Evolutionary Lightweight Housing System (ELiHS)

Submitted By: SUMMARY architecture



Organization Profile

Organization Name: SUMMARY LDA.

Organization Type: Private sector

Website: https://summary.pt/en/

Practice Details

Country(ies): Portugal

City(ies): Porto, Oeiras, Torres Vedras

Start Year: 2019 **Ongoing:** Yes **End Year:** N/A

Main Adequate Housing Components:



Housing Thematic Areas:

- Social Housing
- Housing & Climate Mitigation
- Housing Data & Monitoring
- Technology & Digital Solutions in Housing

Relevant SDGs:



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Problem & Context

Portugal's housing crisis results from market liberalization, tourism expansion, and insufficient public policy. Rising property prices and rents—fueled by foreign investment, short-term rentals, and urban regeneration—have limited access to affordable housing, particularly in Lisbon and Porto. With social housing representing less than 3% of the total stock and wages stagnating, many households face displacement. Policies such as the "Golden Visa" have encouraged speculation, while weak rent regulation and low public investment deepened inequalities. The absence of a coherent long-term housing strategy and poor coordination between national and municipal levels hinder effective governance. Addressing these structural gaps requires innovative approaches. Prefabrication and agile construction methods offer faster, cost-efficient, and sustainable housing solutions, enabling large-scale delivery and reducing environmental impact.

Solution Developed

The main objective is to propose a rapidly implemented solution that is replicable on a large scale, generates little construction waste, and is primarily factory-produced, given the shortage of construction workers. Its presents an accurate and efficient answer to the contemporary need for simplify and accelerate the building processes.

Thus, the aim is to quickly respond to the lack of social housing, a demand that has increased with the pandemic and has been further pressured by increased immigration and rising housing prices. The efficiency of the system is directly linked to the speed of housing production and the reduction in the waiting time of populations for decent and healthy housing.

The effectiveness of the solution is based on the evolutionary system, which each module leaves the factory completely or partially ready, including all interior and exterior finishings, insulations, window frames installations, fixtures and fixed furniture pieces. This approach of production of all components in factory environment, allowed a faster and highly controlled construction process, avoiding construction problems, unforeseen events, on-site works, thus reducing waste production.

Implementation

The prototype system is the result of a research and development project result of the collaboration of AEC companies to develop a construction solution for a social housing building that would have to be completed in fourteen months. The most important was to build it as quickly and cost-effectively as possible. The construction time of the solution was developed five times faster than the average in Portugal, without compromising the building's structural quality. Thus, in a situation like this, the architecture role is not just about to design but mainly to coordinate based on data-driven design, in order to take advantage of the know-how of each company to enhance every feature of the solution

Enablers & Obstacles

The main key driver in Portugal is the rising house affordability pressure – rooted by rental prices and inflation-, also the gentrification processes pushed by tourism and international investments in short-term rental market. Due to those factors, there´s a growing demand for social and affordable house. In other hand, EU and internal national funding programs are catalysts for construction or rehabilitation of new dwellings, aiming to enlarge the public housing stock, on the way to guarantee the constitutional right for housing.

In other hand, to respond to that growing demand, the AEC industry stakeholder's area adopting prefabricated and industrialized evolutive building methods. That can enable costs reduction, controlled budget and mainly short time dwellings delivers.

Results & Impact

In the longer term, the impacts of the evolutionary lightweight system are reducing construction costs — by scaling up production, reducing material waste and shortening construction timelines — and attracting private investment in the production of social housing.

The lightweight evolutionary system was developed to allow construction with both steel-frame and cross-laminated timber structures, and both construction solutions are currently being developed for social housing projects. Furthermore, the two systems have the flexibility and potential for disassembly and reuse, supporting circular economy and end-of-life solutions. It also worth nothing that is notable the benefits of timber in decreasing the embodied carbon in the construction process.

In terms of the urban policies, the modularity enables rapid expansion of the dwellings stock, reducing deficits and easing pressure on rental and property prices. Moreover, the reduced schedule of construction, highly controlled factory quality and less material waste, which result in less costly and more controlled budged processes, act as incentive for the involvement of the private sector in the production of social housing.

Now, 3 projects with a total of 86 dwellings made with evolutionary lightweight construction, with steel and timber, are under construction in Portugal. The system allows more versatility of typologies and combination enabling a variety of typologies from one-bedroom to four-bedroom.

Replication & Scale Up

The evolutionary design solution was repeatable, across Portugal in three projects with 86 dwellings so far. The successful is enabled by data-driven concept processes that improves efficiency when designing for different sites and contexts, making the project more adaptable and optimizing the outcomes. Furthermore, the design based on information enhances the modular systems to diverse typologies and regulations. Also, one of the key factors for success

is the partnership with local industry and factory-produced elements, ensuring speed, quality control, and cost reduction.

The replicable framework of evolutionary lightweight solution by modular design can be easily scaled-up and the project can be exported by joint-venture models, to ensure design quality and local monitoring of the work.

The system has the flexibility to adapt to different designs solutions, geographic contexts, housing requirements, and building codes, whether in Europe or abroad. This is guaranteed due to its parameterization and modularity, the project can be replicated anywhere and adapting to physical conditions, without any loss of architectural and spatial quality.

Policy Uptake

This housing practice is a new or innovative practice that is not yet adequately or fully integrated into formal policy frameworks.

Since 2023, the prefabricated and modular solutions were integrated in national legislation for public projects. Despite the recent integration of the subject in the legislation, a broader incorporation into public housing promotion policies is necessary, allowing for the effective advancement of replicability and large-scale production.

Furthermore, there is still some prejudice against prefabricated solutions, still stemming from the post-war period. The trend, with the increase in new prefabricated projects, is to reverse the perception of this solution.

Lessons & Takeaways

There is still some way to go regarding the incorporation of wood and the reduction of steel in the system in to decrease system's footprint.

However, we also understand the potential for further exploring the deconstruction and reuse of buildings, which has great potential in the circular and end-of-life economy, facilitated by the fact that it is an evolutionary modular system.

Furthermore, there is a need to expand quantitative and qualitative monitoring of post-occupancy projects to improve proposed design solutions and support data-driven design.