MIHOUSE
Multi Intelligent House Using Solar Energy

SOLAR DECATHLON
LATIN AMERICA & CARIBBEAN 2015
CALI - DECEMBER

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Team: MIHOUSE Multi Intelligent House Using Solar Energy
Universidad de San Buenaventura Cali
Universidad Autónoma de Occidente

SOLAR DECATHLON LATIN AMERICA & THE CARIBBEAN 2015 – Getting to know the competition

Being part of the participating teams in the first version of the Solar Decathlon Latin America & the Caribbean that will take place in Cali, Colombia, being "Caleños", makes us very proud. As we move forward with the development of our project, we also get to thoroughly know the competition. This has allowed us to learn by researching on the experiences of the teams that participated on the previous versions of the contest, getting to know their ideals and dreams, seeing those being sketched on the paper until seeing them fully realized.

Since the objective of the SDLAC 2015 is the realization of an urban social housing project, we decided to depart from the creation of a minimum housing unit, built and equipped with elements that allow the positive impact on the livelihood of an ordinary citizen, in order to transform him/her into a user of the future, whom is empowered and responsible for his/her actions on his/her surroundings, generating consequences that impact collectively.

Ten are the contests in which we are consciously working on with the aim of making MIHOUSE *the most sustainable housing prototype at the SDLAC 2015: Architecture, engineering and construction, energy efficiency, electric balance, comfort, sustainability, house functioning, marketing and communications, urban design and economic accessibility and innovation. Over these 10 contests we have based our planning efforts, the design proposal and the construction technique.*

Universidad de San Buenaventura Cali

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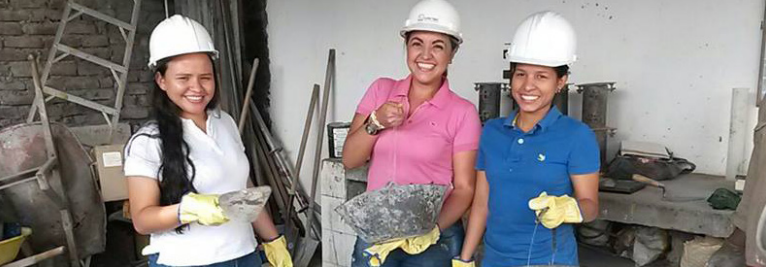


MIHOUSE´s sustainability ideals

Sustainability, as a complex principle of relation, brings up a series of challenges and opportunities to the design and its planning. Being able to count with an interdisciplinary group has allowed to define varied action lines and innovation to the proposed project. At the same time, the joint work of professors and students have achieved the perfect synergy to generate the needed transition between the visualization of a dream and its construction process.

This is how MIHOUSE responds to the 10 requirements of the competition, develops its sustainability ideals and projects as the most sustainable proposal SDLAC 2015:

1. Architecture

The MIHOUSE solution fulfills the architectural requirements for social housing in tropical contexts. MIHOUSE is:

• Flexible: The indoor areas can be modified according to the family´s needs.

• Progressive: The expansion of certain spaces in the living unit is possible thanks to the existence of a space for future growth (terraces), which can be used (meanwhile) for home gardens or productive spaces to grow food.

• Productive: It permits the generation of income to its households. Cropping systems with easy maintenance and of recommended intake for the health and human health are incorporated.

• Bioclimatic: Incorporates strategies to reduce urban heat islands and increase the albedo, such as using light colored roofs and facades, vegetated roofs, and the outdoor use of local vegetation.

2. Engineering & construction

The interdisciplinary work of the MIHOUSE team has integrated solutions for the viability of the proposal in terms of:

• The structural system: Is based on the prefabrication of pre-tensed concrete elements, which is beneficial for the construction of mass housing at reduced costs. It also includes innovative materials that help to reduce its ecological footprint while accomplishing with national construction codes.

• The energy system: Includes solar photovoltaic panels to produce electric power and strategies for reducing the energy consumption, such as the use of natural and low consumption artificial lighting.

• The solid waste and water system: Includes the management of solid waste with the purpose of using part of it as compost in urban orchards, while the integrated water management system helps to reduce the waste of potable water, permits the efficient use of rain water and the correct treatment of gray and waste waters.

3. Energy efficiency

MIHOUSE includes an efficient energy system thanks to 2 elements:

• The careful process taken during the selection of photovoltaic solar panels

• The reduction of electric energy consumption with the use of high-efficiency appliances.

The photovoltaic solar system produces the energy needed to meet the demand and to deliver excesses to the electric distribution network.

The location and architectural design of the proposal allows the passage of wind and natural lighting.

4. Electrical energy balance

MIHOUSE proposes the complete balance between the generation of solar power and electric consumption, optimizing to the maximum its use by selecting efficient appliances and using the following strategies:

- Natural day light is used inside the houses
- Large windows are located to permit the entrance of natural light during the morning (lowers temperature) and fresh air during the afternoon and night
- Solar photovoltaic panels are used to produce clean energy, avoiding CO2 generation during the process.
- A modern technology of efficient LED lighting is used.

5. Confort

MIHOUSE responds to Cali´s tropical and climatic conditions by ensuring its comfort at urban and architectural scales. The project:

- Avoids direct solar radiation
- Allows crossed ventilation thanks to the location of the buildings and to the housing architectural design
- Includes a proper selection of materials that regulate the thermal behavior
- Incorporates bioclimatic principles in the design
- Includes autochthonous vegetation that help refreshing and cleaning the air

6. Sustainability

Economic and social sustainability:

- The MIHOUSE project encourages the economic and social development of its inhabitants by promoting activities that provide employment opportunities and income: training for implementing small businesses, facility maintenance, recycling, among others. These initiatives will contribute to have a sustainable economy articulated to the surrounding urban life.

Environmental sustainability:

- MIHOUSE ´s urban project improves the sector´s environmental quality due to the fact that it proposes green areas that create favorable micro climatic conditions. This helps to foster the endemic avifauna and reduces the existing deficit of green areas in the sector.
- Water consumption is being reduced with two basic strategies: 1) The use of rain water storage in low tanks and used for plant irrigation. 2) The reuse of water from the shower, sink and the washing machine which are filtered and treated at very low cost, with the purpose of using it in toilets and for cleaning.
- The use of electric power coming from photovoltaic panel located on the roofs.

Links to the private sector:

- MIHOUSE has strategic alliances with companies that care about sustainable development. These will provide economic resources, services or technical training to the team.

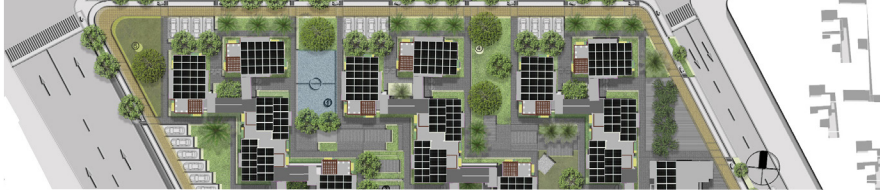
Impact in education:

- This project demonstrates de compromise of both USB and UAO in forming new professionals compromised with the country´s sustainable development.

7. House functioning

Through a comparative matrix, MIHOUSE selected the appliances that can efficiently comply with a household´s needs ensuring an efficient functioning of the house. Different variables were taken into consideration:

- Consumption
- Technology
- Efficiency
- Cost and size



8. Marketing y communications & social awareness

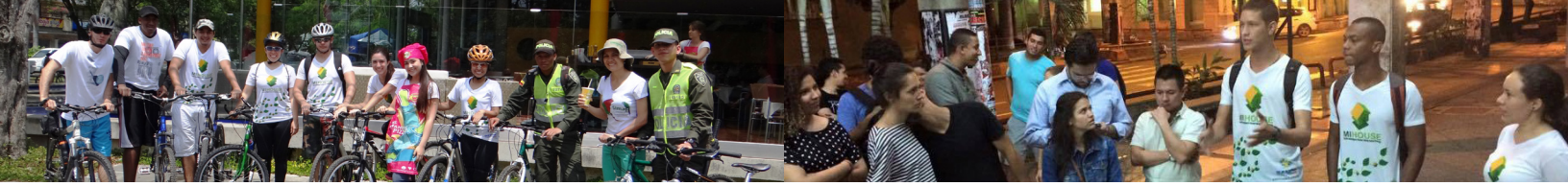
In MIHOUSE, the industry´s experiences meet the research and skills of academia to build solutions that can be sustained in time. It is beneficial to the development of the sustainable social housing of the future, because of its impact on the lifestyle of its inhabitants.
MIHOUSE is an innovative proposal that promotes social conscience and environmental protection. The objectives of its communications project are:
• Generate an urban culture that recognizes the existence of other sources of renewable energy.
• Raising awareness about the importance of environmental stewardship.
• Socialize the MIHOUSE project as the proper energy-efficient housing solution for tropical contexts.

9. Urban design & affordability

MIHOUSE takes advantage of urban areas going through deteriorating processes by providing them with a new housing project and public spaces that could reverse those dynamics into ones of renovation and densification.
• The urban proposal is conceived from smaller modules that can be copied, joined and organized, creating spaces that can be used as parks between buildings.
• The public spaces are designed for recreation, sports and environmental contemplation. They will include the cultivation of fruit trees and orchards.
• It includes mini markets (where the orchard´s products can be sold), childcare facilities and spaces for training people on sustainable practices.
• It gives priority to pedestrians and bicycles.
• The urban proposal is composed of a maximum of 150 dwellings, with ranging areas between 45 to 81 mts2.
• The proposal is economically viable for people with a low income, thanks to the subsidy and funding schemes proposed.

10. Innovation

MIHOUSE is innovation:
• Its urban and architectural designs are flexible, adaptable and bioclimatic.
• It includes home gardens that will supply with food products that add to the household´s income, while being green protected environments.
• It proposes new ecologic materials with enhanced mechanical properties.
• Promotes de use of recycled materials and regional products.
• It is energy efficient due to the use of solar photovoltaic panels that supply the energy demand of the houses while being able to sale the surplus to the electric national grid.
• It achieves around 23% of drinking water savings by collecting rainwater that will be channeled to underground storage tanks.
• Rain water harvesting provides the water supply for green areas and residential gardens.
• There will be a reduction of solid waste for final disposal to approximately 6.54 ton/month by incorporating strategies for solid waste treatment.
• Proper areas for the separation, classification and storage of ordinary, organic and inorganic waste are included.
• It incorporates composting areas to treat organic waste that will later be used as fertilizer in the gardens.
• The prefabricated elements of the structural system will allow a high efficiency in the construction and the fulfillment of construction norms.
• Technological apps have been created to help the inhabitants reduce their energy consumption.
Video games have been designed in order to teach people about sustainable practices.



MIHOUSE, from a Project to the real life

You will be able to visit the sustainable MIHOUSE *social housing prototype at the Solar Villa in December. This will be located at the Melendez campus of Universidad del Valle. We invite you to follow the development of* MIHOUSE *project during the Solar Decathlon Latin America & the Caribbean 2015 by visiting www.mihouseproject.com and its social network @mihouseproject in Facebook, Twitter and Instagram.*

In consequence, MIHOUSE covers urban, socio-economic and environmental issues through innovative aspects that result in sustainable solutions. This is why the use of solar energy as main source of power is one of the most important aspects.

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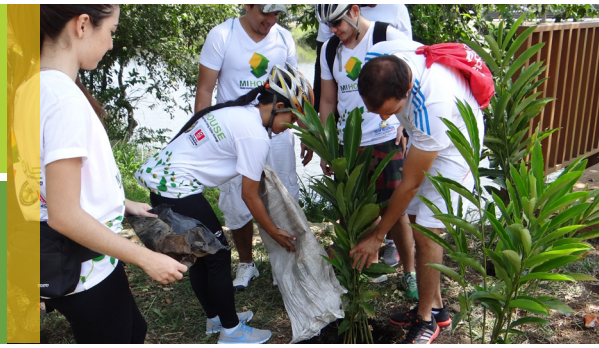

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