system is designed to support a unit of biomass considered carbon neutral, located at the center of the house. Given the need for ventilation due to the humid climate (1 ach), the climate control system is supported by a system of heat recovery located in the forced renewal unit. Natural cross ventilation is established between the lower floors and the skylight located over the stairway. Supports for solar or photovoltaic energy are installed on the flat roof.

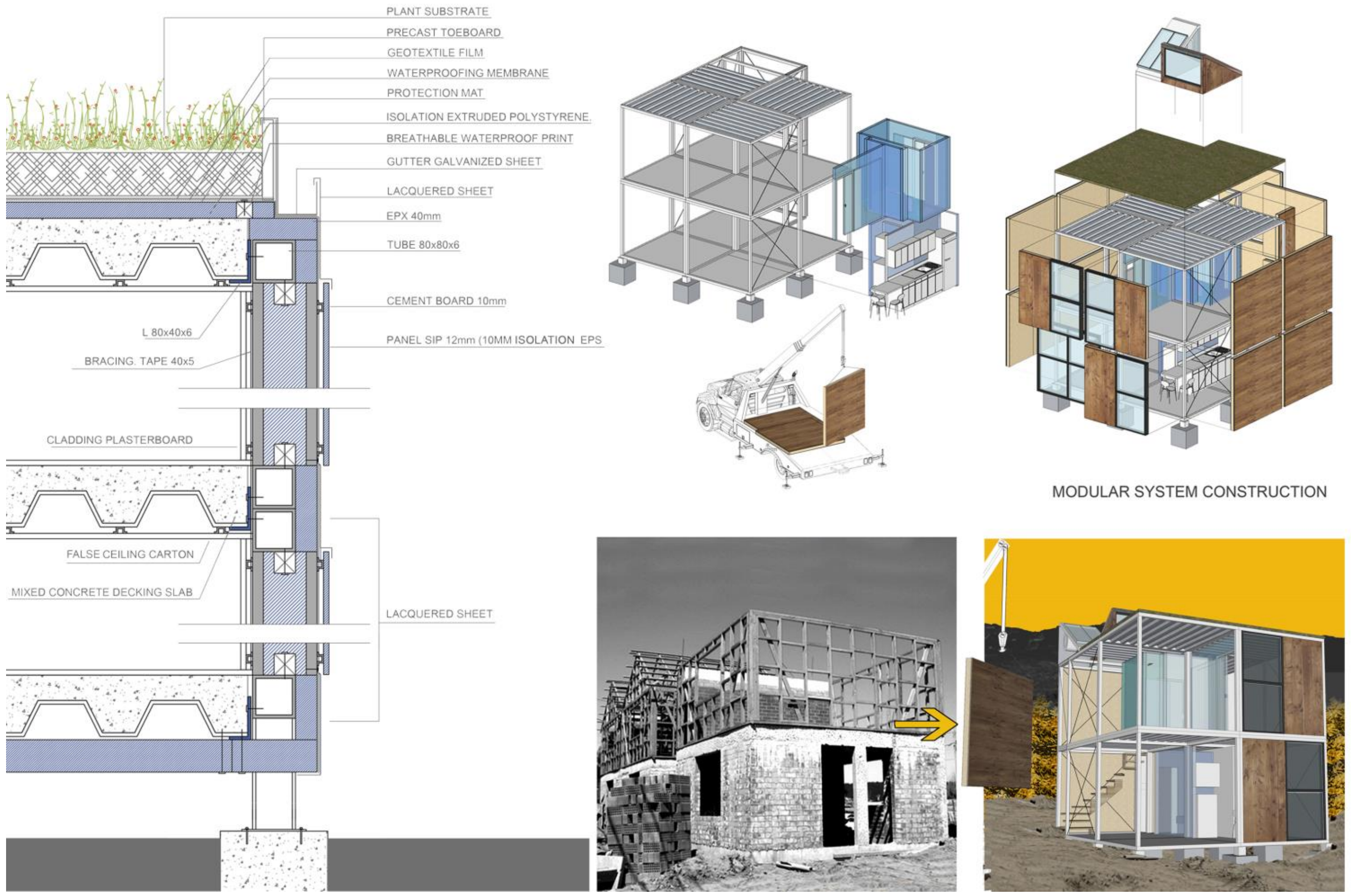

Figure 4. Construction modular system and the difference with the traditional construction system.

RESULTS AND CONCLUSIONS

About the architectural proposal for the CASA+ housing model previously described (2 floors and 60m2); simulations were performed with specific software. All simulations were performed with a north orientation of the main facade. In all the studied cases, sharp declines in energy demand were obtained when comparing data between materiality referred to the Thermal Regulation and the proposals. Several starting decisions for the architectural design, and the choice of materials, have been predicted from previous investigations, such as increased insulation of the envelope to suitable U values, the use of inner thermal inertia, or the dimensioning of the windows in approximately 20% of the floor surface (Fig.5). From the results obtained in the simulations, the following conclusions can be drawn:

- The CASA+ prototype, simply by being architecturally designed according to the climatic conditions, obtains, using an envelope according to the Thermal Regulation for a comfort range between 18°C and 27°C, an energy demand of 115-100kWh/m2, lower than homes built today in Chile in the area on the research, which ratio ranges from 190kWh/m2 to 143kWh/m2, according to data provided from previous research.

- The CASA+ prototype developed with an improved thermal envelope in relation to Thermal Regulations, shows a decrease in energy demand of 70-75%, and fits into the category A of energy efficiency as it shows savings exceeding 55% over the reference building according to TR. This improvement increases up to 75-80% in the case of semi-detached houses, with a common dividing wall, and 80-85 % in the case of terraced houses matched by two sides. Improving energy efficiency in detached and semi-detached houses is between 20-22% in the case of semi-detached houses and between 30-32 % for terraced housing. The values in the lower ranges, between 47 and 16 kWh/m2 are values already adjusted to acceptable quality standards in developed countries.

THERMAL ANALYSIS OF TRADITIONAL HOUSINGS

WALLS W/m²ºC	WINDOWS W/m²ºC	% NORTH WINDOWS	% SOUTH WINDOWS	THERMAL MASS 10cm	AGGREGATION																		
1,7	5,8	30	20	No	HOUSING WITH THERMAL CURRENT REGULATION (1)	147		107		69		143		111		81		140		115		91	
						KWh m²/year	% improvement	KWh m²/year	% improvement	KWh m²/year	% improvement	KWh m²/year	% improvement	KWh m²/year	% improvement	KWh m²/year	% improvement	KWh m²/year	% improvement	KWh m²/year	% improvement	KWh m²/year	% improvement
0,8	3	30	20	No	HOUSING IMPROVED WITHOUT THERMAL MASS (2)	91	39%	70	35%	50	28%	87	39%	71	36%	55	33%	75	46%	67	42%	60	34%
0,8	3	30	20	Yes	HOUSING IMPROVED WITH THERMAL MASS (3)	76	49%	54	49%	33	51%	71	50%	55	51%	38	53%	65	54%	53	54%	40	56%
0,8	3	60	10	Yes	OPTIMIZATION OF NORTH WINDOWS SURFACE AREA (4)	58	61%	34	69%	20	71%	54	63%	42	62%	29	72%	51	64%	41	65%	34	63%
0,8	3	60	10	Yes	% WINDOWS AREA WITH REGARD TO HOUSING FLOOR AREA (4)	22%		21%		20%		19%		17%		17%		22%		21%		20%	

Figure 5. Energy saving simulations.

Another quality of the prototype is to achieve these standards with a sufficiently tight economic investment in cost-benefit ratio. The budget studies show that the construction of CASA +, considering the plot, represents an impact of 57USD/m2 , which fits into the average cost, that is at the 65USD/m2 . Major savings could be achieved by improving the execution times at the workplace, increasing prefabrication, which could lead to improvements in finished or increscent of the floor area.

The first CASA+ prototype is currently in the pre-project implementation phase. The interest of the property market on the proposal, leaves the door open to a new phase in which, if it is possible to combine synergies and attract the adequate funding, the completion of a construction project. Its development would be made in UBB to assess the complexity of construction, cost and assay, and above all, to make the energy monitoring over a prolonged period of time, so that the feasibility of the proposed scale can be demonstrated. The research methodology allows to be extended to other climates of the region and other Latin American socio-economic realities, with a previous study of local peculiarities, both in terms of climate and the constructive development. The system, currently limited to detached or grouped house, could be developed using the same methodology for high-rise housing. The private sector participation in the development of the system is considered crucial by being involved in the technological development and financial feasibility, as well as the legislature, by facilitating the exchange of improving energy efficiency by equivalent improvement in the construction and architectural quality of the middle and lower class's homes.

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