Modularization and Off-Site Construction Towards Sustainable Urbanism

Investigating their interaction within an experimental workshop

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Abstract

According to the United Nations, the number of people living in cities compared to the global population is expected to rise from 50% up to 70% in the following 30 years [1]. Due to its worldwide known high-quality living standards and its integrative social policies, Vienna is one of the cities in Europe growing the most, and it is forecast to keep on growing in the next years, achieving two million inhabitants and being its maximum size since the so-called “Gründerzeit” at the end of the 19th century. Responding to this massive socio-demographic change, in 2017, Vienna set as a challenge to offer 13,000 social housing units per year, whereas 9,000 were funded [2]. In order to succeed throughout this urban growth, a sustainable urbanization concept is essential, based not only on environmental but also on economic and social strategies, so that the new urban interventions are equitable, viable, and bearable. Space and resource shortages, together with the greenhouse gas (GHG) emissions reduction, are decisive factors for environmental sustainability. At the same time, the cost and speed of construction are to be kept as low as possible with no compromise to the quality of space and comfort.

To meet these expectations, a systematic approach focused on improving efficiency in the planning and construction process needs to be implemented. A high level of prefabrication allows an accurate production in local factories that meet the high energetic standards set as mandatory in Vienna since 2015 [3] and throughout reach the highest passive standards in housing, while errors, labor injuries, reworks, and delays are drastically minimized. Furthermore, besides noise and dust, the time spent on-site and consequently also the costs are considerably reduced, since the area is turned into an assembly site where the pieces are delivered “just in time” and only need to be joint on-site, whereby the space required for stock elements remains minimal and which is consequently the most suitable approach in compacted cities with shortage of space. Such a standardized procedure based on modular elements implies different design strategies and building methods, which should be implemented in an early stage of the project. Universities and academic environments are expected to offer specific knowledge and praxis-oriented training, where architects and urban planners are able to investigate new perspectives and formulate innovative and flexible practices based on modular prefabricated low-intensive components. Following this interdisciplinary discourse and aiming to relieve the urban pressure European cities are expected to live, an experimental workshop with students of architecture was developed at the Vienna University of Technology. The scenario was a hole in the city and the goal its densification through the creative use of modular prefabricated timber-based elements, the LCT-System developed by Cree by Rhomberg, to achieve valuable social and living spaces while improving the whole building lifecycle assessment and taking advantage of the remarkable benefits of the system. Regular interdisciplinary meetings were conducted throughout the four-months extended workshop, where impressions and hypotheses were systematically exchanged with the goal to identify innovation potentials.
Different fundamental subjects, such as flexible and adaptable living forms, social interaction and inclusion, and design for assembly and disassembly, were taken into account. The intensive experimental know-how exchange between students, teachers, and Cree by Rhomberg served as a platform where a significant variety of applicable and suitable solutions were explored from Cradle to Cradle in order to meet the expectations of the desired sustainable urbanization. The results obtained through the teamwork were analyzed and compared, including all participants’ viewpoints, to establish the baseline of a discussion about the benefits, constraints, and deficits of such a systematic approach.

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References


Biographies

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