allowed us to discern the true story of our energy efficiency.

**Step 6: Lighting Systems Scrutiny**

Lighting, a key facet of our energy consumption, received special attention. We evaluated existing lighting technologies and proposed energy-efficient alternatives. The dawn of LED lighting emerged as a promising beacon on our energy-saving horizon.

**Step 7: The Renewable Energy Frontier**

Sustainability champions by heart, we looked skyward. Solar panels, wind turbines, and other renewable technologies were explored. The potential of harnessing natural resources to supplement our energy needs became a tantalizing prospect.

**Step 8: Proposing Energy Conservation Measures**

The culmination of our journey led to the proposal of a comprehensive set of energy conservation measures. Tailored to our university's unique needs, these measures spanned equipment upgrades, behavioural changes, and operational optimizations.

**Step 9: Cost-Benefit Evaluation**

In the realm of sustainability, economic viability is paramount. We meticulously estimated the costs associated with implementing each energy-saving measure. We projected potential energy and cost savings over time. The return on investment (ROI) for each proposed measure was evaluated to ensure fiscal prudence.

**Step 10: Crafting the Energy Audit Report**

Our journey found its voice in the comprehensive Energy Audit Report. This document encapsulates our findings, recommendations, and the minutiae of energy consumption across our campus. Each proposed energy conservation measure is presented with its expected benefits, serving as a roadmap to our sustainable future.

In the end, the Energy Audit at Tripura University is more than just a report; it's a testament to our unwavering commitment to responsible resource stewardship, environmental consciousness, and proactive energy management. It's our blueprint for a greener, more energy-efficient campus and a brighter, more sustainable future for all.

**POST AUDIT STAGE**

Beyond numbers and statistics, the post-audit stage of Tripura University's Energy Audit unveils a vivid portrait of our sprawling campus. This narrative, framed by the land's contours and human endeavours, tells the story of our commitment to sustainable energy management.

**Land use and land cover**

Our campus, nestled amidst an undulating topography, presents a diverse canvas of land use and land cover. Central to this portrait is a pristine wetland, a shimmering lake that graces our midst. Fed by

rain's benevolence, it remains a perennial oasis, a sanctuary for nature's myriad creations. Scattered trees adorn this landscape, creating a picturesque haven that beckons a rich tapestry of flora and fauna.

Over the years, our academic and residential footprint has expanded. What were once highlands or gently sloping lowlands are now home to academic departments, hostels, and residential quarters. This coexistence of concrete and nature paints a harmonious picture of sustainable living.



Fig1a. Landscape of lake existing at Tripura University

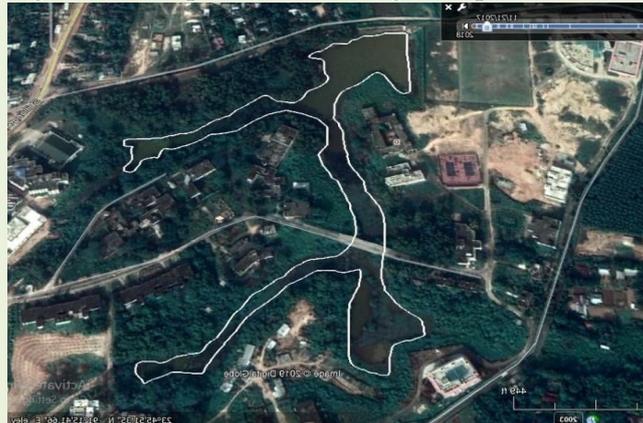


Fig. 1b. Map showing the Tripura university lake

### The Land by the Numbers

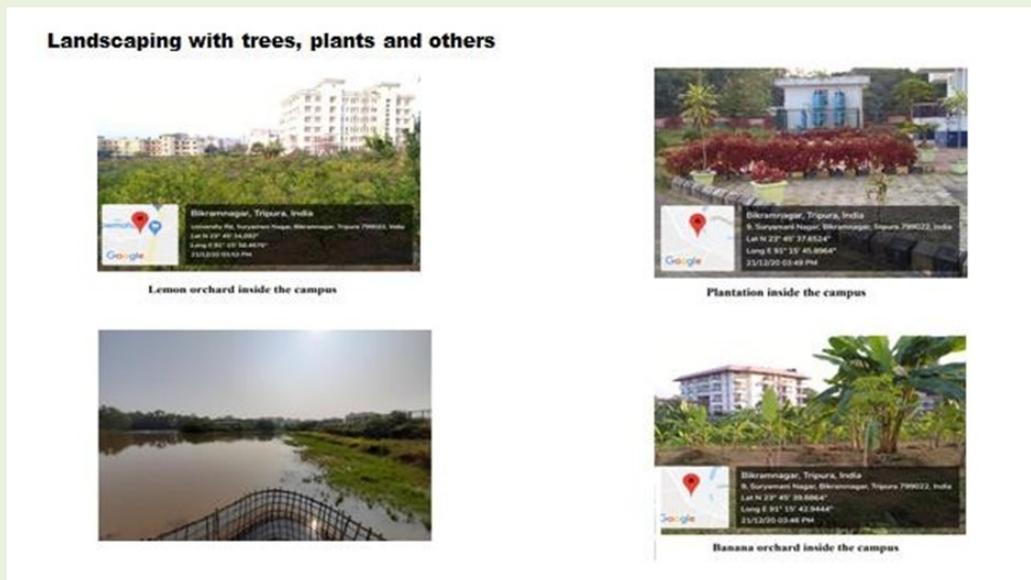
The data from our audit cast a spotlight on the sprawling canvas of our campus. A total of 97 acres make up our academic realm. Among these, 75 acres have been integral to our main campus, while an additional 22 acres were embraced in 2015. Orchards, wetlands (our beloved lake), the botanical garden, and a forest park collectively span 29.07 acres. These spaces bear witness to our commitment to preserving nature's beauty within our precincts.



## A Mosaic of Commitment

In the intricate mosaic of our campus, every building, every tree, and every path bears witness to our dedication to sustainability. The wetland teems with life, the orchards bloom with promise, and our multi-storied structures reach for the sky. The Energy Audit is not just a report; it's a chapter in our ongoing story of harmonizing human endeavours with nature's grandeur.

As we navigate the post-audit stage, we do so with an enriched understanding of our landscape. We are not just a university; we are stewards of an ecosystem. Our commitment to responsible energy management is etched in the very contours of our campus. In these landscapes, we find the palette for our sustainable future.



## Energy audit

### Illuminating Our Energy Journey

Energy audit, as per the Energy Conservation Act of 2001, is a comprehensive assessment of energy usage. It involves monitoring, verification, and analysis of energy consumption, leading to recommendations for enhancing energy efficiency. A critical element of this audit is cost-benefit analysis and the formulation of an action plan for reducing energy consumption.

### Exploring Our Energy Landscape

Our energy audit encompassed the totality of electrical and natural gas energy consumption within Tripura University's expansive campus, spanning academic and administrative precincts. Notably, our hostels primarily employ LPG cylinders for culinary pursuits, a resource diligently counted in our audit. It's important to note that domestic LPG connections were not considered in this study, focusing instead on our institutional energy footprint. Within the campus, no other fossil fuels such as coal or firewood are used for energy generation.

### Bathing in Natural Light

A distinctive feature of our university is the architectural design of our buildings, engineered to harness natural light. During daytime hours, no electricity is squandered on illuminating tube lights or electric bulbs. Our structures are endowed with ample daylight and ventilation provisions,

epitomizing an eco-conscious ethos.

### Solar Resplendence

Tripura University proudly champions renewable energy utilization, symbolized by the installation of rooftop solar panels boasting a capacity of 600 KWp across 14 buildings. This strategic initiative has significantly curbed our electricity consumption. Over three years, from January 2019 to December 2021, we've saved a substantial sum, amounting to Rs. 12,000,000/-, with an average monthly saving of Rs. 3,50,000/-.



Fig 3(a): Use of solar power panels in TU Campus



Fig 3(b): Use of solar power panels in TU Campus

### Lights of Efficiency

Our commitment to energy efficiency extends to our lighting infrastructure. All High-Pressure Sodium Vapour lamps (HP-SV) and High-Pressure Metal Halide (HP-MH) street lights have been replaced with energy-efficient LED counterparts. Additionally, mushroom head LED lights have been installed as part of our green initiatives. This transition to LED technology across 258 fixtures has resulted in a total saving of Rs. 79,44,159.78 over four years and six months, from May 2017 to December 2021, with an average monthly saving of Rs. 147,114.07/-. At present, we boast 500 LED bulbs and LED panels, as compared to 220 CFLs and 280 Halogen bulbs across various academic and administrative buildings.

### Cooling Strategies

In terms of cooling, our university comprises 500 air conditioners and 3500 fans distributed across academic and administrative blocks.

### A Gastronomic Tinge

Within the vibrant tapestry of our campus, an average of 45 natural gas (LPG cylinders) worth of cooking fuel per month is utilized across different hostels and guest houses.

### Energizing Statistics

In the year 2021-22, Tripura University's monthly electricity consumption averaged 110,000 units, including residential quarters. In contrast, the preceding years—2018-19, 2019-20, and 2020-21—saw monthly average power consumption figures of 220,000, 110,000, and 110,000 units, respectively (Fig. 4 and Fig. 5). This reveals a commendable 46% reduction in monthly average electricity consumption in the current year, attributable to our strategic installation of solar panels in specific zones (Fig. 6).

In summary, our energy audit underscores Tripura University's unwavering commitment to sustainable energy management, exemplified by our embrace of renewable energy, energy-efficient lighting, and innovative energy practices.

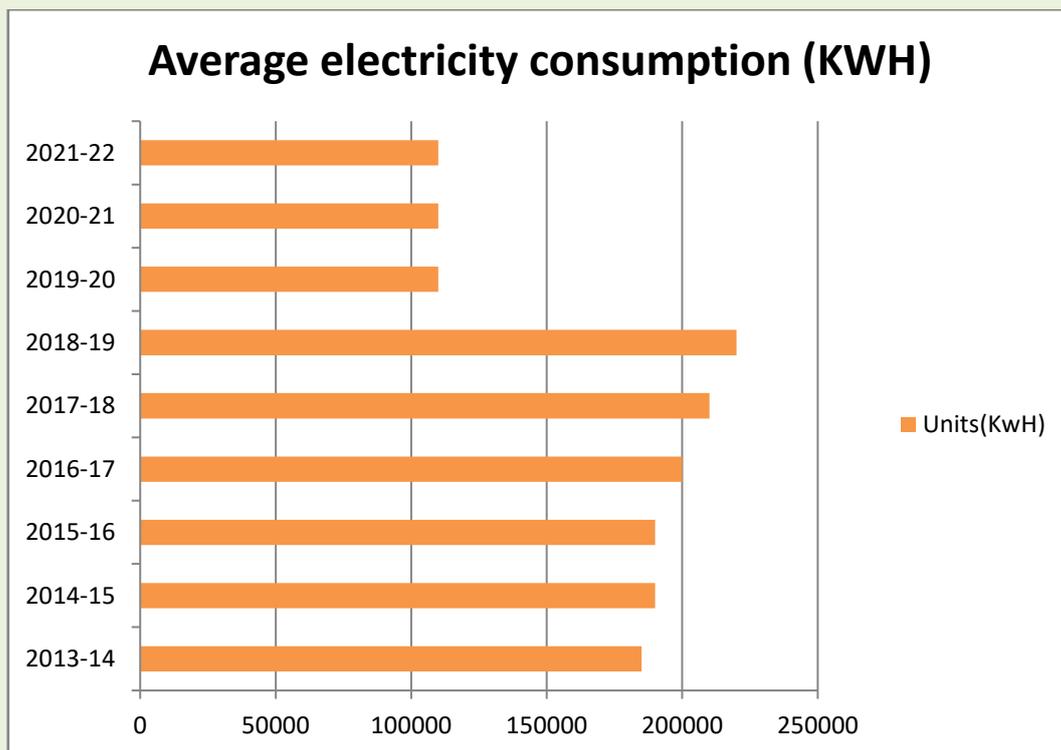


Fig. 4: Average electricity consumption in TU campus from 2013-14 to 2021-22

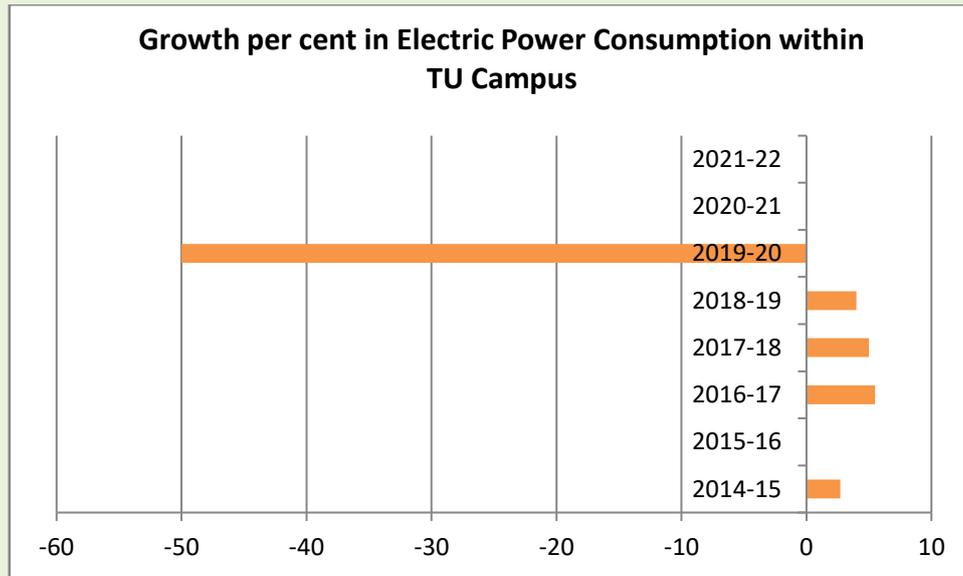


Fig. 5: Percentage growth in Electric Power consumption in TU campus from 2014-15 to 2021-22

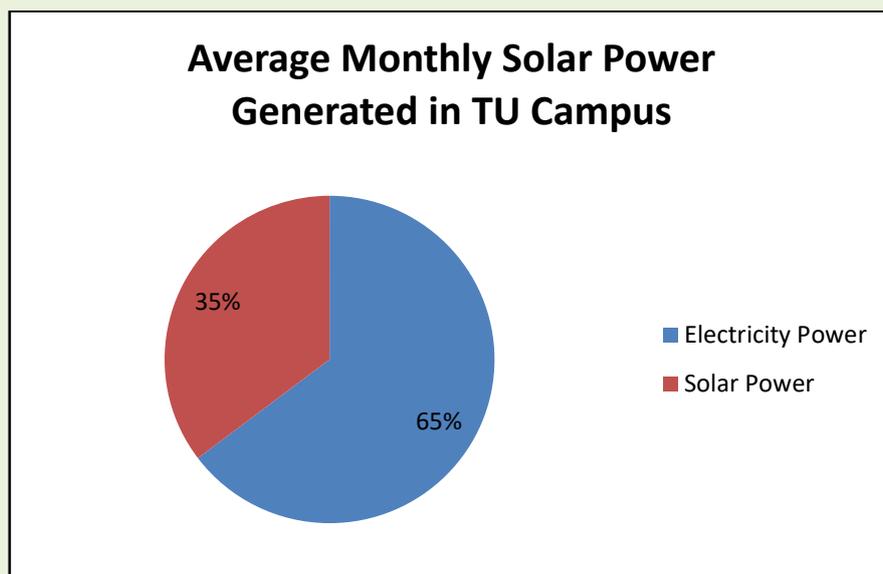


Fig. 6: Monthly Solar power generated within TU campus

### Observations

In our quest to illuminate energy management practices within Tripura University's vibrant campus, a few noteworthy observations have come to light.

**Metering Matters:** One conspicuous observation is the absence of separate electricity meters in our hostels, academic blocks, and administrative precincts. This gap in metering can impede our ability to precisely monitor energy consumption at the building level.

## Suggestions and Recommendations

To address these observations and illuminate a path forward, we offer the following suggestions and recommendations:

**Metering Equality:** First and foremost, there should be a concerted effort to install electricity meters in each building. This step ensures that we have granular visibility into energy consumption patterns, enabling us to make informed decisions and implement targeted energy-saving measures.

**Harnessing Solar Brilliance:** The power of the sun holds tremendous potential. We propose the installation of solar power-generated roadside poles to tap into this clean and renewable energy source. By harnessing solar energy, we can further augment our campus's energy sustainability.

**A Solar Tomorrow:** As we stride into the future, we envision a campus increasingly powered by solar energy. Investing in additional solar infrastructure in the coming years will reduce our carbon footprint, enhance energy security, and pave the way for a more sustainable future.

**Lights Out, Green On:** Energy conservation begins with individual responsibility. We advocate for regular campaigns within our university community, emphasizing the importance of turning off lights and other electric appliances after use. These small but collective actions can have a significant impact on reducing energy waste.

In conclusion, these suggestions and recommendations serve as guiding beacons, steering us toward a more energy-efficient and sustainable future for Tripura University.

## Summary

Energy auditing is a strategic journey towards optimizing energy consumption and bolstering sustainability. In pursuit of this goal, Tripura University conducted its annual "Energy Audit" for the fiscal year 2021-2022. The overarching objective of this audit was to craft a comprehensive narrative of the university's energy practices and to deliver a meticulously curated energy audit report.

This intricate energy audit embarked on a multifaceted exploration, commencing with a meticulous analysis of diverse facets, encompassing energy consumption patterns, conservation strategies, and the efficiency of energy-related utilities that power the university's operations. Our audit team conducted a diligent examination of various facilities spanning our sprawling campus, identifying a myriad of appliances and utilities, including but not limited to lighting systems, water coolers, faucets, restrooms, fans, and air conditioning units. Each item underwent scrutiny, with energy usage quantified in terms of appliance wattage or water flow rates. The scrutiny extended to the frequency of appliance utilization and their consequential impacts. Engaging our faculty members and students enriched our data collection, offering insights into usage frequencies and general characteristics. This thorough data gathering amalgamated on-site visits and direct measurements, forming the bedrock of this comprehensive energy audit report for Tripura University.

One remarkable facet of our university's infrastructure is its conscious design to minimize electricity consumption during daylight hours. Abundant daylight and ventilation negate the need for electric lighting, marking a commendable stride towards energy efficiency. Furthermore, we've embraced renewable energy with open arms. Our installation of rooftop solar panels across 14 buildings, boasting a collective capacity of 600 KWp, stands as a testament to our commitment to sustainability. This strategic move has borne fruit, significantly offsetting our electricity needs. Over three years, from January 2019 to December 2021, we saved a substantial Rs. 12,000,000/-, averaging Rs. 350000/- per month. In line with our green initiatives, mushroom head LED lights were adopted, with 258 fixtures swapped, accumulating savings of Rs. 79,44,159.78 over four years and six months, from May 2017 to December 2021, averaging Rs. 147,114.07/- per month. Our current inventory includes 500 LED bulbs and panels, surpassing 220 CFLs and 280 Halogen bulbs across our academic and administrative edifices.

In the fiscal year 2021-22, our monthly average electricity consumption stood at 110,000 units, encompassing residential quarters. Yet, our eagle-eyed audit team spotted a missing link in our energy management - the absence of separate electricity meters in hostels, academic blocks, and administrative buildings. Our recommendations, therefore, include the imperative need for energy consumption recording facilities in all university buildings. Furthermore, we envision additional solar power generation in the near future, contemplating the installation of roadside solar poles. To reinforce these efforts, we advocate regular campaigns promoting the responsible practice of switching off lights and electrical appliances after use.

In conclusion, Tripura University's energy audit report illuminates not only our energy landscape but also the path to a more efficient, sustainable, and conscientious future.



**TRIPURA UNIVERSITY SURYAMANINAGAR | TRIPURA (W)- 799022 |  
TRIPURA | INDIA**