

CETYS University Commitment to Sustainability. Experiences of a Mexican Private University



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Abstract CETYS University is a multicampus (three campuses) private university located in the Northwest corner of Mexico, on the border with California in the United States. The climate in the region goes from arid (Mexicali Campus) to semi-arid (Tijuana and Ensenada Campuses) and the most important environmental problems faced by the campuses are: water scarcity, long-term drought, and the impacts of climate change (e.g. changes in rain regimens, increase in atmospheric temperatures and wildfires, among others). This paper shows the efforts done by the institution in terms of new constructions of green/smart infrastructure, water management, use of renewable energy—to take advantage of its location and climate, and waste management programs. The installed solar photovoltaic capacities (1.2 MW) makes CETYS the academic institution with the largest potential in Latin America. The wastewater treatment plants in Tijuana and Mexicali campus reduce significantly the amount of new water required, and finally, the “Zero Waste” program has given excellent results internally, which has allowed CETYS to expand this experience and provide service to the community that surrounds the Tijuana campus. Through these dimensions of analysis, this paper tries to show CETYS’ commitment to sustainability and its regional leadership around this issue.

Keywords Sustainability · Mexico · Baja California · Water scarcity · Private university

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1 Introduction

The Center for Higher and Technical Education, CETYS University is a private university located in the state of Baja California, México, in the northwest part of the country, adjacent to the border of California in the United States. With 62 years of existence, the institution has three campuses in the cities of Mexicali (state capital), Tijuana and Ensenada, with a total student population of 5249 (year 2023) and 48,300 alumni. As a non-profit institution, 80% of the students have some type of scholarship or financial support, and according with its educative model, 69% have had some kind of international experience (León 2023).

CETYS Strategic Plan 2010–2022 establishes four main components or dimensions in its mission: (a) high educational quality, (b) competitive worldwide, (c) functioning as a learning community and (d) recognized by its actions and results in favor of sustainable development (CETYS 2010). In the new CETYS 2036 Development Plan (2023–2036), the institution not only reaffirms its commitment to sustainability, but also seeks to intensify its actions in this regard, in all areas of university work, with special emphasis on the renewed commitment to the Sustainable Development Goals of the United Nations 2030 Agenda (INESU 2023).

In this context, in 2023 the Institute for Sustainability Studies (ISS) was created, with the aim of: organizing, coordinating, promoting and lead the actions that the institution has been developing over the years and that will develop around sustainability. Among the actions developed by ISS, it is worth highlighting the awareness of more than 2000 students and teachers in relation to the United Nations Sustainable Development Goals, the proposal of the CETYS Climate Commitment and the deployment of several projects aimed at offsetting emissions into the atmosphere, conserving biodiversity and promoting green entrepreneurship that actively involve the entire community. The action lines of the ISS include: education (graduate and undergraduate levels), research, networking (international, national, regional and local), community actions related with sustainability, rankings and certifications and, collaboration in the definition of internal policies to improve the physical infrastructure and quality of life on campuses.

This document will present the experience of the institution around three aspects that can be evaluated as outstanding in its transition to sustainability: (a) water management, (b) use of solar energy through program “CETYS Solar Power” and, (c) waste management by means of the program “CETYS Zero Waste”.

2 Water Management at CETYS

In the binational region California (USA)-Baja California (Mexico), where CETYS University is located, water scarcity, long-term drought and the impacts of climate change effects—like temperature increase and/or changes in precipitation patterns—are the main environmental phenomena that condition the development and

well-being of the population, as well as the proper functioning of environmental services and systems. Figure 1 presents the historic yearly accumulated rain and the yearly average minimum temperature in Baja California state (BC).

The impacts of climate change and phenomena associated with climate variability are already manifesting in the region unequivocally (Rivera-Arriaga et al. 2023). The most recent rainfall data (2022) is 45% below the historical average (1980–1999), while the minimum temperature is 30% above its corresponding historical average. This represents an important challenge for the University’s performance, which contributes to the reduction of its water footprint through the following actions (see examples in Fig. 2):

- (a) operation of two wastewater treatment plants, one of which even has enough capacity to accept water from neighboring homes,
- (b) the use of treated water for irrigation of the institution’s planted vegetation and forest areas,
- (c) a water purification plant that allows feeding the public fountains within the institution and
- (d) almost 90% of water-efficient usage appliances like: hand washing taps, toilet flush and waterless men’s urinals.

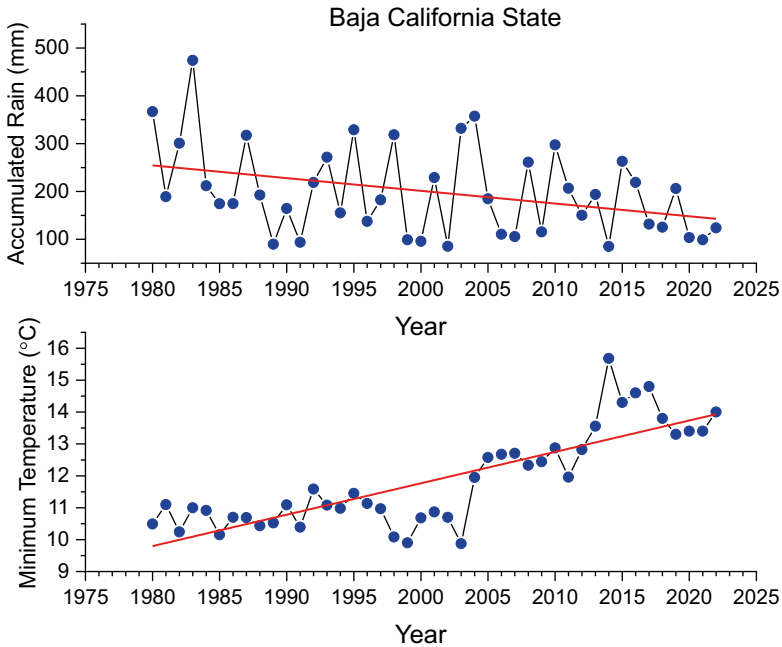


Fig. 1 Historic yearly accumulated rain and its linear trend (upper) and yearly average minimum temperature and its linear trend (bottom) in Baja California State, Mexico. (Source of data: Mexico’s National Weather Service n.d.)



Fig. 2 Examples of wastewater treatment plants (upper) and water efficient usage appliances (bottom)

In the near future (2024), CETYS University is planning the deployment of several academic-oriented projects toward the automaton of irrigation areas, capturing scarce rainwater by simple collection methods from downspouts and detailed calibration of flow times in automatic handwashing systems.

3 CETYS Green/Smart Infrastructure

CETYS new building infrastructure seeks to have more environmentally friendly facilities and smarter buildings. The Center for Entrepreneurship and Competiveness (CECE) located in Mexicali Campus, where temperatures in summer could reach 50 °C, is a relatively new facility, in which, from the architectural design, it was



Fig. 3 Examples of green/smart new buildings at CETYS University. Center for Wine Studies at Ensenada campus (right) and Center for Entrepreneurship and Competiveness at Mexicali campus (left)

decided to incorporate a “skin” around the building to naturally regulate the internal temperature and reduce energy consumption associated with the use of air conditioners. The newest building in CETYS system is the Center for Wine Studies (CEVIT), large windows were incorporated in its architectural design to make the most of natural lighting and also have natural thermal control (see Fig. 3). Automatic control systems for room temperature and light intensity operate regularly, as well, water control devices in toilets and sinks. Additionally, all the drinking water in the CECE comes from a purification plant, which covers the internal consumption.

Currently, institutional policies, in addition to complying with all official regulations, seek to adapt old facilities with elements that make them more sustainable (e.g. energy, water, waste management), while new building projects already integrate from the construction planning phase these elements.

4 CETYS Solar Power Program

CETYS University System is the academic institution with the largest generation of photovoltaic solar energy in all Latin America, with an installed generation capacity of 1.37 MW. Mexicali campus, with one of the greatest solar irradiation (intensity and duration) in the country, produces 1.2 MW, while Tijuana campus start the panels installation with a current generation of 0.17 MW and strong growth plans (see Fig. 4).

At CETYS University, a degree in renewable energy engineering is offered and additionally in the state of Baja California there are important commercial generation plants, both solar and wind, which offers a wide field of work for its graduates.



Fig. 4 Photovoltaic generation facilities at CETYS University

Additionally, the installation of solar panel production plants in the region has allowed joint work and collaboration between academia and industry.

5 Zero Waste Program

Zero Waste program fully implemented at CETYS campus Tijuana and in development at campus Mexicali and Ensenada, has obtained international awards and recognition (VOCETYS 2019) for the way it has been implemented and the way it operates. Before the pandemic, the Tijuana campus offered waste collection not only for the campus, but also for neighboring homes. Currently (2023), efforts are being made to recover this service to people outside CETYS.

The zero waste efforts began with a strong awareness and internal dissemination campaign (see Fig. 5), followed by training courses for maintenance personnel, installation of trash cans to separate waste, educational signage, waste treatment and management (see Fig. 6).

Organic waste and tree foliage are converted into compost that is used in the green areas of the campus and the surpluses in small farming areas near the facilities. In addition to being separated, the inorganic material is delivered to certified recycling companies, minimizing the amount of waste that is deposited in the city’s landfills.

Since august 2018, Campus Tijuana started the efforts to handle 90% of the waste that goes to the Municipality landfill, actually 70% of the generated waste is managed through the Zero Waste Program and a 7% reduction of the waste generation was achieved.

The amount of waste sent and handled by the recycling center could be summarized as follow:

- (a) 1.5 metric tons of PET processed,
- (b) 353 kg of aluminum cans were processed,
- (c) 2.4 metric tons of cardboard processed,
- (d) 1.6 metric tons of paper were processed.

From the highest levels of educational authorities, to the behavior of students and service personnel, they have benefited from the implementation of the Zero Waste program, which in addition to bringing economic and environmental benefits has allowed people to change their mentality in the approach to the waste management.

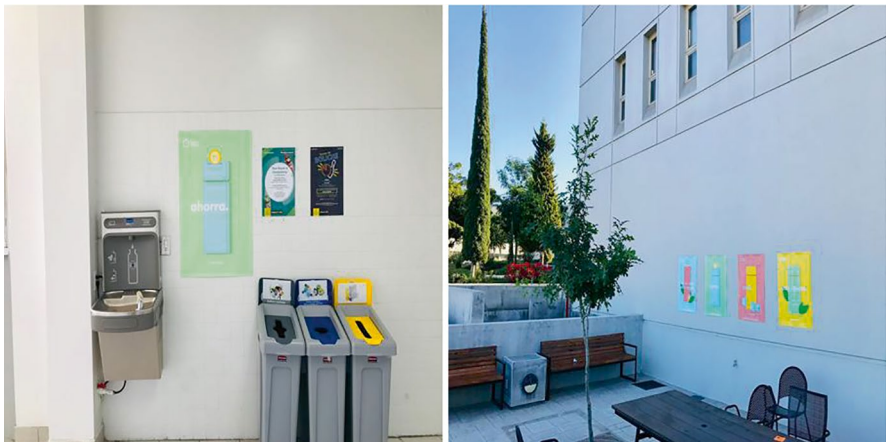


Fig. 5 Campaign to avoid the use of paper water cups



CETYS ZERO WASTE
Auditoria de Contaminantes: EXPOCETYS

- Fecha de recolección: viernes 28/02/20
- Fecha de auditoria: viernes 28/02/20
- Horario: 4:00 pm a 5:00 pm
- Ubicación: Gimnasio.
- 1 participante: 1 colaborador
- 109.6 kg de residuos de 2 estaciones



*Se recomienda 2 colaboradores
*2 se refieren a sábado

Fig. 6 Examples of Zero Waste Program facilities and actions

6 Measuring the Advances in Sustainability at CETYS

The progress made by CETYS University in aspects related to sustainability, described in the preceding sections, must be framed in two important facts: firstly, the interruption of academic normality due to the COVID pandemic that impacted during the years 2020–2022, and secondly, the creation of the Institute for Sustainability Studies at the beginning of 2023, as the principal body in charge of sustainability issues in education, research, networking, certifications and physical infrastructure in all CETYS campuses.

Considering a recent time frame, of approximately 5 or 6 years, the performance of the institution has been outstanding. In 2018, none of the three campuses had photovoltaic energy installations, currently, all CETYS campuses have solar panels,

placing CETYS as the Latin American academic institution with the greatest installed capacity (1.37 MW). In Mexicali campus, the largest and with the major student population, 50% of the energy consumed is produced by renewable sources (photovoltaic); on the Tijuana Campus, the gym—one of the main energy-consuming building—is powered entirely by renewable energy. Table 1 shows the amount of energy consumption for recent years and the quantity of energy produced by solar panels.

As mentioned previously, water resources are scarce in Baja California state, and it is the main limitation to development in the region. In this sense, CETYS has been committed since 2001 to the construction of a wastewater treatment plant on Campus Tijuana and since 2008 on Campus Mexicali. Collectively, the sewage treatment plants have an installed capacity of 9.5 l/s (299,592 m³/year) and the treated flow has been on average 3.6 l/s, which shows the additional treatment potential for the coming years. The treated water is used for irrigation of the green areas on campuses. In recent years (data from 2023), the institution has been concerned with making sustainable use of water resources within its campuses, gradually replacing old equipment with new facilities. On the Tijuana and Mexicali campuses, all drinking water is generated through internal purification processes. The sinks use 88% water-saving equipment, the toilets 100% and the urinals 75% are free of water use (dry urinals).

Finally, it is important to highlight the results obtained with the “Zero Waste” program, implemented entirely at Campus Tijuana, in which a very important cultural change has been observed. The facilities and awareness campaigns deployed on campus have allowed the separation of different types of waste from garbage cans (e.g. PET, HDPE, aluminum, glass, ferrous materials, paper and paperboard, organic materials, pruning, liquids and recently electronics), their collection and recycling or final disposal. Part of the collected material is used for compost inside the campus and the surplus is donated to the community. Started before the pandemic and interrupted due to it, the monthly open days for waste collection from the community surrounding CETYS have resumed in 2024. Figure 7 shows the volume of waste collected at CETYS University and the percentage of recycled materials.

Table 1 Usage of energy and renewable energy production at CETYS University

Year	Energy usage (kWh)	Renewable energy production (kWh)	Percentage of renewable energy (%)
2019	3,755,550	99,154	2.6
2020	1,439,106	858,813	59.7
2021	2,815,938	806,548	28.6
2022	2,143,552	922,712	43.0

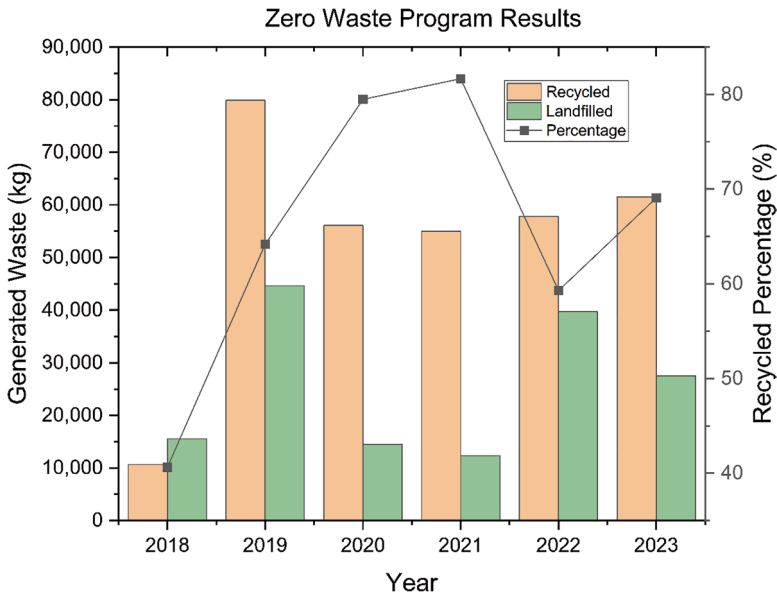


Fig. 7 Historic evolution of the materials recycled and disposed to the landfill under the Zero Waste program

7 Conclusions

Academic institutions have the moral responsibility to educate and contribute to the achievement of the principles of sustainability, based on concrete actions that benefit both the university and its community.

CETYS University is no exception, and for several years it has contributed with specific efforts such as those presented in this document: responsibility in water management in a region of resource scarcity, use of solar energy due to the benefits of its geographical location and climatic characteristics, seeking to harmonize its physical infrastructure with the best practices for the benefit of the environment and responsible management of its waste, including its wastewater, which has benefited not only the university itself but also the surrounding settlements.

The involvement of its students and learning community in general in the processes of sustainability and appropriation of the United Nations Sustainable Development Goals has been notable. During 2023, around 2400 students and teachers have participated in awareness-raising and training talks about SDGs, and in the area of research, around 50% of the internal funds have been to support projects related to the SDGs.

This work is far from over, the challenges imposed by the pandemic in the economic, educational and environmental spheres are still being overcome, however, from the highest levels of university authorities, the transition towards sustainability has been decisively promoted, which will surely position CETYS Universidad as a regional and even international reference in sustainability good practices.

References

- CETYS (2010) Plan CETYS 2020. <https://wasc.cetys.mx/Autostudy/docs/Evidence19CETYS%202020%20Development%20Plan.pdf>. Accessed 3 Sept 2010
- INESU (2023) Sustainability report 2023. Building lasting efforts. <https://www.cetys.mx/sustentable/>
- León F (2023) Informe Annual 2022. <https://www.youtube.com/watch?v=16l2oN0SPH0>
- Mexico's National Weather Service (n.d.) (several years) <https://smn.conagua.gob.mx/es/>
- Rivera-Arriaga E, Silva R, Cruz-Ramírez CJ, Azuz-Adeath I, Vega-Serratos BE, Posada G (2023) Risk management of extreme precipitation in Mexico: building resilience. In: Eslamian S, Eslamian F (eds) Disaster risk reduction for resilience. Springer, Cham. https://doi.org/10.1007/978-3-031-22112-5_12
- VOCETYS (2019) Conoce la universidad tijuanaense que obtiene premio internacional a favor del medio ambiente. <https://www.cetys.mx/noticias/conoce-la-universidad-tijuanaense-que-obtiene-premio-internacional-a-favor-del-medio-ambiente/>