

# Renovation and adaptive reuse as drivers of sustainable and liveable office solutions

## Introduction

As the world gradually emerges from the COVID-19 pandemic, companies around the globe will be looking to reimagine the office. In the first white paper in this series, we covered the key driver of this process and argued that success can only be achieved if the future office is based on sustainable and liveable solutions.

In this white paper, we offer a unique perspective on achieving sustainable and liveable office buildings through adaptive reuse and renovation. We argue that the potential of adaptive reuse and renovation is so strong that these interlinked approaches are going to be winning strategies in the coming decade.

In the next few years, a high proportion of the office building stock will need to undergo thorough renovation projects to ensure modern, safe, and sustainable work environments. Ramboll has extensive experience with projects of this type and offers a broad range of services essential to deriving maximum value from renovation and refurbishment projects.

## Making the case for renovation of office buildings

In the coming decade, a huge renovation drive will sweep through Europe. This will be fuelled in part by government regulations and subsidies, and in part by institutional investors seeking to future-proof their portfolios.

In October 2020, the European Commission published its 'Renovation Wave Strategy' to improve the energy performance of buildings. The Commission aims to at least double renovation rates in the next ten years and make sure renovations lead to higher energy and resource efficiency. Buildings are responsible for some 40% of energy consumption and 36% of CO<sub>2</sub> emissions in the EU. Office buildings in particular have been identified as contributing significantly to global warming during their building lifecycle with a substantial contribution to CO<sub>2</sub> emissions .

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<sup>1</sup> The Business Case for incorporating Sustainability in Office Buildings: The Adaptive Reuse of Existing Buildings (Wilkinson & Reed, 2012).

### **Adaptive reuse as a renovation strategy**

Adaptive reuse is a concept that carries many different meanings depending on the context in which it is used.

Numerous similar terms are therefore used interchangeably: renovation, retrofitting, conversion, adaptation, reworking, rehabilitation, historic preservation, or refurbishment <sup>2</sup>.

We define adaptive reuse as a process that retains as much as possible of the original building while upgrading the performance to suit modern standards and changing user requirements.

In adaptive reuse, environmental, economic and social impacts are all linked to one another. Reusing the materials already contained in a building reduces the use of new materials, bringing an environmental benefit, but also an economic one as it lowers the cost of materials on the project <sup>3,4</sup>. Similarly, a Ramboll report on the total economic and environmental cost of renovation versus new construction showed that renovation outperforms new construction both in terms of the total economic cost of the project and in terms of lower CO<sub>2</sub>-emissions and associated climate impact <sup>5</sup>.

90% of our time is spent in our homes, workplaces and other buildings <sup>6</sup>. The quality of the indoor environment of those buildings can therefore significantly impact our health, well-being and economic productivity. Risk factors include poor indoor air quality, temperatures that are too hot or too cold, mould and damp <sup>7</sup>. A survey conducted by Ramboll has shown that indoor air quality, daylight and quality lighting, and thermal comfort are the top three most important factors affecting well-being and health <sup>8</sup>. Furthermore, a range of studies show and support the necessity of focusing on the actual experience of living in buildings <sup>9</sup>.

A further argument for renovating buildings is to increase their resilience to climate change. By resilience, we mean that buildings are well-conceived, well-constructed and protected against known hazards such as fire, flooding, earthquakes and spread of infection. Designing for resilience to prevent extreme events from seriously impacting urban communities requires a holistic building design that considers risk levels for general safety, including fire prevention, as well as energy efficiency.

In addition, renovation enhances the resilience of the construction sector in the face of a crisis, as evidenced by experience in recent years. Employment dropped drastically in countries where the construction sector focused mainly on new build construction projects compared to countries in which the proportion of renovation activities was higher <sup>10</sup>.

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<sup>2</sup> Adaptive reuse as an emerging discipline: an historic survey (Plevoets, B., Van Cleempoel, K., 2013).

<sup>3</sup> Efficacy of adaptive reuse for the redevelopment of underutilised historical buildings: Towards the regeneration of New Zealand's provincial town centres (Aigwi, I.E., Egbelakin, T., Ingham, J., 2018).

<sup>4</sup> Community-Initiated Adaptive Reuse of Historic Buildings and Sustainable Development in the Inner City of Shanghai (Yung, E.H.K., Chan, E.H.W., Xu, Y., 2014).

<sup>5</sup> Renovation versus demolition – a case-based analysis of life cycle CO<sub>2</sub>-emissions and costs (2020), Ramboll.

<sup>6</sup> The National Human Activity Pattern Survey (NHAPS): a resource for assessing exposure to environmental pollutants (Klepeis, N.E., 2001)

<sup>7</sup> Putting Renovation on the Agenda – Global Perspectives on the Value of Renovation (Rockwool Group, 2018).

<sup>8</sup> Sustainable Buildings Market Study 2019 (Ramboll, 2019)

<sup>9</sup> Listed in Putting Renovation on the Agenda – Global Perspectives on the Value of Renovation (Rockwool Group, 2018).

<sup>10</sup> Boosting Building Renovation: What Potential and Value for Europe? (Policy Department A: Economic and Scientific Policy, 2016).

Finally, studies also show that office buildings classified as energy-efficient command higher rents than less energy-efficient but comparable office buildings <sup>11</sup>, and that it is both cheaper and more climate friendly to renovate rather than tear down and build new office buildings <sup>12</sup>.

### The renovation market in Europe

The European Parliament estimates that by 2030, 35 million buildings could be renovated and up to 160,000 additional green jobs created in the construction sector. Residential buildings account for approximately 75% of the building stock in Europe, while non-residential buildings account for about 25% and office buildings in particular account for approximately 6%. Much of the European building stock needs renovation. More than 40% was built before 1960 and 90% before 1990, and most of these buildings will still be standing in 2050 <sup>13</sup>.

Some European member states already have mandatory minimum energy performance standards in place. France has implemented a ban on rent increase in the case of poorly performing buildings, starting in 2021. Moreover, the country has committed to renovating the worst performing buildings by 2028. In the Netherlands, all office buildings will need to have an Energy Performance Certificate of at least Class C by 2023, increasing to Class A by 2030. Similarly, in Belgium, Flanders is also considering proposals for minimum energy performance levels for non-residential and residential rented buildings <sup>14, 15</sup>.

At the municipal level, most larger cities in Europe are currently focusing on energy renovations and retrofitting. A recent Ramboll project compiled more than 20 city-run energy efficiency programmes and strategies in North Europe alone <sup>16</sup>.

The EU energy renovation market has been estimated to be worth approximately EUR 109 billion in 2015 and consists of 882,900 jobs. The French, German and Italian energy renovation markets account for almost half of the EU total, and of these, the German market is by far the largest, accounting for 22% of the total <sup>17</sup>.

Similarly, the market size of commercial property remodelling in the US reached USD 34.7 billion in 2019, continuing a strong trend of market growth that began in 2011 and seems to be continuing <sup>18</sup>.

### Key Takeaways

- It is both cheaper and more environmentally friendly to renovate rather than tear down and build new office buildings.
- Renovating offices can increase their resilience to hazards such as fire, flooding, earthquakes and spread of infection.
- Offices classified as energy-efficient command higher rents than less energy-efficient but comparable commercial buildings.
- Indoor air quality, daylight and quality lighting, and thermal comfort are the top three most important factors affecting well-being and health in offices.

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<sup>11</sup> The Value of Energy Labels in the European Office Market (Kok & Jennen, 2011).

<sup>12</sup> Renovation versus demolition – a case-based analysis of life cycle CO2-emissions and costs (Ramboll, 2020).

<sup>13</sup> Boosting Building Renovation: What potential and value for Europe? (European Parliament, 2016).

<sup>14</sup> <https://www.euractiv.com/section/energy/news/this-is-the-moment-to-renovate-your-buildings-eu-tells-member-states/>

<sup>15</sup> Do homes with better energy efficiency ratings have higher house prices? (Copenhagen Economics, 2015).

<sup>16</sup> Energy efficiency in other cities and countries (Ramboll, forthcoming).

<sup>17</sup> Energy Transition of the EU Building Stock. Unleashing the 4th Industrial Revolution in Europe (Saheb, Y., 2016).

<sup>18</sup> <https://www.statista.com/statistics/1040238/commercial-property-remodeling-market-size-usa/>

## Cases

### ‘Holmens Kanal 20’, Copenhagen

In the very heart of Copenhagen, just a stone’s throw away from the Danish Parliament, Ramboll has provided engineering expertise on a complete renovation and redesign of an old iconic government building from 1937. The renovation project included a complete replacement of all existing installations.

The project included renovation of 8,000 m<sup>2</sup>. The building has been newly furnished for offices and facilities for two ministries. The redesign also includes a meeting centre.

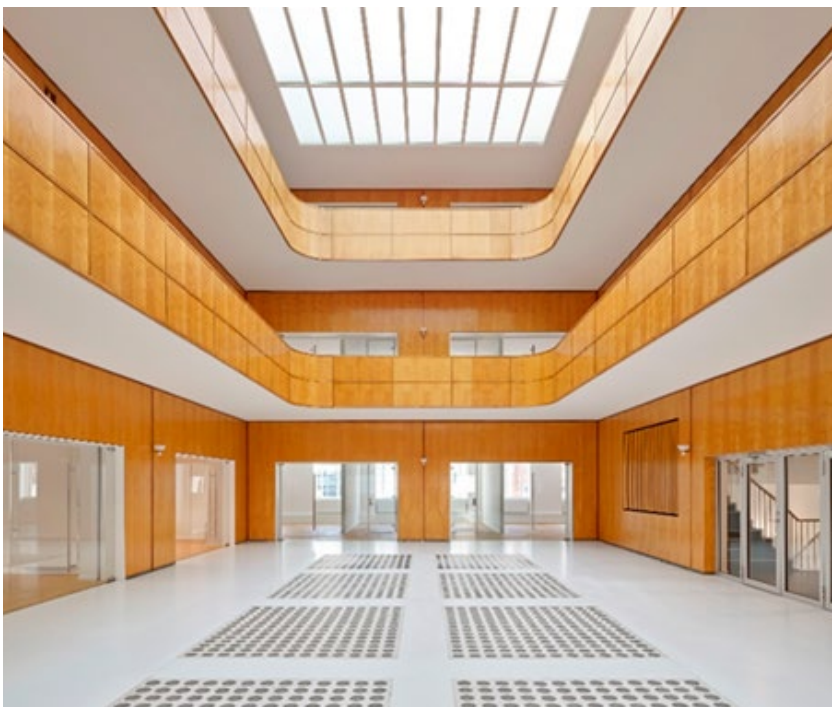
The building has been furnished as an open, flexible office space and all workplaces are designed with a focus on indoor and working environments. The design of the transformation is based on original architect’s approach towards materials and was carried out with integrated installations to ensure an architectural and technical whole with a recognisable identity.

The building is designed with open plan offices with smaller pockets of flexible spaces, kitchens and contained working areas.

In modernising the building, emphasis has been on retaining respect for the original look and conservation value of the building, while ensuring adherence to modern standards for indoor and work environments.

#### Ramboll services:

- Specialist services
- 3D modelling
- Fire, acoustics, indoor environment, and commissioning



## The State House, Helsinki

The State House on the corner of Esplanadi and Unioninkatu in central Helsinki, was renovated with Ramboll's help to add workspaces to the property. The building is used by the Finnish Ministry of Economic Affairs and Employment. A special focus of the renovation project was indoor air quality.

### Ramboll services:

- Construction planning
- Structural design
- Indoor air quality
- Deep renovation of protected building

The building, originally from 1913, is culturally and architecturally valuable and protected in the city plan. Renovation thus had to take place without changing the physical look and feel of the building. Renovating an old protected property poses special challenges. In updating premises to meet modern requirements, the design and detail of the structures must be carefully considered.

Structural changes had to be made to the extent required for building engineering services and to rectify moisture problems. The biggest structural change was the upgrading of the roof and the upper floor, as well as the partial raising of the yard wing. HVAC mechanical rooms were placed in the attic spaces by increasing the yard-facing roof structures with steel frames and installing a new floor with a composite slab structure.

Modifications to the ground and basement floors of the building were made because of the upgraded building services system and the excavation of a new flood basin into the bedrock.





## ‘Hollenderiet’, Skien, Norway

‘Hollenderiet’ was built in 1907 in Skien as part of a paper factory. The building is the oldest factory building in the neighbourhood and is therefore of cultural and historical importance in Skien. The building was left unused in 2006 when its current owners left.

### Ramboll services:

- Adaptive reuse
- Construction planning
- Structural design

To prepare the building for new tenants, Ramboll assisted with engineering services in what can be characterised as an extensive adaptive reuse project. Any renovation and reconstruction had to be done with respect for the special features and characteristics of the building. For example, the original windows and the original brick facade had to be restored.

The renovation resulted in a new, beautiful office building. Ramboll's role in the project was to control and reinforce existing structures of concrete and brick. New recesses were made in the roof construction to bring in new skylights in the arched concrete roof. Large recesses were also made in existing concrete walls and reinforcements in brick facades. Several window openings that were closed were returned to their original opening position and Ramboll designed a new elevator shaft in steel to improve accessibility.

The rebuilt ‘Hollenderiet’ today has a restaurant and office space on the 1st floor, offices on the 2nd floor and physiotherapists with treatment rooms and gyms on the top floor. The building received Skien Municipality's Conservation Award in 2019.

