

Sustainable Housing Laboratory of Northeast Area

Rubén S. Roux Gutiérrez, María E. Molar Orozco, and Mireya Pérez Zertuche

Facultad de Arquitectura US, Universidad Autónoma de Coahuila, México

Abstract: The main problems of the housing construction industry are the changes in the building systems and materials that reflect a concern for helping preserve the environment, promote energy saving and increase the comfort of the users, resulting in the building of houses for primarily commercial criteria. With growing interest in the problems caused by climate change and the implementation of construction processes with limited environmental awareness in the development of housing, countries worldwide have begun to generate regulation and evaluation systems for new housing.

In concept of sustainable building, it refers to the use of processes and materials that are environmental friendly (with environmental or environmentally preferable advantages) in the planning, design, location, construction, operation, and demolition of houses. This paper aims to present a proposal for a sustainable housing Laboratory to develop housing models suitable to different climatic regions of the states of Coahuila, Nuevo León and Tamaulipas, these studies include the environmental, economic and social aspects of housing through the Academic Board for Technology in Architecture of the UA de C Unit Saltillo, Campus Arteaga, based on his experience in the line of Technological Innovation in Housing.

Key words: housing, sustainability, evaluation

1. Introduction

With the growing interest presented in the problems caused by climate change and the implementation of construction processes with limited environmental awareness in the development of housing, countries worldwide have begun to generate regulation and evaluation systems for new housing.

Mexico has also entered into a certification process that has developed over recent years through Mexican Official Standards (MOS) going in the direction of sustainability and energy saving, and has even developed specifically Green Building Regulations as the governments of the Distrito Federal and Jalisco.

Sustainable building refers to the use of practical and environmental friendly materials (with environmental or environmentally preferable advantages) in the planning, design, location, construction, operation, and demolition of houses. The term applies to both

renovation and makeover of existing buildings and the construction of new buildings. The use of advanced technologies for energy conservation in buildings can generate huge reductions in demand for fossil fuels and emissions of greenhouse gases (GHGs). Also, best practices in design and construction can help address environmental challenges such as depletion of natural resources, waste disposal and the pollution of air, water and soil, as well as helping to obtain health benefits and prosperity [1].

In September 2008, in the city of Minneapolis, USA, during the event of the International Code Council (ICC), several countries met to define and accept the following environmental elements for green and sustainable building:

- Sustainable solutions for site and soil
- Solutions for water conservation
- Solutions for energy efficiency
- Solutions to mitigate environmental impacts from source materials
- Solutions to ensure environmental quality in building interiors

Corresponding author: Rubén S. Roux Gutiérrez, Doctor, research areas/interests: sustainable land architecture. E-mail: rubenrouxgutierrez@uadec.edu.mx.

- Innovative solutions

According to the above and in order to reduce emissions of greenhouse gases (GHGs), especially in real estate in Mexico, they have been implementing programs of sustainable housing, by the Comisión Nacional de Vivienda (CONAVI) as they are: Nationally Appropriate Mitigation Measures (NAMA) of new housing, the existing NAMA Housing and Urban NAMA [2].

The Instituto de Fomento Nacional a la Vivencia de los Trabajadores (INFONAVIT) launched the “Guarantee Program for Sustainable Housing” [3] but these efforts have not had the desired impact, since very little has been made with the development of its own technology and the training of high level human resources in the field of green building.

Besides, the power to develop housing models appropriate to each region in Mexico and certified green materials, has not been carried out because there is not enough laboratories that focus on conducting the necessary studies and train the required human resources to conduct this work.

2. Background

Throughout history there are many adjectives that have been used for the relationship of the building with the environment, and the exploitation of renewable energy, including: Bioclimatic Architecture, Eco-friendly Building, Helio-design, Solar Architecture, Self-Sufficient Building, Green Buildings, Sustainable Architecture, among others, to indicate a building with low environmental impact, other definitions arose as environmental design, eco-design, natural design and bio-design.

It can be said that in Mexico, many of the historical buildings and vernacular work according to the principles of sustainability, the windows facing south in cold climates, the use of certain materials with certain thermal properties such as wood or adobe, the calcimine of the housing or the trace of the villages are not accidental, they have a specific role, based on trial

and error designs to optimize a specific environment [1].

Ref. [3] comments:

Practically the first works of bioclimatic studies of some cities in Mexico were published by Jauregui in the 60's. Among the several works developed are those related to human bio climate and the urban development of cities in the tropics, with bioclimatic approach; in the 70's, Everardo Hernandez worked on the feasibility of the use of solar energy in Mexico to meet housing requirements, concerned mainly in the passive cooling of social housing. During the same decade, the General Direction of Urban Ecology of the SAHOP, presented a demonstration project on eco techniques for human settlements in the Mexican humid tropics. In the early 80's, in San Luis Potosi, Fritche and Zapata worked on technology projects and proposals for a self-sufficient housing, which emphasized significantly the need for the climate, technology and building materials to achieve a suitable environment, for the man; Becerril worked on the levels of sunlight in architecture, focused on energy efficiency for thermal conditioning. Between 1983 and 1989, Sámano consolidated a small research group that focused its work on the study and analysis of the performance of passive systems for thermal conditioning in time Solar Energy Laboratory of IIM-UNAM, among others.

Morillón ends noting that in the past ten years, various academic and research institutions have joined the activities related to bioclimatic and sustainable architecture, mainly by training through specialties, certifications or incorporation of classes into the curriculum of the major in architecture of such institutions, in addition to providing equipment for bioclimatic studies.

3. Development

The laboratory of sustainable housing in the Northeast Zone is a project that aims to develop studies of sustainable housing models suitable to different

climatic regions of the states of Coahuila, Nuevo Leon and Tamaulipas, these studies consider the environmental, urban, economic and social part of housing, in order for users to have decent housing, quality and high efficiency.

It is also intended that this laboratory develops sustainable alternative materials and to be able to certify them with a green label, in order to ensure that these are of low environmental and energy impact. For this certification exists a program for buildings with low environmental impact, from the Procuraduría Federal de Protección al Ambiente (PROFEPA), although it is not clear the methodology and it has only one building accredited. But it also counts with two systems that are the Comisión Nacional de Vivienda (CONAVI) and the Gobierno del Distrito Federal (GDF), many which are based in energy efficiency taken from the prepared by the Sello Fide, although this is limited to products for energy efficiency.

With the criteria and indicators for sustainable housing from the CONAVI, the fulfillment of the minimum values to allow the certification of the housing, which determines the sustainable value of it. On the other hand the Government of the Federal District has issued since 2008 a Certification Programme of Sustainable Buildings, based on the official Mexican standards related to the design, management of energy, renewable energy and energy efficiency which considers the principles Green mortgage, based on technologies including INFONAVIT; although this regulation is based on the United States, for which specific considerations for Mexico according to work done by Dr. Guadalupe Huelsz are required.

The certification rates the energy efficiency of housing according to the parameters of construction; electricity consumption by appliances, lighting, active use of air conditioning, besides the consumption and water heating process is valued. To do this it takes into account aspects such as Life Cycle Analysis (LCA) of building materials, orientation, ventilation, natural

lighting, the type of windows and doors used, the degree of thermal insulation of housing, the use of alternative energy, type and characteristics of appliances, among other factors involved in the project phases, construction and use of a housing.

This requires raising awareness among current and future professionals of the importance of developing these buildings, through a training in high quality human resources through a certification, the laboratory not only aims to develop proposals and alternatives but to offer certifications, specialties, master's and Ph.D. in sustainable housing to form future professionals of housing construction.

According to the above the Academic Corpse (AC) of Technology in the Architecture Unit of the Faculty of Architecture UA de C Unit Saltillo, Campus Arteaga, has lines of research in the analysis of contemporary and regional materials as well as the study of Comfort and Heat transfer and about their properties, with training on the subject with experts from the IER UNAM; it has a history recording and analysis of the thermal behavior in existing homes, according to their environment and topological distribution of Coahuila.

Currently there's a new member with another line of research on Sustainability and Analysis on the behavior of new materials, with experience in the development of a code of energy costs that can generate adequate energy efficient housing, with the intention of reducing consumption of energy inputs during phases of production and construction, as well as the commissioning of the house.

On the basis that it has undergraduate and master students actively collaborating in research with the CA, they have been generating human resources of conscious professionals of their role in climate change, so it is intended to reinforce and train through the laboratory new generations, who can also be certified on the creation of sustainable homes, improving the quality of the user and context according to the current demand of society itself.

4. Methodology

There will be performed a documentary research which will allow us to make an analysis of national and international standards that will be the basis for practical development in the laboratory study, in order to analyze the effects of the sun on housing and propose criteria for protection and thermal insulation to make it suitable. Also an analysis of ventilation according to wind speeds to determine the use of passive cooling systems, in conjunction with the analysis of natural lighting to propose appropriate devices in order to take this natural energy; plus the analysis of the most used materials in housing construction, and the proposed alternative materials that are suitable to the climate in different climatic zones according to the indicators and standards governed established to achieve certification.

At the same time it is intended to work on laboratory certification that can generate both students and professionals certificate human resources, to provide better service to government agencies without forgetting that the main objective is to benefit society and reduce both the impact environment through courses and workshops to certify the graduate.

5. Goals

Develop prototypes of sustainable housing based on a diagnosis in different areas of the northeastern region of Mexico:

- Affordable Housing.
- Bio building techniques adapted to different climatic conditions.
- Alternative technologies for energy optimization.
- Model developed by an interdisciplinary team of architects, landscapers, bioclimatic, permaculture and work execution experts.

Developing alternative materials with low environmental and energy impact:

- Development of regional building materials.
- Certification of green materials.

- Development of eco-techniques with appropriate local technology.

To generate sustainable housing specialists with critical and proactive capacity with knowledge that combines the contributions of architecture, urbanism and technology, to analyze contexts, to propose housing policies and their environmental performance:

- Training of high-level human capital in building techniques, sustainable standards and sustainable housing policies.

6. Conclusions

It is necessary a paradigm shift, leaving behind projects that do not take into account the impacts on the environment, society and the general user, and take the concepts to move towards a culture of efficient use of resources and sustainability.

So it is important to analyze and produce models of sustainable housing and adapted to each climatic region of northeastern Mexico, high quality, low cost and appropriate to the society in which it is located. Along with the study and development of alternative building regional materials under environmental and energy impact, enabling the economic development of the region with characteristics of low or no waste production, with the green certification.

Currently there are atlases, guides, manuals, green mortgage, the code and the criteria and indicators, as well as tools available to students, professionals, authorities and government officials, as well as builders and developers in both technical aspects, design, regulation and financing, to make the building that's going to be built in Mexico be sustainable, which should be integrated into a MOS for the country.

This requires to train high-level human resources, which directly impact on the housing sector, to have extensive knowledge of sustainability and high technological capacities, which allow it to further develop appropriate alternative housing in Mexico.

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