GREEN METRIC REPORT 2025

UNIVERSIDAD TECNOLÓGICA DE BOLÍVAR

SOSTENIBLE

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INTRODUCTION

The Technological University of Bolívar (UTB) reaffirms its commitment to sustainability and environmental stewardship through its participation in the UI GreenMetric ranking, a global initiative that evaluates universities' performance in green practices and sustainable management. Since 2018, UTB has consistently demonstrated its dedication to reducing environmental impacts, innovating in green infrastructure, and fostering a culture of environmental responsibility across its academic community.

This report outlines the actions and achievements of 2024, aligned with the six strategic dimensions of UI GreenMetric: Environment and Infrastructure, Energy and Climate Change, Waste, Water, Transportation, and Education and Research. It highlights initiatives such as the adoption of energy-efficient technologies, comprehensive waste management programs, water conservation strategies, and the development of academic and community projects that promote sustainability.

Among the most significant milestones are the generation of 28% of UTB's energy demand through the "UTB Solar" photovoltaic plant, a 25% reduction in ordinary waste thanks to the 3R program, and the creation of the first Aquabus-e, an innovative electric water transport system. In addition, UTB's alignment with the United Nations Sustainable Development Goals (SDGs) is reflected in the integration of sustainability into its curriculum, research, and social engagement.

Through this report, UTB not only accounts for its environmental management, but also seeks to inspire the university community and society at large to embrace more sustainable practices, consolidating its position as a benchmark in building a balanced and planet-friendly future.

1 Setting and Infrastructure

1. SETTING AND INFRAESTRUCTURE

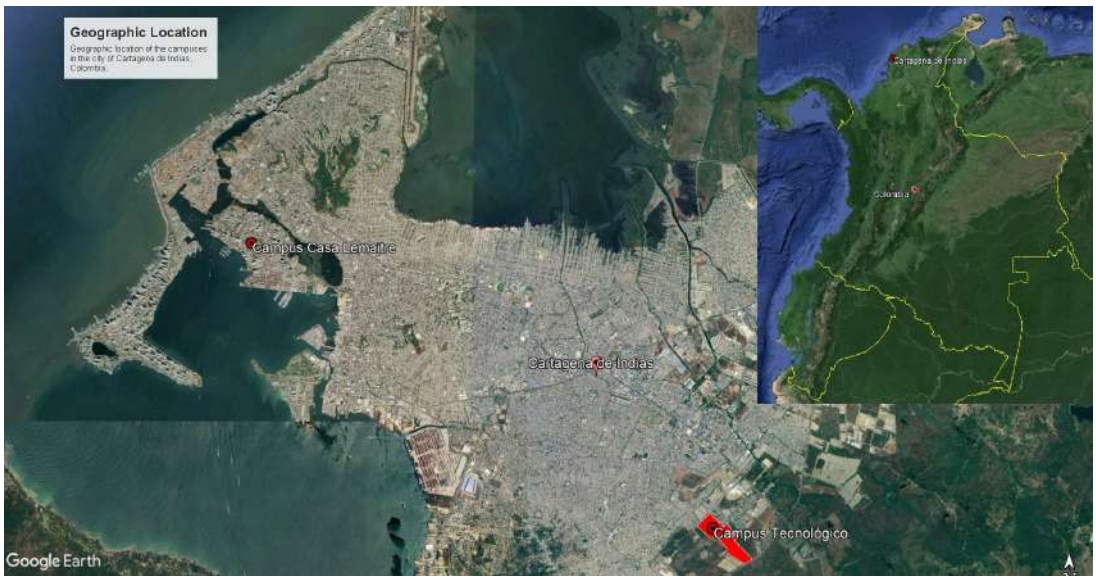
1.1 Number of campus sites (E1.3)

The Technological University of Bolívar (UTB) is a high-quality institution of higher education located in Cartagena de Indias, Colombia. It operates across two campuses and serves both undergraduate and graduate students. By the end of 2023 and throughout 2024, UTB undertook a comprehensive strategic review and institutional analysis. This process enabled the university to define its development horizon through 2030, in anticipation of the conclusion of its current Institutional Development Plan in 2025.

The reflection was driven by the global challenges facing higher education, particularly the need to train professionals with the skills and competencies required to thrive in a rapidly changing world shaped by globalization, technological advancement, and artificial intelligence. In response, the university restructured its academic organization, replacing the traditional faculty model with a more agile academic-administrative framework designed to better align with student aspirations and the demands of the global environment.

This transformation gave rise to three new schools: the School of Engineering, Architecture and Design; the School of Business, Law and Society; and the School of Digital Transformation. The following illustration shows the geographic location of the university's campuses:

Illustration1: Geographic location of university campuses.



Source: Google Earth.

The main campus, known as the Technological Campus, is located in the Ternera neighborhood, within the Carlos Vélez Pombo Industrial and Technological Park, at kilometer 1. Spanning approximately 24 hectares, it houses the academic and administrative buildings that support a wide range of undergraduate programs.

The Casa Lemaitre Campus, dedicated to graduate studies, is situated in the Manga neighborhood of Cartagena de Indias, at Calle del Bouquet Cra. 21 No. 25-92. Its centerpiece is the historic Casa Lemaitre, a district monument recognized for its historical, artistic, and cultural significance, as well as its symbolic role in the city's development. This heritage building lies at the heart of the campus and represents an essential cultural asset for the university. At the end of 2021, the campus embarked on a process of typological restoration and structural reinforcement aimed at improving its preservation and enhancing its functionality.

The following images present both university campuses:

Illustration 2: Technological Campus.

Source: Technological University of Bolívar.

Illustration 3: Campus Casa Lemaitre.

Source: Technological University of Bolívar.

1.2 Campus Setting (E1.4)

The main campus is located in the southwestern area of Cartagena de Indias, Colombia, within the Carlos Vélez Pombo Industrial and Technology Park. It borders the Tenaris company, the El Rodeo residential development, and the firms Villegas Vélez and Álvarez & Collins.

The Industrial and Technological Park is strategically connected to Cartagena, the department of Bolívar, and the wider Caribbean Region through the Troncal de Occidente Highway, the Anillo Vial, and the Cartagena Cargo Corridor. The land currently occupied by the Park was once part of the historic Hacienda Bajo Miranda, a territory rich in vegetation and wildlife that formed an interconnected biodiversity system extending toward Turbaco, an area known for its underground aquifers and lush flora and fauna.

Today, the campus preserves native tree species and a representative tropical dry forest, home to diverse regional flora and fauna. It spans 242,550 m^2, encompassing academic and administrative buildings, forested zones, and sports and wellness facilities for students. Topographically, 60% of the campus consists of flat land with natural slopes

favorable for rainwater drainage, while the remaining 40% features gentle inclines. The soil is predominantly composed of expansive clays, influenced by natural mud diapirism.

The Casa Lemaitre Campus is located in the Manga neighborhood of Cartagena de Indias, 13 km from the historic walled city center, and covers 4,135 m². From a fauna perspective, its vegetation is divided into two main areas: interior gardens with ornamental and shade trees, and open spaces populated by species such as mango, palm, almond, oak, bay, and others. Due to extensive urbanization in the Manga neighborhood, much of the original wildlife was displaced to nearby areas. However, the creation of new green zones—gardens, parks, and outdoor spaces—has gradually allowed the return of certain species and the establishment of new ones, including iguanas, parakeets, and other native fauna.

The soils in areas influenced by surrounding mangroves, such as Caño Bazurto and Ciénaga de las Quintas (Pie del Cerro, Pie de la Popa, Barrio Chino, Manga, and Martínez Martelo), are organic deposits consisting of fine sand, silt, and mud. The following images illustrate the surroundings of both the Technological Campus and Casa Lemaitre Campus:

Illustration 4: Technological Campus – Environment.

Source: Technological University of Bolívar.

Illustration 5: Campus Casa Lemaitre – Surroundings.

Source: Technological University of Bolívar.

1.3 Total campus área – m2 (E1.5)

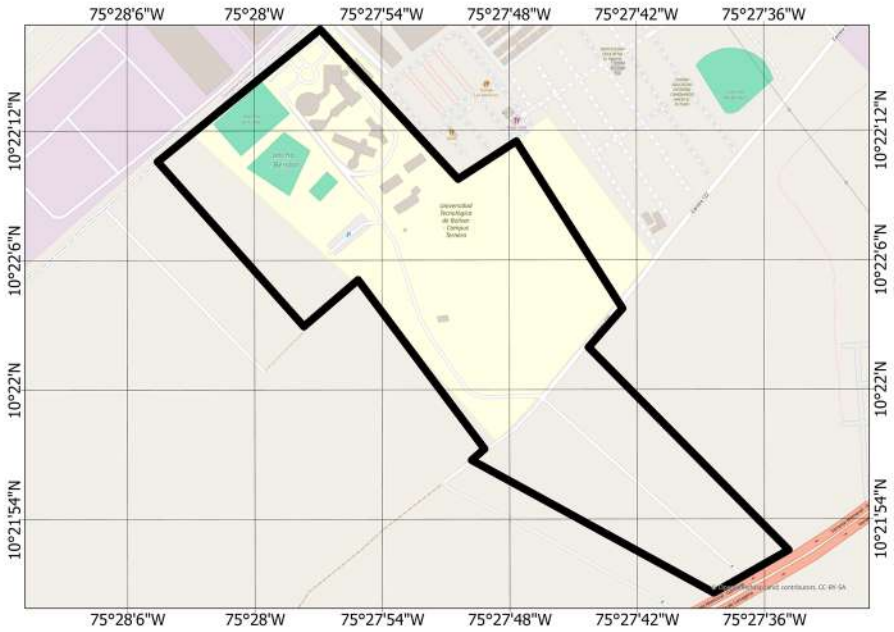
The Technological University of Bolívar has a total of 246,685 m2 of available space across its two university campuses, distributed as follows:

Total area	Areas (m2)
Technological Campus	242,550
Campus Casa Lemaitre	4,135
Total	**246,685**

These campuses comprise a variety of spaces that support academic and student life, including laboratories, classrooms, academic offices, sports facilities, parking areas, libraries, lounges, recreational zones, and green areas. Together, they create an environment that fosters learning and holistic development. The following diagrams

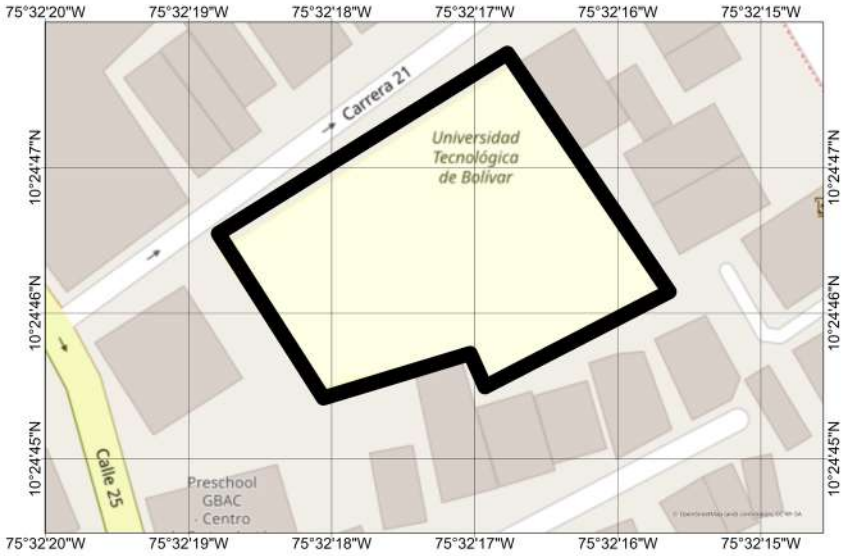
present the layout and design of both the Technological Campus and the Casa Lemaitre Campus:

Illustration6: Limits of the Technological Campus.



Source: Technological University of Bolívar.

Illustration7: Limits of the Casa Lemaitre Campus.



Source: Technological University of Bolívar.

1.4 Total campus buildings area -m2 (E1.7)

The total built area across both UTB campuses is approximately 31,191 m². The Technological Campus comprises around 16 buildings: nine dedicated to laboratories, study spaces, and classrooms, and seven allocated to teaching and administrative staff.

The Casa Lemaitre Campus includes three buildings: the MB and PS buildings, which host postgraduate programs, diploma courses, and other academic offerings; and the historic Casa Lemaitre building, which accommodates the campus library, administrative and academic offices, as well as classrooms.

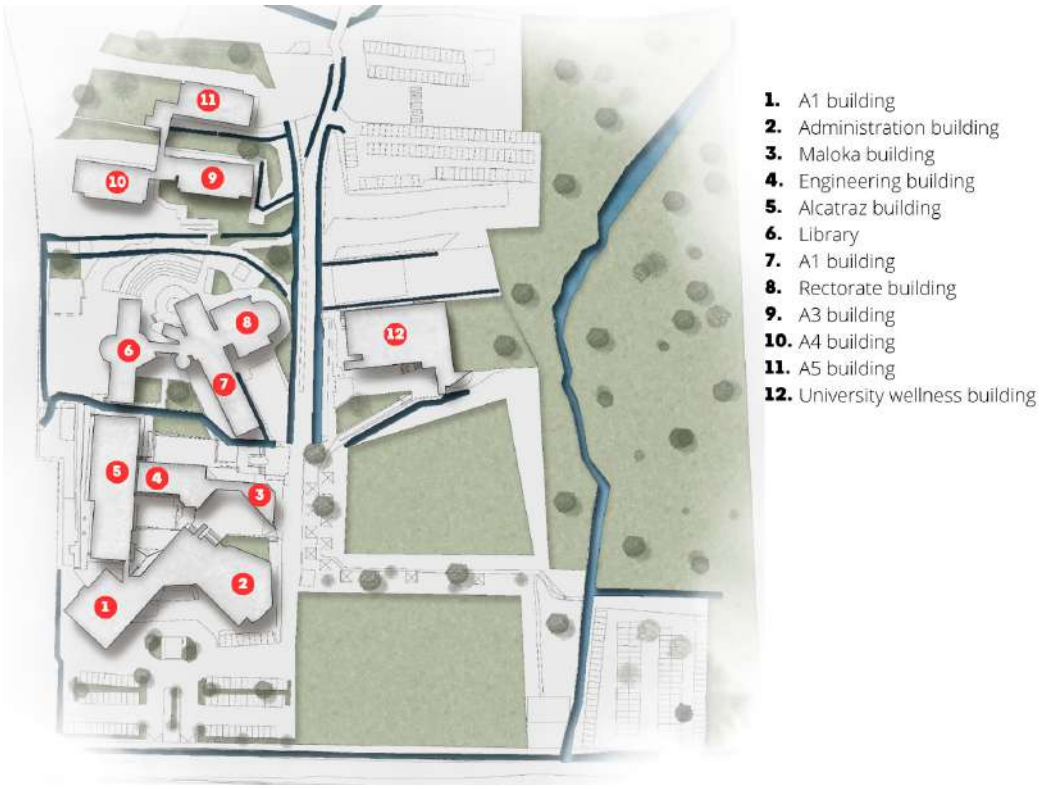
The following tables and illustrations provide details on the area, characteristics, and spatial distribution of each building on the two campuses:

Table 1: Total area of campus buildings.

TOTAL AREA OF PROPERTY MAIN CAMPUS	AREA (m2)
EDF BIBLIOTECA	1,283
EDF A1	2,870
EDF A2	5,124
EDF A3	1,297
EDF A4	1,297
EDF A5	1,297
EDF ALCATRAZ	3,810
EDF BIENESTAR	2,140
EDF RECTORIA	784
EDF ADMINISTRATIVO	2,260
EDF MALOKA	462
EDF INGENIERIA	909
ED. CONTENEDORES	140
LAB TECNO DE FABRICACION	191
LAB SUELOS	207
EDF TALLERES	860
CAFETERIA PROVISIONAL	676
SUBTOTAL	**25,607**
FLOOR AREA OF EFIDIFIOS CAMPUS CASA LEMAITRE	AREA (m2)
EDIFICIO POSGRADO	2,142
CASA LEMAITRE	1,385
EDIFICIOS AULAS	2,020
ASCENSOR	37
SUBTOTAL	5,583
TOTAL	**31,191**

Source: Technological University of Bolívar.

Illustration 8: Spatial distribution of the buildings of the Technological Campus.



Source: Technological University of Bolívar.

Illustration9: Maloka Building – Technology Campus.

Source: Technological University of Bolívar.

Illustration10: Auditorium Building and A2 – Technology Campus.

Source: Technological University of Bolívar.

Illustration 11: Technical Building – Technological Campus.

Source: Technological University of Bolívar.

Illustration12: Rector's Office – Technological Campus.

Source: Technological University of Bolívar.

Illustration 13: Library Building – Technological Campus.

Source: Technological University of Bolívar.

Illustration 14: Alcatraz Building and Engineering Building – Technology Campus.

Source: Technological University of Bolívar.

Illustration15: Casa Lemaitre – Casa Lemaitre Campus.

Source: Technological University of Bolívar.

1.5 Total ratio of open space area to total area (E1.8)

On the university campus, 95.3% of the total area consists of open spaces, while only 4.7% is occupied by ground-level buildings. This distribution reflects a campus layout that prioritizes open, green, and circulation areas, fostering well-being, interaction, and recreation within the university community. The following image illustrates the distribution of open spaces across the campus:

Illustration16: Open space on campus.

Source: Technological University of Bolívar.

1.6 Total area on campus covered in forest vegetation used for research, teaching, and/or community engagement (E1.9)

The Universidad Tecnológica de Bolívar campus encompasses 92,808 square meters of tropical dry forest, representing 38% of its total surface area. This unique ecosystem plays a vital role in conserving biodiversity in the Colombian Caribbean. The forest hosts trees reaching heights of up to 10 meters, primarily located on university-owned land. A defining feature of these species is their remarkable adaptation to local climatic conditions: during the dry season, they shed their leaves to minimize moisture loss, conserving water and ensuring survival through the driest periods of the year.

In this context, UTB has advanced the publication of its book Roots and Shadows, a project developed by the UTB Sustainability Committee to document the campus's natural heritage. The initiative aimed to characterize the diversity and relative abundance of tree species found on the Carlos Vélez Pombo Technological Campus, including both native tropical dry forest species and introduced ones. In collaboration with the Ecology course, students actively contributed to the process by georeferencing specimens and evaluating the phytosanitary status of the identified trees.

This integration of teaching, sustainability, and environmental management positions Roots and Shadows as both an educational resource and a technical reference. The following images illustrate the spatial distribution and characteristics of the forested areas within the campus:

Illustration17: Area covered by tropical dry forest.

Source: Technological University of Bolívar.

Illustration 18:Tropical dry forest zone 2.

Source: Dronedeploy.

Illustration19: Vegetation cover of the tropical dry forest.

Source: Dronedeploy.

1.7 Total area on campus covered in planted vegetation (E1.10)

The Technological Campus distinguishes itself through its commitment to the environment and the well-being of its university community, with approximately 16,254 square meters of planted vegetation, representing 6.6% of its total surface area. These green areas are strategically distributed across the campus, including interior gardens within buildings, exterior gardens that enhance the landscape, and a green wall that functions as an ecological lung. Together, they not only beautify the campus but also create a welcoming, semi-rural atmosphere—an oasis of tranquility and nature within the academic environment.

The presence of this vegetation plays a vital role in improving air quality, reducing stress among students and staff, and fostering biodiversity. The following images illustrate the spatial distribution and characteristics of the vegetated areas across the campus, as well as photographs of the university gardens:

Illustration20: Green areas and gardens on the Technology Campus.

Source: Technological University of Bolívar.

Illustration21: Garden Building A5.

Source: Technological University of Bolívar.

Illustration22: Hemicycle.

Source: Technological University of Bolívar.

Illustration23: Green auditorium wall.

Source: Technological University of Bolívar.

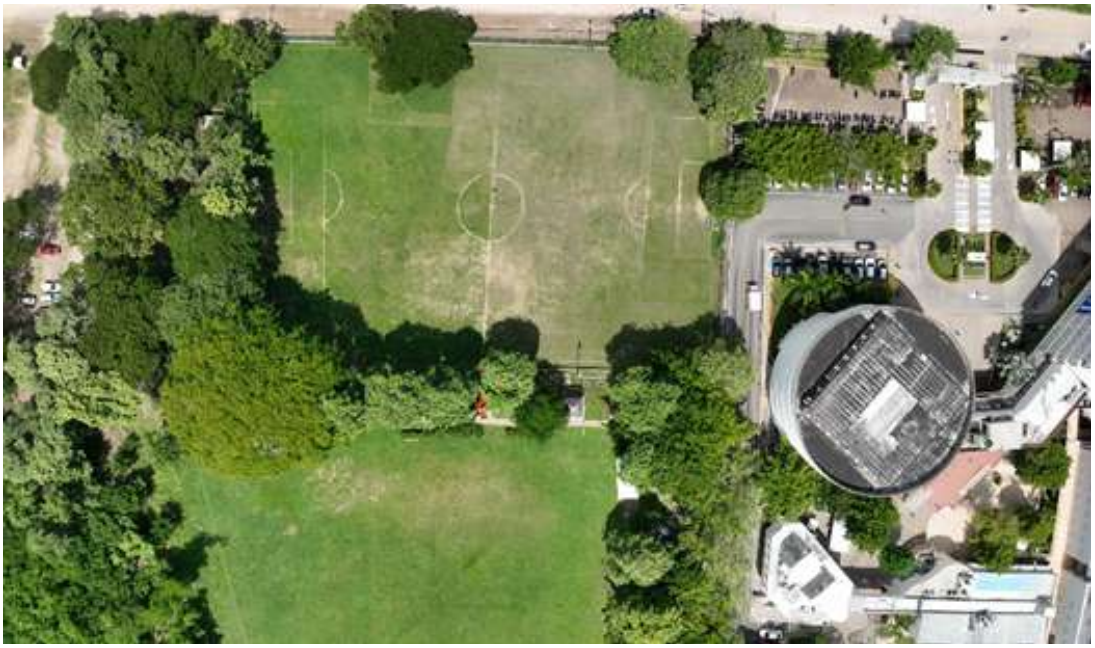
Illustration24: Plaza Boulevard.

Source: Universidad Tecnológica de Bolívar, 2021.

Illustration25: Gardens Building A3.

Source: Technological University of Bolívar.

Illustration26: Sports fields.



Source: Technological University of Bolívar.

Illustration27: Natural terrain slopes.

Source: Technological University of Bolívar.

Illustration28; Garden Collection Center.

Source: Technological University of Bolívar.

1.8 Total area on campus for water absorption besides the forest and planted vegetation (E1.11)

The UTB main campus is distinguished by its extensive areas designed for water absorption, covering approximately 105,075 square meters—equivalent to 43% of the total campus area. These include pedestrian walkways, natural-terrain parking lots, and designated expansion zones. The campus infrastructure has been carefully planned to optimize water absorption capacity, incorporating sustainable materials and techniques that promote natural infiltration.

Pedestrian walkways and plazas are built with permeable paving stones that facilitate rainwater infiltration and reduce the risk of flooding. Likewise, several parking areas are constructed with gravel or preserved as natural soil, enhancing permeability and contributing to groundwater recharge. The following images illustrate the campus spaces specifically designed for water absorption:

Illustration29: Areas forewater absorption.

Cobblestone Boulevard Plaza in Royal Veta.

Pedestrian path on cement tiles.

Pedestrian path on cement paving stones.

Auxiliary gravel parking.

Parking lot A5 on natural terrain.

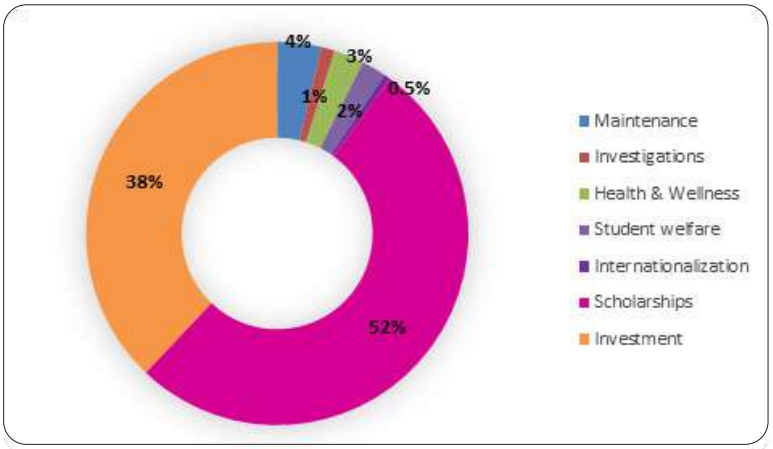
Small squares made of cement paving stones.

Source: Technological University of Bolívar.

1.9 University budget for sustainability efforts (in US Dollars) (E1.17)

UTB's investments in institutional sustainability span a wide range of areas, from the adoption of responsible technologies and practices in campus management to financial support for students through scholarship programs. These initiatives demonstrate the university's commitment to fostering a more equitable and sustainable society, where academic development and environmental stewardship progress hand in hand. In 2024, UTB allocated approximately USD $3,019,351 from its expenditure and investment budget to strengthen these efforts. The percentage distribution of this total investment across the different categories is illustrated below:

Graphic1: Budget for sustainability efforts over the past 9 years.



Source: Technological University of Bolívar.

Of the total investment, more than 50% was directed toward scholarship funding, an effort that aligns with Target 4.3 of Sustainable Development Goal 4 (Quality Education), which seeks to ensure equal access to quality higher education for all.

Reinforcing this commitment, UTB—together with associations and companies from Cartagena's economic sector—awarded 3,248 scholarships in 2024. These were granted to students from socioeconomic strata 1 and 2, university employees, high-achieving youth, and beneficiaries of institutional discount programs. Through these initiatives, the university aims to facilitate access to and retention in higher education for talented individuals, particularly those in vulnerable situations. The following table presents the distribution of students who benefited from the scholarship program:

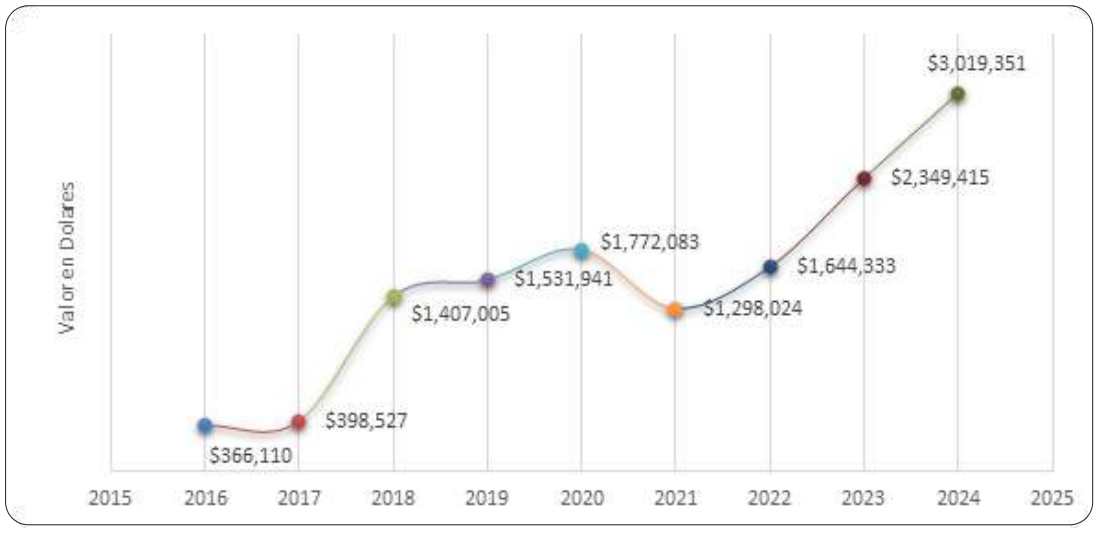
Table 2: Number of students benefiting from the scholarship program.

Scholarships and Discounts	No. Students
Undergraduate	3022
Postgraduate	226

Source: Technological University of Bolívar.

Furthermore, when averaging sustainability investments over the past three years, the university has allocated approximately USD $2,337,700 annually to these priority areas, representing 13.3% of its total average budget. The following graph illustrates the annual evolution of budget allocations dedicated to sustainability initiatives:

Graphic2: Budget for sustainability efforts over the past 9 years



Source: Technological University of Bolívar.

1.10 Campus facilities for disabled, special needs, and/or maternity care (E1.19)

The Technological University of Bolívar has developed its infrastructure in accordance with accessibility standards, ensuring access, circulation, and usability of campus spaces for people with reduced mobility. Across both the Casa Lemaitre and Technological campuses, structural features have been incorporated to facilitate fluid movement, including elevators with steel structures, ramps with controlled slopes that meet minimum wheelchair dimensions, and elevated walkways and bridges connecting key buildings such as Alcatraz, A2, Engineering, Maloka, the Library, and A1.

In addition, all university buildings are equipped with accessible restrooms designed according to technical criteria of ergonomics, maneuverability, and accessibility, enabling safe and independent use by individuals with reduced mobility, pregnant women, or people with temporary disabilities. Reserved and clearly marked parking spaces have also been established in line with international accessibility standards, strategically located near the main entrances of the buildings.

The following images illustrate the campus spaces designed to support people with reduced mobility, special needs, and maternity care:

Illustration 30: Access ramps.

Alcatraz Plaza View 1.

Alcatraz-A2 Connecting Walkway.

Boulevard Plaza.

Access ramp to Maloka Building and Engineering.

Access ramp to the Rector's Office.

Access ramp to the Welfare Building.

Illustration31: Connection Bridges.

Bridge between Maloka Building and Engineering Building.

Bridge between Alcatraz

Bridge between Building A2 and Building Alcatraz.

Bridge between Buildings

Illustration32: Parking

Parking lot, Rector's Building.

Administration parking lot..

Illustration33: Bathrooms

Bathrooms Ed. A2.

Bathrooms Ed. Rectoría..

Illustration34: Elevators

Elevator Building MB.

Elevator Building A1.

Elevator Building MB.

Elevator Building A1.

1.11 Security and safety facilities (E.120)

The Technological University of Bolívar has an infrastructure designed according to accessibility standards, ensuring access, circulation, and usability of the spaces for people with reduced mobility. On the Casa Lemaitre and Technological campuses, structural elements have been installed to facilitate fluid mobility, including elevators on steel structures, ramps with controlled slopes that meet the minimum dimensions for wheelchairs, as well as walkways and bridges on the second level that connect buildings such as Alcatraz, A2, Engineering, Maloka, Library, and A1.

Likewise, the Technological University of Bolívar has implemented accessible restrooms in all its buildings, designed according to technical criteria of ergonomics, maneuverability, and accessibility, allowing for safe and independent use by people with reduced mobility, pregnant people, or people with temporary disabilities. Likewise, reserved and marked parking spaces have been created in accordance with international accessibility recommendations, strategically located near the main entrances to the buildings. The following images show the spaces within the campus designated for people with reduced mobility, special needs, and/or maternity care.

Illustration35: 24-hour video surveillance.

Source: Technological University of Bolívar.

Illustration36: CCTV Office.

Source: Technological University of Bolívar.

The university is equipped with a wide range of security devices and systems designed to ensure the safety and protection of all members of the campus community. These include panic buttons installed in elevators to provide rapid assistance in emergencies, as well as fire alarm buttons strategically located across the campus for immediate activation in the event of a fire. Fire extinguishers are also evenly distributed throughout the university, ensuring that one is always within reach when needed.

In addition, hydrant systems are installed at the main entrances to the campus, enabling quick and efficient access to water for firefighting purposes. The Alcatraz building is further equipped with fire cabinets on every floor, containing hoses and other essential emergency equipment. The following images illustrate the hydrant systems available on campus:

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Illustration37: Fire buttons and alarms.

Source: Technological University of Bolívar.

Illustration38: Hydrants.

Source: Technological University of Bolívar.

Illustration39: Fire Cabinets.

Source: Technological University of Bolívar.

The university also has trained personnel prepared to respond to security incidents and emergencies. This includes a security team composed of nine guards assigned to the Ternera campus and one guard at the Manga campus, all operating 24 hours a day under contract with the company Vimarco. In addition, the university maintains a first aid brigade made up of 27 volunteers from within the institution, trained and ready to act in the event of medical emergencies. The following images present the university's security team and first aid brigade:

Illustration40: UTB Security Corps.

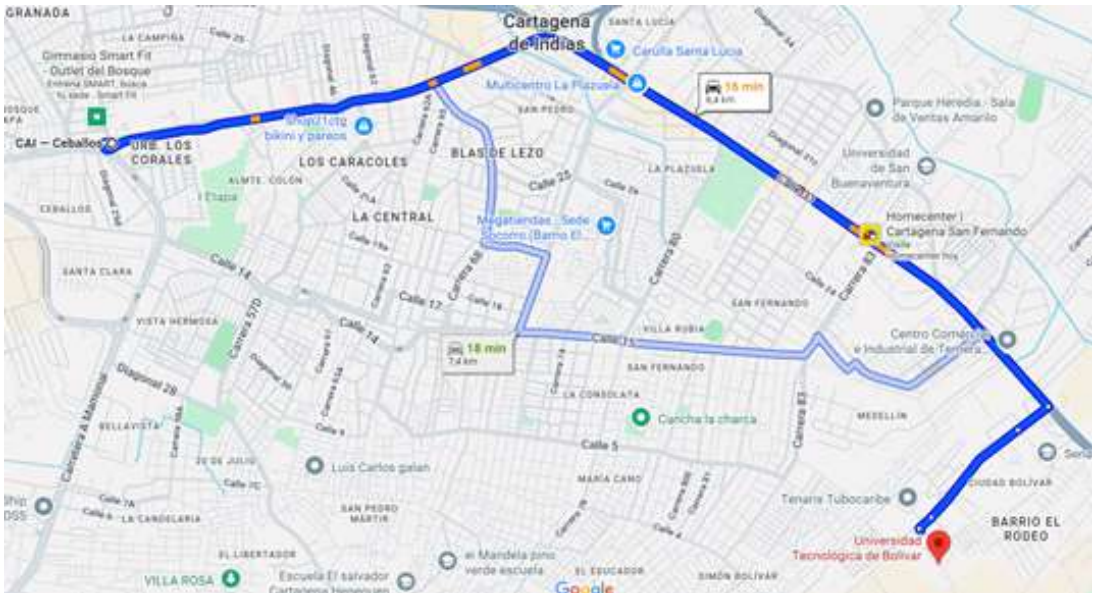
Source: Technological University of Bolívar.

Illustration41: Brigade Group.

Source: Technological University of Bolívar.

Finally, the university has implemented an Emergency Prevention, Preparedness, and Response Plan, as well as an Emergency Tree protocol, which enables trained personnel to promptly contact the appropriate security and emergency agencies in the event of an incident. Response times range from 10 to 20 minutes. The Cartagena City Fire Department is located 4.3 km from the Technological Campus and 3.0 km from the Casa Lemaitre Campus, ensuring a maximum response time of 20 minutes. Similarly, a police CAI is located 6.4 km from the Technological Campus and 1.4 km from the Casa Lemaitre Campus, also with a maximum response time of 20 minutes. The following images illustrate these emergency routes:

Illustration42: Tour of the CAI San Fernando to the Technological Campus.



Source: Google Maps.

Illustration43: Tour of the CAI Manga to the Casa Lemaitre Campus.

Source: Google Maps.

1.12 Health infrastructure facilities for students, academics, and administrative staff's well-being (E1.21)

The UTB campuses are equipped with two infirmaries that provide first aid services to the entire university community. These facilities are furnished with the necessary tools and equipment to deliver immediate care in emergencies, ensuring a rapid and effective response. Following initial treatment, the nursing staff coordinates with the patient's designated health provider (EPS or IPS) and arranges transfer to the nearest hospital or clinic for specialized medical attention.

Beyond emergency care, the infirmaries also serve as preventive health centers, offering basic medical services, guidance, and wellness programs aimed at promoting the health and well-being of students, staff, and visitors. This comprehensive approach ensures that members of the UTB community are protected and supported at all times. The following images showcase the infirmary facilities on campus:

Illustration44: Nursing – Technological Campus.

Source: Technological University of Bolívar.

1.13 Conservation: plant (flora), animal (fauna), or wildlife, genetic resources for food and agriculture secured in either medium or long-term conservation facilities (E1.22)

Although the university does not currently offer a specific program in agriculture or food sciences, it carries out plant conservation initiatives as part of its commitment to environmental sustainability. One such initiative focuses on reforestation through the propagation of fruit-bearing species, particularly mango trees, by germinating seeds collected on campus. Once the seedlings reach an adequate height for transplanting, they are relocated to different areas of the university grounds, contributing to the preservation of plant genetic resources and the strengthening of local ecosystems. The following image shows the storage of seedlings prior to reforestation:

Illustration45 Mango plants for reforestation.

Source: Technological University of Bolívar.

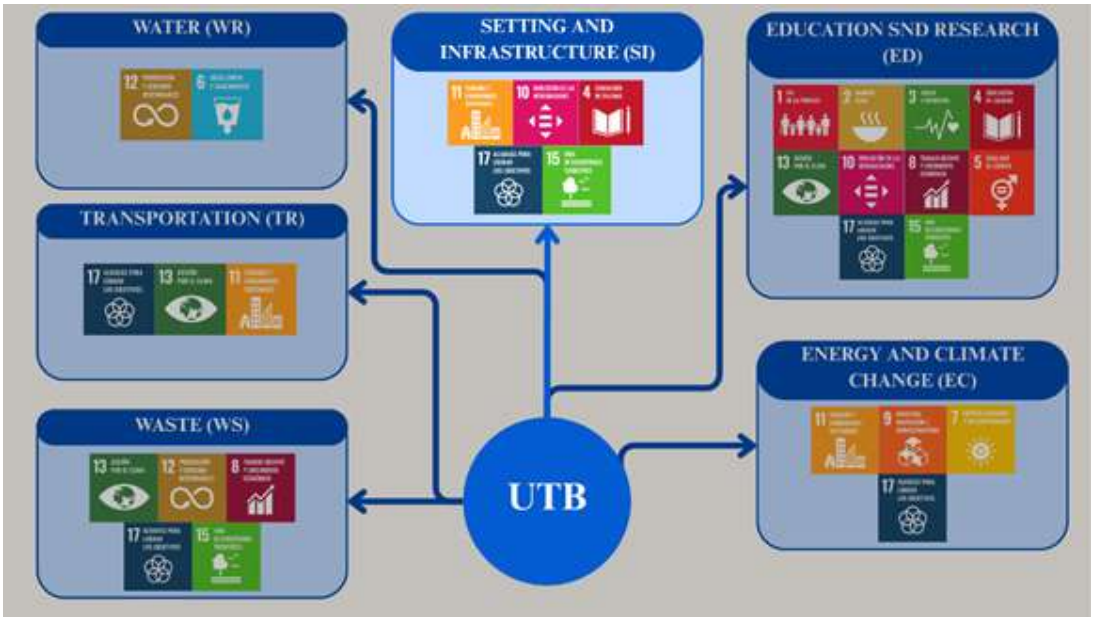
1.14 Planning, implementation, monitoring and/or evaluation of all programs related to Setting and Infrastructure through the utilization of Information and Communication Technology (ICT) (E1.23)

To date, the university does not have an Information and Communications Technology (ICT)-based system in place for the planning, implementation, and evaluation of programs related to physical infrastructure.

1.15 Impact of Setting and Infrastructure programs in supporting the Sustainable Development Goals (SDGs)) (E1.24)

The university's environmental and infrastructure programs contribute in a comprehensive manner to the achievement of several Sustainable Development Goals (SDGs). The conservation of the tropical dry forest directly supports SDG 15: Life on Land by promoting biodiversity protection and the recovery of one of the country's most threatened ecosystems. The scholarship program aligns with SDG 4: Quality Education by ensuring equitable access to higher education for vulnerable students, while also reinforcing SDG 10: Reduced Inequalities. Inclusive facilities, together with the development and maintenance of green areas and gardens, contribute to SDG 11: Sustainable Cities and Communities by fostering accessible, safe, resilient, and environmentally responsible spaces. Finally, the allocation of financial resources to sustainability initiatives demonstrates UTB's institutional commitment to SDG 17: Partnerships for the Goals, by strengthening implementation mechanisms and consolidating long-term strategies for environmental and social sustainability. The following image illustrates the SDGs supported by UTB's environmental and infrastructure programs:

Illustration46: UTB's contribution to the SDGs from the Environment and Infrastructure dimension.



Source: Technological University of Bolívar.

2 Energy and Climate Change

2. ENERGY AND CLIMATE CHANGE

2.1 Energy efficient appliances usage (E2.1)

As part of the UTB Energy and Climate Change Program, 67% progress has been achieved in the implementation of the project to incorporate energy-efficient equipment. This initiative aims to mitigate the effects of climate change and reduce the university's carbon footprint by gradually replacing lighting, air conditioning units, and computers with more energy-efficient technologies. The progress achieved in each line of action within the program is outlined below. The following table presents the number of energy-efficient devices currently in use across the campus:

Table 3: Number of Energy Efficient Equipment.

Appliance	Total Number	Total number energy Efficient appliances	Percentage
LED Lamp	3578	3578	100%
Air-conditioning	323	6	2%
Computers	1451	1451	100%
		Average Percentage	**67%**

Source: UI GreenMetric.

- **Replacing Incandescent and CFL Lamps or Fluorescent Tubes with LED Luminaires**

Replacing incandescent bulbs, CFLs, and fluorescent tubes with LED luminaires is a key strategy for enhancing energy efficiency. Compared to traditional technologies, LED luminaires consume significantly less energy, have a longer operational lifespan, and generate less heat. This transition not only lowers electricity costs but also reduces greenhouse gas emissions, thereby contributing to global efforts to combat climate change. In 2024, UTB successfully replaced 100% of its conventional luminaires with LEDs..

- **Replacing Air Conditioning Equipment with Efficient Technologies**

Conventional air conditioning units on campus are being progressively replaced with energy-efficient inverter-based systems. These new units, classified as A, B, or C in energy efficiency, are fully digital and use R-410A or R-32 refrigerants, which are ozone-friendly and contribute to reducing global warming potential. In addition, a variable primary chilled water production system has been installed, consisting of four air-cooled chillers with a combined capacity of 148 tons. This system meets the highest standards of energy efficiency and quality, lowering energy consumption while maintaining optimal performance.

- Replacing Old Computer Equipment with Efficient Ones

This year, the university upgraded its entire computer fleet, replacing it with energy-efficient equipment certified by Energy Star. This certification, granted by the U.S. Environmental Protection Agency (EPA) and the Department of Energy (DOE), ensures that all devices meet rigorous energy efficiency standards, thereby supporting more sustainable institutional operations. According to the ICT Office, all newly acquired equipment—primarily from recognized brands such as DELL, HP, LENOVO, and APPLE—complies with these requirements. In fact, DELL, HP, and ASUS models manufactured since 2010 are Energy Star certified by default. The oldest equipment currently in use dates back to 2015, confirming that the university's entire technology fleet meets established efficiency criteria. The following images illustrate the use of energy-efficient equipment across the campus:

Illustration 47: Energy Efficient Appliances Usage.

Use of LED lighting.

Replacement of Air Conditioning Equipment.

Computers.

Source: Technological University of Bolívar.

2.2 Total campus' smart building area (E2.2)

The Universidad Tecnológica de Bolívar has constructed a smart building known as Alcatraz, which incorporates six key features of the smart building concept. First, the use of BIM methodology optimized both the design and management of the facility. Second, an advanced security system was implemented to safeguard occupants and property. Third, the building is equipped with highly efficient lighting systems that significantly reduce energy consumption. In addition, a solar control system regulates the entry of light and heat, enhancing both thermal and visual comfort. Finally, passive daylighting strategies have been integrated to maximize the use of natural light and minimize reliance on artificial illumination. The following table summarizes the implementation of smart building features across the campus:

Table 4: Implementation of smart buildings.

No.	Name	Place	automation		safety				energy		water		Indoor environment				lighting				Building Area (m^2)
			B1	B2	S1	S2	S3	S4	E1	E2	A1	A2	I1	I2	I3	I4	L1	L2	L3	L4	
1	Building Alcatraz	Cartagena, Colombia	X			X	X										X		X	X	3,810
Total																					3,810

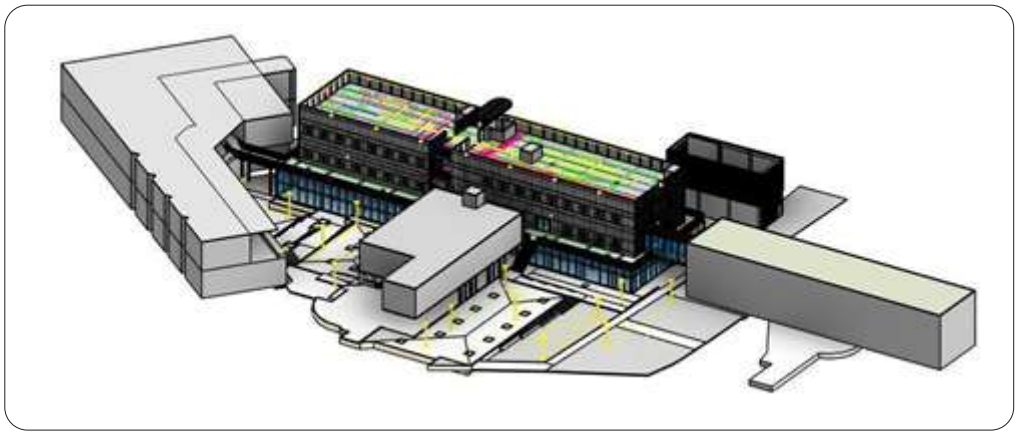
Source: UI GreenMetric.

The following section highlights some of the distinctive features of the Alcatraz Building.

1. BIM Building Management System

From the outset, the building was designed using BIM methodology, with each stakeholder contributing their technical designs to bring the project to fruition. The digital model served as the basis for obtaining key information required for cost estimation and the initiation of construction. However, due to prevailing cultural practices, the model was not fully utilized during the construction phase. Upon project completion, all information was consolidated into a comprehensive digital model, accurately reflecting the as-built conditions and integrating all disciplines involved. Today, UTB retains this digital model of the building, enabling efficient management and maintenance throughout its entire lifecycle. The following images illustrate this model:

Illustration 48: BIM Model – Alcatraz Building.



Source: Technological University of Bolívar.

Illustration49: Volumetric Section of the Model - Alcatraz Building.

Source: Technological University of Bolívar.

2. Security System

In terms of security, the building is equipped with a 24-hour video surveillance system, closed-circuit television (CCTV), and a fire protection system, all of which ensure a safe environment for the activities carried out within the facility. The CCTV network consists of a modern camera system that can be remotely operated from a control room. This system provides essential support for risk prevention, loss control, and the monitoring of specific areas. The following image shows the model camera used in the campus video surveillance system:

Illustration 50: CCTV video surveillance.

Source: Technological University of Bolívar.

The Alcatraz Building is equipped with a wet-pipe fire protection system that includes automatic sprinklers, a control station, and fire cabinets. The system supplies water to five (5) cabinets and sprinkler networks located on floors 1 through 3.

Each cabinet provides 1 ½" and 2 ½" hose stations, designed for use by trained personnel as well as firefighters. A fire department connection is available to provide supplemental flow when required. Each cabinet is equipped with a hose and nozzle stored in its canister, an axe, a spanner wrench, and a fire extinguisher, with one cabinet located on each floor.

In addition, the university has invested in a centralized wet-pipe fire protection system with a branched linear distribution network, designed to supply fire water to all campus buildings. This system is currently in operation and provides fire water to the Alcatraz Building. The following images illustrate the systems described:

Illustration51: Fire Pump.

Source: Technological University of Bolívar.

Illustration52: Fire Cabinets.

Source: Technological University of Bolívar.

3. Lightning

The Alcatraz Building is equipped with 100% high-efficiency LED luminaires that ensure uniform light distribution. These fixtures create an attractive and comfortable atmosphere while significantly reducing energy consumption and maintenance costs and providing long-lasting performance. The following image illustrates the lighting capacity of these luminaires:

Illustration53: LED luminaires – Ed. Alcatraz

Source: Technological University of Bolívar.

In addition, the architectural design of the building applied a sustainable architecture approach, aimed at optimizing building performance by leveraging available resources and architectural variables such as construction materials, sunlight, breezes, and wind.

For the construction materials, double-paned thermoacoustic glass was used, combined with micro-perforated steel profiles and an interior desiccant to dehydrate the air chamber. This air chamber enhances the acoustic attenuation index, while the combination of glass thickness (6 mm) and gray color improves thermal regulation. As a result, the system reduces air-conditioning costs, achieves energy savings of up to 70%, and minimizes moisture condensation on the glass (TECNOGLASS, 2014). The following image shows the glass facade of one of the campus cafeterias:

Illustration54: Facade in thermoacoustic glass.

Source: Technological University of Bolívar.

More than 60% of the building's façade is covered with a system known as a Ventilated Façade, composed of eco-friendly panels manufactured from 70% renewable wood fibers and 30% thermosetting resins. These panels are resistant to UV radiation and function as independent thermoacoustic insulators while also contributing to net carbon capture, making them an environmentally sustainable solution. Installed using a floating fixing system, the panels remain structurally independent from the main building, which allows for greater flexibility and control over façade plane movement (LAMITECH, 2021). The following image shows the façade of the Alcatraz Building library:

Illustration55: Ventilated Facade.

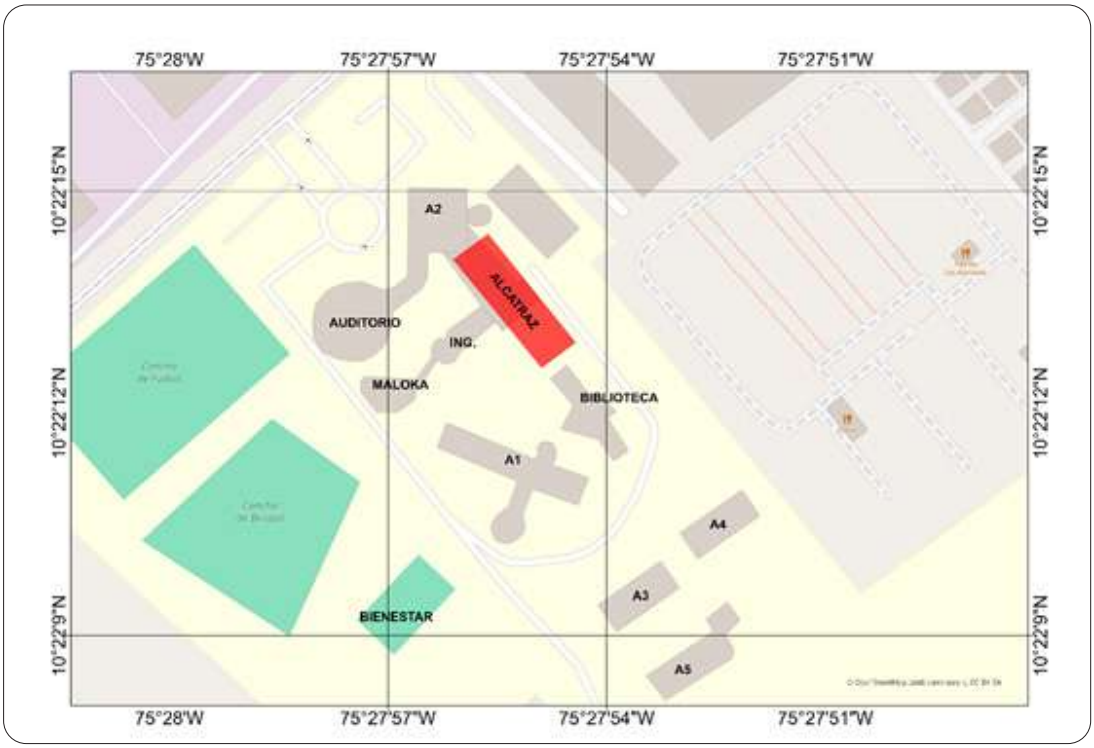
Source: Technological University of Bolívar.

On the roof and walkway areas directly exposed to sunlight, 4-inch polyurethane sheets and sprayed polyurethane were applied to improve energy conservation by serving as thermal insulation. These materials are also sustainable, as they consume less than 0.1% of global oil resources while saving up to one hundred times more energy than is used in their production.

2.3 Smart building implementation (E2.3)

The Universidad Tecnológica de Bolívar has reached a 12.2% smart building implementation rate, calculated as the proportion of smart building floor area relative to the total built area on campus. This facility integrates technologies focused on BIM-based building management, energy efficiency, and passive systems that optimize the use of natural light. The campus map below highlights the location, layout, and extent of the smart building, shaded in red:

Illustration56: Smart building surface.



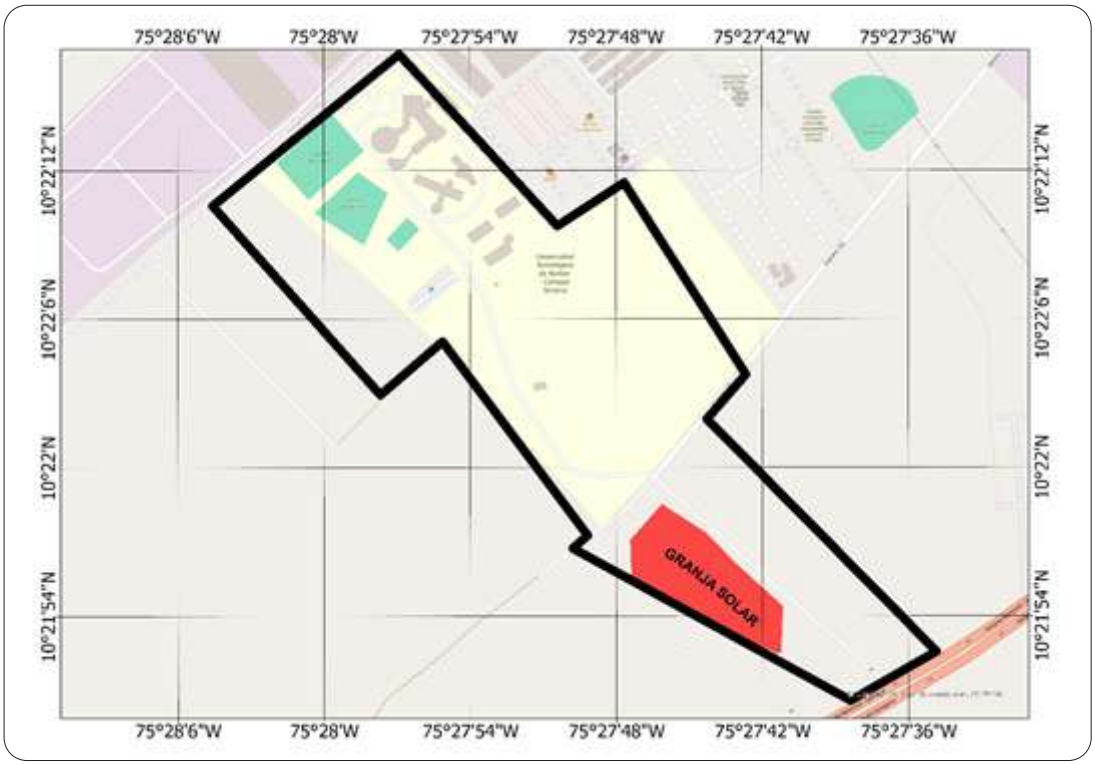
Source: Technological University of Bolívar.

2.4 Renewable energy sources and their amount of the energy produced (in kilowatt-hour) (E2.5)

The university operates a 16,961 m^2 photovoltaic solar plant, equipped with 1,260 solar panels distributed across 25 support tables with a single-axis tracking system. This system follows the sun's movement throughout the day, maximizing solar radiation capture and, consequently, energy generation.

Each module array is interconnected and linked to six inverters, which convert the direct current (DC) produced by the panels into alternating current (AC). The electricity is then routed to a transformer that increases the voltage to 13,200 volts, enabling efficient distribution from the solar farm to the main campus substation, located approximately 750 meters away, through an overhead distribution network supported by poles. The campus map below highlights the location of the solar farm, shaded in red:

Illustration57: Location of the Photovoltaic Solar Farm



Source: Technological University of Bolívar.

In 2024, the UTB Solar farm generated a total of 1,095,846 kWh of clean energy, of which 872,423 kWh were consumed internally by the university to support its academic and administrative operations. The surplus—223,423 kWh—was injected into the regional energy distribution grid of Colombia's Caribbean Coast, operated by Afinia, a subsidiary of the EPM Group. In theoretical terms, this contribution could supply the monthly electricity consumption of approximately 1,000 households in Cartagena. The following images provide an aerial view of the campus solar farm:

Illustration58: Aerial view of the UTB Solar Farm.

Source: Technological University of Bolívar.

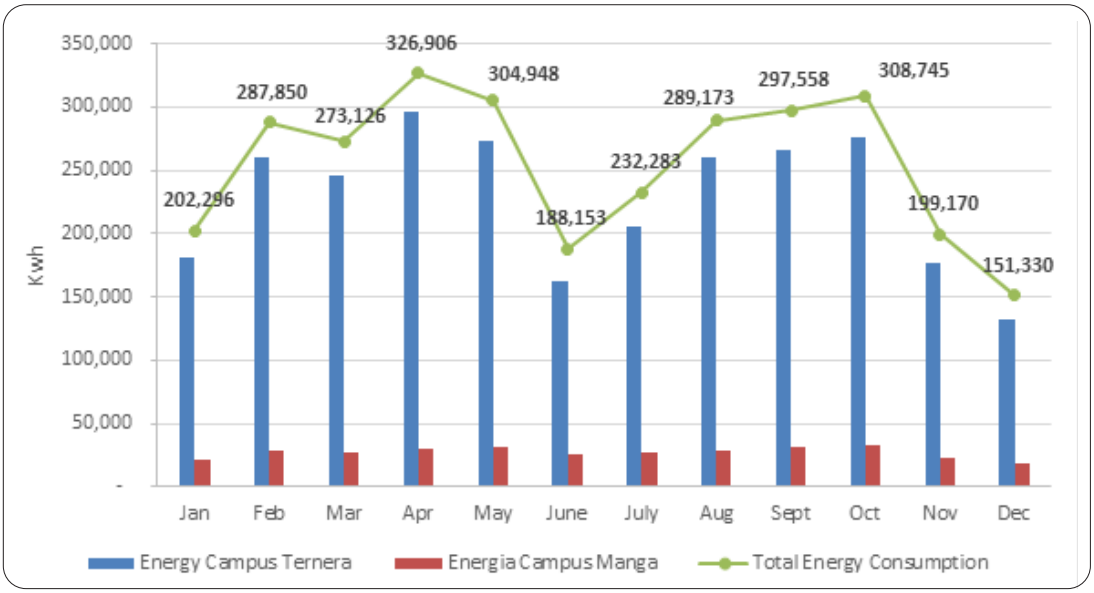
Illustration59: "UTB Solar" photovoltaic farm.

Source: Surtigas.

2.5 Electricity consumption per year (E2.6)

In 2024, the Technological University of Bolívar's total electricity consumption reached 3,061,538 kWh. Of this amount, the main campus represented the largest share, with 2,737,221 kWh, while the Manga campus accounted for 324,317 kWh. These figures reflect the energy demand generated by the university's academic, administrative, and operational activities and are summarized in the following graph:

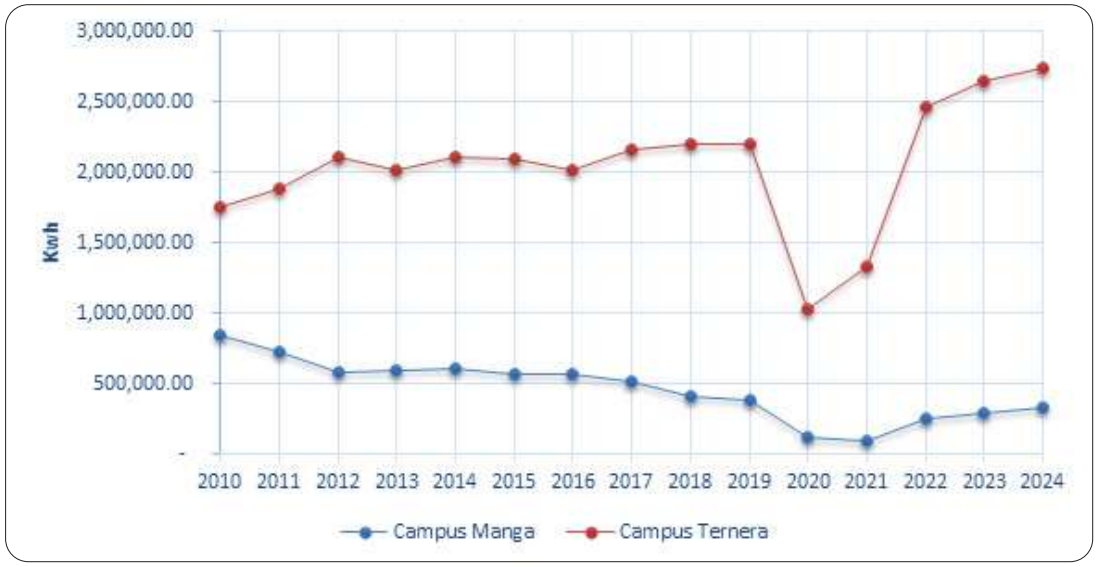
Graphic3: Electricity consumption 2024.



Source: Technological University of Bolívar.

An analysis of the Technological University of Bolívar's energy consumption between 2010 and 2024 reveals an upward trend at the Ternera campus, except during the COVID-19 pandemic, when a temporary decrease was observed. In contrast, the Manga campus has experienced a downward trend in energy consumption over the same period. In response, the university continues to strengthen its energy efficiency strategies and initiatives, aiming to mitigate demand growth at the main campus and to foster a more rational and sustainable use of energy.

Graph 4: Trend by campus from 2010 to 2024.

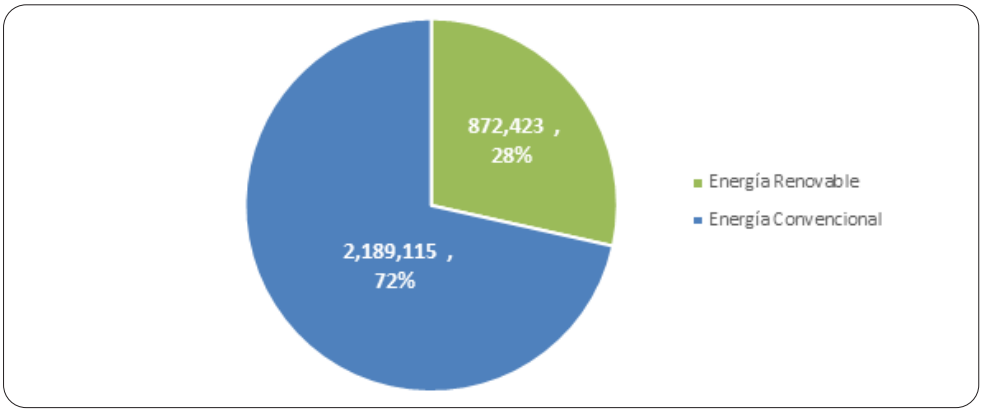


Source: Technological University of Bolívar.

2.6 The ratio of renewable energy production divided by total energy usage per year (E2.8)

In 2024, 28% of the total electricity consumed by the Technological University of Bolívar was supplied by renewable sources, specifically from the UTB Solar photovoltaic plant. This clean energy was used at the main campus, underscoring the university's commitment to the energy transition and to reducing its carbon footprint. The following graph illustrates this distribution:

Graph 5: Portion of conventional energy consumption vs. renewable energy..



Source: Technological University of Bolívar.

2.7 Elements of green building implementation as reflected in all buildings (E2.9)

The university has implemented two practices across all its buildings that align with green building standards:

1. Renewable energy

All campus buildings are powered by the UTB Solar photovoltaic plant, a clean energy source that significantly reduces CO^2 emissions and dependence on fossil fuels. This practice represents a core principle of green building, which promotes the use of renewable technologies such as solar, wind, biomass, and geothermal energy. According to the Green Building Index (GBI) criteria, meaningful progress is recognized when at least 2.0% of total electricity consumption—or a minimum of 40 kWp, whichever is greater—comes from renewable sources. In this regard, UTB greatly surpasses this threshold with a 700 kWp installation, underscoring its strong institutional commitment to the energy transition.

2. Waste management

The university has implemented a comprehensive waste management system across all its buildings, covering both operational processes and the daily practices of users. This system encompasses waste reduction, segregation, monitoring, and recycling, ensuring proper and sustainable final disposal. To support this, eco-friendly collection points for recyclable, biodegradable, and ordinary waste have been strategically installed throughout the campus.

In addition, recycling and composting programs have been established to make use of organic waste generated in cafeterias and green areas. As a key component of the system, the university also conducts environmental awareness and training programs for students, administrative staff, and service personnel, fostering an institutional culture firmly oriented toward sustainability.

2.8 Greenhouse gas emission reduction program (E2.10)

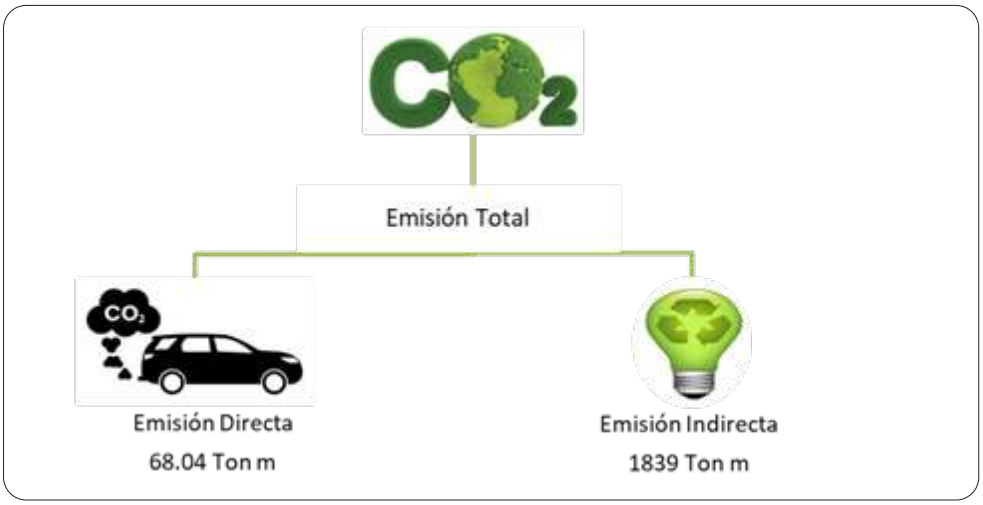
At present, the university does not have a formally established and structured program for reducing greenhouse gas (GHG) emissions. Although sustainability-oriented initiatives such as solar energy generation, recycling campaigns, and the promotion of sustainable transportation have been implemented, these actions remain isolated and are not integrated into a comprehensive plan with measurable targets, a defined timeline, or a continuous monitoring and reporting framework. The absence of a formal policy hinders the consolidation of interdepartmental efforts and limits the effective use of key data,

such as annual emissions inventories or carbon footprint analyses by scope. Recognizing this gap, the institution acknowledges the need to advance toward the development of an institutional climate mitigation program aligned with international standards and consistent with its long-term sustainability objectives.

2.9 Total carbon footprint (CO2 emission in the last 12 months, in metric tons) (E2.11)

UTB's carbon footprint was calculated considering two main sources of emissions: direct emissions from fossil fuel consumption (vehicles) and indirect emissions from electricity use. Using the Carbon Footprint methodology, the university's annual emissions from campus activities were estimated at 1,907 metric tons of greenhouse gases. The following illustration presents these results:

Illustration60: UTB's carbon footprint for the year 2024.



Source: Technological University of Bolívar.

2.10 Number of innovative program(s) in energy and climate change (E2.13)

Cartagena has an extensive hydrographic network that, until now, has been underutilized as part of the city's urban mobility infrastructure. Its waterways hold great potential to alleviate land traffic congestion and improve overall mobility, particularly if transportation systems are implemented under principles of environmental sustainability, energy efficiency, and technical feasibility. Recognizing this opportunity, the Technological University of Bolívar (UTB) initiated an academic and technological project to address this urban challenge.

Within this framework, UTB spearheaded the design and construction of the Aquabus-e, the first fully electric catamaran-type river transport vessel in the city. Developed as an innovative prototype for sustainable mobility, the Aquabus-e accommodates 12 passengers and demonstrates the technical feasibility of a zero-emission water transport system in Cartagena. Solar panels were incorporated as a complementary energy source, further reinforcing the vessel's environmentally responsible profile.

The development of the Aquabus-e actively engaged UTB students and faculty from Naval Engineering, Electrical Engineering, Mechatronics, and Mechanical Engineering programs, combining interdisciplinary expertise to address challenges of structural design, energy efficiency, hydrodynamic stability, and electrical systems management. The project also represented a successful university–industry collaboration, supported by partners such as Ecopetrol Group, Celsia, Astivik, and Agua&Tierra, who contributed resources and technical capacity. The vessel was officially launched and christened on Tuesday, September 24, 2024.

From a sustainability standpoint, the Aquabus-e addresses three critical dimensions. Environmentally, it is a zero-emission, silent, and clean-energy-powered transport system. Socially, it provides an accessible, comfortable, and efficient mobility alternative for users. Economically, it offers low operating and maintenance costs, making it a replicable model for other urban areas of the country with similar conditions. The following images provide photographic evidence of the launch and implementation of the Aquabus-e project:

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Illustration61: Launch and christening of AquaBus-e.

Source: Technological University of Bolívar.

Illustration 62: AquaBus-e boat fist departure.

Source: Technological University of Bolívar.

2.11 Impactful university program(s) on climate change (E2.14)

Currently, UTB does not have a formal program addressing climate change risk, impact, mitigation, adaptation, reduction, or early warning. However, the university is advancing sustainable projects both on and off its campuses, aimed at reducing environmental pollution and fostering more responsible environmental practices.

2.12 Planning, implementation, monitoring and/or evaluation of all programs related to Energy and Climate Change through the utilization of Information and Communication Technology (ICT) (E2.15)

At present, the university plans, implements, and evaluates its energy programs and projects using manual tools and basic software such as Excel and Word. However, through the Smart Energy Lab, it aims to centralize this information using advanced

digital platforms. This centralization will enable comprehensive monitoring not only of energy, but also of solid waste generation, water consumption, and climate data. By leveraging this digital system, the university will be able to make more informed decisions, implement effective strategies, and track performance over time, thereby enhancing the sustainability and efficiency of its operations.

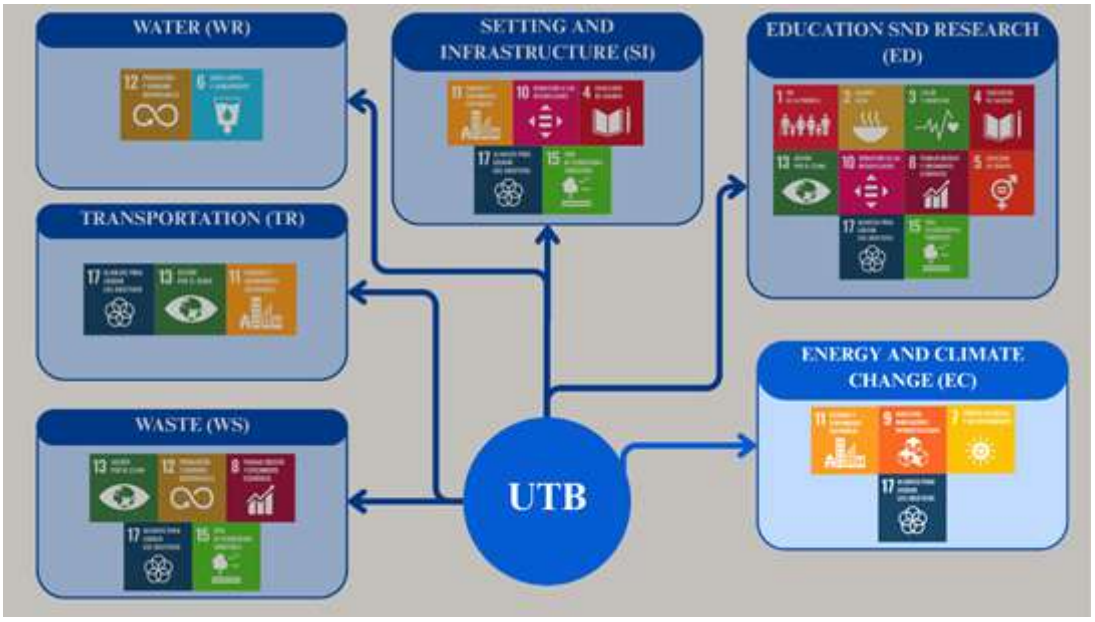
2.13 Impacto de los programas de Energía y Cambio Climático en el apoyo a los Objetivos de Desarrollo Sostenible (ODS) (E2.16)

Through its Energy and Climate Change Program, the Technological University of Bolívar promotes a range of initiatives aimed at advancing the energy transition and reducing emissions. These include the incorporation of energy-efficient equipment, the UTB Solar photovoltaic system, and the development of the Aquabus-e. Together, these actions demonstrate the institution's strong commitment to the Sustainable Development Goals (SDGs).

Specifically, they contribute to SDG 7 (Affordable and Clean Energy) by expanding the use of renewable sources and low-consumption technologies. The Aquabus-e, as a technological innovation in electric mobility, also supports SDG 9 (Industry, Innovation, and Infrastructure) by fostering applied research, sustainable infrastructure, and academic talent development. Both initiatives contribute to SDG 11 (Sustainable Cities and Communities) by offering concrete solutions to urban challenges related to transportation and energy efficiency. Finally, UTB's collaborative work with private sector partners and other organizations exemplifies SDG 17 (Partnerships for the Goals), strengthening alliances for sustainable development.

The following image illustrates the SDGs supported by UTB's Energy and Climate Change Program:

Illustration63: UTB's contribution to the SDGs from the Energy and Climate Change dimension.



Source: Technological University of Bolívar.


ORGÁNICO
Restos de comida
Desechos agrícolas
RECICLABLE
Plástico - Cartón
Vidrio - Papel
Metales
ORDINARIOS
NO RECICLABLES

3 Waste

3. WASTE

3.1 3R (Reduce, Reuse, Recycle) program for university's waste (E3.1)

In 2024, the Technological University of Bolívar surpassed its environmental targets, achieving a 25% reduction in ordinary waste compared to the 2018 baseline year (exceeding the initial 20% goal). This accomplishment represents more than 100% of the objectives set by the university's waste management programs, made possible through the strategic implementation of its Integrated Solid Waste Management Program (PGIRS) (Table 5). Aligned with circular economy principles, the program effectively addressed key challenges such as soil and water pollution, offensive odors, and pest control through the following actions:

- Recovery of 10.78 tons of recyclables (goal: 10 tons) through the PlastiTON program.
- Composting of cafeteria waste, reused in campus gardens, with 4.28 tons recovered (goal: 4 tons).
- Educational campaigns aimed at raising awareness among the university community.
- Collaborations with Essentia and the Cartagena Amigable Collection Center, promoting the dignity of recycler work.

Table 5: Summary of the PGIRS UTB.

Component	Achievement 2024
Waste reduction	25% vs. 2018 baseline (target: 20%)
Recyclables used	10.78 tons (PlastiTON)
Composted organics	4.28 tons

Source: Technological University of Bolívar.

Illustration64: Launch and implementation of the PlastiTON 2024 program.

Source: Technological University of Bolívar.

Illustration 65: Educational campaigns with training aimed at cleaning staff and students at UTB.

Source: Technological University of Bolívar.

Illustration66: Articulation between the Cartagena Amigable Collection Center, professional recyclers and UTB.

Source: Technological University of Bolívar.

3.2 Total volume of paper and plastic produced this year (tons) (E3.2)

In 2024, the Technological University of Bolívar managed a total of 10.8 tons of recyclable waste, of which 4.0 tons corresponded to paper and plastic. The main sources of this waste were university cafeterias—primarily plastic beverage containers and other sales-related materials—and academic and administrative activities, including printing paper, documents, and teaching materials.

Semiannual data reveal an increase in plastic recovery (1,036 kg in the first semester vs. 1,439 kg in the second), while paper remained relatively stable (709.75 kg vs. 765.5 kg). These results are detailed in Table 6.

Tablem 6: Recyclable waste by type (2024).

Material	1st Semester (kg)	2nd Semester (kg)	Total (ton)
Paper	709.75	765.50	1.5
Plastic	1,036.00	1,439.00	2.5
Total	1745.75	2204.5	4.0

Source: UTB Sustainability Committee.

As a result of these efforts, the Technological University of Bolívar received recognition from Essenttia, a leading company in the production and marketing of raw materials for the plastics industry, including polypropylene, polyethylene, and masterbatch. This distinction was awarded within the framework of the PlastiTON initiative, in which UTB actively participates, standing out for its annual commitment to increasing the volume of recyclable materials—such as plastic and cardboard—managed in a sustainable manner. This achievement further strengthens the university's positive contribution to promoting the circular economy and reducing waste, as illustrated in the following image:

Illustration67: Recognition to UTB for its commitment to sustainable transformation of society through PlastiTON.

Source: UTB Sustainability Committee.

3.3 Total volume of paper and plastic produced last year (tons) (E3.3)

In 2023, the Technological University of Bolívar managed a total of 7.4 tons of recyclable waste, including 3.7 tons of paper and plastic—key materials within its circular economy strategy. When compared with 2024, these results reflect an 8.1% increase in the recovery of these materials, highlighting continuous improvement in waste separation and recycling processes. The comparative breakdown is presented in the following table:

Board7: Annual comparison of recycled waste (Tons).

Material	2023	2024	% Change
Paper	1.4	1.5	+7.1%
Plastic	2.2	2.5	+13.6%
Paper + Plastic	3.7	4.0	+8.1%
Other materials	3.7	6.8	+83.8%
TOTAL	7.4	10.8	+45.9%

Source: Comité de Sostenibilidad UTB.

The increase in recyclable waste generation not only reflects growing environmental awareness within the UTB community but also creates greater opportunities for recycling, transformation, and progress toward sustainability goals. Every kilogram recovered translates into environmental and social benefits—from reducing landfill waste to generating raw materials for new products.

The following image documents the waste collection and disposal process at the university's collection center, serving as tangible evidence of the collaborative work carried out by students, administrative staff, and the Sustainability Committee:

Illustration68: Collection and disposal of waste suitable for recycling.

Source: Comité de Sostenibilidad UTB.

3.4 Program to reduce the use of paper and plastic on campus (E3.4)

The Technological University of Bolívar has implemented a comprehensive system made up of five programs and measures aimed at reducing paper and plastic use across its academic and administrative operations. As a result, the university achieved the recycling of four tons of these materials by 2024. The details of each initiative are outlined below:

1. Digitization of administrative processes

Workflow software has transformed institutional document management by digitizing processes such as contracts, budget requests, and service orders. This platform has substantially reduced the reliance on physical printouts, streamlining administrative procedures and promoting more sustainable practices.

Illustration 69: Software Workflow.

Source: Technological University of Bolívar.

2. Academic communication platforms

Through tools such as Microsoft Teams and SAVIO, the university's academic platform, the UTB community can carry out collaborative activities without relying on printed formats. These solutions enable:

- Cloud storage (OneDrive)
- Collaborative document editing
- Comprehensive management of digital academic processes

Illustration 70: SAVIO academic platform.

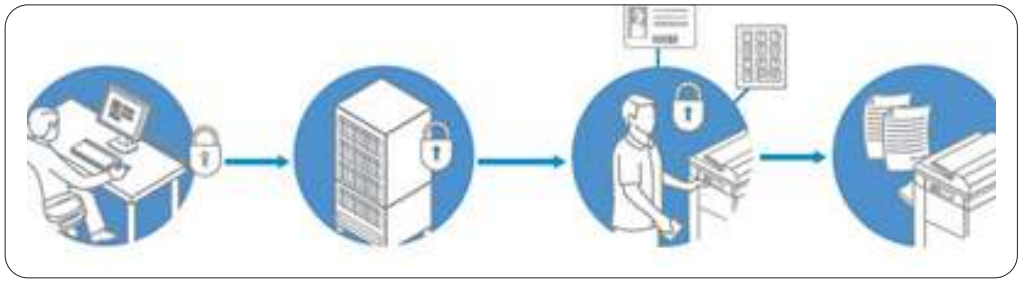
Source: Technological University of Bolívar.

3. Responsible printing

The centralized printing model (Illustration 70), supported by 22 strategically located devices, has achieved:

- An 11% reduction in monthly print volumes.
- Optimized ink and paper consumption.
- Enhanced quality of printing services.

Illustration 71: Decentralized Printing Model – Scheme.



Source: Technological University of Bolívar.

4. Sustainable materials

The university has implemented specific measures to reduce its ecological footprint, including:

- Exclusive use of FSC-certified recycled paper (100% post-consumer recycled fiber).
- Replacement of plastic cups with cardboard alternatives.
- Promotion of reusable thermoses at water and coffee stations.

5. Institutional digital transformation

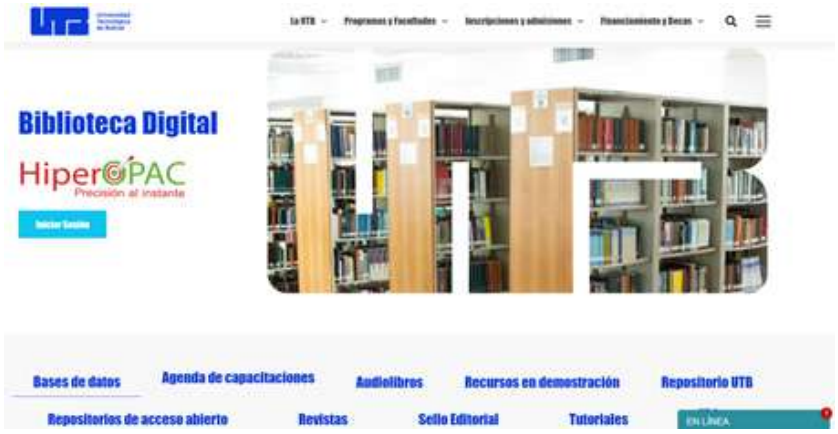
Two key initiatives have driven the transition toward less paper-intensive operations:

- Full implementation of electronic invoicing, eliminating the need for physical documents.
- Development of a Digital Library (Illustration 71), providing access to more than 50,000 online academic resources.

These initiatives reflect UTB's commitment to operational sustainability. Concrete

achievements of this policy include an 11% reduction in printing and the recycling of more than 4 tons of materials by 2024.

Illustration72: Access to the digital library.

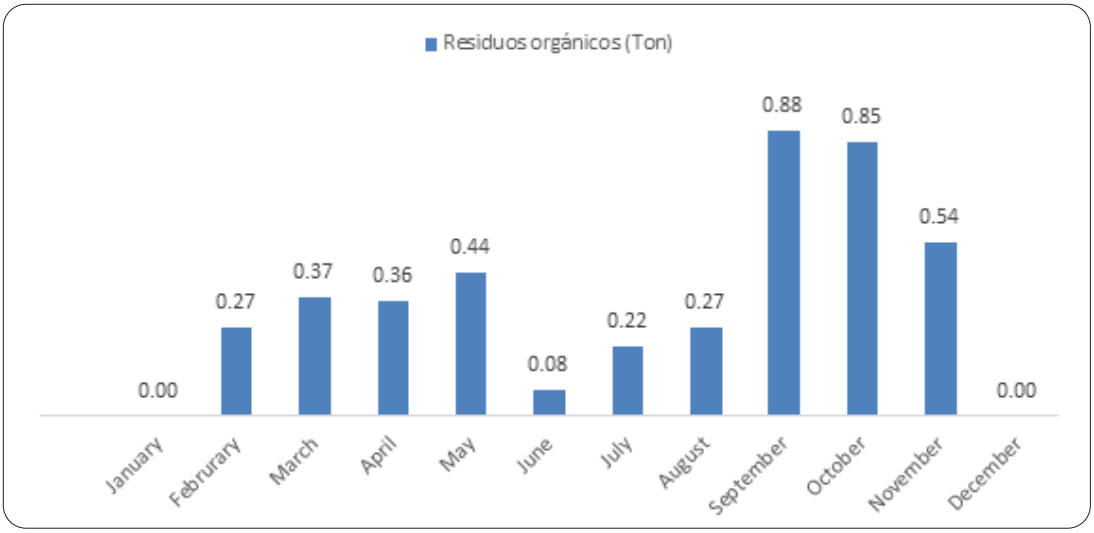


Source: Technological University of Bolívar.

3.5 Total volume organic waste produced this year (tons) (E3.5)

In 2024, the Technological University of Bolívar generated 4.3 tons of organic waste, primarily from cafeterias (including coffee dispensers and teaching coffee makers), the maintenance of green areas (leaf litter and plant material), and specialized sales points such as Fit cafeterias and fruit stands. A monthly analysis reveals a strong correlation with the academic calendar: the highest volumes were recorded in September (883 kg) and October (850 kg), coinciding with peak teaching activity, while production decreased significantly in June and July during mid-term breaks. As further evidence of this pattern, waste generation was nearly zero in January and December, when the institution was in full recess. These trends clearly demonstrate how university dynamics directly influence the volume of organic waste, as illustrated in the following graph:

Graph 6: Monthly generation of organic waste during 2024.

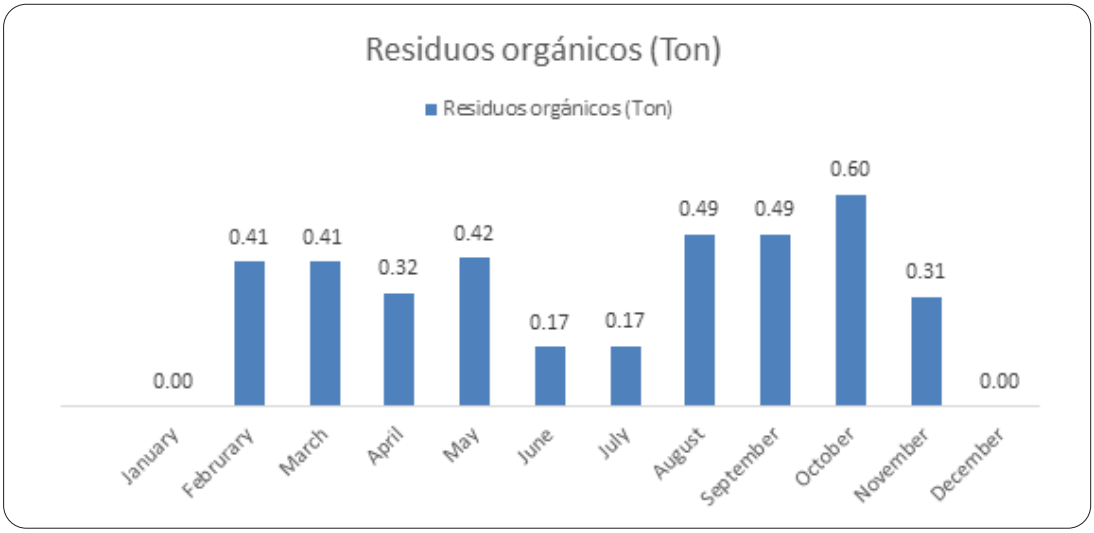


Source: UTB Sustainability Committee.

3.6 Total volume organic waste produced last year (tons) (E3.6)

In 2023, the Technological University of Bolívar generated 3.8 tons of organic waste. A monthly analysis reveals a strong correlation with the academic calendar: October recorded the highest volume (600 kg), coinciding with the peak of academic activity, while production declined significantly in June and July during mid-term breaks. As further evidence of this trend, waste generation was nearly zero in January and December, periods of full institutional recess. These patterns clearly demonstrate how university dynamics directly influence the volume of organic waste, as illustrated in the following graph:

Graph 7: Monthly generation of organic waste during 2023.



Source: UTB Sustainability Committee.

3.7 Total volume organic waste treated this year (tons) (E3.7)

In 2024, the Universidad Tecnológica de Bolívar's institutional composting program achieved significant progress by processing 100% of the organic waste generated on campus, totaling 4.3 tons. This volume was duly recorded during the months of March, May, August, September, October, and December. Compared to 2023, this represents a 13% increase in both the generation and treatment of organic waste, reflecting the university community's growing commitment to proper waste separation and the improved operational efficiency of the composting program.

3.8 Organic waste treatment (E3.7)

The Universidad Tecnológica de Bolívar (UTB) applies the Digester Bale technique to transform biodegradable organic waste into compost. This method combines aerobic and anaerobic decomposition under controlled conditions. Through this process, 100% of the organic waste generated on campus has been treated, producing approximately 704 kg of compost—equivalent to a 16% annual yield. The following image illustrates the compost bale feeding process alongside the material produced:

Illustration 73: Feeding digester bales for composting vs. compost material produced.

Source: Technological University of Bolívar.

To ensure compost quality, analyses are conducted in the UTB Soil Laboratory, where key parameters are evaluated following standardized methodologies. This year's laboratory results are presented in Table 8.

Table 8: Quality analysis of compost produced at UTB (2024).

Parameter	Result	Ideal range (ICA Res. 00375/2013)	Observations
Nitrogen (N)	High	0.8–2.5%	It promotes vegetative development.
Phosphorus (P)	Low	0.3–1.5%	Recommended to supplement with eggshells.
Potassium (K)	Half	0.5–1.5%	Improves disease resistance.
pH	7–8 (neutral-basic)	6.0–8.5	Optimal for agricultural use.

Source: UTB Soil Laboratory, 2024. Reference standard: Resolution 0375 of 2013 (ICA).

The analysis confirms that the compost meets ICA standards for agricultural and landscape use. Its high nitrogen content—ideal for promoting plant growth—and balanced pH are particularly noteworthy. However, the low phosphorus levels highlight the need to enrich future mixes with phosphorus-rich waste (e.g., ground eggshells).

The compost produced is strategically allocated to the maintenance of green areas, institutional reforestation projects, and campus gardening activities, completing a virtuous cycle of circular economy. Under the coordination of the Infrastructure and Environment Department, this initiative consolidates UTB's role as a benchmark in sustainable management by transforming organic waste into valuable resources for the university ecosystem.

Aligned with the 2018–2025 Environmental Management Plan (EMP), the program also strengthens UTB's commitment to the circular economy and environmental education, actively engaging students, faculty, and staff in sustainable practices.

3.9 Total volume inorganic waste produced this year (tons) (E3.9)

In 2024, the Technological University of Bolívar generated 98.4 tons of inorganic waste, distributed across its two campuses: the Ternera campus accounted for 73.13 tons (74.3% of the total), while the Manga campus contributed 25.25 tons (25.7%). This waste stream includes both recyclable and non-recyclable materials—such as paper, cardboard, plastic, and aluminum—originating from the university's academic, operational, and administrative activities. The monthly breakdown of these volumes, presented in Figure 8, provides insights into key patterns that can help optimize the institution's integrated waste management strategy.

Graphic8: Monthly generation of inorganic waste per site (Tons) – 2024

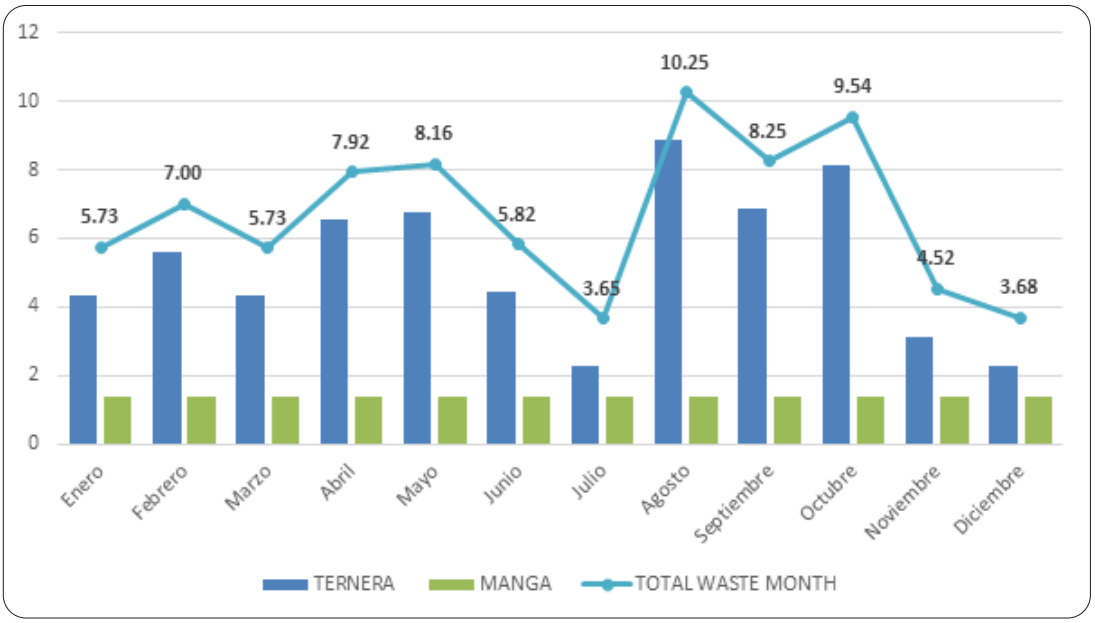
Source: UTB Sustainability Committee.

This detailed record underscores the need to strengthen source separation and recycling strategies, particularly at the Ternera campus, which accounts for the largest share of waste generation. Reinforcing these efforts will further align the university's practices with the principles of the circular economy and environmental sustainability.

3.10 Total volume inorganic waste produced last year (tons) (E3.10)

In 2023, the Technological University of Bolívar (UTB) generated a total of 80.3 tons of inorganic waste, with a notably uneven distribution across its campuses: the Ternera campus accounted for 79.1% (63.52 tons), while the Manga campus contributed 20.9% (16.74 tons). These results are visually represented in the following graph, which highlights the generation patterns:

Graph 8: Monthly generation of inorganic waste per site (Tons) - 2024.



Source: UTB Sustainability Committee.

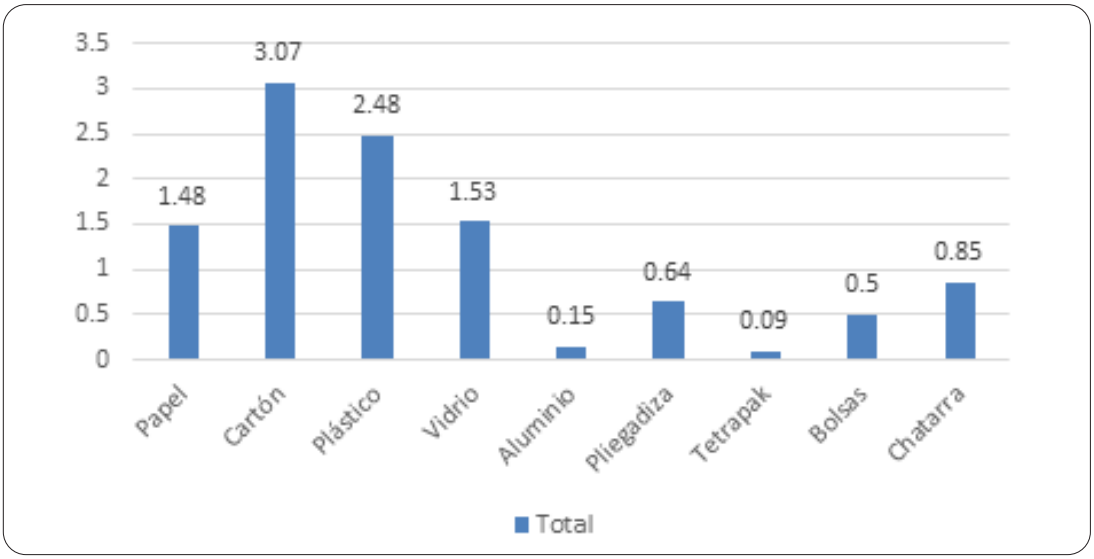
Illustration74: Collection of untreated inorganic waste on the UTB campus

Source: Technological University of Bolívar.

3.11 Total volume inorganic waste treated this year (tons) (E3.11)

In 2024, the Technological University of Bolívar processed a total of 10.8 tons of inorganic waste, distributed across different material categories. The following graph provides the annual breakdown of inorganic waste treated by type of material:

Graph 10: Tons of inorganic waste treated by type of waste (Tons) – 2024.



Source: Comité de sostenibilidad UTB.

Inorganic waste management at UTB in 2024 showed a clear predominance of cardboard (3.07 tons) and plastic (2.48 tons), which together accounted for 51.5% of the total treated. These materials—mainly associated with packaging and educational supplies—were followed by glass (1.53 tons) and paper (1.48 tons), contributing an additional 28% of the annual volume.

Importantly, UTB successfully treated 100% of the recyclable waste generated through its partnership with the Cartagena Amigable Collection Center, thereby complying with national regulatory standards. This outcome not only highlights the university's commitment to sustainability but also demonstrates the effectiveness of the protocols implemented for waste separation, classification, and final disposal.

3.12 Inorganic waste treatment (E3.12)

The Technological University of Bolívar has established a comprehensive inorganic waste management system that integrates operational efficiency with social responsibility. Through a strategic partnership with the Cartagena Amigable Collection Center—a non-profit organization formed by professional recyclers—UTB treated 10.8 tons of the 98.4 tons of inorganic waste generated in 2024, representing a treatment efficiency of 10.6%.

The treatment process begins with the proper separation of recyclable inorganic waste at the ecological collection points distributed across the university. Here, the academic community classifies materials by type in accordance with the official color code (Resolution 2184 of 2019). The separated waste is then temporarily stored in the

institutional collection center before being transported. As shown in Illustration 73, a specialized vehicle periodically transfers the materials to the Cartagena Amigable facilities for final processing.

Illustration75: Secondary classification of inorganic waste by professional recyclers.

Source: Universidad Tecnológica de Bolívar

At the collection center, the materials undergo a rigorous final selection process. Specialized workers manually sort each type of material—plastics, glass, metals, and others. The waste is then weighed, compacted, and packaged into bales, which are subsequently used as raw material in industry.

Illustration76: Cartagena Friendly Collection Center.

Source: Universidad Tecnológica de Bolívar

This system not only complies with the highest environmental standards—including Resolution 2184 of 2019—but also generates a significant social impact. By partnering directly with recycling associations, UTB supports the formalization of the work carried out by dozens of families who depend on this activity, providing them with improved working conditions and access to more stable markets for the materials they recover.

Illustration 77: Partnerships with professional recyclers from the Cartagena Amigable collection center.

Source: Technological University of Bolívar.

3.13 Total volume toxic waste produced this year (tons) (E3.13)

In 2024, the Technological University of Bolívar generated a total of 1.72 tons of hazardous waste, classified into three main categories:

- Waste Electrical and Electronic Equipment (WEEE): 1,278 kg
- Used Cooking Oil (UCO): 411.8 kg
- Batteries: 30 kg

Although this volume represents a relatively small share compared to other waste streams generated at the university, its proper management is critical to preventing the risks associated with improper handling or disposal. The Technological University of Bolívar (UTB) ensures strict monitoring of these materials, guaranteeing regulatory compliance and environmental protection at every stage of the process. The following image illustrates the proper storage and disposal of hazardous waste on campus:

Illustration78: Waste Electrical and Electronic Equipment (WEEE).

Source: Technological University of Bolívar.

Illustration79: Collection of used oils.

Source: Technological University of Bolívar.

3.14 Total volume toxic waste produced last year (tons) (E3.14)

In 2023, the Technological University of Bolívar generated a total of 0.64 tons of hazardous waste, categorized as Waste Electrical and Electronic Equipment (WEEE) and Used Cooking Oil (UCO). These materials were managed in compliance with national regulations, following protocols that included:

- Segregation at source using designated containers.
- Temporary storage in security-controlled areas.
- Final disposal through authorized waste management providers.

Illustration80: Toxic waste produced on the university campus.

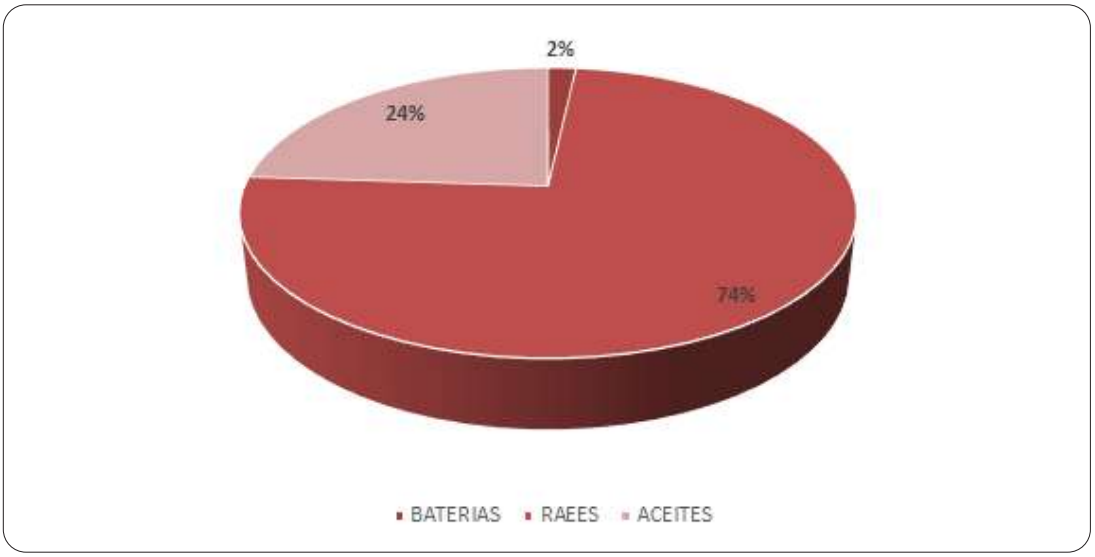
Source: Technological University of Bolívar.

The final disposal of WEEE was carried out by Serviecológica, which managed the collection, transportation, classification, and separation of the waste, followed by temporary storage and subsequent delivery for recycling. Used cooking oil (UCO) was managed by RECOILS, ensuring its recovery and reuse in biofuel production.

3.15 Total volume toxic waste treated this year (tons) (E3.15)

In 2024, the Technological University of Bolívar responsibly managed a total of 1.72 tons of hazardous waste, consisting of WEEE, used cooking oil, and lithium batteries.

Graph 11: Percentages of hazardous waste year 2024.



Source: Technological University of Bolívar.

This year, the most common type of hazardous waste generated at the university was Waste Electrical and Electronic Equipment (WEEE). This was largely due to the institutional computer system upgrade, which included the purchase of 561 new computers. As a result, the system's obsolescence rate decreased by 19%, dropping from 58% to 39%, thereby improving the quality of resources and the overall satisfaction of students, faculty, and staff in their use of computer equipment.

The final disposal of WEEE and batteries was carried out by PCSHEK and SERVIECOLÓGICA, respectively. In both cases, the waste was first collected and separated at the campus collection center, then transported, stored, and ultimately delivered for recycling. Meanwhile, used cooking oil (UCO) was managed by RECOILS, which ensured its recovery for biofuel production.

The Technological University of Bolívar guarantees strict compliance with Colombian environmental regulations, ensuring that each type of hazardous waste is managed according to its specific characteristics. Although this category represents only a small fraction of the university's total waste, its responsible handling is essential to preventing

environmental impacts and safeguarding the health of the university community. To reinforce this commitment, UTB maintains a traceability system that documents each stage of the process—from generation to final disposal—consolidating its pledge to sustainability, safety, and regulatory compliance.

3.16 Toxic waste treatment (E3.16)

The Universidad Tecnológica de Bolívar offers a RESPEL management system that allows for 100% treatment, meaning that all hazardous waste generated on campus is treated through proper storage and final disposal based on national regulations. After being classified and temporarily stored under controlled conditions on campus, this waste is delivered to certified companies specializing in its final treatment, as shown in the following illustration:

Illustration 81: Hazardous waste collection operation by specialized personnel.

Source: Ingeambiente del Caribe S.A., 2024.

Aligned with national regulations (Law 1252 of 2008), this system not only minimizes environmental and health risks but also reinforces UTB's commitment to responsible environmental management. Photographic records, together with disposal certificates issued by authorized companies, provide transparency and enable effective monitoring of the process at every stage.

3.17 Sewage disposal (E3.17)

The wastewater generated in different areas of the Technological University of Bolívar campus—including restrooms, dining halls, and laboratories—is not treated directly on-site. Instead, it is conveyed through the university's internal sanitary network and discharged into the city's main sewage system, operated by Aguas de Cartagena S.A. E.S.P. (Acuacar). As illustrated in the following image, this system forms part of an integrated treatment circuit that relies on urban infrastructure and specialized technology, as described below:

Illustration 82Diagram of the wastewater treatment system in Cartagena.

Source: Technological University of Bolívar.

The Acuacar system, one of the most advanced in the region, comprises an extensive network of 1,135 kilometers of sewers, 63 kilometers of collectors, and 35 pumping stations that transport wastewater to the Punta Canoas Pretreatment Plant. Along this route, wastewater from UTB flows through a 19.5-kilometer pipeline bordering the Ciénaga de la Virgen, ensuring safe and controlled conveyance.

At the Punta Canoas WWTP, the water undergoes a pretreatment stage designed to remove coarse solids, sand, grease, and other contaminants, in compliance with established environmental standards. The process concludes with the controlled discharge of the treated water into the Caribbean Sea through a 4.3-kilometer submarine outfall, a technology that enables safe disposal while minimizing impacts on marine ecosystems.

This integrated system—combining the university's internal network with the city's public infrastructure—demonstrates UTB's commitment to responsible water resource management. By ensuring proper wastewater handling, the university not only safeguards its own operations but also contributes directly to Cartagena's environmental sanitation efforts, in alignment with the Sustainable Development Goals on clean water and marine ecosystem conservation.

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3.18 Planning, implementation, monitoring and/or evaluation of all programs related to Waste Management through the utilization of Information and Communication Technology (ICT) (E3.18)

The Technological University of Bolívar does not yet have a fully integrated environmental waste management system powered by Information and Communication Technologies (ICT) to optimize the entire management cycle. Currently, the institution relies on a hybrid approach, combining advanced tools such as Power BI—for interactive data visualization and advanced analysis—with traditional applications such as Excel and Word for process recording and documentation. This technological ecosystem enables precise monitoring of waste volumes, classified by type and location on campus, and facilitates the identification of seasonal and academic area–specific patterns.

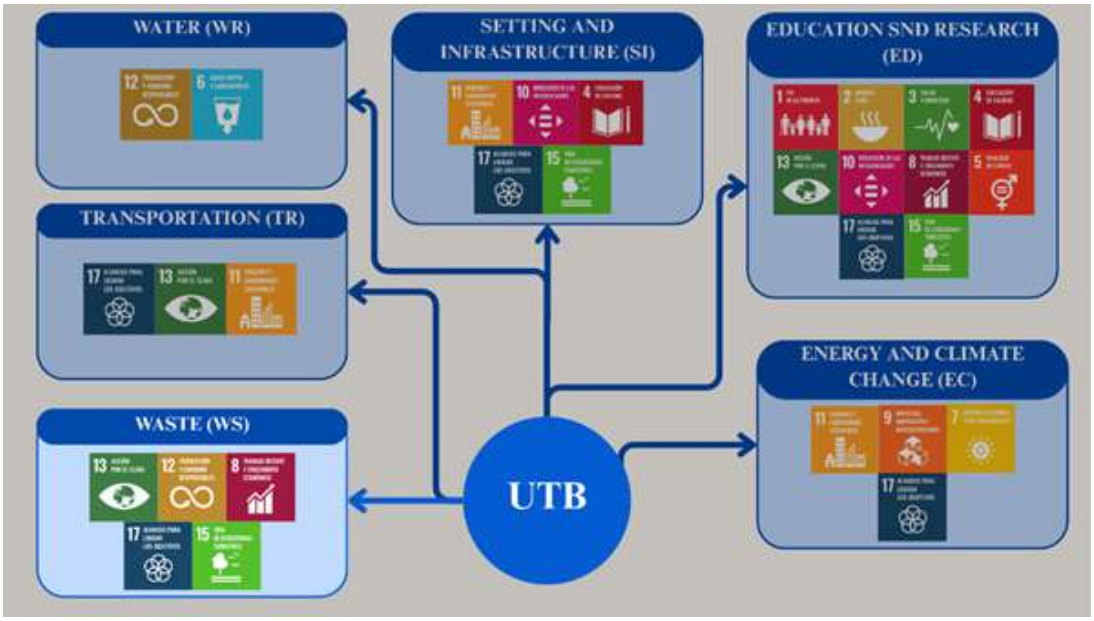
The introduction of interactive dashboards has already transformed decision-making by allowing environmental managers to access real-time processed data and automatically generate reports. Building on this capacity, the university is developing the Smart Energy Lab, a strategic project that will digitally centralize all institutional environmental data. The platform will integrate indicators not only on solid waste generation, but also on energy consumption, water use, and campus climate conditions.

This digital transformation represents a qualitative leap in institutional environmental management, positioning UTB at the forefront of university sustainability. The system will provide early warnings for deviations in key indicators, optimize resource allocation through predictive modeling, and strengthen transparency in environmental reporting. Beyond its operational advantages, the initiative consolidates UTB's smart campus model, where technology bridges administrative management, teaching, and applied research in sustainability, fully aligned with international standards such as ISO 14001 and ISO 50001.

3.19 Impact of Waste Management programs in supporting the Sustainable Development Goals (E3.19)

The Technological University of Bolívar has developed a comprehensive waste management system that makes a meaningful contribution to the achievement of the Sustainable Development Goals (SDGs). Through concrete and measurable actions, these initiatives create a multiplier effect, simultaneously advancing progress across five key SDGs.

Illustration 83: UTB's contribution to the SDGs from the Waste dimension.



Source: Technological University of Bolívar.

Within the framework of SDG 8 (Decent Work and Economic Growth), UTB has created formal employment opportunities through strategic alliances with recycling associations and companies specializing in waste treatment. These partnerships not only generate local jobs but also foster sustainable practices within the university community and among its stakeholders.

Our strategy is centered on SDG 12 (Responsible Consumption and Production), where the 3R program (Reduce, Reuse, Recycle) has produced measurable results. We have significantly reduced the consumption of single-use plastics and paper, while ensuring that 100% of organic waste is composted and recyclable materials are properly processed.

These efforts directly support SDG 13 (Climate Action), as our composting and recycling system prevents the emission of thousands of tons of greenhouse gases that would otherwise result if waste were sent to landfills. At the same time, we contribute to SDG 15 (Life on Land) through the responsible management of hazardous waste, thereby protecting regional soils and water bodies.

Reaching these goals would not be possible without the collaborative approach embodied in SDG 17 (Partnerships for the Goals). Our alliances with certified companies such as Ingeambiente del Caribe S.A. and Cartagena Amigable guarantee the proper treatment of all types of waste, from hazardous to recyclable.

This holistic approach to waste management—visually represented in our reports through the SDG icons—demonstrates how an academic institution can serve as an agent of change for sustainable development, integrating teaching, research, and social outreach into an environmentally responsible model.

4 Water

4 WATER

4.1 Water conservation program and implementation (E4.1)

The Technological University of Bolívar is preparing two programs aimed at promoting efficient water management on campus. These programs are structured around innovative projects that integrate technology with nature-based solutions:

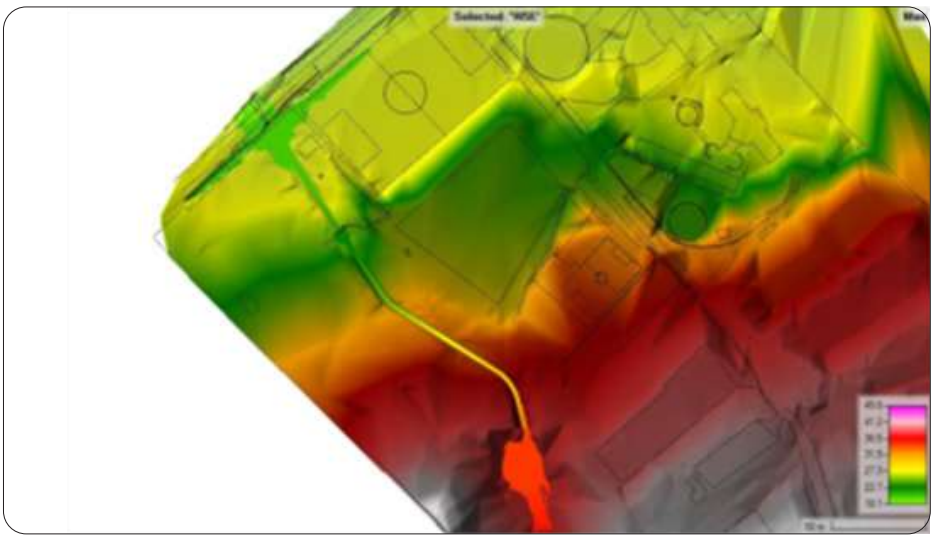
1. Sustainable Lake Management Project (in feasibility phase)

This ambitious project seeks to transform campus water bodies into self-sustaining ecological systems through:

- Natural filtration using biological systems that improve water quality.
- Eutrophication control with carefully selected aquatic plants.
- Aeration systems powered by smart devices that optimize oxygen levels.

As illustrated in the accompanying figure on current water consumption, this initiative will not only reduce the use of water resources but will also create living educational spaces—natural laboratories that support sustainability research and experiential learning.

Illustration 84: Monthly water consumption on campus (m^3, 2024).



Source: Technological University of Bolívar.

2. Rainwater Harvesting System (in formulation phase)

Our master plan includes the installation of a rainwater harvesting system designed to leverage existing infrastructure:

- Key buildings (Alcatraz, A1, A2, Administrative) serving as collection points.
- Main campus channel functioning as an additional collector.
- Estimated capacity: 350–700 m^3 per month per collection point.

This system, which could reduce drinking water consumption by up to 25%, represents a replicable model of hydro-sustainable architecture. The harvested water will be used primarily for irrigating the university's 12 hectares of green areas, thereby creating a closed-loop water cycle within the campus.

4.2 Water recycling program implementation

The Technological University of Bolívar is preparing a water recycling program that includes the design of a Wastewater Treatment Plant (WWTP) for its Technological Campus. This facility will treat a flow of 3.2 l/s—equivalent to the demand of 13,000 users—using advanced filtration and disinfection processes. The reclaimed water will be allocated to four primary uses: irrigation of the campus's 12 hectares of green areas, aquifer recharge, industrial applications, and sanitation system maintenance. The proposed location of the WWTP within the campus is shown in the following illustration:

Illustration 85: Spatial distribution of the WWTP on the Technology Campus.

Source: Universidad Tecnológica de Bolívar, 2024.

Scheduled to begin construction in 2025, this project will reduce drinking water consumption for non-essential uses by 75% and prevent the discharge of approximately 280 m^3 of wastewater per day. Its modular design will allow for future expansions in line with campus growth, while its operation will function as a living laboratory for environmental engineering research. The WWTP is fully integrated into the university's water sustainability system—which already includes rainwater harvesting and lake management projects—thereby consolidating a circular water management model aligned with SDGs 6 (Clean Water and Sanitation) and 9 (Industry, Innovation, and Infrastructure).

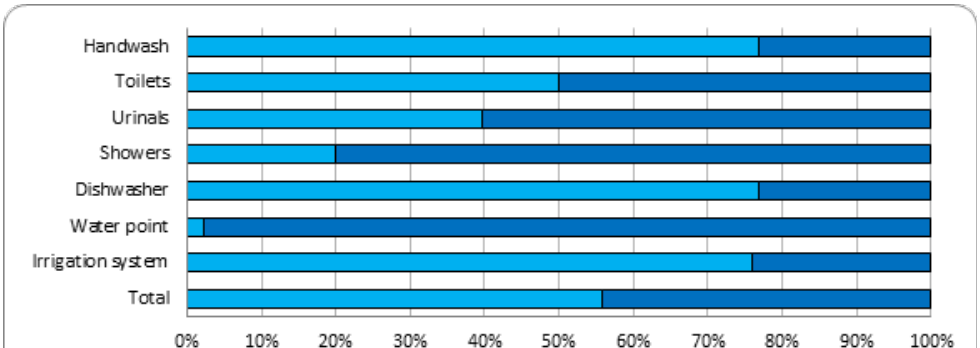
4.3 Water efficient appliances usage (E4.3)

The Technological University of Bolívar has achieved 56% implementation of water-efficient equipment across its campus. This figure includes devices such as sinks, toilets, urinals, and other fixtures that have been progressively replaced with low-consumption models.

As part of this program, conventional sanitary equipment has been upgraded with technologies designed to optimize water use, resulting in significant reductions in daily consumption. Among the most modernized systems are sinks, dishwashers, and sprinklers, which now incorporate highly efficient technologies.

The following illustration presents a comparison between the percentage of water-efficient devices and conventional equipment currently in use on the university campus.

Illustration 86: Hydraulic inventory, 2024.



	Total	Irrigation system	Water point	Dishwasher	Showers	Urinals	Toilets	Handwash
Efficient	296	19	1	20	2	27	87	140
Conventionals	235	6	45	6	8	41	87	42

Source: Technological University of Bolívar.

Despite the progress made in implementing efficient technologies, some areas of the campus are still equipped with conventional sanitary fixtures. These will be progressively replaced as part of UTB's institutional commitment to sustainability and the responsible use of water resources.

Several restrooms and strategic locations on campus are already equipped with water-saving systems.

1. **Handwashing:** the university has installed sinks with a timed mechanism that operates through a push button regulating water flow. This system offers multiple benefits:

- Controls the amount of water used by each user.
- Reduces water waste in high-traffic areas.
- Promotes responsible practices in resource use.
- Contributes to environmental protection through water efficiency.

Illustration 87: Timed handwashing for water saving.

Source: Technological University of Bolívar.

2. Urinals: The Technological University of Bolívar has implemented high-efficiency urinals designed to operate without requiring water for each flush (Illustration 86). These devices use a specialized cartridge containing a biodegradable chemical trap that:

- Prevents the emission of unpleasant odors.
- Avoids environmental contamination.
- Significantly reduces water consumption.
- Improves sanitary conditions in high-use areas.

This technology represents a major step forward in the university's sustainability strategy, combining operational efficiency with environmental responsibility.

Illustration 88: Efficient urinals.

Source: Technological University of Bolívar.

3. Toilets: UTB has also installed high-efficiency toilets designed to minimize water use per flush (Illustration 87). These units operate with a consumption of 1 to 1.6 gallons (3.78 to 6 liters), representing a substantial reduction compared to conventional systems.

Illustration 89: Efficient Sanitary.

Source: Technological University of Bolívar.

4. Dishwasher: In the cafeteria kitchen of the Alcatraz Building, the Technological University of Bolívar has installed a high-efficiency industrial dishwasher designed to clean large volumes of dishes simultaneously (Illustration 88). This equipment optimizes the washing process by reducing both water and energy consumption.

Its main features include:

- Capacity to handle high dish loads in a single cycle.
- Up to 30% water savings compared to traditional methods.
- Reduced energy consumption associated with water heating and pumping.
- Improved operational efficiency of the institutional kitchen.

Illustration 90: Dishwasher.

Source: Technological University of Bolívar.

4.4 Consumption of treated water (E4.4)

The Technological University of Bolívar does not treat rainwater, groundwater, or surface water for human consumption. Instead, it receives its entire supply from the drinking water treatment system operated by the Cartagena aqueduct, which has three treatment plants located at an altitude of 47 meters above sea level (masl), near Loma del Marión, in the Paraguay neighborhood.

These plants receive raw water from the Dique Canal through the Dolores and Gambote intake systems. The water is channeled to a mixing chamber, consisting of two tanks with a total capacity of 2,000 cubic meters, where the treatment process begins, as shown in the following illustration:

Illustration 91: Raw water treatment and conduction system – Aguas de Cartagena SAS

Source: Technological University of Bolívar.

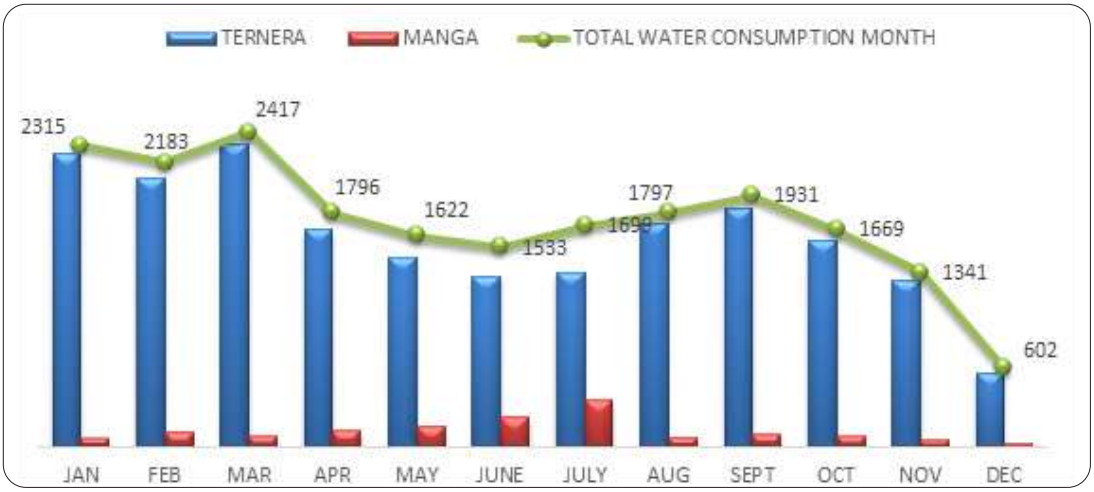
In 2024, the Technological University of Bolívar recorded a total water consumption of 20,905 cubic meters (m^3) across its campuses. This volume was essential to support the comprehensive development of academic, administrative, and maintenance activities.

The water, supplied by the city's drinking water system operated by Aguas de Cartagena, was used to meet the daily needs of students, faculty, and administrative staff, as well as to ensure the proper operation of the following systems:

- Irrigation of green areas.
- Cleaning and sanitation of facilities.
- Essential technical and logistical operations.

The monthly breakdown of the university's total water consumption is presented in the following graph:

Graph 12: Total water consumption at the UTB in 2024.



Source: UTB Sustainability Committee.

4.5 Water pollution control in campus area (E4.5)

To prevent water pollution and ensure that unsafe liquids do not enter the supply system, the Technological University of Bolívar has implemented robust water quality control measures that are regularly applied and monitored. The Technological Campus features a secure storage system composed of two concrete tanks:

- Underground tank: with an approximate capacity of 63 m^3, designed to keep water isolated from the surrounding soil.
- Elevated tank: with an approximate capacity of 270 m^3, positioned at height to facilitate distribution and protected against external agents.

Both tanks are designed to isolate the stored water from external contamination, ensuring optimal storage conditions.

The university has also established a semiannual maintenance plan that includes manual cleaning of the tanks with sodium hypochlorite, a disinfectant effective against a wide spectrum of microorganisms. This process eliminates:

- Pathogenic bacteria: Escherichia coli, Salmonella.
- Viruses: associated with gastrointestinal and respiratory diseases.
- Fungi, algae, and parasites.
- Biofilms: microbial accumulations on internal surfaces of tanks and pipes.

In parallel, the university applies a periodic protocol to verify water quality parameters, covering physical, chemical, and biological aspects, as detailed in the following table:

Table 9: Physical, chemical and biological parameters evaluated in water quality control within the UTB campus.

Category	Parameters Evaluated
Physicists	Temperature, conductivity, color, odor, turbidity
Chemicals	Total solids, pH, aluminum, copper, chromium, nitrite, nitrate, silver, chlorides, total hardness, oils, fats, iron, sulfates, zinc, chlorine
Biologicals	Fecal coliforms, Escherichia coli, mesophilic aerobes, Pseudomonas aeruginosa

These measurements have confirmed compliance with the permissible levels and values of water quality parameters, in full accordance with national standards and regulations, as illustrated in the following image:

Illustration 92: Measurement results of drinking water quality parameters at UTB - 2024.

Gestión Analítica S.A.S

INFORME DE RESULTADO

Cotización:
Código: R-P-GP-01-17
VERSION No. 00

Razón social:	Universidad Tecnologica de Bolivar	**Nit:**	900484140
Nombre solicitante:	Antonio José Suárez Perez	**Teléfono:**	605-6535200
Dirección:	Brr Ternera KM 1 par Industrial y Tecnologico Carlos Velez	**Ciudad:**	CARTAGENA

Datos de Muestra

Orden de trabajo número:	**2643-1**
Fecha de toma de muestras:	14/11/2024
Muestreo realizado por:	Bryan Ramos Marmol
Fecha recepción de muestras:	14/11/2024
Fecha realización de ensayo:	14/11/2024
Fecha de emisión de informe:	14/11/2024
Número de muestras tomadas:	1 de 1
Lugar realización de muestreo:	Ternera
Hora realización de muestreo:	12:00 pm
Norma técnica:	Resolución 2115/2007

Análisis Fisicoquímico

2643-1-1	**Agua potable. Descripción de la muestra: Muestra tomada en: Tanque; T°C: 28.7°C**		
Parámetro	**Método**	**Valor de referencia**	**Resultado**
Nitrito	Técnica Fotométrica,. SM 4500 NO2-B	<0,1 mg/L	0,00
Color	Técnica Espectrofotométrica SM 2120C	15 pt-Co	0
Sabor - Olor	Organoléptico	Aceptable	Aceptable
Turbidez	Técnica Espectrofotométrica. Standard Método 2130 B	<2,0 NTU	0,00
pH	Técnica Electrométrica. Standard Método 4500	6,5 - 9,0	6,80
Aluminio	Técnica Espectrofotométrica, método de adaptación de Aluminio.	0,2 mg/L	0,12
Nitratos	Técnica Espectrofotométrica método reducción por cadmio. SM 4500 NO3-E	<10 mg/L	-0,04
Cloruros	Técnica Titulometria por el método Argentometrico. SM 4500 Cl-B	<250 mg/L	65,48
Dureza Total	Técnica Titulometrica, método EDTA SM 2340 B	<300 mg/L	216,00
Hierro	Técnica Fotométrica, método de Ferrover- Método EPA 315B	< 0,3 mg/L	0,00
Sulfato	Técnica Espectrofotométrica. Standard Methods 4500-SO4 2- E.	<250 mg/L	38,00

Source: Technological University of Bolívar.

Finally, UTB reaffirms its commitment to the care and responsible use of water storage systems by carrying out periodic maintenance on its storage tanks, as illustrated in the following image:

Illustration 93: Cleaning and maintenance of water storage tanks on campus.

Source: Technological University of Bolívar.

4.6 Planning, implementation, monitoring and/or evaluation of all programs related to Water Management through the utilization of Information and Communication Technology (ICT) (E4.6)

The Technological University of Bolívar does not yet have a comprehensive environmental water management system that leverages Information and Communication Technologies (ICT) to optimize the management cycle. However, through the development of the Smart Energy Lab, the university plans to centralize and digitize all information related to water consumption, energy use, waste management, and climate variables using advanced digital platforms.

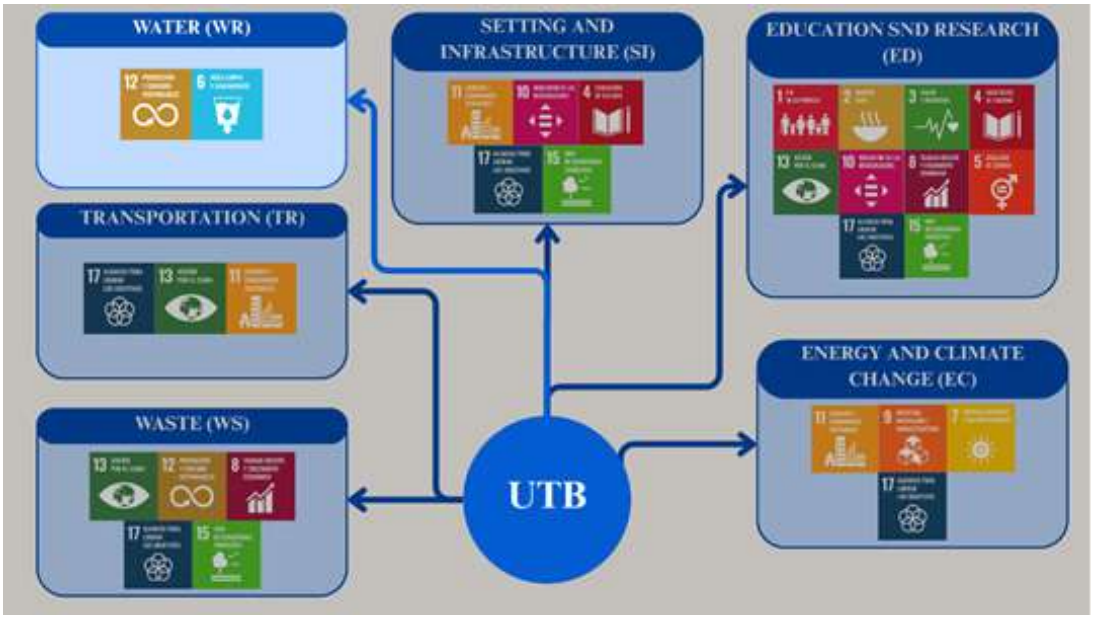
This transformation will enable:

- Real-time monitoring of water and energy consumption.
- Integrated management of environmental and operational data.
- Data-driven decision-making based on accurate, up-to-date information.
- Continuous evaluation of sustainability program performance.
- Optimization of strategies to enhance operational efficiency.

4.7 Impact of Water Management programs in supporting the Sustainable Development Goals (E4.7)

The Technological University of Bolívar currently has a modest impact on the achievement of the Sustainable Development Goals (SDGs). Nonetheless, its initiatives generate a multiplier effect by directly contributing to two key SDGs through concrete and measurable actions, as illustrated below:

Illustration94: UTB's contribution to the SDGs from the Water dimension.



Source: Technological University of Bolívar.

Within the framework of SDG 6 (Clean Water and Sanitation), the university has implemented low-consumption sanitary systems that reduce water use by up to 40%, alongside innovative projects such as the planned Wastewater Treatment Plant, which will allow for the reuse of 75% of treated water. These efforts are complemented by a rainwater harvesting system, currently under development, designed to irrigate the campus's green areas using natural rainfall.

In support of SDG 12 (Responsible Consumption and Production), UTB has established protocols for the efficient use of resources, which include:

- Installation of flow sensors at critical points
- Deployment of state-of-the-art hydrosanitary equipment
- Awareness campaigns promoting responsible consumption

While the path toward full water sustainability is progressive, the progress achieved to date provides a solid foundation. UTB reaffirms its commitment to expand these initiatives in the coming years by incorporating advanced water treatment and recirculation systems, thereby strengthening its contribution to the global sustainability agenda.

5 TRANSPORTATION

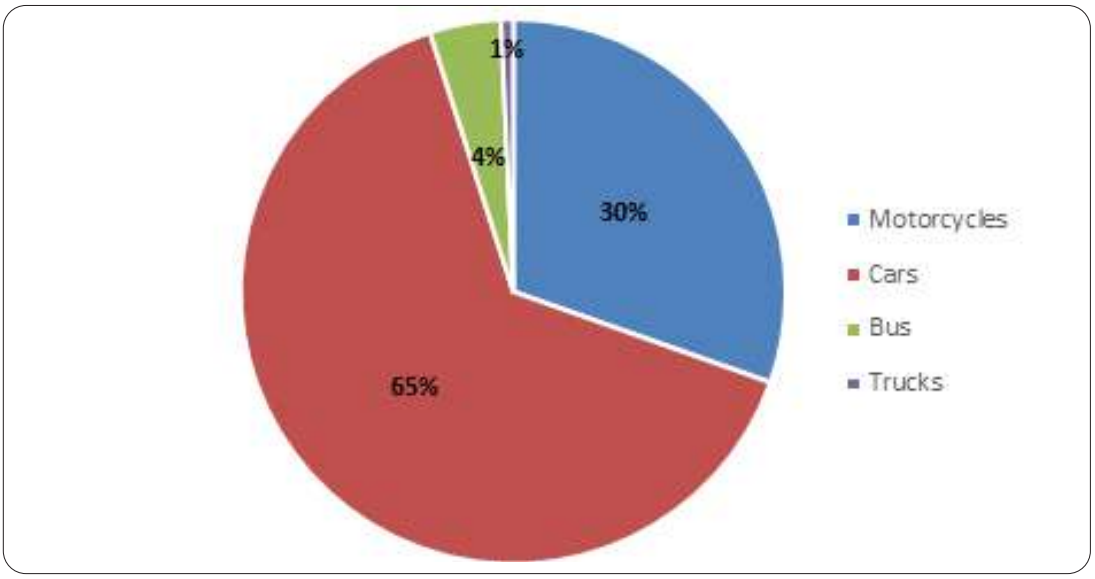
5 TRANSPORTATION

5.1 The total number of vehicles (cars and motorcycles with combustion engines) divided by the total campus' population (E5.4)

Approximately 970 vehicles enter the Technological Campus each day, including cars, vans, supply trucks, motorcycles, heavy trucks, and buses from the city's mass transit system. The vast majority operate with internal combustion engines, while hybrid vehicles are observed only occasionally and fully electric vehicles have yet to be registered on campus.

Regarding the public transit system, Transcaribe operates a fleet powered entirely by natural gas vehicles (NGVs). Although not fully emission-free, this technology represents a cleaner alternative to conventional fossil fuels, as it substantially reduces pollutants such as particulate matter, nitrogen oxides, and carbon dioxide. Its use reflects an important step toward advancing sustainable urban mobility. The following graph illustrates the daily distribution of vehicles entering the campus by type:

Graphic13: Percentage of vehicle types entering per day.



Source: Technological University of Bolívar.

Based on the graph above, 65% of the combustion vehicles entering the Technological University of Bolívar each day correspond to cars and trucks, representing an estimated 627 units on a daily basis.

5.2 Shuttle services (E5.5)

The Technological University of Bolívar has two main vehicle access points to its Technological Campus, ensuring efficient entry and exit. One entrance is located on the Mamonal Bypass and the other at Kilometer 1 of the Carlos Vélez Pombo Industrial Park. Both are interconnected by an internal roadway that traverses the campus, dividing it into two main sectors. This road serves as the primary circulation axis, facilitating direct access for students, faculty, and administrative staff to the different academic, administrative, and service buildings. However, this same connectivity also generates a constant flow of vehicles within the campus, which demands careful planning to ensure pedestrian safety and mitigate environmental impacts.

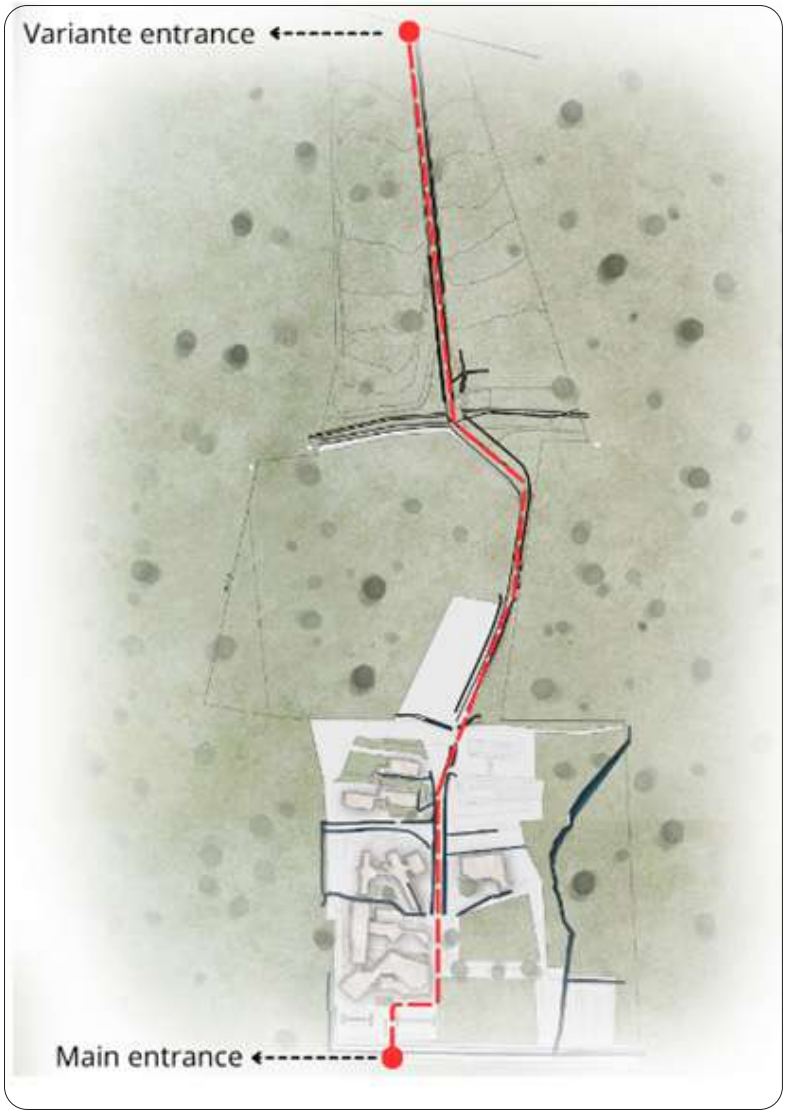
In contrast, the Casa Lemaitre Campus—due to its smaller size and urban setting—does not allow private vehicle access. Designed exclusively for pedestrian circulation, it fosters a quieter environment, free of vehicular emissions, and eliminates the need for an internal mobility system.

The following illustration presents the internal roadway layout and connectivity plan of the Technological Campus.

Illustration 95: Internal Route of the Technological Campus

Source: Technological University of Bolívar.

Illustration96: Internal Road connectivity map of the main campus – UTB.



Source: Technological University of Bolívar.

5.3 Zero Emission Vehicles (ZEV) availability on campus (E5.9)

La The Technological University of Bolívar does not yet implement the use of zero-emission vehicles on its campus, mainly due to the topographical conditions of the terrain. The Technological Campus has areas with slopes greater than 15%, which represent a

significant challenge for the efficient and safe use of sustainable transportation modes such as electric scooters or bicycles.

Although these vehicles are environmentally friendly, their performance is limited on steep inclines, which can also compromise user safety. Despite this restriction, the campus layout ensures comfortable, safe, and accessible pedestrian mobility, allowing easy travel on foot between academic, administrative, and service buildings.

In addition, most students and staff access the campus in private vehicles, which can be parked in designated lots located near their destinations, thereby reducing the need for internal motorized transport. To encourage sustainable mobility, the university also provides bicycle parking areas for students, staff, and visitors who choose this alternative for commuting from their homes to campus, thus supporting cleaner and healthier transport practices.

The following images show the bicycle parking lots and racks available on campus.

Illustration 97: Bicycle parking area.

Source: Technological University of Bolívar.

In this regard, the university receives an average of 31 bicycles per day, which are accommodated in a designated parking area on campus.

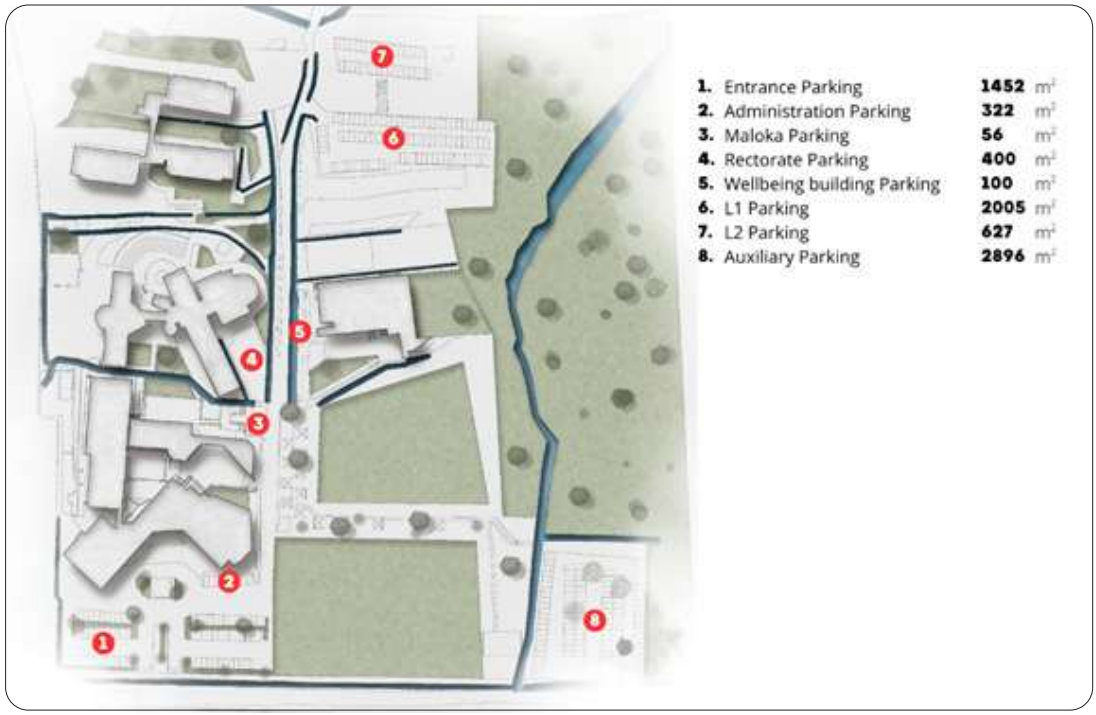
Illustration98: Bicycle rack.

Source: Technological University of Bolívar.

5.4 The ratio of the ground parking area to total campus area (E5.13)

On the main campus of the Technological University of Bolívar, parking areas account for approximately 3.3% of the total campus surface. During peak hours, occupancy levels reach between 90% and 100%, highlighting the high demand for parking spaces. The following map and illustrations show the distribution and availability of parking across the different UTB campuses:

Illustration 99: Spatial distribution of the area available for parking on the Technology Campus.



Source: Technological University of Bolívar.

Illustration 100: Admnistration Parking

Source: Technological University of Bolívar.

Illustration101: Auxiliary Parking.

Source: Technological University of Bolívar.

Illustration102: Parking A5

Source: Technological University of Bolívar.

5.5 Program to limit or decrease the parking area on campus for the last 3 years (E5.14)

Currently, the Technological University of Bolívar does not have a formal program in place to limit or reduce parking on campus. Although strategies promoting sustainable mobility have been implemented—such as incentives for bicycle use, encouragement of public transportation, and the recent introduction of the Aquabus-E—no specific measures to reduce or repurpose parking areas have been adopted over the past three years. Parking management continues to focus primarily on meeting the existing demand from students, faculty, and staff.

5.6 Number of initiatives to decrease private vehicles on campus (E5.15)

The Technological University of Bolívar (UTB) has implemented a key initiative to reduce the use of private vehicles on campus. Since 2017, the university has maintained an agreement with Transcaribe S.A., the city's mass transit system, to encourage public transportation among its community. As part of this agreement, UTB became the final stop of Route A102, known as the "student route," which allows buses to return directly from within the campus. This route connects the university to the main station, Patio Portal, and, since January 2022, has expanded its operating hours to meet increasing demand. The initiative provides students, staff, and visitors with a sustainable and efficient mobility alternative. The following image shows the arrival area for the Transcaribe Route A102 bus inside the campus.

Illustration103: Mass Transportation System – Transcaribe.

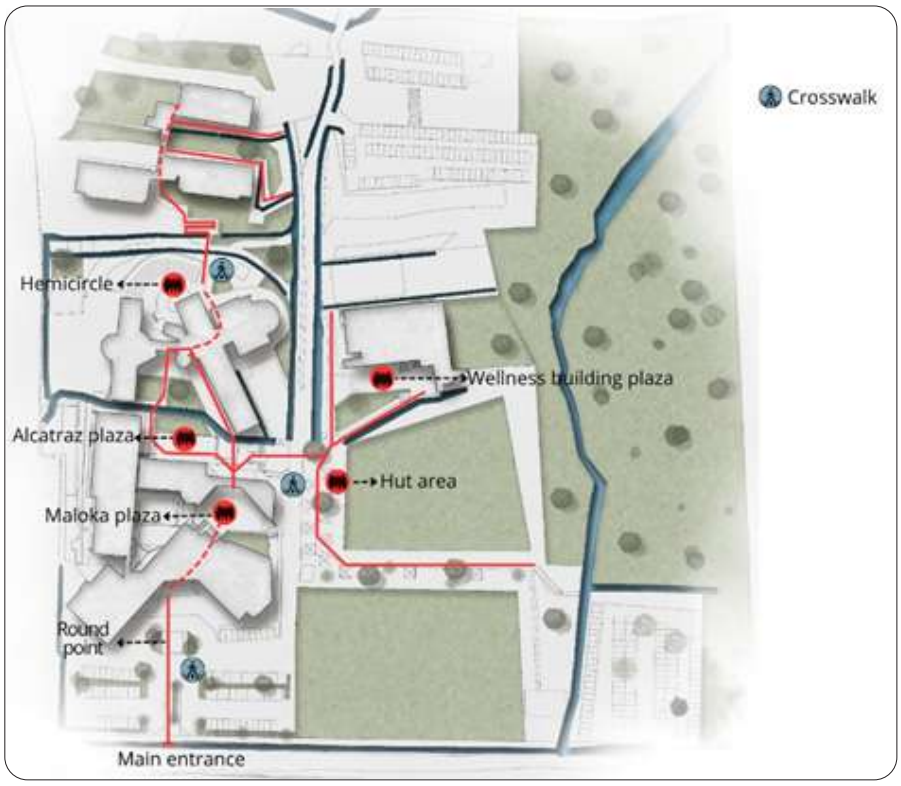
Source: Technological University of Bolívar.

5.7 Pedestrian path on campus (E5.16)

The Technological University of Bolívar (UTB) has pedestrian pathways distributed throughout its campus, designed to ensure both safety and accessibility. These walkways connect access points with internal areas, facilitating safe and convenient movement between the various buildings and facilities.

To enhance pedestrian safety, the paths are equipped with adequate lighting, horizontal signage such as zebra crossings at intersections with vehicular roads, and handrails in designated areas where necessary. In total, the campus features approximately 918 linear meters of pathways that meet established standards of safety, accessibility, and convenience for the entire university community. The following images show the spatial layout and distribution of pedestrian paths across the campus.

Illustration 104: Distribution of pedestrian paths along the Technology Campus.



Source: Technological University of Bolívar.

Illustration 105: Alcatraz Ramps and Stairs.

Source: Technological University of Bolívar.

Illustration 106: Pedestrian path to Building A1.

Source: Technological University of Bolívar.

Illustration 107: Pedestrian ramps A3.

Source: Technological University of Bolívar.

5.8 Planning, implementation, monitoring and/or evaluation of all programs related to Transportation through the utilization of Information and Communication Technology (ICT) (E5.18)

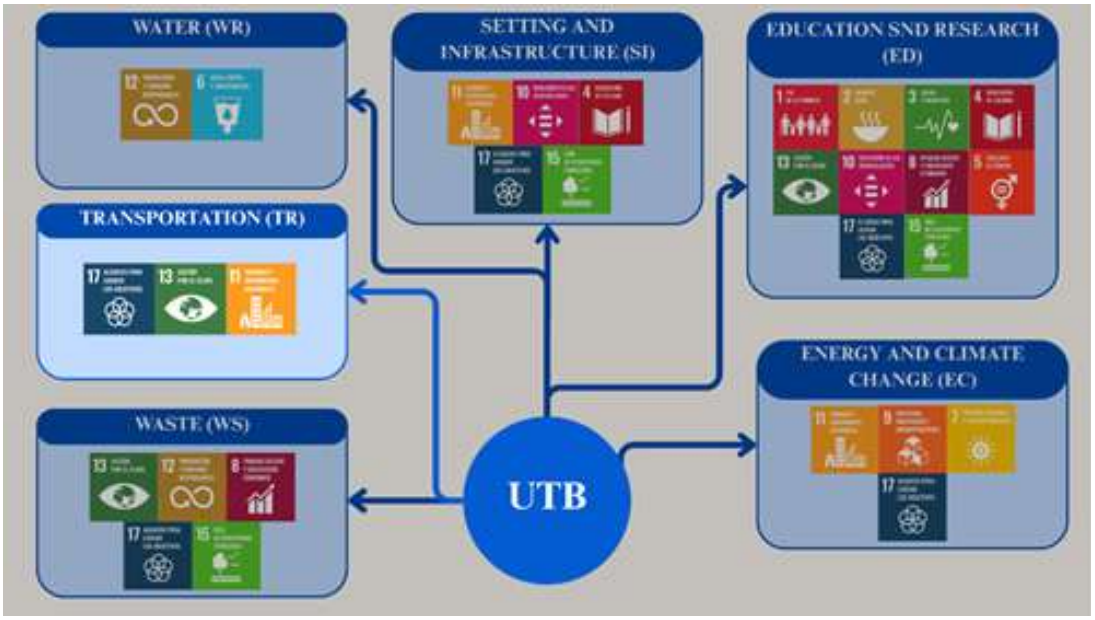
Currently, the Technological University of Bolívar does not have a system in place for planning, implementing, monitoring, or evaluating transportation-related programs through Information and Communication Technologies (ICTs). Existing mobility initiatives—such as the agreement with Transcaribe or vehicle gauging—are managed independently, without the support of dedicated digital platforms. To date, no centralized or automated system for monitoring campus mobility has been implemented or is under development.

5.9 Impact of Transportation programs in supporting the Sustainable Development Goals (E5.19)

The transportation initiatives implemented by the Technological University of Bolívar (UTB) contribute significantly to the achievement of several Sustainable Development Goals (SDGs), particularly SDGs 11 (Sustainable Cities and Communities), 13 (Climate Action), and 17 (Partnerships for the Goals).

Since 2017, UTB has promoted sustainable mobility through an agreement with Transcaribe SA, the city's mass transit system. In addition, the university encourages the use of bicycles as an active means of transportation by installing bicycle parking on campus, promoting zero-emission mobility. Notably, UTB leads the Aquabus-E project, a sustainable electric water transportation initiative within the city of Cartagena de Indias. This alternative means of transportation not only represents a technological advance but also a commitment to clean, innovative mobility aligned with the principles of urban sustainability. The following image shows the SDGs supported by UTB's Transportation programs:

Illustration108: UTB's contribution to the SDGs from the Transport dimension.



Source: Technological University of Bolívar.

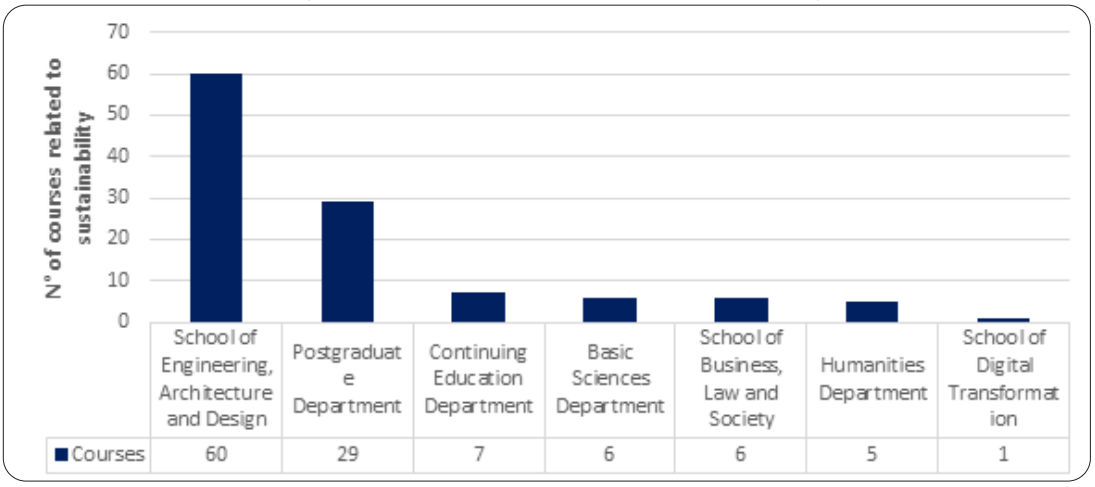
6 EDUCATION AND RESEARCH

6 EDUCATION AND RESEARCH

6.1 Number of courses/subjects related to sustainability offered (E6.1)

In 2024, the Technological University of Bolívar offered a total of 114 courses focused on the environment and sustainability, delivered across its various schools and academic departments. These courses are designed to equip students with the knowledge and practical tools needed to understand, apply, and integrate sustainability principles into both their professional practice and everyday lives. The following chart illustrates the distribution of these courses by academic unit during the year:

Graph 14: Number of courses related to sustainability



Source: Universidad Tecnológica de Bolívar

The following list presents the sustainability-related courses offered in 2024, organized by the academic units responsible for their delivery:

Table 10: Sustainability-related courses from the School of Engineering, Architecture and Design.

No.	Subject	Program
1	Biological Systems	Environmental Engineering
2	Microbiology	Environmental Engineering
3	Ecology	Environmental Engineering
4	Production plan, programming and control	Industrial Engineering
5	Air Quality and Meteorology	Environmental Engineering

No.	Subject	Program
6	Atmospheric Emissions Control	Environmental Engineering
7	Occupational Health and Safety	Industrial Engineering
8	Occupational Health and Safety	Industrial Engineering
9	Biomedical Engineering Workshop	Biomedical Engineering
10	Environmental Engineering Seminar	Environmental Engineering
11	Environmental Thermochemistry	Environmental Engineering
12	Environmental Chemistry I	Environmental Engineering
13	Environmental Chemistry II	Environmental Engineering
14	Bioinformatics	Biomedical Engineering
15	Urban Planning and Environment IV	Architecture
16	Biomedical Instrumentation	Biomedical Engineering
17	Soil Quality	Environmental Engineering
18	Soil Treatment	Environmental Engineering
19	Environmental Geotechnics	Environmental Engineering
20	Geosciences	Civil Engineering
21	Biomechanics	Biomedical Engineering
22	Automatic Production Systems	Mechatronics Engineering
23	Transportation Systems	Civil Engineering
24	Productivity Engineering	Industrial Engineering
25	Energy Conversion	mechanical Engineering
26	Renewable Energy	Electrical Engineering
27	Sustainable Development	Environmental Engineering
28	Integrated Waste Management S	Environmental Engineering
29	Environmental Assessment	Environmental Engineering
30	Solid Waste Management	Environmental Engineering
31	Design of Production Systems	Industrial Engineering
32	Production	Industrial Engineering
33	Environmental Legislation and Policy	Environmental Engineering
34	Water Quality	Environmental Engineering
35	Transportation and Distribution of Energy	Electrical Engineering
36	Biolaw	Biomedical Engineering
37	Material and Energy Balance	Chemical Engineering
38	Urban Planning and Environment II	Architecture
39	Urban Planning and Environment III	Architecture
40	Urban Planning and Environment VI	Architecture
41	Water Treatment	Environmental Engineering
42	Non-conventional Energy Sources	Environmental Engineering
43	Unit Processes	Environmental Engineering
44	Aqueduct and Sewerage	Civil Engineering
45	Non-conventional Construction Methods	Civil Engineering

No.	Subject	Program
46	Urban Planning and Environment V	Architecture
47	Biomaterials and Tissue Engineering	Biomedical Engineering
48	Biochemistry	Biomedical Engineering
49	Human Anatomy and Physiology	Biomedical Engineering
50	Environmental Management	Environmental Engineering
51	Generation Systems	Electrical Engineering
52	Biomedical Engineering Seminar	Biomedical Engineering
53	Biophysics	Biomedical Engineering
54	Control II	Electronic Engineering
55	Urban Planning and Environment I	Architecture
56	Sustainable Energy Systems	Electrical Engineering
57	Urban Planning and Environment VII	Architecture
58	Clinical Engineering and Management	Biomedical Engineering
59	Cleaner Production	Industrial Engineering
60	Technology I	Architecture

Table 11: Courses related to sustainability from the graduate department.

No.	Subject	Program
1	Economy and business	Master's Degree in Administration
2	Advanced Topics: Culture and Sustainability	PhD in Sustainability
3	Advanced topics in ecology	PhD in Sustainability
4	Strategic plan for the city and territory	PhD in Sustainability
5	Elective I impact assessment	Master's Degree in Social Research Methods
6	Advanced Topics in Development Theory	PhD in Sustainability
7	Energy efficiency	Specialization in Sustainable Energy Systems
8	Circular economy and sustainable business	PhD in Sustainability
9	Sustainable management seminar	Master's Degree in Administration
10	Project preparation and formulation I	Specialization in Project Management
11	Economic and social evaluation of projects	Specialization in Project Management
12	Environmental assessment of projects	Specialization in Project Management
13	Data analysis applied to renewable sources	Specialization in Sustainable Energy Systems
14	Management of applied research projects within the framework of green and sustainable growth	PhD in Sustainability
15	Corporate social responsibility	Specialization in Business Management

No.	Subject	Program
16	Topic IV - Sustainable energy systems	Specialization in Maintenance Management
17	Solar and wind energy	Specialization in Sustainable Energy Systems
18	Governance and policies for territorial sustainability	PhD in Sustainability
19	Environmental problems of sustainability	PhD in Sustainability
20	Political ecology: distributive ecological conflicts	PhD in Sustainability
21	Risk management and climate change	PhD in Sustainability
22	Governance and policies for territorial sustainability	Master's Degree in Development and Culture
23	Corporate governance and sustainable development	Master's Degree in Administration
24	Analysis and modeling of sustainable energy systems	PhD in Engineering
25	Environmental energy management	Specialization in Maintenance Management
26	Analysis and modeling of sustainable energy systems	Master's Degree in Engineering
27	Climate analytics	PhD in Engineering
28	Energy project design	Specialization in Sustainable Energy Systems
29	Application of green fuels	Specialization in Sustainable Energy Systems

Table 12: Sustainability-related courses from the Continuing Education Department.

No.	Subject	Department
1	Diploma in Solar Energy: Design and Operation of Photovoltaic Solar Projects	Continuing education
2	Energy Transition Course	Continuing education
3	CREG Resolution Course 015-1028	Continuing education
4	Renewable Energy Projects Course	Continuing education
5	Diploma in Legal and Regulatory Framework for the Development of Renewable Energy in Colombia	Continuing education
6	Corporate Social Responsibility Course	Continuing education
7	Retie Course	Continuing education

Table 13: Courses related to sustainability from the Department of Basic Sciences.

No.	Subject	Department
1	General Chemistry	Basic Sciences
2	Inorganic Chemistry	Basic Sciences
3	Organic Chemistry	Basic Sciences
4	Differential and Difference Equations	Basic Sciences
5	Cell Biology	Basic Sciences
6	Bioremediation	Basic Sciences

Table 14: Sustainability-related courses from the School of Business, Law and Society.

No.	Subject	Program
1	Creativity and Entrepreneurship	Business Administration
2	Economy and Environment	Economy
3	Energy Economics and Sustainable Development	Economy
4	Social Responsibility	Business Administration
5	Sustainable Companies	Business Administration
6	Inclusive Business	Business Administration

Table 15: Sustainability-related courses from the Department of Humanities

Nº	Asignatura	Departamento
1	Constitución Política	Humanidades
2	Arte Y Feminismo	Humanidades
3	Género, Igualdad Y Cine	Humanidades
4	Ciudadanías Bajo La Lupa	Humanidades
5	La Revolución De La Comida	Humanidades

Table 16: Sustainability-related courses from the School of Digital Transformation

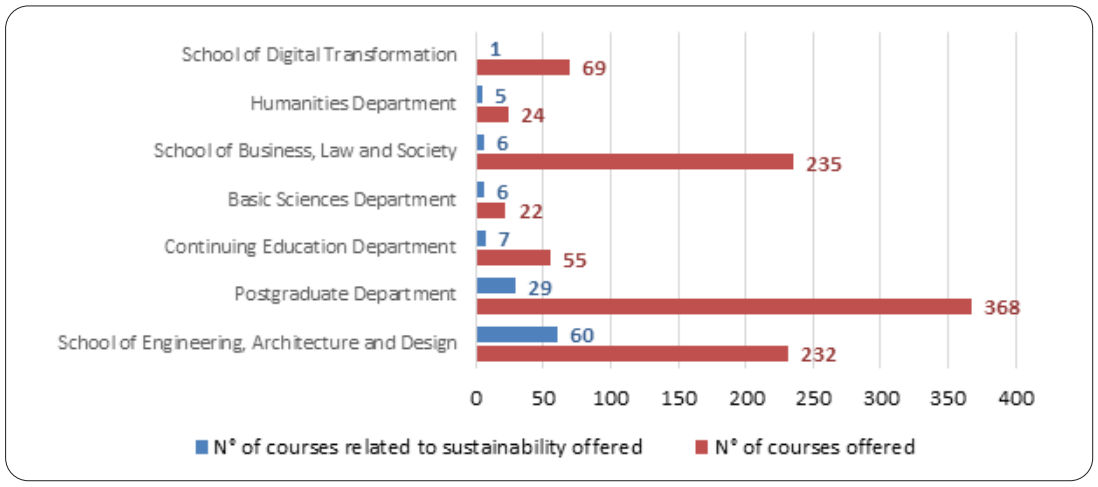
No.	Subject	Department
1	Communication and Human Rights	Social Communication

6.2 Total number of courses/subjects offered (E6.2)

In 2024, the Technological University of Bolívar offered a total of 1,005 courses designed to support the academic development of its student body. These courses encompassed a wide range of disciplines—from applied sciences and technology to the humanities and social sciences—ensuring a comprehensive and high-quality education. The university's curricular design not only complies with national and international academic standards but also prepares students to address the challenges of the contemporary world, fostering critical thinking, innovation, and social responsibility.

The following bar chart compares the total number of courses offered by each academic unit with those specifically related to sustainability. This visualization highlights the extent to which a sustainability focus has been integrated into the university's academic programs and complementary training initiatives as of 2024.:

Graph 15: Relationship between total courses vs. related courses in sustainability



Source: Technological University of Bolívar.

The following tables show the number of courses offered by each school or academic department, corresponding to both academic programs and complementary training developed during 2024:

School/Dependency	Program	Subject No.
Digital Transformation	Data Science	1
	Social Communication	44
	Systems and Computer Engineering	24
TOTAL		69

School/Dependency	Complementary Training	Subject No.
Humanities	Humanities	24
TOTAL		24

School/Dependency	Program	Subject No.
School of Business, Law and Society	Business Administration	32
	Political Science and International Relations	32
	Public Accounting	22
	Right	54
	Economy	29
	Finance and International Business	26
	Psychology	40
TOTAL		235

School/Dependency	Complementary Training	Subject No.
Basic Sciences	Basic Sciences	22
TOTAL		22

School/Dependency	Complementary Training	Subject No.
Continuing Education	Continuing Education	55
TOTAL		55

School/Dependency	Program	Subject No.
Postgraduate studies	Doctorate in Regional and Local Development	12
	PhD in Engineering	20
	PhD in Sustainability	15
	Specialization in Automation and Control of Industrial Processes	14
	Specialization in State Contracting	1
	Specialization in Human Rights	1
	Specialization in Management of Educational Institutions	10
	Specialization in ICT-Mediated Education	4
	Specialization in Applied Statistics	4
	Specialization in Finance	9

School/Dependency	Program	Subject No.
	Specialization in Road Geotechnics and Pavements	4
	Specialization in Occupational Health and Safety Management	4
	Specialization in Maintenance Management	17
	Specialization in Marketing Management	11
	Specialization in Production and Quality Management	13
	Specialization in Project Management	15
	Specialization in Health Services Management	12
	Specialization in Human Talent Management	14
	Specialization in Business Management	12
	Specialization in Tax Management	12
	Specialization in International Business Management	4
	Specialization in Software Engineering	4
	Specialization in International Freight Transport Logistics	5
	Specialization in Strategic and Prospective Planning	10
	Specialization in Sustainable Energy Systems	11
	Specialization in Telecommunications and Networks	11
	Master's Degree in Administration	26
	Master's Degree in Development and Environment	0
	Master's Degree in Development and Culture	3
	Master's Degree in Education	8
	Master's Degree in ICT-Mediated Education	1
	Master's Degree in Applied Statistics	9
	Master's Degree in Finance	6
	Master's Degree in Project Management	13
	Master's Degree in Tax Management	7
	Master's Degree in Innovation Management	11
	Master's Degree in Human Resources Management and Organizational Development.	9
	Master's Degree in Engineering	12
	Master's Degree in Naval and Ocean Engineering	0

School/Dependency	Program	Subject No.
	Master's Degree in Comprehensive Logistics	1
	Master's Degree in Social Research Methods	11
TOTAL		368

School/Dependency	Program	Subject No.
School of Engineering, Architecture and Design	Architecture	38
	Design	0
	Environmental Engineering	24
	Biomedical Engineering	12
	Civil Engineering	27
	Electrical Engineering	19
	Electronic Engineering	17
	Industrial Engineering	26
	Mechanical Engineering	27
	Mechatronics Engineering	13
	Naval Engineering	13
	Chemical Engineering	16
TOTAL		232

6.3 Total number of study program related to sustainability offered (E6.3)

Of the 65 academic programs offered by the University in 2024, 23 incorporate sustainability-related content, representing approximately 35% of the academic offerings. The list of these programs is detailed below:

School/Dependency	Program
School of Business, Law and Society	Business Administration
	Economy

School/Dependency	Program
School of Engineering, Architecture and Design	Architecture
	Environmental Engineering
	Biomedical Engineering
	Civil Engineering
	Electrical Engineering
	Electronic Engineering
	Industrial Engineering
	mechanical Engineering
	Mechatronics Engineering
	Chemical Engineering

School/Dependency	Program
Digital Transformation	Social Communication
School/Dependency	**Program**
Postgraduate studies	PhD in Engineering
	PhD in Sustainability
	Specialization in Maintenance Management
	Specialization in Project Management
	Specialization in Business Management
	Specialization in Sustainable Energy Systems
	Master's Degree in Administration
	Master's Degree in Development and Culture
	Master's Degree in Engineering
	Master's Degree in Social Research Methods

6.4 Total research funds dedicated to sustainability research (in US Dollars)) (E6.5)

In 2024, the Technological University of Bolívar did not allocate its own resources to sustainability research. However, significant progress in this field was made possible through external funding provided by institutions such as the French Embassy in Colombia, ICETEX International Experts, and other partners. Despite the absence of internal investment, these collaborations enabled the continuation and development of impactful sustainability projects.

Such strategic alliances are vital for advancing research that fosters sustainable practices and innovative solutions. UTB remains firmly committed to sustainability and will continue working in close partnership with external organizations to drive initiatives that contribute to sustainable development and global well-being. Over the past three years, average annual funding for sustainability-related research has reached USD 5,923.87.

The following section details the research projects carried out in 2024, including the funding entities and the amounts allocated to each initiative.

Table 17: Research projects funded by entities external to the UTB

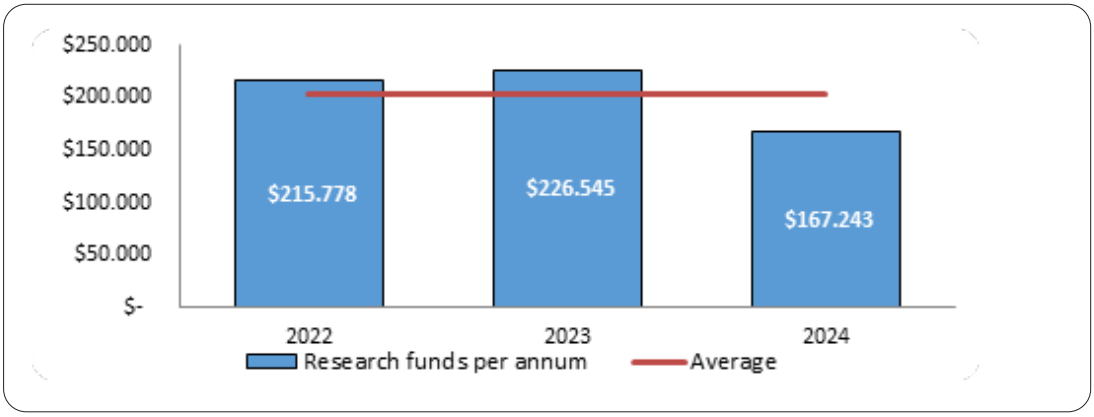
Items	Project title	Line of research	Research Funding Entity	Amount financed (USD)
1	"Biodegradation of polyethylene terephthalate by Antarctic bacterial consortia: A metaproteomic approach"	Plastic Waste Management and Sustainability:	French Embassy in Colombia - Trampolin	$2,041.21
2	"Connecting Dreams: Empowering community entrepreneurship in Colombia and Peru through digital capacity building"	Social Innovation	ICETEX International Experts - Grants 2024	$60,479.68
3	"JUS-Tic-Ia: Legal Design for the Administration of Justice" led by the Faculty of Law's Artificial Intelligence and Administration of Justice research center.	Legal Innovation and Digital Transformation for Social Sustainability	ICETEX International Experts - Grants 2024	$14,357.71
Total				**$76,879**

Source: Universidad Tecnológica de Bolívar

6.5 Total research funds (in US Dollars) (E6.6)

In 2024, the Research Directorate's general budget amounted to USD 203,188 on average over the past three years, covering all departmental expenses. This information is summarized and complemented in the following chart:

Graph 16: Annual research funds



Source: Technological University of Bolívar.

6.6 Number of lecturers and researchers on campus in one year period (E6.8)

In 2024, a total of 100 research professors were actively engaged across the university's research groups, highlighting UTB's academic and scientific capacity. These faculty members have contributed to advancing knowledge, training students, and strengthening academic and research processes.

They are distributed across approximately 17 research groups that address a wide spectrum of disciplines, underscoring the university's interdisciplinary approach and institutional commitment to research and innovation. The main areas of focus include industrial automation, educational innovation, human development, business management, renewable energy, social justice, applied engineering, environmental sustainability, data analysis, and emerging technologies.

Through these groups, UTB develops high-impact projects, fosters the training of new researchers, and generates meaningful contributions at both the local and global levels. The following chart presents the distribution of faculty members by research group.

Table 18: Number of teachers per research group.

Names of the Research Groups	Number of Teachers
Center for Business and Internationalization Studies	14
Research Group in Industrial Automation and Control	5
Research Group on Development, Health and Human Performance	6

Research Group in Education and Educational Innovation	5
Alternative Energy and Fluids Research Group	3
Research Group on Chemical and Biological Studies	4
Research Group in Social and Humanistic Studies	11
Research Group in Applied Physics and Image and Signal Processing	10
Innovation Management Research Group	1
Research Group in Gravitation and Applied Mathematics	4
Naval and Offshore Engineering Research Group	1
Global Justice Research Group	4
Research Group on Continuous Materials and Structures	6
Productivity and Quality Research Group	7
Research Group in Applied Technologies and Information Systems	7
Research Group on Environmental and Hydraulic Systems	7
Institute for Development, Economics and Sustainability Studies	5
Total	100

Source: Technological University of Bolívar.

6.7 Number of scholarly publications on sustainability in one year period (E6.9)

In 2024, the Technological University of Bolívar published a total of 14 research projects indexed in Google Scholar and Scopus, addressing topics related to sustainability and the environment. This academic output underscores the university's commitment to advancing knowledge and developing innovative solutions to contemporary sustainability challenges. The following list presents these publications:

Table 19: Number of academic publications on sustainability

No.	Titles of Indexed Publications
1	Advanced Control Strategies for Cleaner Energy Conversion in Biomass Gasification
2	Effect of void ratio on soil erodibility
3	Real-Time Analysis and Digital Twin Modeling for CFD-Based Air Valve Control During Filling Procedures
4	Data collection
5	Electrification as a development and sustainability approach in rural areas using renewable energy sources
6	Bioprospecting of extremophilic perchlorate-reducing bacteria: report of promising Bacillus spp. isolated from sediments of the bay of Cartagena, Colombia

7	Sustainable Catalysts from Industrial FeO Waste for Pyrolysis and Oxidation of Hospital Polypropylene in Cartagena
8	Reverse Logistics and Sustainability: A Bibliometric Analysis
9	Unlocking the potential of Eichhornia crassipes for wastewater treatment: phytoremediation of aquatic pollutants, a strategy for advancing Sustainable Development Goal-06 clean water
10	Potential of caffeic acid as an effective natural antioxidant for polypropylene-polyethylene copolymers: A DFT and experimental study
11	Attenuation of pipeline filling over-pressures through trapped air
12	Determining Changes in Mangrove Cover Using Remote Sensing with Landsat Images: a Review
13	Yes, size does matter (for cycling safety)! Comparing behavioral and safety outcomes in S, M, L, and XL cities from 18 countries
14	Are digital twins improving urban-water systems efficiency and sustainable development goals?

Source: Technological University of Bolívar.

6.8 Ratio of scholarly publications on sustainability to lecturers and researchers on campus in one year period (E6.10)

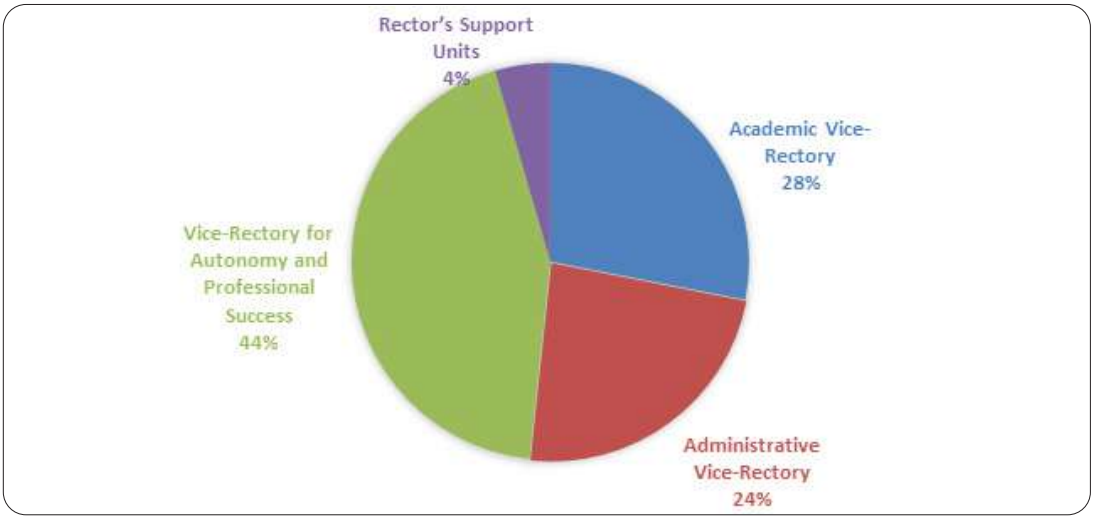
The calculated ratio of 0.14 indicates that, over the past year, approximately one sustainability-related publication was produced for every seven (7) active professors or researchers. While this figure remains below the desired benchmark, it represents a valuable starting point that highlights the presence of sustainability research initiatives within the academic community. This metric also reveals opportunities to strengthen scientific output in this field by promoting a deeper integration of sustainability principles across diverse research lines and fostering greater interdisciplinary collaboration to address global challenges from the university environment.

6.9 Number of events related to sustainability (environment) (E6.11)

Over the past three years, the Technological University of Bolívar has implemented a wide range of initiatives to promote sustainability, averaging 110 events annually. These activities have included training sessions, forums, conferences, competitions, and workshops, all centered on sustainability-related topics. Their primary purpose is to provide the university community with both theoretical and practical tools to adopt and promote sustainable development across diverse fields of knowledge.

The following chart presents the percentage distribution of sustainability- and environment-focused events organized by the different academic and administrative units of the university during 2024:

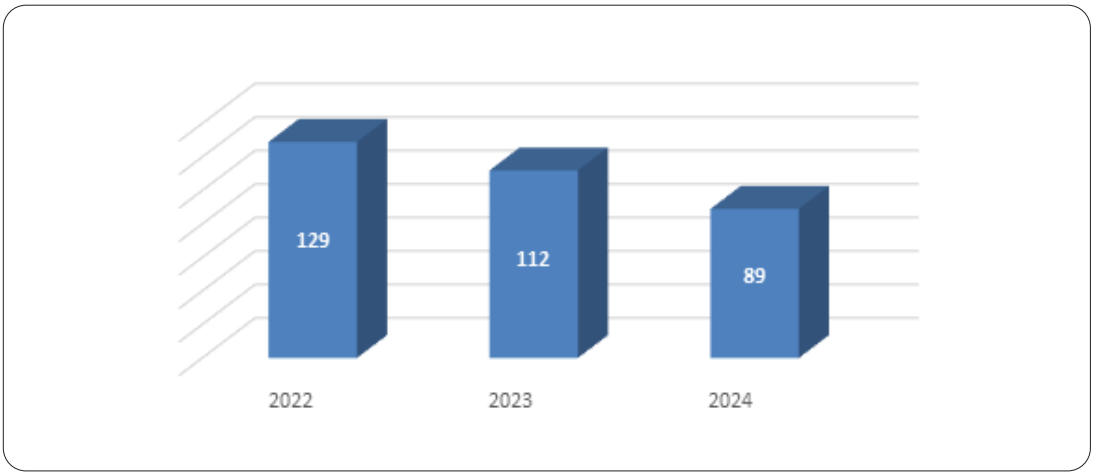
Graph 17: Percentage of sustainability-focused events by unit.



Source: Technological University of Bolívar.

The following chart illustrates the variation in the number of sustainability- and environment-focused events organized by the Technological University of Bolívar over the past three years:

Graph 18:Number of sustainable events held in the last 3 years



Source: Universidad Tecnológica de Bolívar

As an example of institutional initiatives, five key sustainability-related events held in 2024 are highlighted below:

1) A Sustainable Day at UTB

This event was held on Saturday, July 13, at the Technological Campus, organized by the Alumni Department. Participants took a guided tour of the university facilities and engaged in various activities, including tree planting as a symbol of environmental commitment, a visit to the solar farm to learn about the operation of solar panels and the benefits of clean energy, and a tour of the waste collection center to understand proper solid waste sorting and the composting process for untreated organic material. The initiative aimed to foster environmental awareness among alumni while strengthening their bond with their alma mater through meaningful and sustainable experiences. Photographic evidence of the event is presented below:

Illustration 109: A sustainable day at UTB.

Source: Technological University of Bolívar.

2) Open Chair on Sustainable Development Goals

This event seeks to promote academic and scientific exchange on the progress and challenges of achieving the Sustainable Development Goals (SDGs). It serves as a forum for dialogue and collaboration among representatives from academia,

civil society, the business sector, and public institutions. The initiative is led by the Institute for Studies in Development, Economy, and Sustainability (IDEEAS) of the Technological University of Bolívar, an academic and research center dedicated to transforming the environment and improving quality of life through knowledge generation, civic education, and the promotion of sustainable human development. Photographic evidence of the event is provided below:

Illustration110: Open Chair Event on Sustainable Development Goals.

Source: youtube.com.

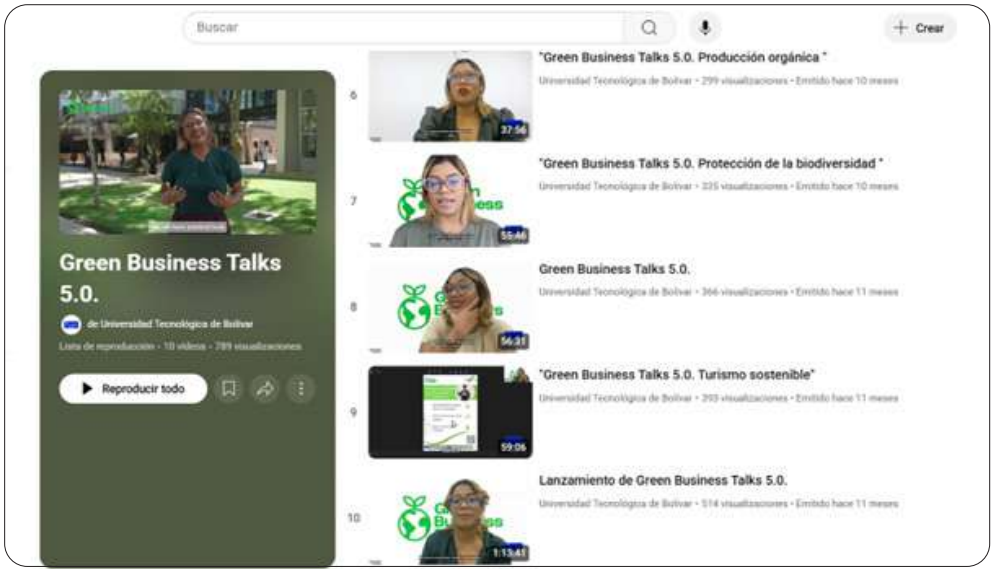
3) Green Business Talks 5.0 (GBT)

This event promotes leadership in sustainability education and pedagogical innovation by fostering disruptive methodologies that go beyond traditional teaching models. Over its editions, it has built a robust knowledge network that connects students and teachers—both national and international—with green entrepreneurs, environmental authorities, academics, and experts from the sustainable business ecosystem. This collaborative environment enables innovative ideas to flourish, be replicated, and evolve into high-impact projects.

In its fifth edition, held in 2024, the event featured the participation of 12 green entrepreneurs from Colombia, Mexico, and Chile. Green Business Talks (GBT) aligns with Sustainable Development Goals (SDGs) 4, 12, and 17, particularly targets 4.7 and 12.8, which focus on ensuring that individuals acquire the knowledge and skills needed to promote sustainable development, foster lifestyles in harmony with nature, and encourage responsible production and consumption practices. To support these objectives, the event provides open-access resources, such as YouTube videos and an international course offered at each edition.

Additionally, GBT advances Target 17.17 by fostering effective partnerships among the public and private sectors and civil society, leveraging synergies, experiences, and resource mobilization strategies. This initiative brings together national and international green enterprises, the six environmental authorities of the Colombian Caribbean region, universities from different countries, and a wide audience committed to sustainability. Photographic evidence of the event is provided below.

Illustration 111: Green Business Talks 5.0 Virtual Events.



Source: youtube.com.

4) Commemoration of the International Day of Girls and Science at the University of Buenos Aires (UTB)

As part of the commemoration of the International Day of Girls and Women in Science, the Technological University of Bolívar (UTB) welcomed students from various educational institutions in the city to encourage girls' participation in the scientific field. During the event, the dean of the Faculty of Engineering, Sonia Contreras, highlighted the importance of reducing the gender gap in this field, stating that "more women are needed in scientific fields."

The event featured prominent female scientists who are now UTB role models for new generations of girls and adolescents interested in science. Among them were Rosa Acevedo Barrio, Lenny Romero, Nicol Guerrero, Yady Solano, and Cristina Osorio.

The event also provided a space for young students to share their scientific initiatives and projects. Participants included Oriana Ahumando and Lenis Pérez from the Nuestra Señora del Buen Aire Educational Institution (Pasacaballos), as well as Andrea Quintero and Danna Hernández from the Soledad Román de Núñez Educational Institution. Below is photographic evidence of the event:

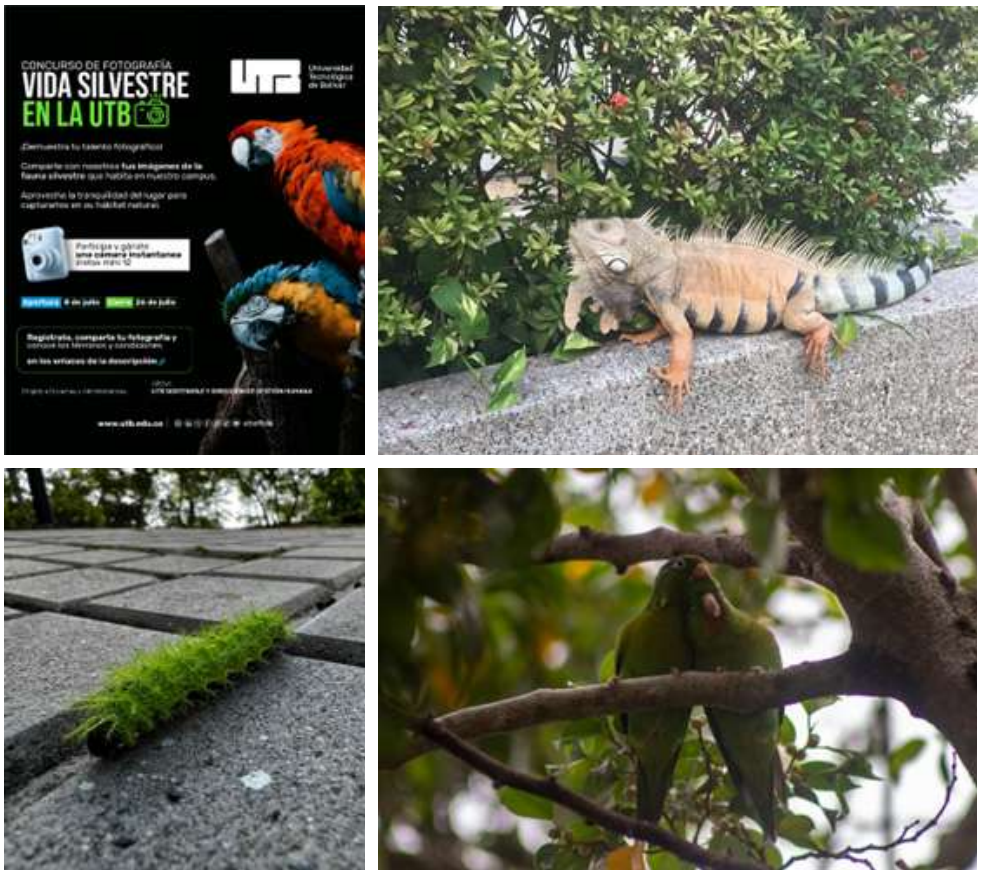
Illustration 112: International Day of the Girl and Science at UTB

Source: Technological University of Bolívar.

5) Wildlife Contest

The event was organized by the Office of Infrastructure and Human Resources Management with the purpose of caring for, preserving, and appreciating the wildlife found on the university campus. This institutional initiative promotes a culture of respect and environmental awareness within the academic community, underscoring the ecological importance of the species that inhabit the university's natural corridors. Through the contest, students, faculty, and administrative staff were encouraged to identify, value, and protect local biodiversity, thereby strengthening their commitment to sustainability and the natural environment as essential components of the university's development. The following photographs provide evidence of the contest:

Illustration 113: Photography Contest Results.



Source: Technological University of Bolívar.

6.10 Number of activities organized by student organizations related to sustainability per year (E6.12)

In 2024, the Technological University of Bolívar hosted four student groups dedicated to sustainability. These groups organized seven institutional events aligned with the Sustainable Development Goals (SDGs). Each group contributed through specific activities, including research projects, field trips, awareness campaigns, and environmental volunteering. Collectively, these initiatives reinforced student engagement with sustainability, fostered responsible practices, and promoted a culture of environmental stewardship. The list of events is presented below:

Table 20:Events held by Student Groups on sustainable topics.

Student Groups	Schools / Departments	No. Events
Environmental Care Volunteering	Ecosystem	4
Inclusive and Sustainable Green Business Seedbed (NVIS)	Business School	1
Research Seedbed in Environmental Sciences	Basic Sciences	1
Seedbed of clinical and health psychology, Psychometry	Social Sciences and Humanities	1
Total		**7**

Source: Technological University of Bolívar.

Below are some representative images of the events held throughout 2024:

Illustration 114: Agricultural Activity Camellias.

Source: Inclusive and Sustainable Green Business Seedbed.

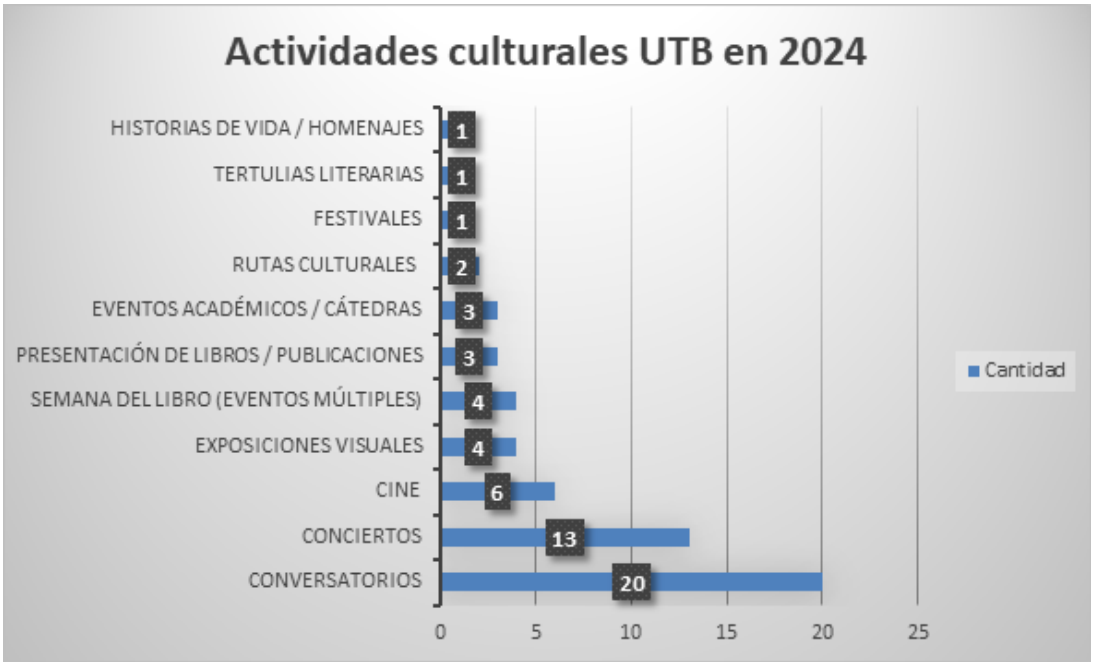
Illustration 115: Volunteer Activities with the Cartagena Food Bank.

Source: Environmental Care Volunteering.

6.11 Number of cultural activities on campus (E6.17)

In 2024, the Universidad Tecnológica de Bolívar (UTB) strengthened its role as a cultural catalyst by organizing 58 activities that went beyond mere numbers, building bridges between tradition and innovation, collective memory and contemporary creation. With the participation of 3,230 attendees, these initiatives—led by the Humanities Department and the University Ecosystem—transformed academic spaces into vibrant stages where bullerengue (a traditional dance and music genre) blended with virtual reality, old photographs unveiled forgotten neighborhood histories, and the verses of Don Quixote echoed alongside the sounds of Spanish guitars. The following graph presents the number of cultural activities held at UTB, classified by type:

Graph 19: UTB cultural activities in 2024.



Source: Directorate of Humanities and University Ecosystem..

Below are photographs of some cultural events held in 2024:

The virtual reality dialogue 'Anonymous and Resilient' transcended geographical and generational boundaries. Led by Manuel García-Orozco, together with singers Juana Rosado and Rosa Matilde Rosado—women who had never left their communities—the event showcased how bullerengue, an ancestral Caribbean rhythm, can be reinvented in digital formats without losing its essence. UTB not only documented this tradition but also projected it as a living heritage, directly contributing to SDG 9 (Industry, Innovation, and Infrastructure) and SDG 11 (Sustainable Cities and Communities, cultural heritage).

Illustration 116: Anonymous and resilient Bullerengue in virtual reality, canta'o conversation with Manuel García-Orozco, guest artists: Juana Rosado, Rosa Matilde Rosado, Marco Gómez - Moderated by: Federico Ochoa.

Source: Technological University of Bolívar.

During International Week 2024, the concert 'Tres morillas m'enamoran' (Three Moorish Girls Make Me Fall in Love) and the discussion 'Por qué leer el Quijote?' (Why Read Don Quixote?) transformed Spanish music and literature into a dialogue with Caribbean identities. Julián Navarro's Renaissance vihuela, combined with Cervantes' verses and local percussion, illustrated how UTB builds global networks (SDG 17) while critically and creatively reinterpreting its colonial heritage.

Illustration 117: UTB International Week 2024 Spain.

Source: Technological University of Bolívar.

The Caña Dulce y Caña Brava concert was more than a recital—it was a masterclass in interculturality. Mexican son jarocho, performed with jarana and zapateado, merged with Cartagena rhythms in the Jorge Taua Auditorium, demonstrating music's power as a universal language for peace (SDG 16). A prelude discussion with Dean Navarro underscored the role of universities as custodians and promoters of these migrant traditions.

Illustration118: Cultural Agenda Casa Lemaitre - Sweet and Wild Sugar Cane Concert.

Source: Technological University of Bolívar.

French singer-songwriter Laé embodied the intersection of two worlds: her European melodies, enriched by Cartagena's drums and alabaos after a decade living in the city. This concert illustrated how UTB serves as a home for transnational creators, advancing SDG 10 (Reduced Inequalities) through artistic narratives that challenge stereotypes of 'the local.".

Illustration119: Casa Lemaitre Cultural Agenda - from France to the Caribbean: stories and songs.

Source: Technological University of Bolívar.

Finally, the discussion 'Views from Another Side' brought together Cartagena photographers and filmmakers such as Emanuel Angulo and Liliana Álvarez, who deconstructed the city's tourist image by presenting short films about neighborhoods like Nelson Mandela. The event highlighted how art can serve as a tool for spatial justice (SDG 11), amplifying the voices of those who inhabit the city's symbolic borders..

Illustration 120: Cultural Agenda Casa Lemaitre - Views from another side.

Source: Technological University of Bolívar.

6.12 Number of university sustainability program(s) with international collaborations (E6.18)

In 2024, the Technological University of Bolívar reinforced its commitment to global sustainability through three strategic programs developed in partnership with international institutions. These initiatives—encompassing research, academic exchanges, and summer schools—benefited 65 participants, including students, researchers, and professors, positioning UTB as a hub for academic cooperation on environmental, energy, and governance issues. The following table presents the number of sustainability-related courses and activities carried out through international collaborations.:

Table 21. International sustainable programs.

Program	No. Courses/Activities	Participants
Research Stays	3	6
International Academic Semesters	1 (Virtual)	7
Summer school	2	52
Total	**7**	**65**

Source: Internacionalización UTB.

The Research Fellowship program marked the starting point of this journey, bringing together six international academics to collaborate on strategic projects. In the field of Renewable Energy, efforts centered on developing clean technologies tailored to the needs of the Colombian Caribbean, while the Environmental Image and Data Processing course advanced ecosystem monitoring through innovative analytical techniques. These projects not only generated specialized knowledge but also laid the foundation for future applications in local communities.

Complementing this research effort, the Virtual International Academic Semester provided a unique platform for advanced training to seven participants. The course 'Governance and Policies for Sustainability', part of the PhD in Sustainability program, became a forum for intercultural dialogue, where professionals from various countries analyzed regulatory frameworks and exchanged experiences in environmental policy—demonstrating the effectiveness of virtual formats in building lasting collaborative networks.

The Summer School represented the most extensive initiative, benefiting 52 participants through two transformative courses. Wetskills-Colombia 2024 addressed regional water challenges using international methodologies adapted to the local context, while the Columbus Program on Sustainable Cities developed resilient urban planning proposals currently under consideration by local authorities. These initiatives stood out for their practical approach and for integrating global perspectives with regional needs.

The following photographs provide evidence of these events:

Illustration 121: Wetskills-colombia 2024.

Source: WetSkills.

Illustration 122Columbus Program: Building Sustainable Cities.

Source: Columbus Association.

This year's results—seven academic activities carried out in collaboration with international institutions—underscore the strategic value of our global network. Beyond the numbers, these programs have strengthened our ability to address sustainability

challenges with innovative, context-specific solutions. The partnerships established and the knowledge exchanged represent invaluable assets for the years ahead.

6.13 Number of community services related to sustainability organized by university and involving students (E6.19)

In 2024, the Technological University of Bolívar (UTB) implemented 10 community sustainability projects, developed by students and faculty from various academic units in collaboration with local and international organizations. These initiatives reflect the university's strong commitment to sustainable development and its positive social impact. The following section presents the community service projects carried out during 2024..

Table 22: Sustainable Community Service Projects 2024.

#	Project Name	Faculty/Department	Main Objective
1	RES-SIAS	School of Engineering, Architecture and Design, and Basic Sciences	Implement sustainable renewable energy projects in the agricultural sector
2	Addressing gender issues in STEM	Engineering and Basic Sciences	Promote gender equality in STEM programs and the job placement of female graduates
3	Sustainable Eco-Industrial Parks (SEIP)	Engineering	Promote industrial symbiosis for better use of resources in the Mamonal industrial zone
4	Student Volunteering 2024	School of Business, Law and Society	Implement CSR projects that impact environmental, social, economic, and governance sustainability.
5	Preserving the Mangroves	Basic Sciences	Reducing solid waste pollution in the mangroves of the Ciénaga de la Virgen
6	THERMOCANDELARIA	IDEAS	Strengthen community management capacities in surrounding neighborhoods
7	PIGCCT	IDEAS	Develop a Comprehensive Climate Change Management Plan

8	SANTO DOMINGO FOUNDATION	IDEAS	Leadership Training for Youth
9	GRANITOS DE PAZ FOUNDATION	IDEAS	Analyze the impact of the Foundation's work in its area of influence
10	Connecting Dreams	School of Business, Law and Society	Empowering community entrepreneurship through digital capabilities

Source: Technological University of Bolívar.

The 10 projects developed in 2024 stand out for their practical and collaborative approach, addressing key regional challenges through strategic alliances and participatory methodologies. Among the most notable initiatives, the Sustainable Eco-Industrial Parks (PEIS) project—implemented in partnership with Ecopetrol—is transforming the Mamonal industrial sector by introducing circular practices that optimize resource and energy use. Similarly, Preservando los Manglares (Preserving the Mangroves) engages directly with the communities of La Boquilla, combining scientific research with cleanup actions and environmental education to protect this vital ecosystem.

In the social sphere, Conectando Sueños (Connecting Dreams) has strengthened community enterprises in Montes de María and Chocó by developing digital capabilities, with a special focus on vulnerable populations. These projects share a common methodology built on three key phases: community assessment to identify real needs, solution design with a technical and sustainable approach, and collaborative implementation with beneficiary groups.

The success of these initiatives has been made possible through strategic partnerships with organizations such as Ecopetrol, the Santo Domingo Foundation, and Granitos de Paz, whose support has been instrumental in expanding both the scope and impact of UTB's interventions. The following photographs provide evidence of these projects.

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Illustration 123: UTB Volunteering 2024.

Source: IDEAS UTB.

Illustration124: Development of the Comprehensive Climate Change Management Plan in the Department of Bolívar

Source: Government of Bolívar.

Illustration 125: Leadership Training for Young People.

Source: Santo Domingo Foundation.

In the coming year, UTB will continue to strengthen these projects while seeking new strategic partnerships and enhancing its impact measurement efforts. Together, these initiatives demonstrate how academic knowledge can be transformed into concrete actions that benefit both communities and the environment, fulfilling the university's mission of educating professionals committed to sustainable development..

6.14 Number of sustainability-related startups (E6.20)

In the past three years, the Technological University of Bolívar has not created or directly managed any sustainable startups. This reflects the institution's current focus on other forms of knowledge transfer and its commitment to sustainability through:

- Applied research projects
- Community outreach programs
- Collaborations with the productive sector

Although no in-house startups have yet been developed, UTB remains committed to fostering sustainable entrepreneurship by providing training and consulting for external initiatives, thereby laying the groundwork for potential future developments in this area

6.15 Total number of graduates with green jobs (for the last 3 years) (E6.21)

Over the past three years, the Technological University of Bolívar has reported 18 graduates employed in positions classified as 'green' under international criteria. These roles contribute directly to environmental preservation and sustainability across various economic sectors. The following list presents the graduates who have entered these fields:

Table 23: Graduates who register green jobs (2022-2024).

No.	Full Name	Academic Program	Graduation Year	Industrial Sector	Green Job Type	Description of Environmental Contribution
1	Mauricio Rodríguez Gomez	Economy	1999	Conservation	Environmental Authority	Protection of natural areas and biodiversity
2	Willie Ramos Genes	Electrical Engineer	2004	Construction	Sustainable construction	Engineering designs with ecological criteria
3	Carlos Eduardo Contreras Bohórquez	Mechanical Engineering	2007	Energy	Renewable energies	Zero-emission green hydrogen projects
4	Alexander Orozco Posada	Industrial Engineer	2011	Waste	Waste management	Comprehensive refinery management program
5	Angel David Puello Gomez	Environmental Engineer	2014	Consultancy	Environmental consulting	Consulting on environmental legislation
6	Gloria Patricia Diaz Santos	Environmental Engineer	2015	Waste	Waste management	Port environmental supervision
7	Jose Dionisio Castilla Álvarez	Production management	2015	Conservation	Environmental protection	Environmental fire department
8	Suara Alejandra Cuervo Narváez	Environmental Engineer	2016	Construction	Sustainable construction	Head of Projects and Innovation
9	Maria Jose Diaz Garcia	Environmental Engineer	2017	Waste	Waste management	Traceability of recyclable materials
10	Breyem Moreno	Electronic Engineer	2017	Energy	Renewable energies	Solar/wind project tenders
11	Eduardo Torres Sierra	Master's Degree in Environment	2017	Energy	Environmental management	Environmental management plans

12	Raúl Arana Castellano	Environmental Engineer	2019	Construction	Sustainable construction	Sustainable city development
13	Daniel Felipe Mejía Triviño	Environmental Engineer	2021	Education	University SGA	Institutional environmental management
14	Lady Giset Sánchez Guapacha	Administration	2021	Energy	Energy efficiency	Industrial energy transition
15	Rosa Martínez Alemán	Environmental Engineer	2022	Logistics	Environmental management	ISO 14001 and recycling campaigns
16	Jeimy Flórez Ramírez	Environmental Engineer	2023	Waste	Waste management	Cartagena's Solid Waste Plan
17	Natalie Taborda Navarro	Environmental Engineer	2023	Waste	Waste management	Corporate sustainability reports
18	Jose David García García	Civil Engineer	2023	Energy	Renewable energies	Supervision of solar installations

Source: UTB Graduate Department.

6.16 Total number of graduates (for the last 3 years) (E6.22)

Between 2022 and 2024, the Technological University of Bolívar registered a total of 3,943 graduates across its different academic levels. Of this total, 61.8% (2,435 students) completed professional undergraduate programs, 34% (1,339 students) graduated from postgraduate programs (specializations and master's degrees), and the remaining 4.3% (169 students) from technical and technological programs.

At the undergraduate level, which represents the largest share of graduates, Civil Engineering (316) and Industrial Engineering (217) were among the most prominent programs. The School of Business, Law, and Society contributed the highest proportion, accounting for 43.4% of undergraduate graduates, with notable results in Business Administration (138) and Public Accounting (246 across in-person and virtual modalities).

At the postgraduate level, specializations accounted for 77.3% of graduates, with Project Management (162) and Human Talent Management (100) standing out. Master's programs represented 22.7% of postgraduate graduates, with Administration (115) and Education (64) as the most relevant.

Although technical and technological programs accounted for only 4.3% of total graduates, they showed a strong concentration in Accounting and Financial Management Technology, which alone represented 77.5% of graduates at this level. The following table shows the distribution of graduates by program over the past three years.

Table 24: Undergraduate graduates by academic program (2022-2024).

SCHOOL/FACULTY	PROGRAM	Year 2022	Year 2023	Year 2024
Digital Transformation	Systems Engineering	25	26	15
	Social Communication	19	56	65
Business, Law and Society	Business Administration	31	48	59
	Political Science and International Relations	12	22	20
	Public Accounting	61	58	58
	Public Accounting (Virtual Mode)	27	120	29
	Right	36	34	44
	Economy	7	11	8
	Finance and International Business	50	84	70
	Psychology	29	55	70
Engineering, Architecture and Design	Environmental Engineering	42	26	24
	Biomedical Engineering	0	0	11
	Civil Engineering	92	128	96
	Electrical Engineering	16	43	50
	Electronic Engineering	12	26	20
	Industrial Engineering	85	77	55
	mechanical Engineering	51	60	37
	Mechatronics Engineering	42	48	40
	Naval Engineering	13	26	29
	Chemical Engineering	4	20	13
TOTAL		2435		

Source: UTB Alumni Department.

Table 25: Postgraduate graduates by academic program (2022-2024).

PROGRAM	Year 2022	Year 2023	Year 2024
Specialization in Project Management	48	62	52
Specialization in Automation and Control of Industrial Processes	0	10	7
Specialization in International Accounting and Auditing	6	11	1
Specialization in Management of Educational Institutions	12	14	8
Specialization in Finance	11	23	31
Specialization in Maintenance Management	26	43	30
Specialization in Marketing Management	11	29	19
Specialization in Production and Quality Management	31	33	25
Specialization in Health Services Management	1	9	13
Specialization in Human Talent Management	20	46	34
Specialization in Business Management	14	34	30
Specialization in Tax Management	23	30	33
Specialization in Business Environmental Management	2	10	0
Specialization in International Freight Transport Logistics	0	10	11
Specialization in Strategic and Prospective Planning	3	0	18
Specialization in Strategic and Prospective Planning (Córdoba)	1	1	0
Specialization in Telecommunications and Networks	13	10	0
Specialization in Sustainable Energy Systems	0	0	9
Master's Degree in Administration	34	55	26
Master's Degree in Applied Statistics and Data Science	6	1	12
Master's Degree in Development and Environment	12	1	2
Master's Degree in Human Development in Organizations	4	3	0
Master's Degree in Human Resources Management and Organizational Development	0	0	11
Master's Degree in Development and Culture	4	3	5
Master's Degree in Management of Tourism Businesses and Organizations	1	1	0
Master's Degree in Education	22	20	22
Master's Degree in Finance	8	8	12
Master's Degree in Project Management	19	13	21
Master's Degree in Innovation Management	3	4	7
Master's Degree in Engineering	15	9	11
Master's Degree in Production Engineering	9	1	1

Master's Degree in Naval and Ocean Engineering	3	1	2
Master's Degree in Comprehensive Logistics	1	6	1
Master's Degree in Marketing	0	2	5
Master's Degree in Social Research Methods	0	8	6
TOTAL	1339		

Source: Departamento de Egresados UTB.

Table 26: Graduates of technical and technological programs (2022-2024).

PROGRAM	Year 2022	Year 2023	Year 2024
Technology in Accounting and Financial Management	20	1	1
Technology in International Freight Transport Logistics	5	2	0
Technology in Operation of Plastic Processing Plants	1	0	0
Technology in Operation of Petrochemical Plants	3	0	1
Systems Technology (Cartagena)	6	2	0
Technology in Accounting and Financial Management	99	11	10
Technology in Software Development	2	3	2
TOTAL	169		

Source: UTB Graduate Department.

In total, 3,943 students graduated between 2022 and 2024.

6.17 Percentage of number of graduates with green jobs (for the last 3 years) (E 6.23)

Of the 3,943 graduates trained by the Technological University of Bolívar over the past three years (2022–2024), 18 have been identified as currently employed in green jobs, representing 0.46% of the total. These professionals make significant contributions to environmental sustainability across strategic sectors, particularly in waste management, renewable energy, and sustainable construction.

Calculation: 18 graduates with green jobs / 3,943 total graduates × 100 = 0.46%

An analysis by academic program shows that Environmental Engineering accounts for 50% of these graduates (9 professionals), followed by other engineering programs with 6 graduates (33%), and non-engineering programs with 3 graduates (17%). This distribution

reflects both UTB's academic strengths and the regional opportunities within the green labor market.

Although the current percentage presents a challenge for expanding sustainable employment, UTB is implementing strategies to strengthen this trend. These include updating curricula with a focus on the circular economy and building partnerships with companies committed to the ecological transition. The identified green jobs demonstrate the potential of graduates to lead key environmental initiatives across the productive, institutional, and service sectors.

This commitment has also been recognized and amplified by the UTB Alumni Department, which has publicly highlighted the achievements of graduates who are driving sustainable transformations in their respective fields. Notable examples include Miguel Pérez Ghisays, a UTB graduate and current manager of Termocandelaria, who—together with more than 14 fellow alumni—successfully oversaw the closure of the Termocandelaria Combined Cycle Plant, a milestone in the city's energy efficiency efforts. Similarly, Civil Engineering graduate Gissela Román Ceballos now serves as General Manager of Corvivienda Cartagena, where she promotes sustainable housing initiatives with a strong social and environmental focus.

These cases exemplify how UTB talent is shaping the regional ecological transition and underscore the role of green jobs as a pathway to sustainable development. The following photographs provide evidence of the alumni recognitions carried out by UTB:

Illustration 126: Miguel Pérez Ghisays and team at Termocandelaria.

Miguel Pérez Ghisays, a UTB graduate and manager of Termocandelaria, along with a team of more than 14 graduates who led the closure of the Combined Cycle Plant, promoting energy efficiency in the region. Source: UTB Instagram.

Illustration127: Gissela Román Ceballos.

Gissela Román Ceballos, a graduate of the UTB Civil Engineering program, is the new manager of Corvivienda Cartagena, where she promotes housing projects with a sustainable approach. Source: UTB Instagram.

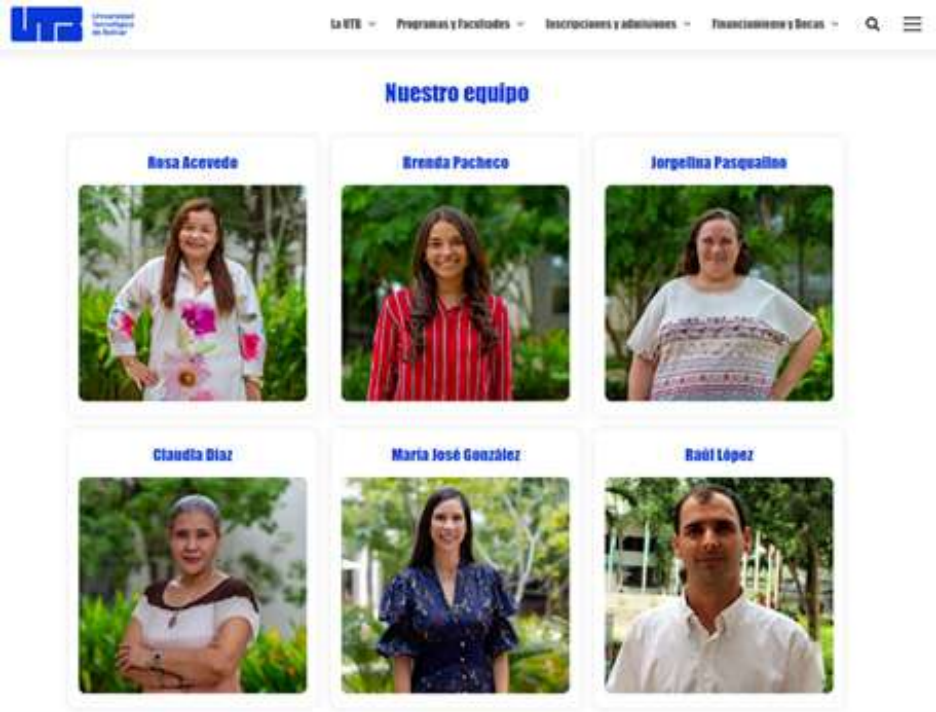
6.18 Availability of unit or office that coordinate sustainability on campus (E6.24)

On February 5, 2020, the Technological University of Bolívar established the UTB Environmental Sustainability Committee as part of its commitment to advancing the 2018–2025 Environmental Management Plan (PGA) and University Environmental Projects (PRAUS).

Created by the Administrative and Academic Vice-Rector's Offices, the committee is composed of an interdisciplinary group of professionals united by the common goal of designing and implementing sustainable initiatives within the university. Its mission is to develop projects that improve conditions for both the UTB community and surrounding local communities.

The committee aligns its work with the Sustainable Development Goals (SDGs) through six strategic areas: Waste, Water, Environmental Education and Culture, Energy, Environment and Landscaping, and Transportation. The members of the UTB Sustainability Committee are presented below:

Illustration 128: Members of the UTB Sustainability Committee.



Source: Technological University of Bolívar.

6.19 Planning, implementation, monitoring and/or evaluation of university governance through the utilization of Information and Communication Technology (ICT) (E6.25)

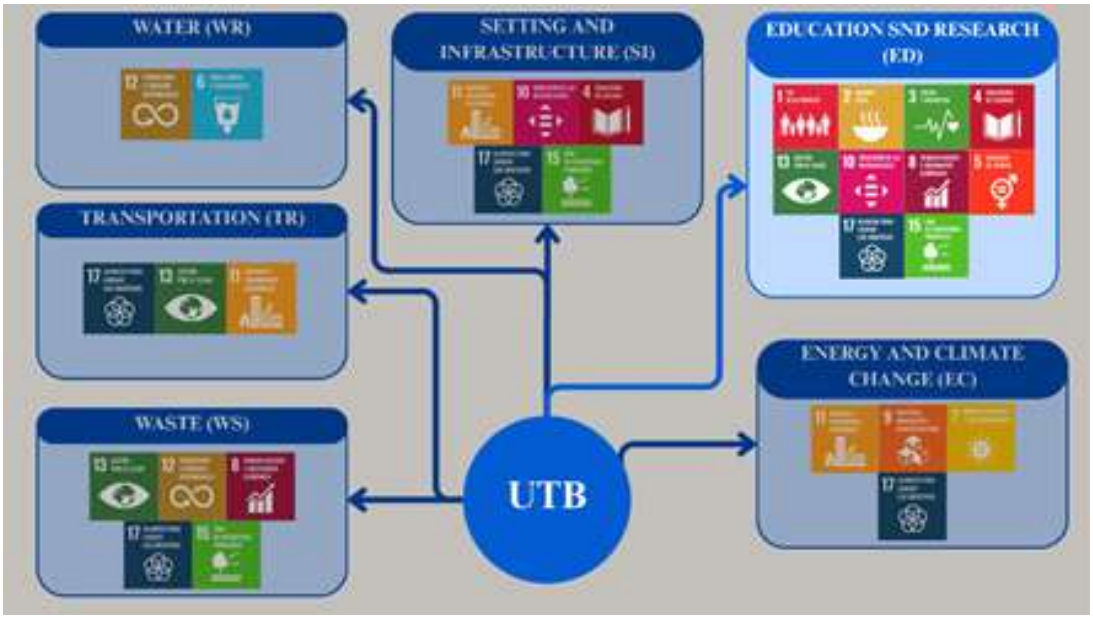
To date, the university does not have an ICT-supported program for the planning, implementation, and evaluation of initiatives related to education and research, community engagement, reporting, and graduate employability on campus.

6.20 Impact of Education and Research programs in supporting the Sustainable Development Goals (SDGs). (E6.26)

The Technological University of Bolívar (UTB) has developed a distinctive sustainability model that integrates three fundamental components: specialized academic training, applied research, and social impact projects. Rather than addressing the SDGs in isolation, our approach builds strategic connections among them to maximize impact in the Colombian Caribbean region.

The following image highlights the SDGs supported by UTB's Transportation programs:

Illustration 129: UTB's contribution to the SDGs from the Education dimension..



Source: Technological University of Bolívar.

SDG 1 – End Poverty

UTB combats poverty through initiatives that transform local realities. A flagship example is the rural entrepreneurship program Connecting Dreams, where students and professors from multiple disciplines work directly with vulnerable communities to create sustainable businesses in areas affected by armed conflict. At the same time, through the Student Participation Center (ECO), students volunteer to improve living conditions in marginalized neighborhoods of Cartagena, showing how academia can serve as a driver of social development.

SDG 2 – Zero Hunger

Our contribution to food security is realized through innovative projects such as the Agrovoltaic Seedbed, where researchers study how to integrate agricultural crops with solar panels to optimize land use. Meanwhile, engineering and business students advise small farmers on sustainable practices, while partnerships with local foundations bring this knowledge to communities most in need—bridging the gap between academic research and real-world solutions.

SDG 3 – Good Health and Well-being]

At UTB, we approach health holistically. The University Wellness Office promotes healthy lifestyles through activities such as Rumba Terapia and active breaks for students and staff. Beyond campus, ECO volunteers implement nutrition and prevention programs in underserved communities, while researchers explore sustainable medical materials—integrating physical, mental, and environmental well-being.

SDG 4 – Quality Education]

As an educational institution, we transform traditional learning. Green Business Talks bring international experts together with students to explore sustainable entrepreneurship, while the Caribbean Microbial Meeting provides a platform for young researchers. Initiatives such as the Math Olympiad and school-based workshops encourage scientific vocations from an early age, particularly among girls and vulnerable populations.

SDG 5 – Gender Equality]

Gender equity is a cross-cutting priority. The Women in STEM program provides mentorship and networks of support for female students, while events such as the International Day of Girls in Science bring role models into schools. Our research also examines ways to dismantle workplace gender barriers and promote new masculinities among male students.

SDG 8 – Decent Work and Economic Growth]

We train professionals prepared to lead sustainable development. The UTBot Robotics Tournament attracts hundreds of young innovators, while Green Business Seedbeds research new economic models. Through partnerships with companies, we offer internships that combine technical excellence with social responsibility—ensuring that graduates contribute to building a more equitable economy.

SDG 10 – Reduced Inequalities

Our commitment to inclusion is reflected in UTB Diversa, which provides safe spaces for the LGBTIQ+ community, and in projects such as TERMOCANDELARIA, which improves living conditions in neighborhoods near industrial zones. Scholarships for diverse talents and community outreach programs confirm our role as a powerful social equalizer.

SDG 13 – Climate Action

We are at the forefront of the climate agenda. The UTB Solar Farm functions as a living laboratory for renewable energy, while the Zero Waste campaign engages the community in sustainable practices. Students also lead urban reforestation projects and deliver environmental education in schools, extending our impact beyond the classroom.

SDG 15 – Life on Land

We actively protect ecosystems. The Living Mangroves project combines research and community participation to safeguard these vital coastal areas. On campus, the Wildlife Photography Contest raises awareness of biodiversity, while recycling and composting programs strengthen sustainable habits within the community.

SDG 17 – Partnerships for the Goals

Our impact is amplified through strategic alliances. The pioneering Aquabus-e, Colombia's first solar boat, was made possible through collaboration between UTB engineers, the private sector, and government agencies. Similarly, the PEIS project for industrial sustainability demonstrates how academic knowledge, business needs, and public policies can converge to deliver real solutions.

Through this comprehensive approach, UTB has positioned itself as a model of how universities can act as catalysts for sustainable development. From volunteer initiatives to large-scale research projects, every action contributes to building a network of impact that extends beyond the university and positively transforms society and the environment."