

Neo-ecological Approaches to Solving the Construction Crisis

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Submission: April 07, 2025; Published: April 21, 2025

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Abstract

Current conditions pose a significant challenge for the European construction industry in producing high-quality buildings that are both resource-efficient and cost-effective. Various issues overlap, such as land scarcity, disproportionately rising energy and raw material prices, extensive legal and regulatory requirements, increased environmental standards, growing consumer comfort demands, and declining real incomes of the middle class. This situation can also lead to unconventional solutions, such as the approach presented here, which focuses on analyzing and evaluating historical crisis situations, deriving strategies from them, and disseminating research findings in an accessible manner.

Keywords: simple smart buildings; construction crisis; neo-ecology; proven solutions

Introduction

Smart buildings vs. simple smart buildings

The mainstream currently follows the path of innovative advancements in building automation as a promising strategy. The development goal is “intelligent” buildings, so-called “Smart Buildings,” whose functions should be optimized through AI control. However, it is often overlooked that technical innovations can increase overall resource consumption. As early as the second half of the 19th century, economist William Stanley Jevons recognized that technological advancements, which allow for more efficient resource use, do not lead to savings but rather to increased consumption of these resources [1]. In contrast, this article discusses the reimplementation and moderate advancement of historically proven technologies as an alternative approach.

Our architectural heritage holds a wealth of experiential knowledge that remains underutilized. Past generations routinely built durable structures using simple means. Across different regions, resilient construction techniques and building types developed using locally available materials, many of which have endured for centuries. This selection of the best buildings has survived a rigorous evolutionary process, forming a repository of best practices [2].

By combining experiential knowledge with applied construction research, viable future strategies can be defined, with long-term effects already evident in existing structures. These techniques and systems are generally simple, cost-effective, and yet intelligent, making them accessible to large portions of the global population, unlike short-lived and expensive high-tech systems.

Intermediate technologies instead of high-tech

This approach is by no means an endorsement of anti-technology sentiment or a return to the Stone Age. Rather, it is about a comprehensive evaluation process for intermediate technologies and their long-term efficiency potential. The concept of Intermediate Technology, developed in the 1970s, offers the potential for a globally implementable technological shift at a low threshold [3]. Intermediate technologies are characterized by both efficiency and sufficiency: they are intuitively understandable, easy to maintain and repair, and have a long lifespan. A striking example is the hydraulic ram pump, which uses the kinetic energy of flowing water to self-regulate and pump water upwards, functioning maintenance-free for decades without operational costs. In construction, intermediate technologies such as pulleys and adjustable wooden shutters [4] were prevalent until well into the 20th century (Figure 1).



Figure 1: Wooden shutters - a proven low-tech approach for window shading with high aesthetic value.

Renovation instead of new construction

The negative ecological consequences of increasing land sealing and the high infrastructure costs of sprawling developments make greenfield construction less attractive both ideologically and economically. At the same time, there is a substantial number of vacant buildings in already developed areas. Rising energy and material costs, along with extensive regulatory requirements and environmental standards, continue to drive up the costs of new construction systems offered by the industry. By contrast, renovating an existing building using methods summarized under the concept of “Simple Smart Buildings” can be significantly more cost-effective [5]. Buildings constructed before the 20th century generally require fewer modifications, as their substance already embodies “Simple Smart Buildings.” However, structures from the 20th century often present greater challenges due to the introduction of new construction techniques that may require more extensive adaptation.

Used instead of new

Industrial production and mass consumption have led to an unprecedented abundance of goods. Since many homes can no longer accommodate the volume of possessions, self-storage facilities and second-hand markets have become commonplace. In the construction and housing sector, the range of second-hand goods includes everything from building materials and machinery to furniture and home textiles. Online platforms make these resources easily accessible and cost-effective. The continued advancement of AI is expected to further simplify the search for suitable materials. Moreover, AI-driven expert systems could suggest solutions outside conventional thought patterns, leading to more efficient and appropriate applications.

Simple instead of complex

Efficiency gains on one side often result in resilience losses on the other. The more control technology is used in a system, increasing its complexity, the higher its susceptibility to failure. By understanding and deliberately utilizing the natural physical behavior of traditional, time-tested building materials and constructions, complex regulatory systems for building conditioning can be rendered unnecessary.

Monolithic instead of layered

Massive masonry made of stone or brick has been the universal wall-building material in most architectural cultures for millennia. Depending on the masonry bond, it offers advantages such as using regionally available raw materials, good structural stability, and high thermal mass. Combining local stone with traditional lime mortar creates durable walls with a balanced ecological footprint [6]. Unlike cement, lime absorbs atmospheric CO₂ during the curing process. In Central Europe, stone walls were once considered difficult to heat in winter. However, as summers become increasingly hot and prolonged, they now provide a naturally cool indoor climate without the need for energy-intensive cooling technology.

Dismantlable instead of inseparable

Simple and intuitively understandable dismantlability of building constructions facilitates renovation and promotes the reuse of building components. For example, lime-bound mortar joints in brick masonry are visually and structurally recognizable, allowing bricks to be easily separated from the mortar due to its low but sufficient adhesion. These bricks can then be reused immediately without further treatment, while the mortar can be crushed with minimal effort and repurposed as aggregate,

backfill, or recycled as raw material for new lime production. The same principle applies to traditional, interlocking wooden joints that are not glued. Such constructions are easy to dismantle, and the recovered timber can be reused for long-lasting secondary applications, as numerous historical examples demonstrate.

Durable instead of short-lived

The concept of deliberately designing products with a short lifespan to boost industrial sales was first introduced as a strategy to counter the Great Depression of the 1930s. However, this approach drives excessive consumption of raw materials and energy, ultimately contributing to the vast waste generated by Western disposable societies. This economic principle is also reflected in the construction industry, where the life cycles of building components, and even entire buildings, are continuously shrinking, now often lasting only a few decades. While this artificially increased demand inflates new construction costs, the shortening life cycles lead to higher depreciation and, consequently, rising housing expenses. In contrast, long-lasting buildings result in lower housing costs and a reduced burden on the overall ecological system.

Handcraft instead of industrial products

Industrial production and large-scale distribution of goods are most efficient as long as raw materials and energy remain affordable and reliably available. However, when crises disrupt supply chains, energy becomes expensive and uncertain, and deindustrialization releases a large workforce, handcrafted production using locally available raw materials can become a viable economic alternative.

A closer look at Austria's economic crisis after World War I provides valuable insights into how alternative strategies enabled the creation of high-quality housing despite challenging economic conditions. The dissolution of the vast economic area of the Austro-Hungarian Empire into small states with diverging economic interests led to supply chain disruptions, a decline in industrial production, and mass unemployment. The transformation of the multinational empire into individual nation-states triggered migration flows and, consequently, increased demand for housing.

Cooperation instead of going it alone

In Vienna, alongside an extensive municipal housing program, a cooperative settlers' movement emerged, in which housing was created collaboratively and through individual initiative. Cooperation took place in various forms: the collective purchase and subdivision of large plots of land, joint labor on all the settlement's houses, and cooperative purchasing of building materials and tools at wholesale prices.

Beyond the significant savings on land, materials, and labor costs, the joint work in these settlements also fostered strong social networks that endured well beyond the construction phase. Knowledge transfer between different settler groups was

facilitated through associations and their regularly published materials.

This model can be adapted to address today's challenges in renovating existing buildings. Modern social networks and platforms, such as YouTube as a learning platform for construction techniques, are excellent tools for knowledge and experience exchange.

Own work instead of outsourcing

Labor costs in Central and Western Europe are disproportionately high due to heavy taxation on human labor. The ratio of how many hours one must work to earn the net income required to pay for one hour of a skilled worker's labor is typically around a factor of five. While certain tasks may initially take longer to complete due to a lack of experience, skills improve over time, increasing productivity and fostering a sense of accomplishment. In addition to simple, rough manual construction tasks that are easy to learn, more complex processes can be taught by more experienced group members. Since the "Simple Smart Buildings" approach requires significantly fewer highly specialized skills that can only be performed by professionals, a much greater share of construction work can be done independently.

Regional instead of international

The collapse of global supply chains in the early 2020s demonstrated the vulnerability of material supply in the construction industry. Beyond fundamental ecological considerations, the increasing global trend toward protectionism and rising transportation costs make the use of regional building materials increasingly attractive. Regional materials not only shape local building cultures but are also exposed to local climatic conditions over long periods. As a result, the existing regional building stock serves as a real-time, full-scale material laboratory, providing valuable insights for durable and resilient construction.

Knowledge transfer through podcasting

To make the concept of simple yet intelligent building methods widely accessible, the authors have developed the podcast series "Simple Smart Buildings" alongside numerous scholarly articles [5]. A new episode is released every two weeks, covering topics through interviews, expert discussions, and freely formulated thoughts. With over 150 episodes, the podcast presents a comprehensive exploration of this field.

References

1. Jevons WS (1866) The Coal Question. London: Macmillan and Co.
2. Idam F, Kain G (2023) Proven solutions. The medium technology of the building cultural heritage. In: Matthias Ripp und Christer Gustafson (Hg.): Climate change related urban transformation and the role of cultural heritage. Lago: International Scientific Publisher, pp. 281-299.
3. Schumacher EF (1973) Small is Beautiful. Economics as if People Mattered. London: Vintage.

4. Kain G, Idam F, Huber A (2023) Beschattungsrahmen für die Fenster-Außenbeschattung im Denkmalbereich. Shading frame for exterior window shading in historic preservation areas. In: Bauphysik 45(6): 297-304.
5. Idam F, Kain G (2024) Simple Smart Buildings – Podcast series. Historical building techniques - the future relevance of proven methods. <https://podcasted3e6b.podigee.io/> (last accessed on 29.04.2025).
6. Idam F, Kain G (2020) Historische Bautechniken für Wildbachverbauten im Salzkammergut. (Historical Construction Techniques for Torrent Control Structures in the Salzkammergut). Göttingen: Cuvillier Verlag.



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DOI: [10.19080/CERJ.2025.15.555913](https://doi.org/10.19080/CERJ.2025.15.555913)

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