CISFA

SUSTAINABLE INFRASTRUCTURES INITIATIVE

2023

NATIONAL AUTONOMOUS UNIVERSITY OF MEXICO

SCHOOL OF ARCHITECTURE

la fa

Executive Summary

Motivation

Sustainability Agenda

Areas of Research and Implementation

Main Partners and Projects

INTRODUCTION

The Universidad Nacional Autónoma de Mexico [National Autonomous University of Mexico] (UNAM) embodies a strong tradition in the development of technologies and strategies for environmental sustainability from areas such as Engineering and Chemistry. Over the last decades, the Facultad de Arquitectura [School of Architecture] (FA) has trained professional talents in architecture, urban planning, landscape architecture, and industrial design with a comprehensive vision of environmental sustainability. Low-carbon design and construction are among the areas of its laboratories and research centres

In this context, the purpose of the Coordinación de Infraestructuras Sustentables de la Facultad de Arquitectura [Sustainable Infrastructures Initiative at the School of Architecture] (CISFA), established in May 2021, is to design and implement a series of infrastructures that facilitate, in a decentralized approach, the flow of water, waste, food, an electricity in architectural, rural, and urban scales. The vision of this initiative is to position the work of the FA-UNAM as a dynamic example of ecological thought and action in Mexico and the world

MOTIVATION

We live in a global context where the use of fossil fuels for the generation of electricity, transport, and heating generates two-thirds of the emissions of gases that trap heat in the atmosphere, a phenomenon known as global warming. On the other hand, the production of cement and steel, the plowing of fields, and the degradation of various ecosystems for the expansion of cities emit large amounts of carbon dioxide daily, causing also thermal retention

Notably, the professional activity of architecture, landscape architecture, industrial design, and urban planning belongs to sectors and industrial processes with a high environmental impact. Our motivation is shaped by the optimism to participate in a new social contract in Mexico and the world, which focuses on reducing the carbon footprint of the buildings we design, operate, and inhabit in our cities and villages

• Dr. Mario Molina (1943-2020) co-recipient of the Nobel Prize in Chemistry in 1995 for his role in discovering the threat to the Earth's ozone layer from chlorofluorocarbon gases, did his undergraduate studies in Chemistry at UNAM in Mexico City

• Greenhouse gases come from six sectors: 25% in electricity production, 24% in food, agriculture and land use, 21% in industry, 14% in transportation, 6% in buildings and construction, and 10% other energy-related emissions. Greenhouse gas sinks are the counterpoint to these sources. While ~59% of these emissions stay in the atmosphere, ~24% are quickly removed by plants on land and ~17% are taken up by oceans

See IPCC (2014). Climate change 2014: Mitigation of climate change. Contribution of Working Group III to the fifth assessment report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

SUSTAINABILITY AGENDA

When we talk about the design of the built environment, the sustainability narrative of the majority of projects is increasingly linked to climate science, particularly from areas such as Geography, Physics, Chemistry, and Biology. These specializations contain their own vocabulary, diagrams, acronyms, jargon, and methodologies. More often than not, when climate concepts are presented to a general audience, the transmission of this knowledge creates separation and distance, frequently leading to failed implementations in architectural and urban projects

Therefore, the sustainability agenda of CISFA proposes to close the climate communication gap with a simple, comprehensive, and attractive language. One that motivates teachers, students, and civil society to imagine buildings and cities that help us reverse global warming

Following this agenda, the Sustainable Infrastructures Initiative contributes to two fundamental tasks

- Significant reduction of our carbon footprint in the buildings we design, build, and inhabit
- Significant regeneration of the biodiversity and ecosystems that we have lost in large parts of our habitats

AREAS OF RESEARCH AND IMPLEMENTATION

• **Climate Communication for Sustainable Design: Concepts, Methods, and Basic terminology.**

Programmes involved: Architecture, Landscape Architecture, Industrial Design, and Urban Planning

CISFA develops manuals and videos to train teachers and students in the basic concepts of sustainability in architecture, landscape architecture, urban planning, and industrial design. We hold an inventory of technical and cultural approaches from institutions that delineate sustainable design strategies. This catalog is an analysis of various methodologies used by planners, architects, and engineers that define the goals for a sustainable world in the coming decades

• **Rural Design: Technology and Environment In Rural Contexts**

Programmes involved: Architecture, Landscape Architecture, and Industrial Design

The systems and technologies that operate and supply renewable energy to our territories are less expensive than traditional systems that depend on fossil fuels, particularly in rural contexts. The goal of this topic is to understand and apply renewable energy technologies that replace fossil fuels. Special attention is paid to infrastructures that facilitate the flow of water, electricity, food, and waste in the built environment, in settlements with a population of fewer than 100,000 inhabitants and with a population density of fewer than 3,000 people per km2 (settlements that host around 65 % of the world population)

• **Low-carbon Architecture: Sustainable Materials, Assemblies, and Construction Methods.**

Programmes involved: Architecture

In this topic, we offer a basic understanding of low-carbon architecture and building traditions. Four topics are discussed: 1) Building with timber, 2) Building with bamboo, 3) Thermal modeling techniques for walls and roofs, and 4) Retrofit systems in architecture. This area reviews construction methods and performance of buildings based on technical, cultural, and environmental dimensions of the contexts where they are built

• **Public Space and Biodiversity: Ecological Regeneration in Urban Design**

Programmes involved: Architecture, Landscape Architecture, and Urban Planning

This theme examines best practices and methodologies that apply ecological thinking in urban contexts. How to design sustainable spaces in our cities? The main task here is to measure and analyze four themes 1) Population density and its effects on cities, 2) the Biodiversity index of cities, 3) Demographics and age groups in cities, and 4) The human scale and its impact on the biodiversity of cities

• **Public Transport and Architecture: Design for Sustainable Mobility**

Programmes involved: Architecture, Industrial Design, and Urban Planning

This topic focuses on three of the most efficient forms of urban mobility, which are 1) walkability, 2) cycling, and 3) mass transit. Here we explore the relationship between these modes of transport and the built environment. How does architecture shape sustainable mobility and vice versa? How to integrate these three means of mobility in the design of cities?

MAIN PARTNERS AND PROJECTS

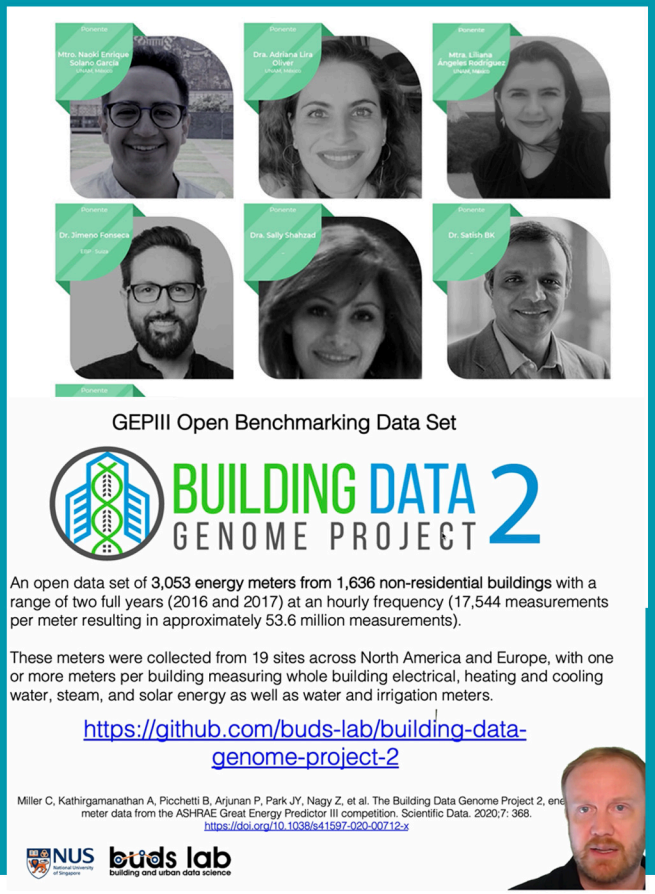
- 2021-2022

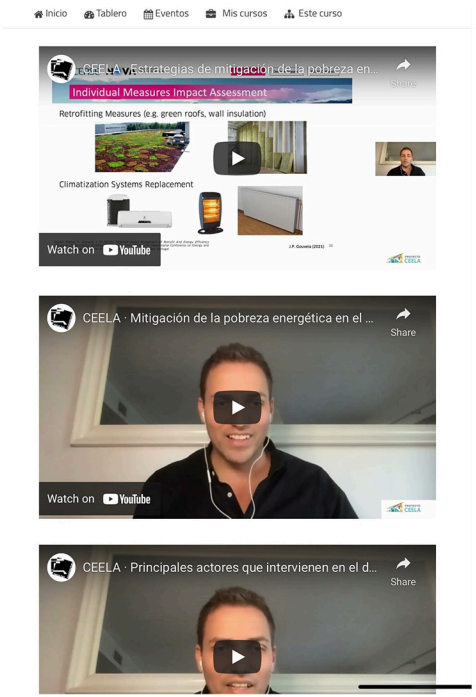
Swiss Agency for Development and Cooperation (SDC)

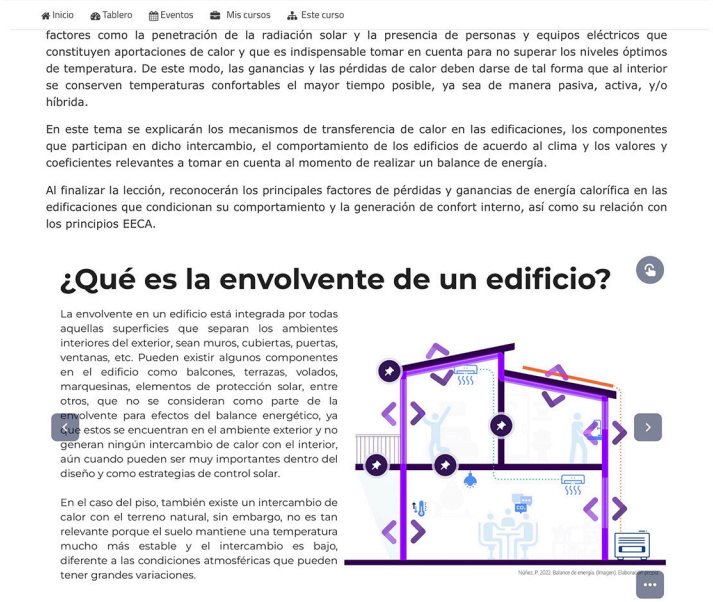
Development and implementation of the International Digital Course Building with Energy Efficiency and Thermal Comfort in Latin America.

45+ International experts and 1,500+ students who satisfactorily completed the course

Grant awarded: $65,227.43 Swiss Francs (USD 70,817.36 in 2023)







MAIN PARTNERS AND PROJECTS

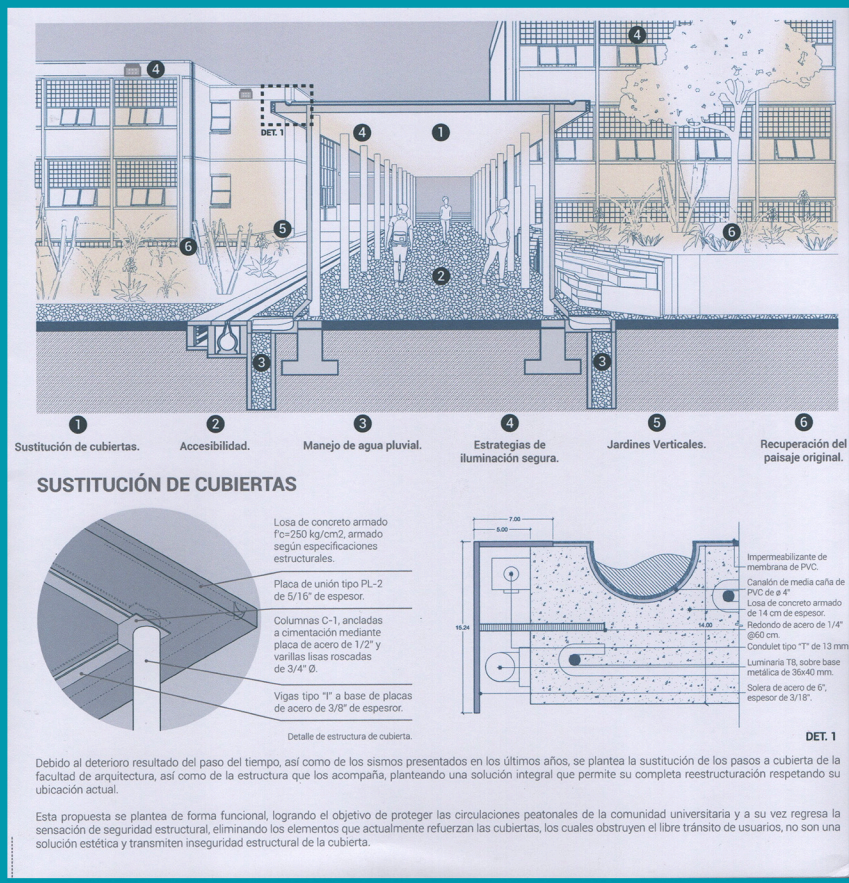
- **2021-present**

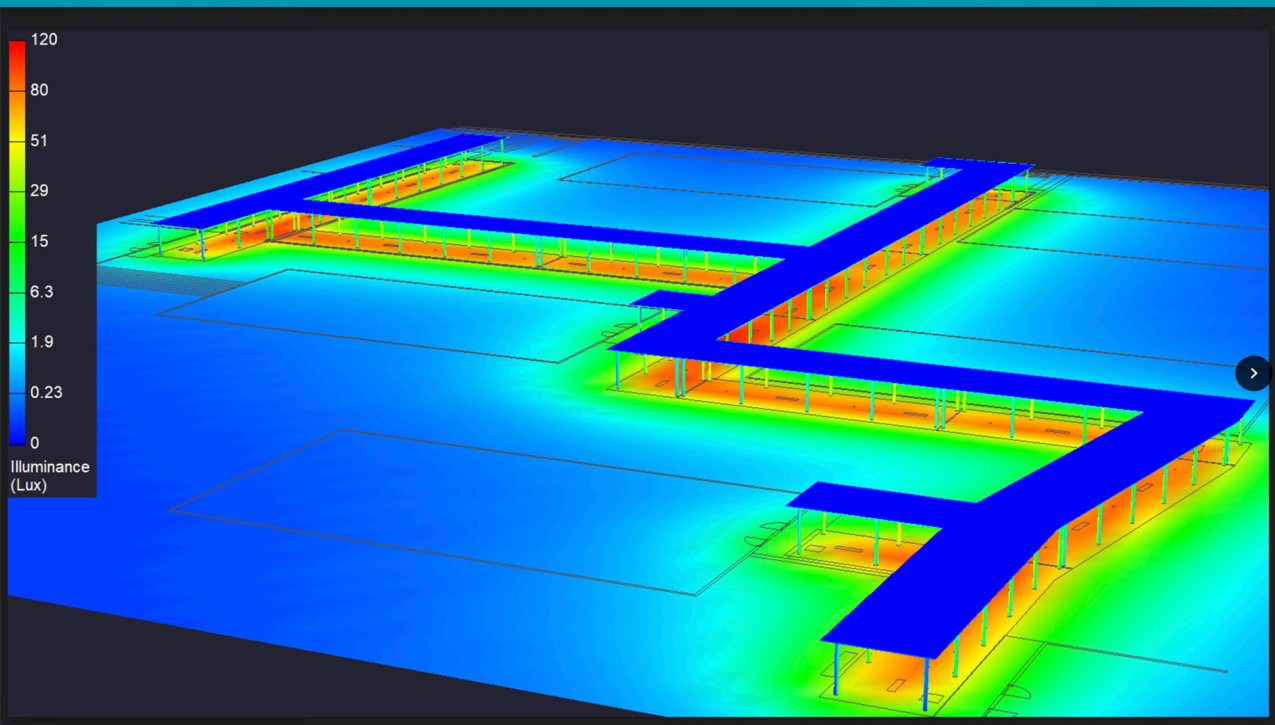
Dirección General del Patrimonio Universitario

[UNAM's Direction of University Heritage]

Design and implementation of sustainable infrastructure strategies of rainwater capture, walkability plan, and energy-efficient architectural lighting for UNAM's School of Architecture in a Campus protected by UNESCO, Ciudad Universitaria in Mexico City

- Approximate Budget: MXN 10,000,000 (USD 532,918.70 in 2023)





MAIN PARTNERS AND PROJECTS

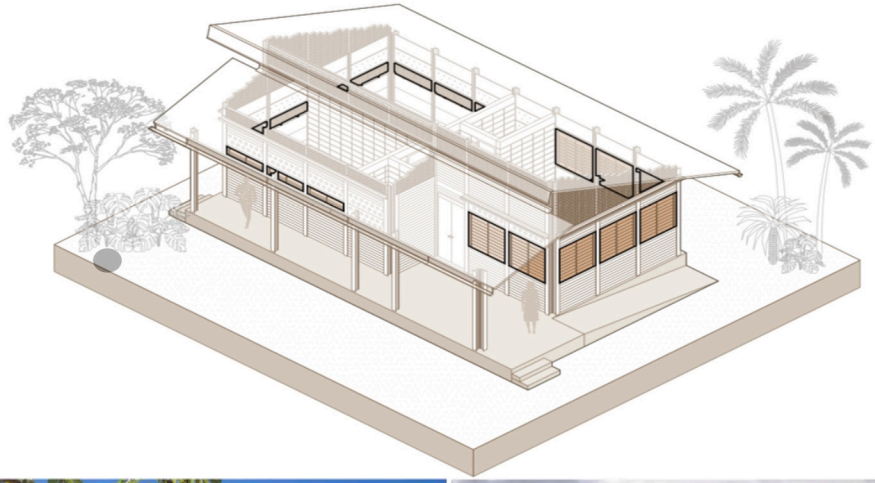
- 2021

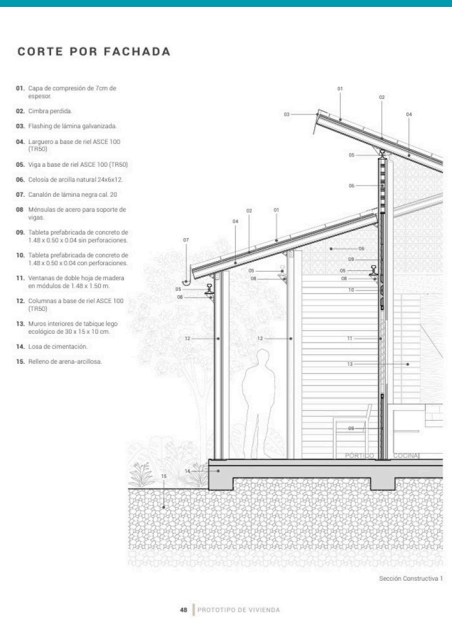
FONATUR

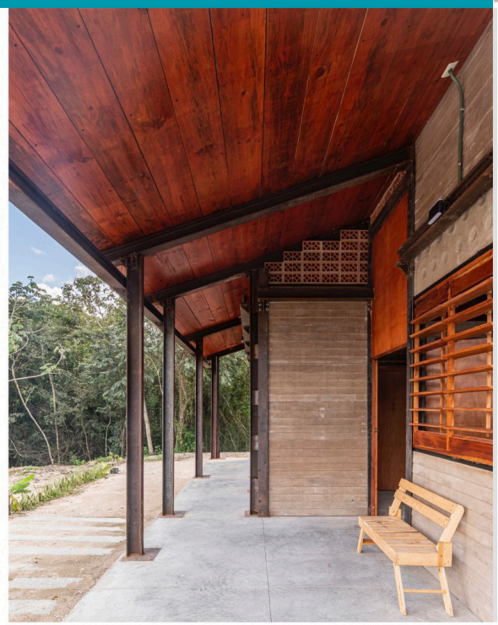
(National Fund for Tourism Development)

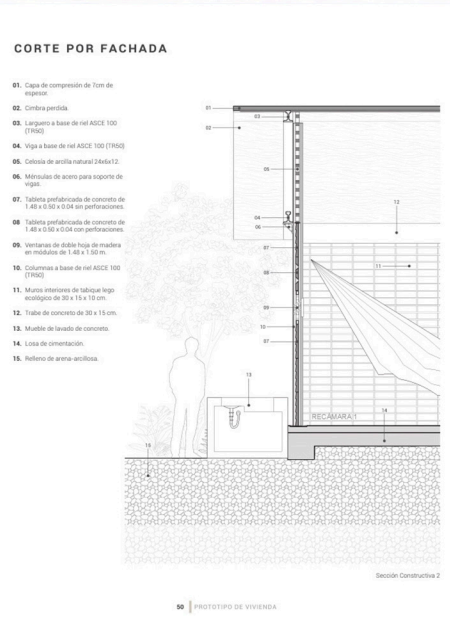
in partnership with UNAM's School of Architecture

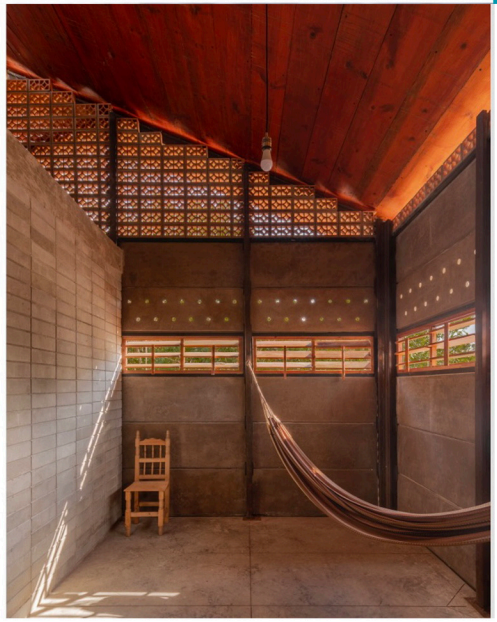
Development of sustainable strategies in the design process of rural housing in the Yucatán Peninsula, Mexico











CONCLUSION

CISFA serves as a link between academia and the industry in the area of environmental sustainability. It is an initiative based in Mexico City that integrates a coalition of institutions, international experts, and participants of civil society. The aim is to strengthen an alliance that addresses the ecological imagination and action of architectural and territorial projects. We propose tools to accelerate the implementation, at scale, of academic research and public policies that are aligned with our sustainability agenda

Dr. Juan Ignacio del Cueto Ruiz-Funes
Dean of the School of Architecture, UNAM

Dr. Ernesto Valero Thomas
Senior Manager of the Sustainable Infrastructures Initiative, School of Architecture, UNAM

C I S F A, UNAM

Mtro. Jehú Aguilar Paniagua

Mtra. Liliana Ángeles Rodríguez

Arq. Natalia Boo Fontenla

Mtro. Juan Carlos Calanchini González Cos

Arq. Armando Carranco Hernández

Dr. Daniel Daou Ornelas

Mtra. Marcela Delgado Velasco

Arq. Midori Endo Gutiérrez

Mtro. Daniel Escotto Sánchez

Arq. Juan Pablo Espinosa Vargas

Mtra. Susana Ezeta Genis

Mtra. Karina Flores Flores

Mtra. Allegra Fonda Bonardi

Arq. Isaura González Gottdiener

Dr. João Pedro Gouveia

Mtro. Francisco Hernández Spínola

Dra. Adriana Lira Oliver

Mtra. Judith Meléndrez Bayardo

Arq. Valeria Méndez Pineda

Mtra. Claudia Ortiz Chao

Mtro. José Luis Salazar Maya

Mtro. Antonio Suárez Bonilla

Mtro. Naoki Solano García

Mtro. Enrique Soto Alva

Mtra. Elena Tudela Rivadeneyra

Mtro. Alejandro Vidal Ruiz

Mtro. Rodolfo Vilchis Martínez

Arq. Emmanuel Vital Bori

Dra. Angeles Vizcarra de los Reyes

Arq. Paisj. Valia Wright Sánchez