RUTA AZUL:

Achievements and progress in the face of climate change crisis

APRIL 2022 - FEBRUARY 2023

Ciclopista Campus Monterrey.

Tecnológico de Monterrey

ruta azul
2025 SUSTAINABILITY AND CLIMATE CHANGE PLAN

INDEX

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Rector and Executive President

at Tecnológico de Monterrey

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2023 is a special year for Tecnológico de Monterrey: our eightieth year of training innovative leaders committed to being better people and having better communities, for a better planet. The Institution will be celebrating for the entire year, knowing that our actions and commitments have given us, and will continue to give, the fruits that benefit society.

One of our initiatives for committing to the future of humanity and our planet is Ruta Azul, the 2025 Sustainability and Climate Change Plan at Tecnológico de Monterrey.

Two years after publishing the Plan, we are consolidating sustainability as a strategic initiative, converting Ruta Azul into a recognizable symbol for our entire community.

Rectoría Campus Monterrey.

Ever more people and areas are making sustainability a priority in their daily activities. The progress made over these two years has been outstanding. We have made progress in our commitment to attaining carbon neutrality at our Institution, achieving a 41% reduction in greenhouse gas emissions compared to 2019; to reach this goal, we are focusing on the direct consumption of fossil fuels, the consumption of nonrenewable energy, and institutional travel.

We have made progress in other equally outstanding areas, such as Culture, Education, Research, Mitigation, Adaptation, and Outreach, through the following actions:

•We carried out the initial measurement of the Sustainability Culture Index, which permits identifying the community's knowledge, attitudes, ideologies, and behaviors with regard to sustainability; the end goal is to establish an indicator for measuring the advances of Ruta Azul. The overall rating of this first measurement (2022-2023) positioned us on a baseline of 66.5 over 100, and allowed us to identify the most important areas of attention and establish goals for future periods.

• In 2022, we attained 74% consumption of renewable energy for Tecnológico de Monterrey and TecSalud, bringing us closer to our goal of carbon neutrality.

• Also in 2022, we achieved a reduction of 15% in our total water consumption and 18% in our per capita water consumption.

• Given the water stress in the state of Nuevo León, we implemented an emergency plan consisting of twenty actions at our campuses and facilities in the Monterrey region. The result was total water savings of 22,920 m^3 from April 20, 2022 to December 31, 2022 (thirty-six weeks): consumption equivalent to that of 612 homes with four inhabitants for two months (the two-month summer vacation) in the Monterrey Metropolitan Area.

• In Monterrey we opened the E2-Off Grid, a building with water sustainability that captures and filters rainwater and generates drinking water from the moisture in the air. The building covers its own needs for watering plants, consumption, and hygiene, and operates for most of the day without a connection to the city water grid.

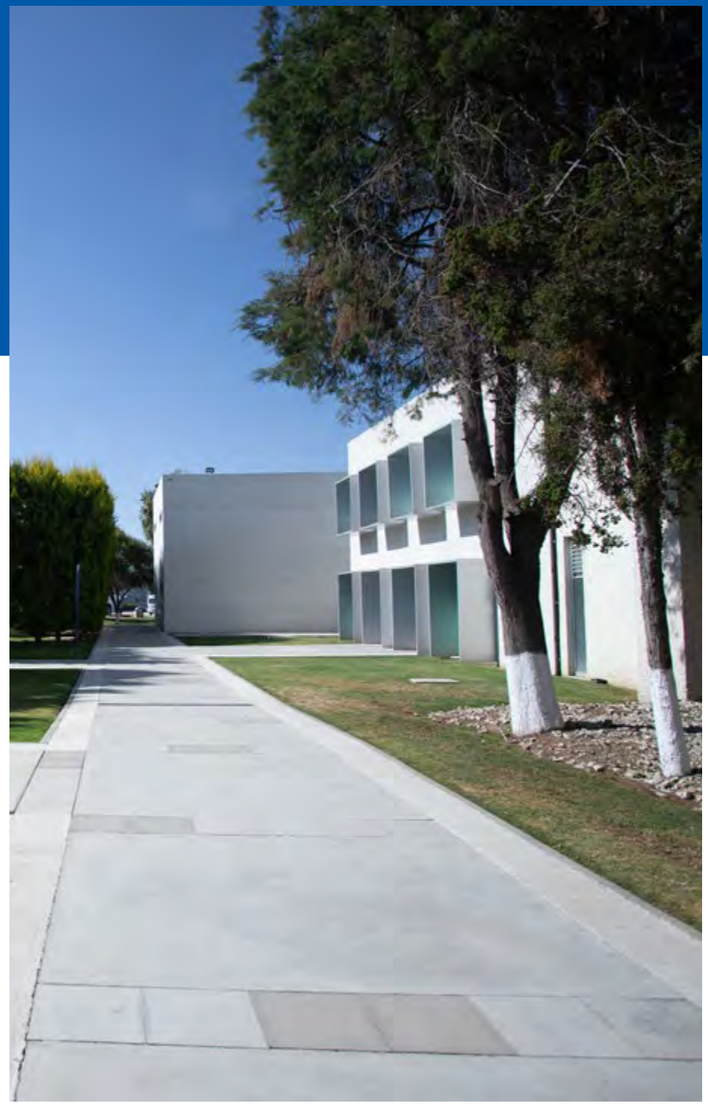
•In the international sphere, we participated in COP27 in Egypt. We are members of associations such as **University Global Coalition** and form part of the organizing committee of SDG **Action Week**, as well as other associations.

During her recent visit to Tec de Monterrey, Katharine Wilkinson mentioned that "climate crisis is a leadership crisis". At Tecnológico de Monterrey, we believe firmly in the need to demonstrate leadership in a world that is not acting with the urgency and scope that the climate emergency requires. We are increasing our efforts to build a common front with other social actors, and prevent the grave scenarios that science is now predicting.

As we celebrate the eightieth anniversary of our founding and the second year of Ruta Azul, we are proud of the efforts made and our commitment to sustainability over time. Our plans are ambitious and they are bringing us closer to a more sustainable future for all.

I appreciate every student, teacher, employee, and board member who has joined in the efforts of sustainability in their sphere of action. Ruta Azul is all of Tecnológico de Monterrey.

David Garza Salazar
Rector and Executive President



INÉS SÁENZ NEGRETE

Vice President of Inclusion, Social Impact, and Sustainability

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The year 2023 has brought mixed feelings. For Tec de Monterrey and Ruta Azul, it is a year of celebration to show the strong steps we have taken as an institution to make sustainability a priority in decision-making and in the daily life of staff, faculty, and students. Two years after launching the 2025 Sustainability and Climate Change Plan, we can see consolidation within Tec de Monterrey aimed at a better world.

In another sense, the year has been troubling in terms of nations' progress in fully facing the threat of climate change. International actions are critically insufficient to guarantee a sustainable world with equity and justice for all. As the United Nations Secretary-General Antonio Guterres forcibly affirmed during COP27: "We are on a highway to climate hell with our foot still on the accelerator." Greenhouse gas emissions continue to increase throughout the world and time is up for meeting the goal of the Paris Agreement, that of limiting a rise in the Earth's surface temperature to less than 1.5 degrees Celsius.

While mitigating climate change at the global level failed to advance with sufficient ambition, 2022 had worrisome impacts: fires of great magnitude, extreme drought in Mexico and in other regions of the world, terrible floods like that of Pakistan, hurricanes, and other extreme weather events. And as the impacts have become more serious, more people have been displaced, sickened, or killed by climate disasters, and inequalities have expanded to even greater levels, worsened by the crisis.

Each day, this crisis has become more complex. As time passes, we have fewer options for acting and solving the situation at the international, national, and local levels.

Is a sustainable future possible? Of course it is. Hope exists. Yet hope should not arise from the optimistic ingenuity of believing that everything will be fine. **Concrete, collective actions must be carried out: a united front that complies with what it proposes and continues to do more against the climate crisis.** That is the source of our hope.

For this reason, we cannot yield to the self-complacency of celebrating our achievements as if they were the goal itself. Instead, we must remain focused on the urgency of the climate crisis and work for progress, at Tecnológico de Monterrey and specifically through Ruta Azul— progress that is increasingly ambitious, broader in scope, and more powerful in bringing together more people to meet the largest challenge faced by humanity in this century.

Each attainment reported in this document is a product of the conviction of tens and even hundreds of people that we can change the world, and that is it possible to devote ourselves professionally and personally to a higher cause: the vision that we can forge a sustainable future.

At Tecnológico de Monterrey we are convinced that we can leave a significant legacy to humanity by being the generation capable of creating the conditions for human flourishing. Let each and every one of us be part of this movement. Let us do more. We have set the course to follow.

Campus Monterrey.

"We continue on the highway towards a climatic hell with our foot still on the accelerator".

António Guterres
Ninth Secretary-General of the United Nations

THE PLAN CONSIST OF 6 AREAS

CULTURE

Promote decision making with sustainable awareness

MITIGATION

Reduce the environmental impact of our institution's operations.

ADAPTATION

Minimize the impacts of climate change on our facilities, our community and neighboring communities.

EDUCATION

Train leaders committed to forging a sustainable future.

RESEARCH

Promote interdisciplinary research to provide systemic solutions that fully address the complexity of climate change and enable sustainable development.

OUTREACH

Catalyze climate action in society as a whole.

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AREA 1
CULTURE

OUTSTANDING PROGRESS:

1.

We implemented the first

Sustainability Culture Index,

which allowed us to discover the institution's knowledge, attitudes, ideologies, and behaviors in sustainability and thus establish an indicator for measuring the progress of **Ruta Azul.**

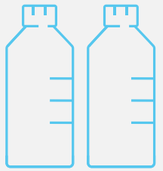
2.

We expanded the implementation of the

Sustainable Events Guide, which allowed us to

PREVENT THE EMISSION OF MORE THAN 8.5 TONS OF CO_2

AND SAVE MORE THAN 707,200 LITERS OF WATER



BY ELIMINATING THE USE OF MORE THAN 112,500 PLASTIC BOTTLES

and to implement other sustainable actions at the institution's flagship events this academic year.[2]

[1] All measurements in tons of CO2 mentioned in this document were obtained according to the equivalencies, scope, and calculations in the ***GreenHouse Gas Protocol (GHG Protocol)***

[2] Flagship events: Family Day, National Teachers Meeting, Loyalty, INCmty Festival, Graduation December 2022 and Fiestas Tec 2022, Board Meeting 2022 and 2023. Other sustainable actions include recycling, composting, and collective mobility initiatives.

MISSION:

To promote decision-making with sustainability awareness.

GOAL FOR 2025:

To govern our administrative and operational processes with guidelines of environmental sustainability, and to involve our teachers, employees, and students in activities inherent to sustainable development.
We are working simultaneously in three areas: **Communication and Awareness Campaigns, Experience, and Measurement.**

COMMUNICATION AND AWARENESS

Mission:

To raise and sustain awareness in the Tec community.

Goal:

For more than 80% of the Tec community to be familiar with the **2025 Sustainability and Climate Change Plan**.

Actions:

My Commitment to Integrity 2023

For the third consecutive year, we included a learning module on climate change in the online course on **My Committment to Integrity 2023,** an annual exercise directed to more than 32,000 members of faculty and staff at Tecnológico de Monterrey. In this course, we reaffirm the commitment to learn, respect, experience, and promote our institution's culture and values.

CULTURE

Ruta Azul Communication Campaign

To position Tecnológico de Monterrey as a sustainable, referent, and proactive institution in the face of the climate emergency, we carried out the following actions:

1. We implemented **an integrated communication campaign** through our institutional channels (email, **mitec**, platform, social networks, websites, news sites, and other channels) to spark the Tec community's interest (**students**, faculty, staff, administration, board of directors, and alumni) in the local, national, and global context of the climate crisis. The campaign was also aimed at presenting Ruta Azul and the 2025 Sustainability and Climate Change Plan, to show the efforts made in the designated areas, to reaffirm the commitments reached, and to involve our community through the invitation to participate in sustainable actions.

2. In April 2022 we launched the **Ruta Azul newsletter** to present our progress and report on events, invitations, recommended reading, and sustainability news. The newsletter links to our **Sustainability Blog,** where we have published twenty-three articles from writers and experts to introduce various viewpoints, thoughts, and opinions on sustainability and climate change. We also offer our readers advice and recommendations for having sustainable habits. As of February 2023, our newsletter had 1,347 subscribers. We invite you to subscribe **here**.

Examples of the communication campaign

Tecnológico de Monterrey

TecSounds Cabin

3. In October of 2022, **we launched the Ruta Azul section in the program "From Campus" on Tec Sounds Radio**, where we address relevant topics in sustainability, environment, and climate change.

4. We have transmitted messages on social networks and carried out actions on our campuses related to **world events** in sustainability, such as World Environment Day, World Car-Free Day, World Vegan Day, and others.

In the upcoming academic year, we shall develop a **new phase of the campaign**, based on our learning in the first phase. We aim to integrate strategies centered on our audiences, focus on creating communication for Tec de Monterrey students, and increase awareness and correct association with Ruta Azul.

CULTURE

Tecnológico de Monterrey

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CULTURE

EXPERIENCE

Mission:

To promote the Tec community's experience of sustainability in various life settings.

Goals for 2025:

To govern our administrative and operational processes with guidelines of environmental sustainability.

To involve our faculty, staff, and students in activities that have a favorable impact on sustainable development.

Actions:

Sustainable Events

This year we are continuing to develop the **Sustainable Events Guide,** which helps organizers to implement sustainable actions in planning and managing in-person events.

During the past academic year, the guide was implemented solely at the Board of Directors Meeting 2022. This year we showed significant progress in training more than 260 people (Human Resources staff, event organizers, and Communication and Marketing teams) on the publication's guidelines for holding events in a sustainable manner.

We implemented actions such as the elimination of PET bottles, a significant reduction in single-use plastic products, and recycling and composting at flagship events: the Annual Board of Directors Meeting, Family Day, National Faculty Meeting, Festival INCmty and Family Forum, Loyalty Ceremonies, Fiestas Tec, and the Graduation on December 2022. These ceremonies were the first PET-free graduations in our institution.

Sustainable actions at flagship events

At the 2022 events and Board of Directors meetings in 2022 and 2023

WE PREVENTED EMISSIONS OF MORE THAN 8.5 TONS OF CO_2

AND SAVINGS OF MORE THAN 707,200 LITERS OF WATER

BY ELIMINATING THE USE OF MORE THAN 112,500 PET BOTTLES

AND IMPLEMENTING OTHER SUSTAINABLE ACTIONS AT EVENTS.

We reached more than 4,300 survey respondents who identified sustainable actions at events, and more than 3,900 who believe that these actions have raised their awareness of sustainability.

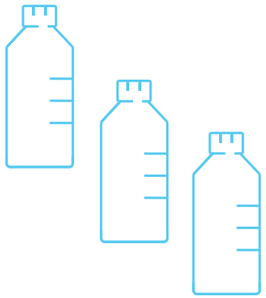
During the upcoming year, we shall continue working on the development and execution of the Sustainable Events Guide to create tools to institutionalize sustainable actions that decrease the environmental and negative social impact of our events.

Example of elimination of single-use plastics at flagship event.

Elimination of Single-use Plastics

We are working to reduce waste, especially:

- PET bottles and containers
- Single-use plastic products (SUPPs) and packaging.



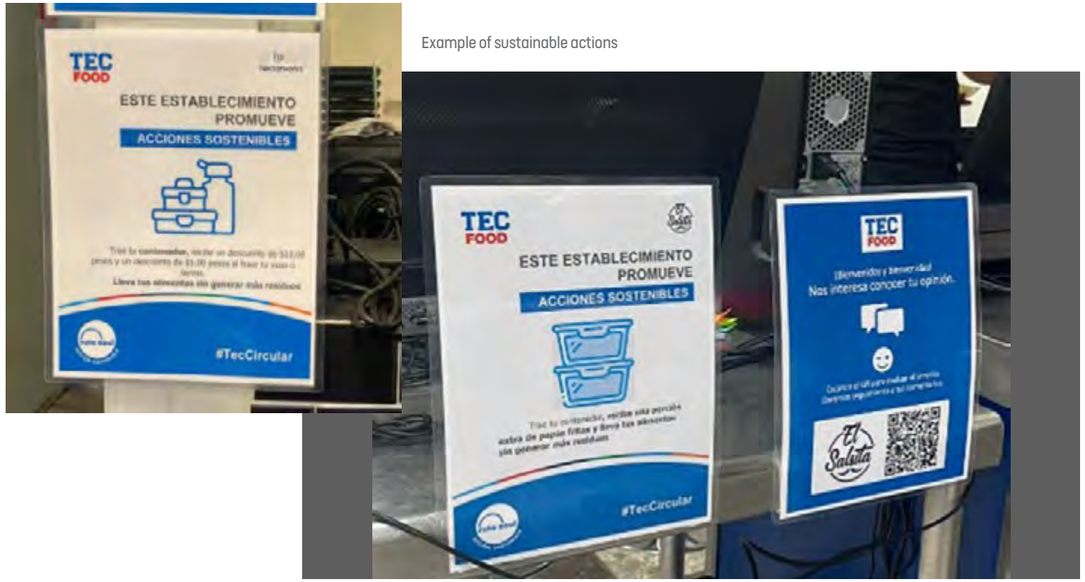
During the academic year and with support from our Strategic Supply area, **we implemented new agreements with suppliers of certified compostable products**. This is a transitional action that contributes to the goal of reducing and eliminating disposables from the operations of our cafeterias and services. Some of the certifications of the approved products are: *BPI Compostable, Din Certco, TUV Austria Ok to compost industrial, and TUV Austria Ok Biobased*.

With support from ***TecFood***, we implemented diverse strategies to reduce the use of PET bottles, containers and disposables in cafeterias and catering. We are also promoting reusable containers among our concessionaires.

We have added more than seventy concessionaires to this national initiative. The concessions offer incentives to the users of their food services to take advantage of reusable containers.

We have experienced success in implementing a system for borrowing reusable containers from a concessionaire on the Puebla Campus. Since opening in February 2023, the Green Chile restaurant began loaning containers, forks, and/or covered glasses to their campus clients who make carry-out orders. The system has prevented the use of more than eight hundred disposables in less than two months of operation.

We shall continue working to integrate more allies into these efforts.



Example of sustainable actions

Tec Volunteers

Through Tec Volunteers, we invited our community to participate in climate action, offering two options for our diverse populations:

1. A composting pilot program on Monterrey Campus, with a duration of four weeks. The participants were seventeen operations employees (***TecFood***, Operations and Maintenance, and distritotec) and thirty-five volunteers. The result was the collection of 799 kg of organic waste, the composting of 83.9 kg of waste, and the prevented emissions of 296 kg of CO_2eq.

2. In the framework of the Tec Volunteers Day 2022, we offered a sustainability workshop in six public schools in Mexico, thanks to the participation of twenty volunteers.

CULTURE

MEASUREMENT

Mission:

To measure institutional growth in sustainability awareness.

Goal for 2025:

To monitor how the actions performed by Ruta Azul influence changes in the awareness, attitudes, and behaviors of the Tec community.

Actions:

Sustainability Culture Index

The Sustainability Culture Index is a primary indicator of Ruta Azul. It measures our progress as we aspire to be a model in institutional sustainability.

In late 2022, we launched the first index measurement of undergraduate and high school students, faculty, and staff. The instrument was designed by an experienced academic team, based on international instruments.

Campus Monterrey

Its purpose is:

1. To understand the attitudes, behaviors, ideologies, and knowledge of the evaluated population regarding sustainability and climate change.

2. To create a baseline or starting point for the current status of the institution's culture of sustainability.

3. To define strategically the areas of opportunity and focuses of the programs for experiencing sustainability, according to the results.

4. To measure the change/impact of carrying out the actions and initiatives of Ruta Azul, defining and following up on new goals, as required.

The index offers a global rating and a rating by population that **allow us to identify the most important areas of attention for each population, and to establish goals for Ruta Azul in upcoming periods.** The global index for this first measurement (2022-2023) marked a baseline of 66.48/100.

CULTURE

Tecnológico de Monterrey

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Table 1

Population	Sample	Average Result
High school students	232 (conf. 95%, e +/-6.3%)	66.54
Undergraduate students	577 (conf.95%, e +/-4.0%)	66.57
Faculty	Max = 324 (conf. 95%, e +/-4.8%) Min = 309 (conf. 95%, e +/- 6.3%)	66.85
Staff	Max = 397(conf. 95%, e +/-4.8%) Min = 309 (conf. 95%, e +/- 5.5%)	66.28
	Global Index	66.48

Data collection dates: Students, October 12 - 19, 2022. Faculty and Staff, November 2 - December 13, 2022.

The results of this first measurement give us clarity and statistical confidence regarding the information's reliability in diagnosing the status of the culture of sustainability.

Current and future measurements will reveal the institution's longitudinal evolution through the strategic actions and interventions of Ruta Azul, and will allow us to adjust the strategy as we encourage a culture of sustainability at Tecnológico de Monterrey.

"Avoiding climate collapse will require some thinking of cathedral. We must lay the foundations even if we do not know exactly how to build the roof."

Greta Thunberg

Campus Monterrey.

AREA 2
MITIGATION

OUTSTANDING PROGRESS:

MITIGATION

1.

WE REDUCED BY
41% **OUR GREENHOUSE GAS EMISSIONS**

in Scopes 1 and 2, with respect to 2019.

2.

In 2022, we attained an
ANNUAL AVERAGE OF
74% **RENEWABLE ENERGY CONSUMPTION**
at **Tec de Monterrey** and **TecSalud.**

3.

We rehabilitated the photovoltaic systems on the Guadalajara Campus,
REACHING
95% **RENEWABLE ENERGY CONSUMPTION,**
with 8% generated on campus.

4.

We reduced our energy consumption from

83.3 kWh PER M² OF CONSTRUCTION IN 2019 TO

77.6 kWh **PER M² IN 2022,**

7% over the established goal of **20% for 2025**.

5.

We finished the design and began the

CONSTRUCTION OF THE

District Power Plant

to be housed on the Monterrey Campus.

6.

WE REDUCED

water consumption per student by

15.1%

7.

We increased the percentage of recycling/composting

FROM 4% IN 2019 TO

24% **IN 2021.**

MITIGATION

Tecnológico de Monterrey

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MITIGATION

MISSION:

To reduce the environmental impact of our institution's operations.

2025 GOAL:

To reduce our carbon footprint by 50% in Scopes 1 and 2 and our water consumption by 20%, and to achieve a sustainable model of waste management at 100% of our facilities.

To reach this goal, we are working simultaneously in four areas: **Emissions, Energy and Fuel, Water,** and **Waste.**

EMISSIONS

Mission:

To measure and reduce our greenhouse gas emissions.

2025 goal:

To reduce by 50% our greenhouse gas emissions in Scopes 1 and 2 for 2025, with respect to 2019.

Goal for prior to 2040:

To achieve carbon neutrality.

Reduction of Greenhouse Gas Emissions in Scopes 1 and 2

During the 2022-2023 academic year, we made progress in the reduction of greenhouse gas emissions for **Scope 1**, related to our direct consumption of fossil fuels, including natural gas, gasoline, and diesel, and in **Scope 2**, related to our consumption of nonrenewable energy. This academic year, we reduced our greenhouse gas emissions by **41%** in comparison with 2019. This **progress brings us 82% closer to our goal of reducing our emissions by 50% prior to 2025**.

Our commitment to reducing greenhouse gas emissions is reflected in our national emissions report, published annually. The report adheres strictly to the **Greenhouse Gas Protocol (*GHG Protocol*)** and the **Annual Operations Seal) r**equired by Ministry of the Environment and Natural Resources (SEMARNAT). Detailed information on the report can be obtained on the link.

The greenhouse gas emissions report **Scopes 1 and 2, 2021**, published in May of 2022, is available at **Sustainability Tables**. The greenhouse gas emissions report 2022 is available on our **website** as of May 2023, along with reports from previous years.

Bycicle station at Guadalajara Campus

MITIGATION

MITIGATION

ENERGY AND FUELS

Mission:

To reduce energy consumption and promote migration toward renewable energy.

2025 goal:

- To obtain 80% of our energy from renewable sources.
- To reduce our energy consumption per square meter by 20% in comparison with 2019.

Actions:

Renewable Energy

In 2022, we attained an annual average of 74% renewable energy consumption at Tec de Monterrey and TecSalud thanks to diverse actions, such as:

In February 2022, we reached 100% renewable energy consumption at the **Zambrano Hellion Hospital and at San José de TecSalud Hospital.**

We rehabilitated the **photovoltaic systems on the Guadalajara Campus**, attaining **renewable energy consumption of 95%**, with 8% generated on the campus itself.

We have added **four new locations that consume renewable energy**: the Zacatecas, Chihuahua, San Luis Potosí, and Hidalgo Campuses.

We shall continue working on::

- **The installation of photovoltaic systems** for onsite energy generation in the parking areas and rooftops of our campuses. These systems will generate at least 1.5% of the energy consumed at the institutional level and will be in line with current energy regulations.

- Increased consumption of renewable energies through contracts in the electric market, in line with current energy regulations.

- The integration of two new load centers to consume renewable energy at the **Saltillo Campus and Santa Anita High School.**

School of Medicine and Health Science at San José Hospital

San José Hospital

MITIGATION

MITIGATION

Energy Efficiency

We reduced our energy consumption from 83.3 kWh per m^2 of construction in 2019 to 77.6 kWh per m^2 in 2022. As a result, we reduced our energy consumption by 7% with respect to 2019, approaching our goal of 20% reduction by 2025.

This reduction was attained thanks to various actions. Some of the most important are:

We defined **operational energy guidelines** for more efficient and sustainable energy use on our campuses.

We replaced three thousand fluorescent lamps with LED and twenty-five air-conditioning equipments o systems with high-efficiency units at five Tec de Monterrey campuses and high schools.

168 smart thermostats were installed at the Sonora Norte, Sinaloa, Chiapas, Chihuahua, Aguascalientes, León, San Luis Potosí, Querétaro, and Saltillo Campuses and at Monterrey high schools for more efficient use of our air-conditioning systems. This change is estimated to lead a reduction of 8% in the energy consumption of the locations where they were installed.

We installed a water heating system with solar collectors at the dormitories on the Guadalajara Campus. **The system will generate savings between 70% and 80% in the building's gas consumption.**


Campus Sonora Norte


CIAP Building


Campus Chihuahua

Central District Park

We also carried out the following initiatives:

We registered the EGADE building in the **Efficient Buildings Challenge**, an initiative of the **Monterrey municipal government** in alliance with the **World Resources Institute (WRI)**. The challenge is to **reduce by 10% the CO_2 emissions generated by the building's operation over twelve months**. The results are expected to be available in early 2024, and will be published through the **Secretary of Sustainable Urban Development of the government of Monterrey**.

The design stage was concluded and construction began on Greenship. This building will make energy use on the Monterrey Campus more efficient and sustainable and will permit the growth of future projects. In contrast with independent installations, centralization permits offering technical, economic, and environmental benefits to daily operations, in addition to developing an important didactic tool.

Greenship will provide access to visits and tours by students, partners, visitors, and the general community, introducing them to technologies focused on complying with SDGs in the reduction of energy consumption, emissions, and water consumption.

We estimate that Greenship, in its final stage, **will generate a reduction of almost three thousand tons of CO_2 per year, equivalent to planting almost one hundred thousand trees per year, and a reduction of almost six million kWh, equivalent to 4% of the institution's current energy consumption.**

Electric vehicle chargers at E2-***Off Grid***

MITIGATION

We shall continue working on::

Replacing more than fifteen thousand light bulbs with LED lights in classrooms, offices, and at sports facilities on 28 university campuses and high schools.

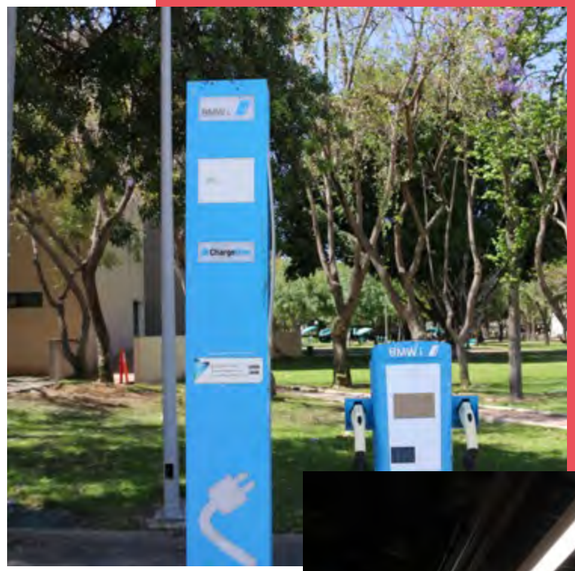
Replacing more than one hundred fifty air-conditioning and heating **equipments with energy-efficiency units on eleven campuses.**

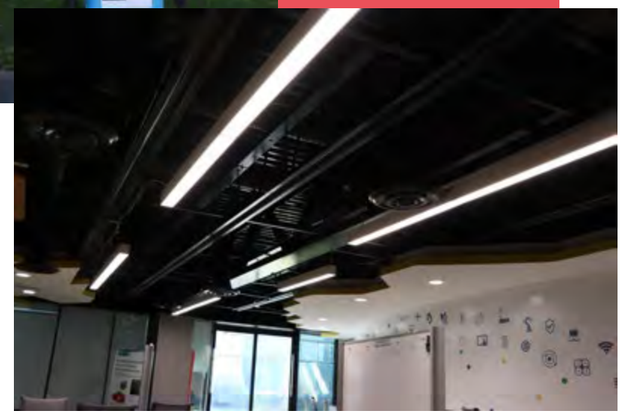
Implementing light control systems in classrooms, collaborative spaces, and parking areas on the Monterrey, San Pedro, Mexico City, Estado de México, and Santa Fe Campus, as well as other campuses.

Implementing electric meters and a monitoring system in real time in buildings with high energy consumption, **to identify operational behaviors and search for areas of opportunity to guarantee greater energy efficiency**.

Evaluating energy storage projects with batteries, in collaboration with academia.

Implementing pilot projects in Industry 4.0 that permit smart campuses and living laboratories on the **Monterrey**, **Mexico City**, and **Guadalajara Campuses**, as well as other campuses.





Electric vehicle chargers at Guadalajara Campus and luminaire in CEDES building

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Electric Mobility

We installed thirty electric vehicle chargers at the Monterrey, Mexico City, and Santa Fe Campuses, the EGADE Business School, and the School of Government and Public Transformation at the San Pedro Campus.

Since the institutional energy portfolio, as previously indicated, is largely composed of energy from renewable sources, the emissions generated by the energy from chargers are drastically reduced.

We acquired five electric vehicles at the Monterrey, Guadalajara, Mexico City, and Querétaro Campuses, through which we shall reduce greenhouse gas emissions with a direct impact on Scope 1 of Tec de Monterrey's fleet. In addition, this purchase means that 5% of our fleet has hybrid technology: nine hybrid vehicles out of a total fleet of 229.

We shall continue working on:

- Installing at least **thirty-five charging stations for additional electric vehicles** at the Mexico City, Querétaro, Puebla, and Guadalajara Campuses and the Zambrano Hellion and San José Hospitals.

- Progress in the migration to low-technology or zero emissions for student transportation services, such as transportation using electricity, natural gas, and hydrogen.

MITIGATION

WATER

Mission:

To achieve circular water management through efficient use in all campus processes and responsible consumption by users.

2025 goal:

To reduce our water consumption by 20% (with 2019 as a base year). To have a water treatment system on 80% of our campuses.

Actions:

In our operations, we have implemented actions for sustainable water management, encouraging water conservation, reducing consumption, increasing our capacity to treat and reuse water, and implementing improvements in our equipment and infrastructure.

In 2022, in comparison with 2019 and as a result of efforts to make water use more efficient, **we attained a reduction of 15.14% in our total water consumption**; in addition, **we achieved a reduction of 18.3% in the water consumption indicator per student** (m^3/student) and **reduced by 14.7% the indicator of water consumption per m^2** of construction (m^3/m^2).

Wastewater Treatment Plants (PTAR)

At the present time, **59% of our campuses have at least one water treatment system.**
In 2022, 19.6% of the total water consumed was treated water.

In 2023, we shall increase wastewater treatment at our PTAR on the Monterrey Campus. At present, approximately four liters per second are treated (lps); through the new project, an additional seven liters per second will be treated. With this increase, **108,000 m^3 per year will be treated and reused (the equivalent of the water from thirty-two Olympic swimming pools)** in addition to the water already being treated through the municipal sewage connection at the Monterrey Campus.

The PTARs at the Laguna and Hidalgo Campuses were connected to municipal sewage, and their operating capacity increased to two and five liters per second, respectively (the equivalent of filling from nine to twenty-three Olympic swimming pools in one year).

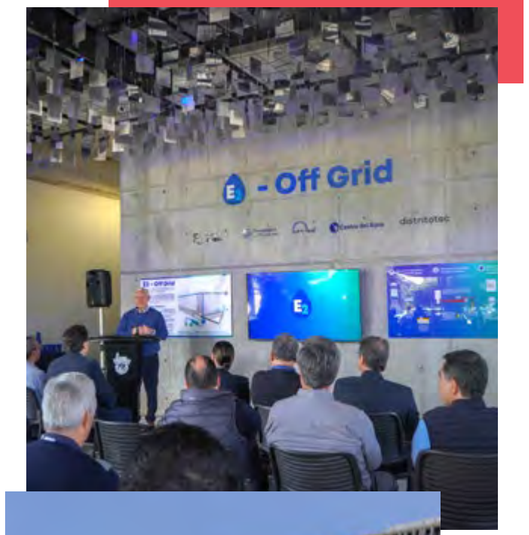
We implemented the water autonomy project for the Off-grid E2 parking garage on the Monterrey Campus, which includes water infrastructure and a PTAR so that the building has the capacity to operate off the municipal water grid for up to four months (depending on rainfall). Further information is available in the section on Adaptation.

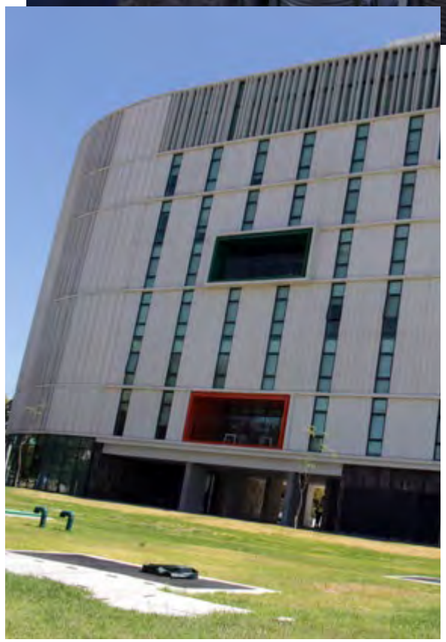
Along with these projects, we built and are putting into service the PTAR of 2.5 lps at the Zambrano Hellion Hospital. Up to 39,000 m^3 per year will be treated and reused in the hospital's cooling towers (the equivalent of filling approximately eleven Olympic swimming pools in one year).

Tec's Response to the Water Crisis in Nuevo León and Mexico

In the context of the water crisis in Nuevo León, we implemented an emergency plan consisting of twenty actions, on our campuses and installations in the Monterrey region. The plan permitted conserving a total of 22,920 m^3 of water from April 20, 2022 to December 31, 2022 (thirty-six weeks), equivalent to the approximate one-day water consumption of 36,730 four-person households in Nuevo León. All of the plan's actions were adopted as part of the permanent operations on campus.

Our water conservation efforts are not limited to our Nuevo León Campus. We have implemented strategies for other campuses, such as the water conservation pilots at all high schools, the replacement of equipment that consumes water with equipment that saves water at the Estado de México, Santa Fe, and Chihuahua Campuses, and the Eugenio Garza Lagüera and Valle Alto high schools, and the installation of efficient irrigation equipment at the Sinaloa Campus.





Rainwater captation system and water tanks in Querétaro Campus

MITIGATION

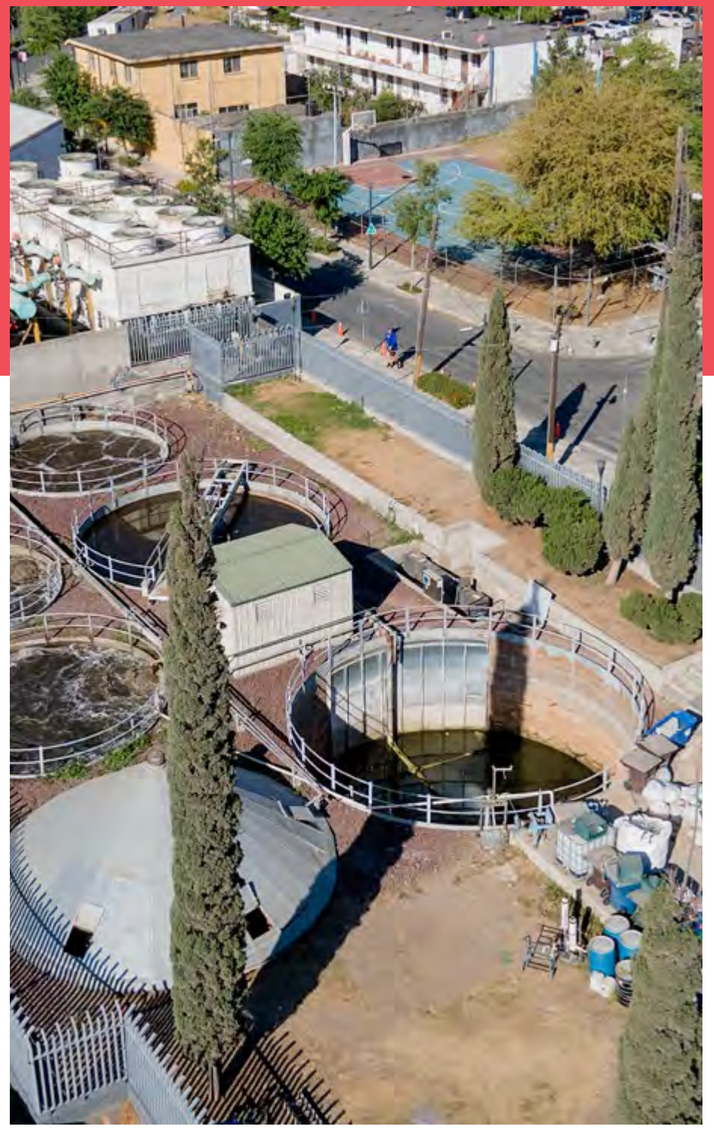
At the Mexico City Campus we installed a rainwater collection system that began operations in January of 2022. The system consists of eight underground tanks as part of an integrated protection project against flooding. The system has the capacity to collect and treat 4,845 m³ of water to reuse it for the irrigation of green areas.

In late 2022, at the **Querétaro Campus we installed a drainage network to collect excess rainwater in green areas and send it to a storm tank. The tank's storage capacity is 228 m³ of rainwater, which is piped through a cross-campus drain to the municipal drainage system.**

We are collaborating with the **International Finance Corporation (IFC)** to carry out a pilot study of water conservation technology with a water treatment system by means of electrolysis. Expected water conservation is up to 4,000 m³ in three months of testing, in the cooling towers on the Monterrey Campus.

Campaigns to Raise Awareness and Conserve Water

At TecSalud we carried out campaigns to raise awareness and water conservation, which allowed us to reduce water consumption by 26% at the San José Hospital and 5% at the Zambrano Hellion Hospital, with respect to 2019. TecSalud reduced water consumption by 49,812 m³ in 2022 with respect to 2019 consumption.



Water treatment plants in Monterrey Campus

In conjunction with the Culture area, **we began a permanent water conservation campaign of "With or Without Crisis."** These actions, in addition to reducing our water consumption, contribute to our ongoing adaptation to long-lasting extreme drought that is a result of the climate crisis.

We shall continue working on::

Improving the operational efficiency of the PTAR on our campuses and carrying out actions that will allow water efficiency.

Implementing projects that promote water circularity.

Monitoring the quality of water at all campus sources and discharges.

Collaborating through alliances with organizations in civil society, government organizations, operators, associates, and the community, to aim for water security on all campuses.

WASTE

Mission:

To attain sustainable waste management.

2025 goal:

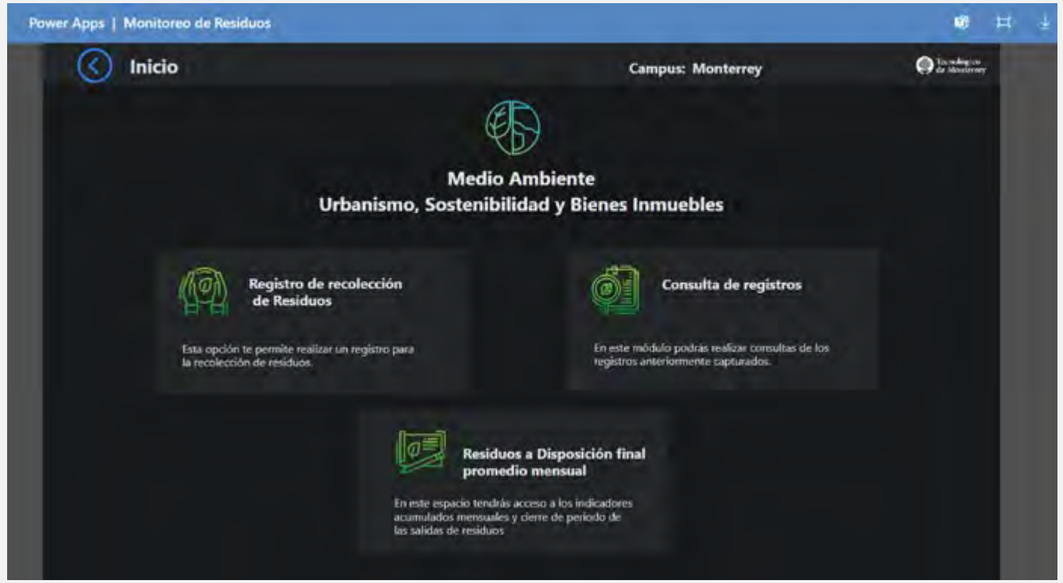
To design a model of sustainable waste management at 100% of our locations, and with its implementation, to ensure that 40% of our generated waste is not sent to a landfill.

Actions:

From 2019 to 2021 **we were able to increase the percentage of recycled and composted waste from 4.5% to 24%, thanks to campus actions in increasing the composting of organic waste from gardens and some cafeterias.**
In 2022 and 2023 we continued implementing measures and compliance indicators to increase these percentages.

MITIGATION

During this academic year, we developed an internal waste management platform available at PowerApps for all campuses. This action allows us **to collect and process information on the generation, reutilization, recycling, composting, and final disposition of waste on the national level**, to establish indicators and design actions to attain our goals.



Powerapps / Waste monitoring dashboard

In conjunction with the Culture area, we participate in the volunteer composting pilot on the Monterrey Campus, with organic waste from all cafeterias. This effort led us to escalate the project and implement industrial composting on the campus, serving TecFood (central cafeterias and Jubileo). The goal is to establish the initiative on all Monterrey campuses.

We shall continue working on::

- Generating guidelines for all campuses to be aware of best practices in managing the waste generated on campus.
- Implementing awareness campaigns to permeate our institutional culture.

Designing mitigation measures, such as the creation of an **upcycling** laboratory to convert our plastic waste into other products, and provide it with a second life cycle to prevent dumping. This initiative aims to link with academia and the rest of the Tec community to generate awareness and create action in generating plastic waste

Every day we are walking the path of sustainability more and more.

AREA 3
ADAPTATION

OUTSTANDING PROGRESS:

ADAPTATION

1.

We carried out precise georeferencing, to create a detailed database,

OF MORE THAN
34,000 TREES ON CAMPUSES

—part of our national tree inventory—to ensure sustainable tree management.

2.

We implemented initial actions in water resilience on our campuses and at distritotec

a floodable urban forest,

bio-ditches on the Mexico City Campus,

and the opening of Off-grid E2.

3.

We published the
BEST PRACTICES GUIDE: MANUAL FOR SUSTAINABLE TREE MANAGEMENT
for Tec de Monterrey campuses.

Tecnológico de Monterrey

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MISSION

To minimize the effects of climate change on our community and on neighboring communities.

GOAL FOR 2025

For 100% of our Campuses to have an analysis of projected climate change impacts in order to develop adaptation plans based on cities and regions' vulnerability and climate risk diagnoses.

To reach this goal, we are working simultaneously in three areas: **climate risks, planning, and training.**

CLIMATE RISKS

Mission:

To elaborate diagnoses of climate risk and vulnerability on our campuses.

Goal for 2025:

For 100% of our campuses to have diagnosed their present and future risk and vulnerability due to the impacts of climate change.

Actions:

National Tree Inventory

In the previous academic year, we prepared a national inventory of the trees located on Tecnológico de Monterrey campuses, totaling more than thirty-four thousand trees of various species.

ADAPTATION

The inventory provides us with data on the number, condition, and species of the campuses' trees, which can guide our efforts to decrease the university's carbon footprint and work on solutions based on adaptation. Such information can also promote sustainable soil management practices and a reduction in the effects of urban heat islands.

In 2022, with support from the School of Engineering and Science, we georeferenced and digitalized the information on the inventoried trees. This action will allow us to visualize and carry out sustainable tree management.

During the first half of 2023, the inventory will be completed to include all of the trees located on our institution's real estate, in addition to the precise calculation of our trees' absorption of CO2 along with their capacity to reduce the effects of heat islands. This information will be available on our **website**.

We invite you to subscribe to our **monthly newsletter**.

Well and biotrenches in Mexico City Campus

Action Plans for Adapting to Climate Change

Taking as a reference the national tree inventory and the identification of climate risks where our campuses are located, we shall continue working on the following actions:

In conjunction with the local operations and administration teams from each campus, and hand in hand with specialists in climate change, we shall create an Adaptation Action Plan for each campus over the short, medium, and long term. The goal will be to prepare and ensure the continuity of our operations in the event of extreme weather.

We shall continue working on the identification of climate risks and vulnerabilities that currently affect our facilities, and generate adaptation strategies to mitigate them.

PLANNING

Mission:

To develop adaptation plans for climate change and to supervise their implementation.

Goal for 2025:

For 100% of our campuses to have an adaptation plan to minimize the impacts of climate change.

ADAPTATION

Actions:

For all of our new buildings to have criteria for sustainability and adaptation to climate change, we shall review and strengthen internal standards of design, construction, maintenance, and operation to take these priorities into account. We have worked with the institution's Master Plans team to include these criteria in future campus developments and to generate action plans for the short, medium, and long term.

During upcoming academic years, a plan for work and follow-up will be developed to ensure the implementation of these strategies in all new buildings and remodeling at the institutional level.

E2 - *Off Grid*

Initial Actions in Water Resilience on Our Campuses

To contribute to the reduction of water stress and prepare our campuses for extended drought, projects and initiatives were implemented in 2022 to promote water resilience at our facilities.

E2 Off-Grid Parking Garage

In November of 2022, in alliance with the FEMSA foundation, distritotec, and the Water Center for Latin America and the Caribbean, we opened a living laboratory in the **E2 Off-Grid** Parking Garage to promote and study applicable technologies for developing infrastructure in our buildings for extended drought; in other words, to contribute to water resilience in climate crisis.

The parking garage does not depend on the municipal water supply for its daily operations since it collects, treats, and reuses its own water *in situ*. The E2 Off-Grid building combines three technologies for independent operations: a rainwater collection and treatment system, a system of environmental moisture condensation, and a wastewater treatment plant allowing for circular water management. This living laboratory projects annual water savings estimated at 547,500 thousand liters.

Strategies for Rainwater Collection

Bio-ditches and Cenote on Mexico City Campus: Ditches are integrated into the green areas and walkways close to the campus library. The purpose is to channel water as it infiltrates into the subsoil, and thus recharge the groundwater. The ditches have the capacity to reduce the speed of water runoff. In the event of heavy rain, the ditches are designed to flood and drain water into the campus cenote.

Floodable Urban Forest, Central Park - distritotec: The floodable urban forest at the Monterrey Campus Central Park adheres to the strategies of an artificial reservoir for conserving rainwater. Its objective is to control the flow of rainwater and promote groundwater recharge. Since the forest was designed to drain completely in a relatively short period after a storm, it is usually empty or dry.


Cenote CCM


Biotrenches in Mexico City Campus

ADAPTATION

ADAPTATION

TRAINING

Mission:

To generate and strengthen teams' abilities so that in conjunction with specialists in climate change, we can identify risks and vulnerabilities, and design and implement actions to reduce the impacts of climate change at all our facilities and campuses.

Goal to 2025:

To train 100% of our operations employees across the nation in the basic knowledge of adapting to the impact of climate change.

Actions:

In 2022, in collaboration with the School of Engineering and Science, we generated a **Best Practices Guide: Manual for Sustainable Tree Management** on our 26 campuses. The manual's objective is to guide teams in the operation and maintenance of green and wooded areas according to protocols and international standards for sustainable tree management. In 2023, we shall introduce an ***addendum*** with a regional plan of best practices, taking into account the unique characteristics of each campus's geographical region. This action will provide guidance through a series of practical examples and initiatives, and a catalog of local and regional species for local teams.

CETEC building

We shall continue working to offer our teams the following training::

A workshop in collaboration with experts in **identifying risks and climate vulnerabilities so that in conjunction with local campus teams, the present and future risks at their facilities can be identified.** A strategic plan will be developed to deal with future impacts.

In collaboration with the School of Engineering and Science, a series of practical sessions and courses will be carried out to train teams responsible for the care and maintenance of green areas. **The topics covered will be sustainable tree management, the identification and application of best practices** according to international methodologies, and practical recommendations for the specific region of each campus.

ADAPTATION

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"We will move to a low-carbon world because nature will force us or because politics will guide us. If we wait for the nature forces us, the cost will be astronomical."
Christiana Figueres

AREA 4
EDUCATION

OUTSTANDING PROGRESS:

1.

We implemented the **Curricular Inclusion Strategy of 13 SDGs** in 2019 undergraduate degree plans, in conjunction with the National Schools.

2.

We consolidated training units that include SDGs; for example, **Tec Week with Human Significance: Climate Emergency and Sustainability Culture**, impacting

MORE THAN 4,500 UNDERGRADUATE STUDENTS

OBJETIVOS DE DESARROLLO SOSTENIBLE

3.

We provided training in **climate change and education for sustainable development** (ESD)

FOR MORE THAN 1,000 TEACHERS FROM APRIL 2022 TO FEBRUARY 2023.

EDUCATION

Tecnológico de Monterrey

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EDUCATION

MISSION

To train leaders committed to forging a sustainable future.

GENERAL GOAL:

To integrate courses on climate change and sustainable development into undergraduate degree plans.

To reach this goal, we are working in three areas: **academic programs**, **training**, and **evaluation and academic certification**.

In the first year of the plan, we worked on designing and implementing pilot programs and including climate change and sustainable development in undergraduate degree plans. In the second year, the pilot programs were consolidated to become permanent activities in the Educational area, as detailed below.

ACADEMIC PROGRAMS

Mission:

To guarantee the inclusion of topics on climate change and sustainable development in the curriculum.

2026 goal:

To include competencies for dealing with the challenges of sustainable development in undergraduate degree plans.

Actions:

Mapping SDGs in Undergraduate courses

As a first step in defining the strategy for integrating climate change and sustainable development into degree plans, we mapped the current integration of SDGs in units of study in 2019 undergraduate degree plans.

At present, **17% to 29% of the National Schools' academic programs are aligned with SDGs during the first five semesters** Through March 2023, we identified 147 undergraduate courses that include at least one SDG, which represent ***21% of the units of study of the Tec21 Model (***http://bit.ly/ODSenTEC21***).*** In addition, ten out of the forty-four academic programs include **SDG 13: Climate Action** explicitly in their undergraduate courses, either in the statement of a challenge or problem situation, the inclusion of topics in content modules and learning activities, or assignments for the development of competencies.

Strategy for the Integral Inclusion of Climate Change and Sustainable Development in Degree Plans

Based on the mapping of integrated SDGs, we worked on a strategy for the short and medium term, divided into **two phases**, for the integral inclusion of climate change and sustainable development. In **phase one**, we integrated climate change into 2019 degree plans, while **phase two** is a strategy for 2026 plans aimed at the holistic integration of ESD from the design stage, as described below:

Phase 1

In conjunction with the National Schools, we began implementing phase 1 to ensure that all undergraduate degree plans have at least one required unit of study that relates the discipline to climate change. **By August 2023, all 2019 degree plans will have at least one required undergraduate course related to climate change.**

Within phase 1, we have also worked on designing and implementing pilot training courses and including climate change and sustainable development in the undergraduate curriculum. In the second year of this phase, **the pilot programs have been consolidated to become permanent activities**.

An example is **Tec Week with Human Significance: Climate Emergency and Sustainability Culture**, designed in 2021 in collaboration with the **School of Humanities and Education and the Director of Social Impact**. A total of **4,746 students** have taken this unit of study and have worked with a **Training Partner** to propose sustainability projects on their campus.

Phase 2

Phase 2 of the strategy consists of **including ESD in the new degree plans by updating the curriculum design**, ensuring that sustainable development is addressed in systemic, integrated form into design guidelines for courses. Phase 2 includes the integration of sustainability into transversal competencies for 2026 degree plans. The purpose is to develop the knowledge, skills, values, and attitudes necessary for leadership in sustainable development among students in all undergraduate majors.

Strategy for Including Climate Change and ESD

we encourage sustainable development among students in all professional careers

TRAINING

Mission:

To train teachers in the concepts, methodologies, and pedagogies for education related to climate change and sustainable development.

2026 goal:

To train teachers who will teach undergraduate courses related to climate change and sustainable development. The topics are the concepts, methodologies, and pedagogies of climate change and sustainable development.

Actions:

To reach the goals in this area, a priority is raising teacher awareness and providing teachers with the necessary tools for addressing the topics of climate change, through holistic teaching. To advance in their training, we designed and implemented activities about climate change and ESD in cooperation with the **Center of Teacher Development and Educational Innovation (CEDDIE), the National Schools**, and other key actors both within and outside of Tec de Monterrey.

From April 2022 to February 2023, we organized and taught **five Refresher Courses in the Discipline (CADi) in collaboration with the SDG Initiative at Tec and the School of Humanities and Education**, with an impact on more than three hundred teachers (see Table 1).

In general, these courses seek to allow teachers:

1. To raise their awareness of the urgency of the climate crisis.
2. To develop key competencies for sustainability.
3. To learn the concepts, methodologies, pedagogies, and necessary tools to integrate climate change and sustainable development transversally in their teaching and the design of undergraduate courses.

*Workshop at PrepaTec high school, January 2023

EDUCATION

*CADI "Educating to Face Climate Change," February 3, 2023

We also used other forums and formats to work with a greater number of teachers:

In collaboration with CEDDIE, we organized and offered the **sustainability track** at the National Faculty Meeting in July of 2022, where we held conferences and workshops for more than six hundred teachers.

With the Institute for the Future of Education (IFE), we participated for the second consecutive year in organizing the **ESD** track at the **International Congress on Educational Innovation (CIIE)**. The main event was the keynote speech entitled **"Rethinking Education for a Sustainable World"** and a panel discussion on **"Education and Climate Change,"** attended by more than three hundred participants.

We also designed the diploma course in **"Sustainable Development: Didactic Tools for Climate Action" with the School of Humanities and Education and the Sierra Gorda Ecological Group**, which has been completed by forty-five teachers and is currently being attended by a second graduating class.

We contributed chapter on **"Transversal Competencies and Sustainable Development"** to the guide on ***Development and Evaluation of Transversal Competencies***. The goal is to offer teachers at Tec de Monterrey the necessary tools to promote the development of transversal competencies aimed at sustainable development.

[1] The guide, *Desarrollo y evaluación de competencias transversales* will be published this year.

EDUCATION

EDUCATION

Table 1: Activities Designed for Teachers in Climate Change and ESD April 2022 – February 2023

Type	Name	Organizer	Teachers Impacted
CADi	Educating to Deal with Climate Change: A Transversal Focus	Ruta Azul	22
CADi	SDG Education for Sustainable Development	SDG Initiative at Tec and La Tríada	40
CADi	Dealing with the Climate Crisis from the University Perspective	SDG Initiative at Tec and WRI	19
CADi	Tec Week with Human Significance: Climate Emergency and Sustainability Culture	Director of Social Impact and School of Humanities and Education	230
CADi	Educating for Sustainable Development	School of Humanities and Education and Ruta Azul	40
Evento	Sustainability Track, National Teachers Meeting	Center of Teacher Development and Educational Innovation	632
Congreso	ESD Track, CIIE	Institute for the Future of Education	300
Diplomado	Sustainable Development: Didactic Tools for Climate Action	Sierra Gorda Ecological Group and School of Humanities and Education	45

[4] La Tríada: A consortium of three Latin American universities—Universidad de Los Andes in Colombia, Pontificia Universidad Católica in Chile, and Tecnológico de Monterrey.

Tecnológico de Monterrey

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EVALUATION AND ACADEMIC CERTIFICATION

Mission:

To validate and recognize within the institution the quality of the curricular and co-curricular inclusion of climate change and sustainable development.

2026 goal:

To have a mechanism for the evaluation and certification of teachers trained in the educational methodology and pedagogy for climate change and sustainable development.

Actions:

Once the strategy of curricular inclusion and teacher training are defined, the following step will be to define the qualitative evaluation and certification of the undergraduate courses related to climate change and sustainable development.

In future academic years, **we shall develop a mechanism of evaluation and certification of teachers trained in the methodology and pedagogies appropriate for education in climate change and sustainable development**. This mechanism will be developed with allies in the academic areas and the National Schools.

On the curricular inclusion of sustainability and climate change, we will continue working on including climate change and sustainable development in current and future undergraduate degree plans, cooperating hand in hand with the **National Schools** to attain qualitative curricular inclusion in all academic programs. We shall also continue working on training processes to increase support for teachers and offer pedagogical tools for improving teaching in climate change and sustainable development.

"Climate change awareness means that we, in every profession we are involved in, are increasingly required to understand climate risk and put everything we are working on as part of the solution."

Kotchakorn Voraakhom

Thai landscape architect and CEO of Porous City Network

RESEARCH

AREA 5
APPLIED RESEARCH AND INNOVATION

OUTSTANDING PROGRESS:

1.

We organized the first Call for projects for applied interdisciplinary research and innovation focused on operating campuses as living laboratories.

2.

We launched the educational track for sustainable development for Novus 2023 a call for research projects in educational innovation from the perspective of ESD and SDGs.

Promover la investigación interdisciplinaria.

Mission:

To promote interdisciplinary research that offers systemic solutions for the complexity of climate change and sustainable development challenges.

2025 goal:

To create a fund for encouraging interdisciplinary research in sustainability and climate change, and to convert campuses into living labs for research.

Actions:

Call for Applied Research and Innovation in Ruta Azul

We designed the first call for applied research and innovation in Ruta Azul, to encourage **interdisciplinary research and promote problem-solving innovations in sustainability and climate change** through various levels of impact:

1. Campus operations and maintenance.

2. The university community's attitudes and behaviors.

The call for research projects, which will be published at the end of the first semester of 2023, looks to facilitate the use of campuses and campus communities to promote applied research and innovation focused on mitigation, adaptation, and culture regarding climate change. The campuses will become living labs to gestate projects with potential for escalation and/or development.

We shall finance projects with preliminary evidence that they will result in products, processes, policies, or services that are improved and/or transforming to benefit the institution and contribute to **reaching the goals of Ruta Azul**. The call for research is directed to research professors at all Tec de Monterrey campuses.

RESEARCH

Novus Call for Research 2023

Track on Education for Sustainable Development in the Novus 2023 Call for Research

We constructed and launched the educational track for sustainable action within the Novus 2023 call for research.

Novus is an IFE initiative to strengthen the culture of educational innovation, based on evidence, among the professors of Tecnológico de Monterrey. **By creating this track, Ruta Azul aims to encourage research projects in educational innovation from the perspective of ESD and SDGs, to impact the institution's educational levels.**

ESD promotes the development of skills, knowledge, values and attitudes for students to understand and address the challenges of sustainable development, empowering them to be agents of change.

Research in educational innovation, from the perspective of ESD, will allow us to use our classrooms as living labs for testing and validating methodologies and resources. In this manner, our students will be offered the knowledge and tools for making progress in sustainable development.

These research projects also represent an opportunity to generate new knowledge and better practices that can be shared with other universities or organizations and ensure that education contributes to SDGs.

The Novus 2023 call for research stipulated a deadline of May 26, 2023 for receiving projects from high school, undergraduate, and graduate school professors.

RESEARCH IN SUSTAINABILITY AND CLIMATE CHANGE AT TEC DE MONTERREY

In addition to research efforts in Ruta Azul, for several years the Vice President of Research, the Interdisciplinary Institutes, the National Schools, and research groups have been carrying out projects and initiatives aimed at creating and sharing knowledge to solve problems in sustainability and climate change. This section will describe a number of projects from the current academic year.

Actions:

Water Research

In the context of the state of Nuevo León's water crisis, and in addition to operational efforts to conserve water, we have shared with the general community our actions in water research at Tec de Monterrey.

Since 1992, we have worked on applied research in water technologies and as of today, our institution has collaborated with more than 160 research centers and universities in seventy-one countries, generating 912 publications on related topics, such as wastewater treatment.

In 2008, in cooperation with the Inter-American Development Bank (IDB) and the FEMSA foundation, the **Water Center for Latin America and the Caribbean** was opened to work on applied research, technological development, and innovation and engineering projects. One of these projects is the **Off-grid E2 parking** garage at the Monterrey Campus.

WaterWeek@Tec Event

During this academic year, the Water Center for Latin America and the Caribbean organized two events to raise water awareness:

- ***WaterWeek*@Tec**: The goal was to socialize and increase the capacities of Tecnológico de Monterrey to generate knowledge about water and the environment, through the participation of faculty and students with experience and disruptive ideas. The in-person event was held on the Monterrey, Puebla, and Guadalajara campuses from March 6-10, 2023. The total audience was three hundred students, faculty members, staff, and guests. The event was organized in collaboration with the research group in Water Science and Technology at the School of Engineering and Science.

- **International Water Forum, Monterrey:** An initiative of Tecnológico de Monterrey with the vision of positioning Monterrey as the Latin American center for discussing border issues regarding water. The 2022 Forum analyzed and shared the experiences of international locations on Day Zero, without water (the state of California, Sao Paolo, Brazil, and Cape Town, South Africa). Other topics of discussion were international and national experiences, and pressing challenges in managing urban water. Research projects on water security by Tecnológico de Monterrey students were presented. The event was held October 6-7, 2022 in person and **online**.

Sustainability and Climate Change Laboratory at Guadalajara Campus

Tecnológico de Monterrey's Sustainability and Climate Laboratory was consolidated on the Guadalajara Campus, to develop technological solutions for environmental problems derived from the region's productive activities. Support is provided by the European Union through the ERASMUS+ program. ***The laboratory follows the needs of the public, academic, productive, and social sectors to identify the challenges of sustainability, develop prototypes for the solution, and apply prototypes in the real setting to mitigate climate change, with a focus on science and public policy***.

One of the laboratory's most important projects is described as: ***"A technical research mission in the bioenergy sector on the potential of biogas in Jalisco, with technical collaboration in energy efficiency from the State of Jalisco's Energy Agency and the Danish Energy Agency, within the framework of the Mexico-Denmark Climate and Energy Collaboration Program."***

The project aims to play a central role in developing and planning activities for the production and utilization of biogas in Jalisco, and to help identify sectors with high potential for producing biogas. In addition, a precise baseline will be established for future work in terms of current practices in waste management. Technical and normative aspects were identified to permit using Danish experiences to reduce production barriers for biogas in Jalisco.

Further information on the laboratory's initiatives can be found in the Outreach section.

Research Projects in Sustainability and Climate Change in the Challenge-based Research Funding Program

In July 2022 the first call for the Challenge-based Research Funding Program was published. The goal is to promote scientific research in the institution to ensure that Tecnológico de Monterrey is a leading university in international research that devises interdisciplinary solutions and technological efforts to address the challenges of society.

Included in the call for research was the challenge of "Detonating Sustainability Actions to Respond to the Climate Emergency." The following fifteen projects from the School of Engineering and Science were selected:

We promote scientific research within the university

Table 3. Projects selected in the challenge "Detonate sustainability actions to respond to the climate emergency" in the call Challenge-based research funding program.

Project Name	Topic
"Circular Bioeconomy Strategy for Managing Tequila Vinasses: Analyzing the Effects of Soil Irrigation on Physicochemical Parameters and Microbial Communities"	Managing and Monitoring Sustainability Policies and Laws
"Two-dimensional Materials with Enhanced Reactivity, Based on Defective Molybdenum and Tungsten Disulfide Monolayers, for the Detection and Adsorption of Nano-sized Emerging Pollutants"	Emerging Pollutants
"Recycling Plastic Waste from Automobiles: Finding Potential Applications for Recycled Polyvinyl Butyral (r-PVB) from Windshields"	Circular Economy
"Circularity of a Microalgae-based Wastewater Treatment Applied to Treat Anaerobically Digested Livestock Waste for Climate Change Mitigation: A Pilot-scale Prototype Including Bio-flocculation, Pollutants Removal, and Biomass Harvesting"	Circular Economy
"Sustainable Polyethylene Textiles"	Circular Economy

RESEARCH

Project Name	Topic
"Polymers with High Thermal Conductivity and Their Study in Nanostructures and Microstructures for Applications in Passive Thermal Management"	Clean Technologies and Emerging Energy Sources
"Development of Phase Change Materials (PCM) for Improving Energy Efficiency and the Integration of Solar Technologies in Buildings"	Net Zero Technologies
"Application of New Materials (Graphene and Hydrophilic Graphene) in Electrodes and Proton Exchange Membranes to Enhance Power Generation in a Functional Microbial Fuel Cell Prototype"	Clean Technologies and Emerging Energy Sources
"Assessing the Ecological and Public Health Risks Caused by the Presence of Persistent and Emerging Pollutants in the Santiago River's Sediments"	Emerging Pollutants
"Microplastics in Urban Settings: Establishing a Baseline for Water Pollution from Microplastics in Northern Mexico and Developing Possible Solutions"	Emerging Pollutants

Project Name	Topic
"Recovering Ca-P Crystals for Water Reuse in Nixtamalization"	Water Circularity
"Optimization and Evaluation of Edible Microcarriers for Sustainable In Vitro Meat Production Based on Mesenchymal Stem Cells from Porcine Bone Marrow, as a Sustainable Lifestyle Strategy"	Sustainable Lifestyles
"Circular Economy: Enhancing the Production and Extraction of Bioactive Compounds from Agrofood By-products to Convert Them into Natural Ingredients through Nanotechnology"	Circular Economy
"Valorization of Whey for the Biotechnological Production of Inanimate Cultures with Potential Postbiotic Capacities for Managing Childhood Obesity"	Circular Economy
"Pulsed Electric Field-assisted Fermentation of Oilseed By-products to Produce Probiotic Beverages in the Circular Economy"	Circular Economy

RESEARCH

Research Projects in the Institute of Advanced Materials for Sustainable Manufacturing

In August 2022 operations began at the Institute of Advanced Materials for Sustainable Manufacturing, one of the three interdisciplinary research institutes at Tec de Monterrey.

The Institute seeks to contribute to the development of an economy aligned with the goals of carbon neutrality, through the discovery, development, and creation of advanced materials to attain sustainable manufacturing. It is focused on the design of advanced materials with zero net emissions and no carbon footprint. In addition, it develops and creates high-technology manufacturing processes that accelerate the production of advanced materials with minimal environmental impact.

The Institute's research units are organized into the following areas: accelerated development of smart materials and light materials; advanced high-performance manufacturing processes; enabling technologies for the rapid discovery of advanced materials for the optimization of manufacturing processes; competitive intelligence for sustainable manufacturing; manufacturing bioprocesses; and processes for the reduction, capture and use of CO_2.

The Institute's projects include:

Table 4. Examples of active projects in the Institute of Advanced Materials for Sustainable Manufacturing

Project Name	Description	Strategic Project or Unit
High-performance manufacturing unit	Implementation of a sustainable casting system for incremental automatization to improve energy efficiency and production by regulating air injection, fuel, and the simulation of a microgrid power subsystem.	High-performance manufacturing unit
Smart biodegradable polymers	This project is centered on developing smart polymers commonly used in 3D printing technologies, which are programmed to biodegrade according to their life cycle.	Accelerated materials development
Sustainability of medical devices throughout their life cycle	The project's objective is to evaluate the state of the art and the sustainability gaps in the life cycle of medical devices, paving the way for a set of priorities for improving the sector. The project represents collaboration between Tecnológico de Monterrey and the University of Warwick, with support from the European Network of Safety and Health Professional Organizations and the Longevity Partners consulting firm.	Enabling technologies for acceleration of materials development
Sustainability footprint calculation of two aluminum transformation processes at Lerma plant, Grupo BOCAR	The objective of this project is to determine the carbon footprint of two processes for producing aluminum parts at Grupo BOCAR in Lerma, Toluca. The goal is to support industries (including Grupo BOCAR) in their decision-making to comply with SDGs. The project is being carried out jointly by industry (Grupo BOCAR) and Tecnológico de Monterrey.	Advanced manufacturing

RESEARCH

Project Name	Description	Strategic Project or Unit
Reduction of harvest losses in greenhouses growing raspberries and blackberries	The project's goal is to reduce harvest loss in Mexican greenhouses growing raspberries and blackberries, by supporting producers in reducing food waste through computer vision systems capable of identifying the fruit's maturity and pickers made of advanced materials. The project is collaborating with companies and greenhouses in the state of Jalisco.	High-performance manufacturing unit
Sensors platform for evaluating and forecasting environmental conditions	The objective is to design and develop a portable device based on low-cost sensors to measure and show environmental variables in real time, with the possibility of storing them on an SD card. Measurements should be transmitted in real time and environmental variables forecasted in the short term.	Enabling technologies for acceleration of materials development
Smart sustainable campus	In 2015, the Mexico City Campus launched the sustainable campus initiative involving four significant areas related to the campus' ecological management, applied research, climate and environmental education, and community and business projects. The project's goal is to include the smart concept on a sustainable campus, offering services like smart electric bicycles, solar chargers, smart greenhouses with a solar energy supply, sanitary services including a tele robot to reduce the impact of COVID-19, and a microgrid for energy management.	Enabling technologies for acceleration of materials development
Development of a smart edible coating for preserving berries	The project is focused on developing a smart edible coating based on natural compounds and biopolymers of agro-industrial subproducts, formulated in nanoparticles to enhance bioactivities, increase shelf life, reduce investment costs and environmental impact, and reduce the requirements of cold chains, with a direct impact on reducing the carbon footprint. Developing this coating will generate benefits for producers and the marketing chain, as well as the National Agrofood System for Rural Development and the final consumer.	Bioproduction systems for sustainable manufacturing

We aim to generate innovative research projects on sustainability and climate change

Research Projects in National Schools

In addition to these projects, **the National Schools and their research groups carry out various collaborative efforts** with universities, companies, agencies of international cooperation, and other actors to **generate innovative research projects in topics of sustainability and climate change**.

Presented below are several projects being carried out in Tec de Monterrey's National Schools:

School of Architecture, Art, and Design

What is the City's Progressive Construction? Global Experience and Local Complications in Latin America

This article argues that in the frenetic global competition for an "inhabitable" or "sustainable" city, local governments are often not significantly involved in the contentious power relations and the democratization of urban decision-making. The article was written through collaboration between Tecnológico de Monterrey and the University of Michigan, and emphasizes how inequity is frequently perpetuated in the desire to create cities that are more sustainable.

Akxo, Urban Aerial Mobility System

Akxo® is project for developing an independent aerial vehicle for urban transportation, directed by a multidisciplinary team in Guadalajara, Estado de México, San Luis Potosí, and Puebla. The initiative faces sizable challenges. One is the autonomy of the vehicle, which must be able to travel forty kilometers in the city and remain in the air for thirty minutes—sufficient time and distance for crossing any city in a straight line and at speeds of approximately one hundred kilometers per hour, with low emissions and noise.

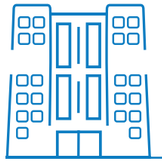
School of Social Science and Government / School of Government and Public Transformation

Advice and Support in Long-term Climate Strategies and Exploratory Models for Supporting Reports on Climate and National Development

This project consists of developing a modeling platform for supporting the design of decarbonization strategies, considering the costs and benefits of a broad range of industrial transformations in the sectors of waste, forestry, livestock, agriculture, energy, and transportation. The project is being carried out in collaboration with the **RAND Corporation**, the World Bank, and the Inter-American Development Bank.

A Micro Simulation Model Based on Transport Agents for SIUM (Metropolitan Urban Information System)

In Monterrey, the proportion of public transportation has decreased from 65% to 25% in thirty years. Since transportation produces 30% of CO2 emissions, mitigating climate change requires increasing the use of public transportation and nonmotorized transportation. This goal will be attained by planning political responses and infrastructures.
The project is being carried out in collaboration with the University of Toronto, University of California, Nuevo León Council, Civic Council, "Cómo Vamos" Nuevo León, Nuevo León Secretary of Transportation, municipal governments, Board of Metropolitan Collaboration, the Inter-American Development Bank, and the FEMSA foundation.



School of Engineering and Science

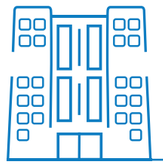
Evaluation of Groundwater Systems in Monterrey's Metropolitan Area and Their Priority Recharge Zones

The study aimed to identify, delimit, and characterize the hydrology and hydrogeology of the groundwater systems in the Monterrey metropolitan area and neighboring regions in order to identify, characterize, and prioritize the recharge areas of the regional aquifers. The goal is to contribute to planning underground water use and improving its sustainability level. The project was carried out in collaboration with the **Permanent Forum of Binational Waters.**

RESEARCH

Decarbonizing Mexico's Industrial Sector: The Industrial Potential of Nuevo León as a Case Study for Defining Technological and Public Policy Routes

The decarbonization of the industrial sector, in particular intensive energy industries, is a key point of discussion in the nation's decarbonization. Identifying plausible decarbonization routes in developed nations serves as a reference for developing the most adequate routes for developing countries, like Mexico. The project's goal is to determine which technological paths and public policy frameworks would be most necessary and cost efficient for Mexico, through the lessons learned in other countries. The project is being carried out in collaboration with Stanford University and the Secretary of the Environment in Nuevo León.



Business School / EGADE Business School

The Roles of Product Participation and Culture in the Relation among Perceived Corporate Social Responsibility, Commitment to the Brand, Consumer Identification with the Brand, Value, and Intended Behaviors

Although evidence points to relating a favorable perception of corporate social responsibility with improved attitude and trust in the brand, some elements suggest that cultural characteristics and product involvement can play an important moderating role in this relationship. The study aimed to identify the roles that products and culture play in corporate social responsibility in a transition toward more responsible production and consumption. In addition, these elements could be key for improving the effect of the relationship on intended behaviors regarding the brand. The project is being carried out in collaboration with Universidad de Valencia.

School of Humanities and Education

Construction of Sustainability Culture Index for Ruta Azul

Teachers and researchers in the research subgroup on Sustainability and Anthropocene (Research Group in Humanities for Sustainability) constructed the Sustainability Culture Index, an instrument designed specifically for Ruta Azul to measure annually the knowledge, attitudes, ideologies, and behavior related to sustainability among students, faculty, and staff.

The index offers detailed information for: 1) designing experience programs; 2) making informed decisions; and 3) measuring the progress of Ruta Azul in its commitment to encourage a culture of sustainability at the institution.

The Index is based on current literature on sustainability culture and pro-environmental behavior and uses descriptive and inferential statistics for data analysis. More details on the Sustainability Culture Index can be found in the Measurement section of this report's chapter on Culture.

RESEARCH

School of Medicine and Health Sciences

Relation of Serum Levels of Endocrine Disruptors in Women with and without Breast Cancer in a Population in Northwest Mexico

Breast cancer is a world health problem. Nuevo León is the state with the highest incidence of breast cancer and the second highest breast cancer mortality rate. Diverse studies have associated the increase in cancer cases with the world increase in environmental pollutants. In the specific case of breast cancer, pollutants are associated with endocrine disruption. The goal is to carry out an epidemiological study of cases and controls among patients with and without breast cancer in northwest Mexico, to measure diverse endocrine disruptions and determine their association with breast cancer, and to discover serum and urine levels are determined by the geographical place of residence.

The above projects and initiatives confirm Tec de Monterrey's actions, through its National Schools and Interdisciplinary Institutes, on topics of sustainability y climate change. These efforts link external actors and show the incidence of research and innovation in local and national settings.

In the Research area of Ruta Azul, we shall continue working on developing and launching our calls for applied research and innovation. We shall announce educational innovation projects for sustainable development to be implemented through Novus, as we continue publishing the institution's scientific work on these topics.

"If we bring together all the knowledge systems we have – science, technology and traditional knowledge – we can give the best of ourselves to protect our people, protect our planet and restore the ecosystems we are losing."

Hindou Oumarou Ibrahim
Association for Indigenous Women and Peoples of Chad (AFPAT)

AREA 6
OUTREACH

OUTREACH

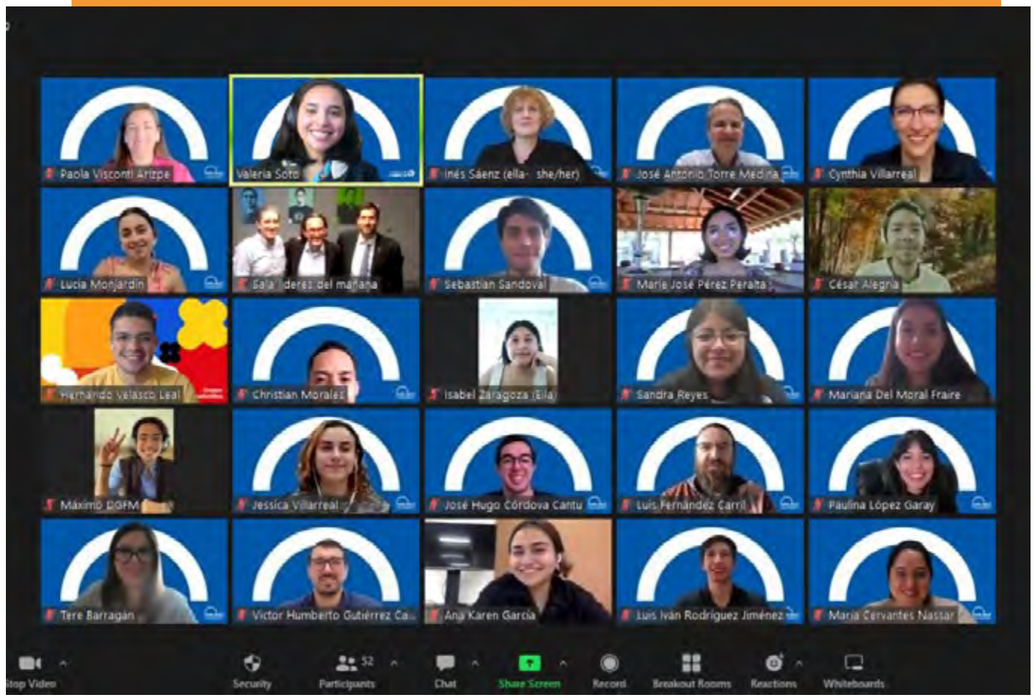
OUTSTANDING PROGRESS:

1.

We launched the Ruta Azul Student Committee, which allows us to establish a direct link with students on all campuses. The Committee is formed by thirty-four student leaders in sustainability from each university and high school campus. It is a joint effort with the **Directorship of Student Groups in Leadership and Student Training** (LiFE).

2.

We launched the ***Life Long Learning Green Academy*** to guide organizations in developing a culture aimed at sustainability, training leaders in sustainability, and raising the awareness of the private sector in identifying climate risks, in conjunction with the **Vice-Rectory of Continuing Education**.



Ruta Azul Student Committee

3.

For the second consecutive year, we participated at the

Conference of the Parties of the United Nations Framework Convention on Climate Change (COP27),

the most relevant event on climate action at the international level, with a delegation consisting of staff, two researchers, and one student.

MISSION:

To catalyze climate action within society as a whole.

2025 GOAL:

To be a leading actor in mobilizing climate action in Mexico.
To reach this goal, we are working simultaneously in four areas: **Alliances and Networks**, **Outreach**, **Community Education**, and **Strategic Projects**.

OUTREACH

Mission:

To involve the Tec community in implementing Ruta Azul.

2025 goal:

To design processes and mechanisms to motivate and ensure the Tec community's involvement in the Sustainability and Climate Change Plan for 2025.

Ruta Azul is for everyone. We are involved, we cooperate, we collaborate, and we make visible the institution's actions for sustainability.

OUTREACH

Internal Linkages Chart

Tecnológico de Monterrey

ruta azul

Listed below are projects that exemplify the Tec community's outreach in sustainability and climate change: from the perspective of campuses, students, and National Schools

Ruta Azul Student Committee

In October 2022 we launched the Ruta Azul Student Committee in collaboration with the **Directorship of Student Groups in Leadership and Student Training** (LiFE). The Committee consists of thirty-four students who belong to the Student Federations (FETEC) and the High School Student Societies (SAPREPA) on all of the institution's campuses.

The Committee's purposes are to **articulate, motivate, and strengthen student efforts in sustainability and climate change on the institution's campus, through FETEC and SAPREPA**.

Since its launching in October 2022, the Student Committee has been working on the following:

- To map student initiatives in sustainability on all campuses.
- To adapt the Sustainable Events Guide to permit its use in the operations of student groups.
- To carry out the semester project, "***En Ruta***," which seeks to strengthen the culture of sustainability in the student community, by creating the Sustainability Declaration in campus groups. The project will also offer the student community workshops and conferences on sustainability.

OUTREACH

Mapping student sustainability initiatives

Tecnológico de Monterrey

ruta azul

The Student Committee is an outreach project promoted by Ruta Azul. In addition to the Committee, multiple initiatives are promoted by diverse areas and campuses. Some of these projects are mentioned below.

Eugenio Garza Lagüera Entrepreneurship Institute

Ranging from networking activities to incubation and acceleration programs, the Eugenio Garza Lagüera Entrepreneurship Institute (IEEGL) promotes conscious entrepreneurship and links organizations that encourage the creation of companies with purpose and impact, declaring that for Tec, entrepreneurship is: "the conscious process of generating opportunities that create value with a positive impact."

Below we present three iconic initiatives in sustainable entrepreneurship:

- The ***HEINEKEN Green Challenge:*** is an initiative promoted by HEINEKEN México, which has accelerated eighty-five innovative projects that have solved socioenvironmental problems in Mexico in the last five years. It has issued a call to 11,114 entrepreneurs offering more than seventeen million pesos in benefits and five million pesos in **equity free** capital.

- In 2022, IEEGL launched the **Conscious Venture Accelerator** that seeks to promote 150 entrepreneurial actions during the next five years to maximize growth, creating value with a positive impact for all stakeholders. The first generation is currently underway, with thirteen companies in three Latin American nations.

- In 2023 **CATALI.5°T,** will be launched in collaboration with **German Cooperation for Sustainable Development (GIZ)**, **Green Climate Fund (GCF)**, **Climate Knowledge and Innovation Community (CKIC)**, and **Investisseurs & Partenaires (I&P).** The objective is to support rapidly scalable companies in their early stages, which show climate solutions with high potential in Latin America.

SDGs at Tec's School of Social Science and Government

The SDG Initiative at Tec participated in the **National Council for Implementing the 2030 Agenda for all of 2022**. It takes part in the Council's four committees: Environment, Economy, Feedback, and Strategy and Wellbeing.

In March of 2022, the SDG Initiative at Tec participated in the **Mexico Partnership Forum of the United Nations** in Merida, Yucatan. It aimed at strengthening relationships and participation among relevant sectors and actors and accelerating the attainment of SDGs in Mexico

In conjunction with the universities of ***La Triada***, the second ***La Triada* Conference on Sustainable Development** was held in April of 2022, centered on "Lessons from the Pandemic for Attaining Sustainable Development in Latin America."

In April of 2022, the initiative of **"Solutions 2030: Promoting Local Sustainable Development"** facilitated the solution of challenges in sustainability in various municipalities in Mexico, through the participation of the public, private, and social sectors. It was promoted by the **Secretary of the Economy**, **GIZ México**, and the **Sustainable Development Solutions Network in Mexico (SDSN).**

In December 2022, the first phase of **"SDG Platform for Local Action"** was presented as an online community open to all who promote SDGs, the participation of subnational governments (states and municipalities), and local replicators (civil society, educational institutions, the private sector, and citizens) in all municipalities and states in the nation. Aimed at consolidating multi-actor alliances and strengthening capacities, the initiative enjoys the collaboration of **GIZ México**, **CEMEX**, and the **United Nations.**

Querétaro Campus

Interuniversity Manifesto for Circular Querétaro to deal with the challenges of climate change, sustainability, and the transition toward a circular economy in the State of Querétaro.

The Querétaro Campus's goals for 2025, the year it celebrates the fiftieth anniversary of its founding, have four strategic priorities: Academic Activities; Internationalization; Innovation and Entrepreneurship; and Inclusion, Social Impact, and Sustainability.

To align with the priority of Inclusion, Social Impact, and Sustainability, the Querétaro Campus led the design, planning, and execution of the signing of the **Interuniversity Manifesto of Circular Querétaro**, with the participation of more than thirty high school institutions and institutions of higher education in the State of Querétaro. The manifesto includes twelve commitments that range from developing research projects, promoting a culture of sustainability and circular economy in programs of study, up to interinstitutional and intersectoral cooperation for sharing best practices.

Guadalajara Campus

Laboratory of Sustainability and Climate Change on the Guadalajara Campus

The Laboratory of Sustainability and Climate Change on the Guadalajara Campus is **a space of exchanges among academia, government, and society** that has attracted outside funds to finance research projects. .

Projects are centered on local problems such as the use of tequila wastes in irrigation and the management of construction wastes and demolition. The PROAN company has collaborated in developing a prototype for an anaerobic digestor for the cultivation of microalgae. Fourteen scientific articles have been published in well-known journals, and students have received prizes and recognition for their work.

Events have been organized with actors in the public and private sectors:

- Organization of the **Mexico Carbon Forum 2022** conference, along with **MEXICO2**.
- Attendance at the Conference of the Parties of the United Nations Framework Convention on Climate Change (COP27).
- Organization of a **Hackathon** to generate proposals to apply artificial intelligence in the analysis of water quality data.
- Participation in the Multisectoral Dialog — Artificial Intelligence and Sustainability.
- Organization of working groups in collaboration with the Government of the State of Jalisco.

Tripartite working group with the participation of the **Mexican Chamber of the Construction Industry and the Ministry of the Environment and Territorial Development (SEMADET).**

Signing of an agreement with the **Metropolitan Planning Institute.**

Projects are underway in collaboration with actors from the public and private sectors, such as **SEMADET, the State Water Commission, CEMEX, PROAN, and ANEBERRIES.**

Estado de México Campus

Greenhouse

The greenhouse is a rehabilitated space on the Estado de México campus, designed to protect plants from environmental damages.

The goal of this modernized space is to generate ideas that solve problems for society and government: on one hand, problems related to agriculture, ranging from crop improvements to the production of metabolites obtained from plants; and on the other, the opportunity to share learning with the community in workshops.

The greenhouse is divided into four areas with specific ends: windrow farming, hydroponic farming, vertical farming, and an area equipped with tables where the pots are located. This project gives the EIC an exclusive space for cultivating species, favors internal and external research processes, and supports sustainability initiatives.

This project will benefit close to three hundred undergraduate students in biotechnology engineering and is open to nanotechnology engineering and chemical engineering students on the Estado de México Campus. Graduate students will also be able to carry out projects in this space.

Monterrey Region

During this academic year, the Monterrey Campus has implemented projects previously mentioned in this report's sections on Culture, Adaptation, and Mitigation:

- Composting pilot (Culture).
- Manual of best practices for sustainable practices in tree management (Adaptation).
- A living laboratory in the **E2 off-grid** parking area (Adaptation).
- Floodable urban forest, Parque Central - distritotec (Adaptation).
- Construction **permit GreenShip** (Mitigation).
- Chargers for electric vehicles and the purchase of electric vehicles (Mitigation).
- Arroyo Vivo (Outreach).

Further project details can be found in the sections on Culture, Adaptation, and Mitigation in this report.

Presentations at Tec

From April 2022 to date we have participated in a total of **twenty events at Tec** to establish dialogs and links with students, to provide training for teachers and increased awareness for staff, and to hold campus meetings. For example:

Annual Board Meeting

In the framework of the Annual Board Meeting at Tec de Monterrey in 2023, we participated as moderators in a conversation with Dr. Katharine Wilkinson, a writer, activist, and expert on climate change, and students from the Monterrey Campus. Dr. Wilkinson's talk emphasized that individual leadership can change systems, and that we must use our education to contribute to solving the climate emergency.

Conversations with Katherine Wilkinson

Lead the Future

We were present at Lead the Future, a training event for approximately five hundred students from groups on the Monterrey Campus. The goals were to raise student awareness and train student leaders to become familiar with climate action initiatives at Tec.

INCmty

Ruta Azul participated for the first time at INCmty, an entrepreneurship festival, by sponsoring a stand and participating in the panel discussion on "From crisis to climate opportunity: The potential for climate innovation." The stand introduced Ruta Azul and distributed articles from ***Stanford Social Innovation Review en español*** that deal with sustainable entrepreneurship. The panel discussions included representatives from various universities who discussed projects and initiatives related to sustainability and climate change, as well as providing support for students on research projects. The primary goal was to present the perspectives and actions that universities have carried out to deal with the climate crisis.

Lead the Future Presentation

ALLIANCES AND NETWORKS

Mission:

To promote participation in national and international alliances in favor of climate action.

2025 goal:

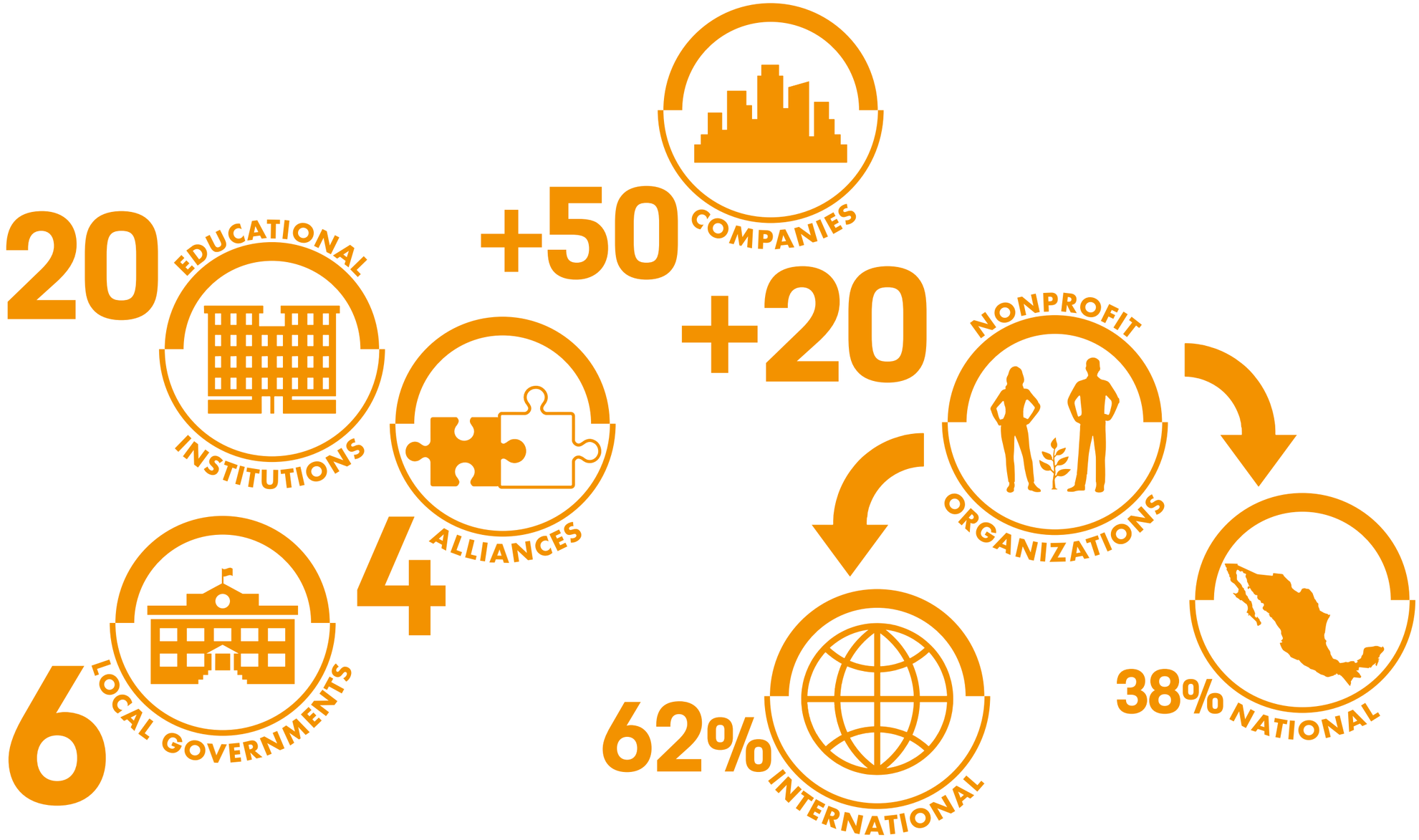
To participate actively in national and international networks that allow us to connect, share, and learn from the actors in society who work for climate action.

Actions:

We work to create collaborative links with society by establishing contacts with local governments, private initiatives, educational institutions, and organizations from civil society in Mexico, the United States, Canada, and countries in Latin America and Europe. This outreach will help us to disseminate Tec de Monterrey's commitment and ambition in climate action, to explore areas of collaboration, and to share experiences, challenges, and learning. To date, we have established links with:

- Five alliances of universities and organizations in civil society focused on climate change and sustainable development, in which we participate actively
- Twenty educational institutions
- Six local governments
- Fifty-one companies
- Twenty-eight nonprofit organizations

OUTREACH


20
EDUCATIONAL INSTITUTIONS
+50
COMPANIES
+20
NONPROFIT ORGANIZATIONS
4
ALLIANCES
6
LOCAL GOVERNMENTS
62% INTERNATIONAL
38% NATIONAL

We hope to increase our outreach by promoting goals and projects. In this second year of work, we have participated at **fifty national and international events** to disseminate the Plan, to communicate the urgency of climate action, to present initiatives, and to reflect on university roles.

OUTREACH

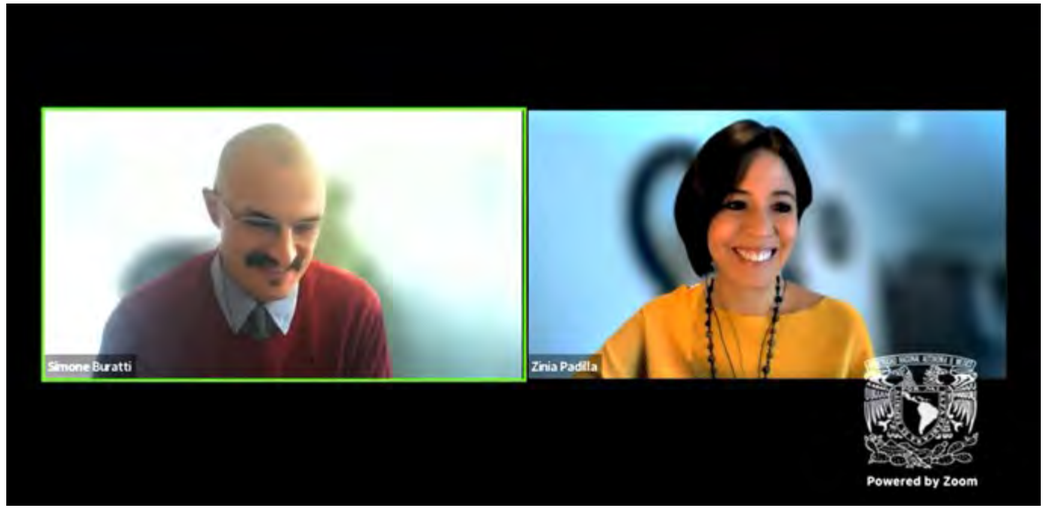
We continue to participate in networks and alliances focused on making progress on SDGs and climate action, primarily within **Mexico's Alliance for Climate Action (ACA-MX)**, the **University Climate Change Coalition (UC3)**, the **International Sustainable Campus Network (ISCN)**, the **University Global Coalition (UGC)**, and **SDSN.**

Some of the most relevant events where we have participated are:

Online participation in a panel discussion, and in-person participation in the working groups at the **UC3 Vancouver Summit: Catalyzing Partnerships to Accelerate Climate Action and Climate Solutions across Sectors and Scales**, on June 23, 2022.

- Annual UGC conference in October 2022, through the organization of a panel discussion on **Partnerships for Climate Action** and David Garza's participation in a panel discussion of university presidents.

*Tec participation at annual UGC conference, October 2022



*Tec participation at ISCN — LATAM chapter, June 2022

We organized an online conference of **ISCN – LATAM Chapter** on "Towards a Culture of Sustainability" on June 29, 2022, in collaboration with UNAM

The SDG Initiative at Tec coordinates SDSN Mexico in conjunction with UNAM; the group has a current national membership of ninety universities. In 2022, SDSN Mexico participated in training more than eighty people in the legislative branch and in local government, and implemented social projects with a focus on sustainable development.

In late 2022, we accepted an invitation to form part of the **board of directors of UC3**: the first and only Mexican university to belong to the network's guiding body. Our inclusion allows us to participate in strategic decision making on the alliance's future. Ever since the creation of UC3 in 2018, Tecnológico de Monterrey has been included in the coalition.

Training on Strategic Communication ACA-MX – ZIMAT Consultants

As a member of ACA-MX, we take part in training in strategic communication led by ZIMAT Consultants. We participate in four workshops with topics such as communication materials, reputation, frequency, and collective action.

In addition, as members of ACA-MX, we have worked on implementing collaborative projects such as Arroyo Vivo (see section on Strategic Projects). We participate in various events and workshops of COP27, described below.

Conference of the Parties of the United Nations Framework Convention on Climate Change 2022 (COP27)

In November of 2022, we attended for the second consecutive year the **Conference of the Parties of the United Nations Framework Convention on Climate Change**, held in Sharm El Sheikh, Egypt. Our delegation consisted of seven individuals: two researchers, one student, and staff.

Our goal for participating in COP27 was to position universities as catalyzers of global climate action, to share the progress of Ruta Azul to date, and to strengthen our alliances.

To prepare for COP27, on November 3, 2022 we participated in the **Interdisciplinarity symposium for the Net-Zero Transition** organized by **ISCN**, as well in the **UC3 COP27 Prep Series of webinars**, and **Second Nature** in the panel discussion on **Key Issues to Watch at COP27**.

From November 6 to 18, during the Conference, we had a total of nineteen interventions at nine events: panel discussions, presentations, global planning meetings, seven personal meetings with Mexican government officials, Tec alumni, and allies—UC3, ACA, and three **networking** events with UC3, ACA, and the Mexico Climate Initiative (ICM). Outstanding events included:

Presentation of the State of Nuevo León and Monterrey Metropolitan Area Climate Action Program, in conjunction with **ICM, World Wildlife Fund (WWF),** ACA-MX, the governor of the state of Nuevo León, Samuel García, and the mayor of Monterrey, Luis Donaldo Colosio.

Accelerating Action among Sectors: Higher Ed Commitment to Climate Action, with UC3.

Dry Cities: Managing Water Scarcity in Cape Town, Los Angeles, Monterrey, and Santiago, with ACA.

Along with fellow lead authors from the **6th Assessment Report of the Intergovernmental Panel on Climate change (IPCC)**, and **Climate Action in the SDGs: Sharing the Insights from IPCC Reports.**

On our return to Mexico, we organized an event on Tec at COP27: Catalyzing Climate Action, to engage in a dialog with the delegation on the challenges of climate action.

OUTREACH

Earthshot Prize

On the invitation of the **Royal Foundation** of the United Kingdom, we were an official nominator of ***The Earthshot Prize*** for the third consecutive year, the sole Mexican organization that forms part of the nominating committee. The Earthshot Prize is a large-scale environmental prize that aims to promote initiatives that propose solutions for the planet's environmental problems.

As a nominating institution, we issued a call for projects, with more than seventy respondents in Mexico and abroad. On finalizing the process of evaluation, five nominations were sent to the organizing committee. The results will be announced in late 2023.

COMMUNITY EDUCATION

Mission:

To offer education on climate change and sustainable development directed to the outside community.

2025 goal:

To ensure and promote the design and implementation of educational programs for increasing the outside community's awareness and training in climate change.

Actions:

In this academic year, the formation of the **Lifelong Learning Green Academy** was consolidated in the Vice-rectory of Continuing Education, with the goal of helping organizations to develop a culture aimed at sustainability, training leaders in sustainability, and raising the private sector's awareness in relevant topics, such as the identification of climate risks. **The Green Academy's topic**s are a culture of sustainability and the development of **green skills**, green strategies of companies, and adaptation to climate change. These topics contain activities of intervention in the form of training, **webinars**, consulting, and certifications

The impact to date is reflected in **twelve webinars**, with a total of **617 participants**. The consolidation of the **Lifelong Learning Green Academy** is also reflected in the international scope for expanding training in climate action. For example, in the sustainability chapter of the Network of Continuing Education in Latin America and Europe (RECLA), we offered a conference on climate change to more than one hundred participants. We also established links with organizations in Colombia, Chile, Ecuador, and Costa Rica. In Mexico, we worked with companies to take them to the next level in sustainability, and we continued working to offer training and consulting to organizations to support them on their path to sustainability.

Leadership for Climate Action: The Role of the Corporate Board of Directors

In 2021, **EGADE Business School**, the Conscious Company Center, and **Chapter Zero** Mexico, the climate change initiative of the World Economic Forum, established an alliance to offer the first program in climate governance for members of the **C-Suite** board, to allow them to lead the climate governance agenda in the organizations.

The program began in August 2022 with twenty-seven participants from eighteen companies, nine instructors, and speakers from various sectors and areas of specialization. A digital course was supplemented by direct sessions every two weeks, for a total of thirty hours.

STRATEGIC PROJECTS IN RUTA AZUL

The strategic projects of Ruta Azul are initiatives and programs that integrate actors in design and implementation. Through these projects, we seek to generate climate solutions in close collaboration with the internal areas of our institution, as well in connection with organizations from civil society, the public and private sectors, alumni communities, and communities adjacent to our campuses.

Arroyo Vivo

Arroyo Vivo started up in 2022 and has been developed in four phases of operations: exploration, remediation, pilot waste management, and the projection and design of infrastructure related to construction of a remodeled Recycling Center on the Monterrey Campus that can offer greater service to nearby communities, including distritotec, Campana, and Altamira.

During this first year, we established twenty-two intersectoral strategic alliances with three levels of government, private initiative, organizations from civil society, neighborhood organizations, and academia.

Four massive volunteer days have been carried out for selective cleanups, with the participation of more than five hundred volunteers and the prevention of more than five tons of ocean waste. These volunteer days have included the removal of more than 1.4 tons of invasive exotic plants.

The volunteer days have allowed us to log waste by means of the ***Circularity Assesment Protocol***, activities of citizen science, and photographic documentation. As of February 2023, we have more than sixteen thousand logs of solid urban waste, with a clearer image of how waste management functions. Having a graphic image or map will help us to make decisions about pertinent actions, and in particular to determine where to establish or strengthen alliances with regard to the movement of waste along riverbeds. .

Working with neighbors who are committed to the project, we have defined four lines of action for remediation: **Arroyo Vivo en todos lados, Arroyo Vivo sin residuos, Arroyo Vivo seguro y Arroyo Vivo en equilibrio.**

In 2023, we hope to conclude the selective cleanup days, establish academic links not only with undergraduate students but also with graduate and high school students, and achieve a pilot design and waste management plan that can serve as a guideline for other bodies of water or natural areas in similar condition.

Circular Systems Pilot in Cafeterias

In the second semester of 2022, we implemented a project in collaboration with TecFood to attain circularity in the operations of our cafeterias on the Monterrey Campus: Centrales and El Jubileo. Our goal is to be a model institution of sustainable waste management, with the priority of waste reduction. In the early stages, we have concentrated on diverse efforts that can be consulted in the sections on Culture and Mitigation.

We shall continue working on reducing disposables (of all materials). To do so, we shall implement a circular system of lending reusable containers, glasses, and utensils, and automatized machinery that facilitates the process of lending and returning these products.

The system will be functioning during the second semester of 2023, with the installation of two machines of the Monterrey Campus, one on the Guadalajara Campus, and one on the Querétaro Campus.

Implementing the system will achieve annual reduction of more than 316,250 single-use products (disposables) in the cafeterias on the Monterrey Campus, translating into approximately 6.3 tons of disposables avoided each year.

The climate emergency crosses borders and requires the collaboration of diverse actors in society to catalyze climate action. It is fundamental to forge links of collaboration, mutual learning, and understanding to reach the goals we have established. Outreach permits the generation of national and international alliances to promote climate action and active community participation in sustainable initiatives. Such action can contribute to accelerating the process of transition toward a more sustainable future and mitigating the negative effects of climate change in society and the environment. In this sense, outreach is a key piece in the effective implementation of the path we have established.

To continue on our mission of catalyzing climate action in society:

- We shall work to ensure that the Tec community is involved in actions for sustainability.
- We shall strengthen our participation in national and international networks, broadening our collaboration with diverse actors in society. We shall also lead the implementation of actions and projects to involve more actors in the struggle against climate emergencies.
- We shall join efforts with Mexican universities to contribute jointly toward the compliance of Mexico's commitments under the Paris Agreement.
- We shall strengthen the community's knowledge and skills in climate change and sustainable development through access to educational programs.
- We shall seek to promote and support the joint design of public policies and legislation aimed at sustainable development.

OUTREACH

RESULTS OF RANKINGS

THE Impact Rankings 2022

The participants in the fourth year of the Times Higher Education (THE) Impact Rankings included 142 Latin American universities in at least four of the seventeen SDGs.

This ranking measures the positive impact of universities' contribution to the seventeen SDGs in research, resource use, and the scope of joint work with the community and State. As in previous years, we participated in sixteen[1] of the seventeen SDGs. .

In 2022, we were positioned in Latin America as follows:

First place in:

Second place in:

Third place in:

In terms of SDG 13 specifically, we moved from fifth to first place in Latin America, where we excel in our use of renewable energy, environmental education, commitment to carbon neutrality, and research on climate action, as well as other actions.

[1]The exception is SCG 14: Life Below Water, where we are not active.

These positions are the reflection of the work Tecnológico de Monterrey has carried out in research, institutional policies and programs, and the scope of our alliances with society focused on SDGs.

GREENMETRIC 2022

The Monterrey Campus has participated since 2016[2] in the ***GreenMetric World University Ranking,*** which classifies the commitment of 1,050 universities to sustainability and the environment through thirty-nine indicators and six criteria (Infrastructure, Energy and Climate Change, Waste, Water, Mobility, and Education and Research).

At the world level, we have moved up 178 positions since 2020, reaching position 274. At the Latin American level, we climbed twenty-four places to reach the thirty-seventh place, and in Mexico, we are in eleventh place, an improvement of three positions since 2021.

Incorporation of a New Indicator

Since 2016, Tec de Monterrey has participated in the ***GreenMetric*** ranking to evaluate only the Monterrey Campus. The rating is used as an indicator for Ruta Azul, but is suboptimal for measuring the project's impact, which occurs on the national level.

We are currently working on adding the STARS methodology to provide greater visibility and recognition to sustainability actions implemented at the local and national levels on all of our campuses.

•STARS has a transparent assessment framework created specifically for universities to measure their sustainability performance in five major categories: Academics, Engagement, Operations, Planning, and Innovation. At present, more than 580 universities around the world report to STARS, and more than twenty universities on the Top 50 QS ***World University Rankings*** use the methodology.

[2] In 2018 and 2019, no information was sent, yet Tecnológico de Monterrey continued to be evaluated according to the most recent information transmitted.

Every tenth of a degree of warming matters.
Every year matters and every decision matters.

Petteri Taalas y Joyce Msuya
IPCC Special Report on Global Warming of 1.5°C

Tecnológico de Monterrey

ruta azul

In Closing
Annual Report 2022

Cynthia María Villarreal Muraira
Jaime Fernando Dorantes Cabrera

These pages underline the achievements we have made and the challenges we have ahead. We can affirm with confidence that we have progressed notably in each area of Ruta Azul, the Sustainability and Climate Change Plan. We are enthusiastic about having taken one step more toward meeting our goals, with renewed aspiration during this cycle—**to build a sustainable future by adopting a proactive culture in the face of the climate emergency, reflected in actions of MITIGATION, ADAPTATION, EDUCATION, RESEARCH and lead us to BE A MODEL OF A SUSTAINABLE INSTITUTION.**

With complete certainty, we shall have to face and solve future challenges, and meet goals and objectives. We shall make all possible efforts to do so, as we hope to have shown in this report on our institutional efforts in dealing with the climate crisis.

The data and figures that we present as evidence of institutional progress contain an element that may not be appreciated at first glance: the enormous efforts of thousands of people who are convinced of the possibility of forging a better future. Behind each attainment and advancement stand the commitment, will, heart, and conviction of countless individuals. They represent the efforts of the base team, the extended team, and of the entire institution in mapping, creating paths, and moving forward toward sustainability. The individuals who advance in this daily struggle are the true soul of Ruta Azul. We deeply appreciate and recognize all who have been part of this report and these efforts.

On the second anniversary of its launching, Ruta Azul continues to make progress on a consolidated road that has a horizon yet no end in sight. Efforts for a sustainable world are unending, as are the conviction and desire to ensure a better future for upcoming generations.

Through our reported progress, we hope to have transmitted the conviction and satisfaction that this work generates among our students, faculty, staff, and readers. Our desire is for the report to serve as inspiration as well as a seed of hope for people avid to join our struggle against the climate crisis.

Hope gestates through the collective actions that produce systemic changes and tangible impacts for people. May all of us at Tecnológico de Monterrey spread inspiration and the hope for a sustainable world. Yes, we can. #elrumboesclaro #Ruta Azull.

Ruta Azul Team

Tecnológico de Monterrey

ruta azul

2025 SUSTAINABILITY AND CLIMATE CHANGE PLAN