

BIBM Position Paper on

Choosing between the Rebuilding and Renovating Options

Abstract

This position paper analyses the rebuilding and renovating options with the aim of improving the construction work performance and sustainability. As the main message, it **challenges the idea that renovating is always better than rebuilding** due to relatively minor operations. Instead, such a choice relies on different factors that shall scientifically be measured and tracked. Given the variety of different drivers involved in this process, this paper **stresses the significancy of life cycle assessment and life cycle costing being proper methodologies** to determine among which should be chosen and therefore incentives to be given. In that sense, the main drivers for choosing between the two are illustrated in this paper.

Introduction

Supported by national, regional and global policies, actions and initiatives, sustainable construction is not a possibility but rather a must to achieve the sustainability goals. In that sense, technologies in the construction sector have noticeably evolved during the last years to respond to the new needs related to sustainable development, circular economy, and decarbonisation. The consequence of such innovations has a drastic impact not only on the performance, characteristics and functionalities of construction products but also on the global and national sustainability agendas.

Thanks to innovations in construction, rebuilding (operation to build again, after a demolishing operation) and renovating (operation of improving a structure) are possible methods to improve the sustainability and performance of construction works. On one hand, the possibilities given through rebuilding include new flexible designs that adapt easily to the new needs of a changing society while not compromising the presence of constraints linked to the existing work. On the other hand, renovating provides benefits to the living construction work through significant advantages that can conform the needs of the inhabitants and users.

With the motivation to contribute to the knowledge on different possibilities in sustainable construction, this position paper represents the main drivers for choosing between rebuilding or renovating and the necessity of performing Life Cycle Assessments and Life Cycle Costing while choosing between the two.

Main Drivers for Choosing between Rebuilding and Renovating

The choice of a rebuilding or renovating activity is based on different drivers, and thus should be based on detailed consideration of them.

1. Building Condition

Building condition plays the major role in determining the choice between the two. Whereas some buildings can carry the load of renovation, the others may be more vulnerable to the proliferation of hidden problems that could easily arise shortly after the end of the renovation process. On the other hand, stability and functionality can also be jeopardized by bad maintenance and the effects of improper use. In this regard, the conditions of the incumbent building should be considered when choosing between rebuilding or renovating. Rebuilding could be the optimal choice if hidden problems are likely to appear in the case of choosing the renovating option. Dangerous substances could be detected in the building, and in that case renovating could be problematic. Otherwise, renovation is the correct choice if no consequences are foreseen.

2. Period of Inoccupation

Both rebuilding and renovating will create a period of inoccupation. The duration and structure of this period differ between the two options and within different cases. Here, renovation can bring opportunities due to the short inoccupation period. On the other hand, rebuilding could be an effective solution as during renovation there is predicted a decrease in the quantity and quality of the usable space.

3. Speed of construction

The speed of construction depends particularly on what is needed and how it is performed. With the industrialised process of precast concrete elements, construction work can fully be planned ahead of starting rebuilding, including the delivery date of the finished building. In addition, by using these elements as both structural and non-structural building envelope, the overall rebuilding time is dramatically reduced and is comparable to the one needed for deep renovations.

4. Changing the quantity and quality of the usable space

The quantity and quality of the usable space are changed in different means in both rebuilding and renovating operations. Both options can increase and change the quality of the usable space, even if rebuilding can be more effective.

5. Fire Safety

Fire safety should be considered when choosing between rebuilding or renovating. In that sense, modern conceptions of fire safety (e.g. reliable escape routes) can already be integrated into a new design in a new building, although there are ways to improve fire safety through renovation.

6. Choosing between short-term or long-term solutions

Rebuilding and renovating bring long and short-term solutions respectively. If the objective is to profit from the structure or work for a longer time, the most favourable choice is rebuilding. Otherwise, it is renovating. At first glance, opting for a short-term solution may sound more profitable as rebuilding costs are higher at the beginning. However, the investment in rebuilding is soon recovered by a lower running cost of the building.

7. Community

Choosing between rebuilding and renovating refers to choosing how the community continues to thrive. With the implementation of newly designed and developed technologies, rebuilding can bring new opportunities for social and economic development while increasing accessibility. Rebuilding activities with precast concrete allows either the conservation of the outside shell with a completely new internal design or the faithful reproduction of the existing style. Otherwise, renovating can bring new opportunities for the community, through altering the layout of the livable space according to the needs.

8. Standardisation

Buildings are subject to national, regional and international standardizations. It is a bit controversial how renovating may not fully fit in with this legal scheme, whilst with a newly designed building such standardizations will fully be covered. At the end, both options should fulfil the same safety and technical requirements.

9. Energy

The construction sector is among the top energy consumers accounting for approximately 40% of global final energy usage. Considering this, the built environment could play a key role in the global sustainability transition. A building can only be energy efficient when a combination of crucial factors like insulation, thermal mass, air tightness and ventilation are properly addressed. Realistically, all these aspects can only be fully tackled in a new building. On the other hand, energy efficiency can be improved through renovation as well.

10. Environmental Impact

From the environmental point of view, the most efficient option should be chosen to offer the users buildings with the best environmental performance possible. This should be subject to scientific and common measurement. In any case, a newly designed building could fit in the sustainability mindset by incorporating such an understanding through using circular technologies.

11. Seismic

Especially in seismic areas, safety construction techniques have dramatically evolved in the recent years. A newly built asset can easily incorporate the latest developments to increase the safety of the occupants. In case of renovation (for example for improving energy efficiency), earthquake behaviour has to be taken into account and incorporated in the refurbishment scheme.

Life Cycle Assessment is the key

In the end, both options rely on different factors in which the appropriate selection depends on the evaluation of all environmental, social, and economic indicators.¹ There is no generic way of determining which of the alternatives should be preferred. In this regard, Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) provide a good comparison of environmental impact between rebuilt and renovated buildings, that has to be considered and conducted ultimately. Scientific studies illustrate the significance of such assessments in order to choose the best option between rebuilding and renovating, also using such assessments in their methodology to compare both options.^{[OBJ] 2 3 4 5 6 7}

The Main Message and Conclusion

Technologies and perceptions in construction have significantly evolved towards the sustainability transition, namely ensuring today's needs with a more responsible manner without compromising future generations' needs. In order to achieve the goals of sustainability transition, stakeholders now consider wisely while choosing between rebuilding and renovating. Apart from the traditional understanding of renovating is the best option over rebuilding, stakeholders should also consider the fact that rebuilding brings opportunities in sustainability as demonstrated in this position paper. At the end, the choice in between rebuilding and renovating a building requires a careful consideration of the main drivers. In order to reach this careful consideration, Life Cycle Assessment and Life Cycle Costing bring ideal methodologies to decide on which one of the solutions fits better to one's needs. Considering all of these, BIBM as the representative of the European precast manufacturers, advocates for conducting Life Cycle Assessment and Life Cycle Costing on both options, and therefore choosing the best way accordingly without having pre-assumptions. From the sustainability point of view, only LCA and LCC methodologies on a case-by-case basis can provide the best solution for a given situation; there should be no a-priori preference for one technical solution over another. Indeed, once the better option is chosen, the same legal, fiscal, financial support should be given by the policy and stakeholders as the other.

¹ Bragadin, Marco A., Luca Guardigli, Mattia Calistri, and Annarita Ferrante. "Demolishing or Renovating? Life Cycle Analysis in the Design Process for Building Renovation: The Progetone Case." *Sustainability* 15, no. 11 (2023): 8614. <https://doi.org/10.3390/su15118614>.

² Palacios-Munoz, Beatriz, Belinda López-Mesa, and Luis Gracia-Villa. "Influence of Refurbishment and Service Life of Reinforced Concrete Buildings Structures on the Estimation of Environmental Impact." *The International Journal of Life Cycle Assessment* 24, no. 11 (2019): 1913–24. <https://doi.org/10.1007/s11367-019-01622-w>.

³ Arkhangelskaya, E, and N Chuprova. "Renovation of Built-up Areas: Life Cycle Assessment." *IOP Conference Series: Materials Science and Engineering* 1079, no. 4 (2021): 042054. <https://doi.org/10.1088/1757-899x/1079/4/042054>.

⁴ Serrano, Teddy, Thomas Kampmann, and Morten W. Ryberg. "Comparative Life-Cycle Assessment of Restoration and Renovation of a Traditional Danish Farmer House." *Building and Environment* 219 (2022): 109174. <https://doi.org/10.1016/j.buildenv.2022.109174>.

⁵ Wastiels, L., Janssen, A., and Decuypere, R. Expanding boundaries - demolition versus deep renovation of residential buildings: Case study with environmental and financial evaluation of different construction scenarios – L. Wastiels, A. Janssen, R. Decuypere, J. Vrijders, 2016. https://doi.org/10.3218/3774-6_76.

⁶ Kara, Emre Can. *Renovation or rebuild? An LCA case study of three types of houses*, 2012.

⁷ Holmbom, Emil. "Life Cycle Assessment of a New and Renovated Building," 2021.