DRIVERS FOR A RESPONSIBLE CHOICE

INTRODUCTION

The construction sector has noticeably evolved during the last 10 years, especially due to the introduction of new techniques of construction that use industrialised processes such as precast concrete elements. The consequence of such innovations is a drastic evolution in performance, characteristics and functionalities of new generation construction works.

Society keeps on changing faster. People's social, economic and environmental needs have also changed quite significantly during the last ten years (average age of people has increased, energy prices grown, awareness of environmental impacts amplified).

Glossary

Rebuild: operation to build again or afresh, after the demolishing operation

Refurbish: operation to work on an existing structure with (minor) changes to improve the performances

Renovate: operation of improving a structure

Thanks to these innovations in construction, rebuilding has become a real alternative when considering renovations, instead of the traditional refurbishment. The possibilities given by new flexible designs adapt easily to the new needs of a changing society and are far better than having to reach a forced "compromise" due to the presence of constraints linked to the existing work

ADVANTAGES OF REBUILDING

1. **Getting a real solution, not a mere band-aid**

   - *Energy efficiency*: a building can only be energy efficient when a combination of important factors like thermal mass, air tightness and ventilation are properly addressed. Energy Efficiency is not only linked to insulation, which is what is added in the renovation of an existing building. Realistically, all these aspects can only be fully tackled in a new building. A proper thermal performance benefits the environment and brings lower costs to the consumer.

   - *Improving internal comfort*: refurbishment operations addressed to improve the comfort of a building are often limited to its external envelope (insulation, windows …), whilst the internal thermal and acoustic comfort are usually not considered or changed. In a new building all these aspects are taken into account, improving the total welfare of the users

   - *Stricter standards that provide healthier environments*: today's buildings are designed to follow stricter rules in terms of health and safety of the occupants, both from a material and a design point of view. This does not apply to old or renewed buildings. Therefore the consumer spends money only on the surface but continues to live in the same conditions as before.

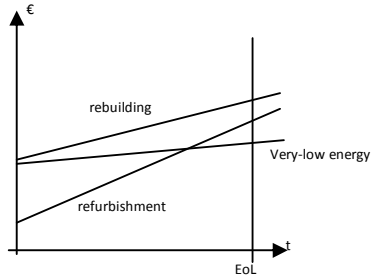
   - *Improved fire safety*: modern conceptions of fire safety (e.g. reliable escape routes) are already integrated in a new design.

   Starting a new project is the best way to avoid possible hidden problems: technical, legal or other surprises (termites, fungi) that can be present and must be dealt with in existing works.

2. **Improving social integration**: After demolishing one or more buildings, the entire area can be designed to fit the present needs of people living there and improve their quality of life. Entire suburban areas can then be designed to include other commodities (like schools, hospitals, shops, recreation centres) whilst keeping a similar number of living units. This would finally improve social integration and add value to the land.

3. **Taking advantage of modern technologies and systems**: modern buildings can be designed with embedded systems of water handling (water tanks, wastewater treatment) and with heating and cooling ensuring better environmental performance. There are also new systems that improve accessibility to the building by facilitating the access of elders and disabled people. All these systems are very easy to install when these elements are included in the initial design, but very difficult and costly in a refurbishment operation.

4. **Getting the most cost effective solution for the long term**: One considers renovations because one wants to keep on using the building for as long as possible. But it is important to take a longer term point of view. Even though rebuilding costs maybe higher at the beginning, the investment is soon recovered by a lower running cost of the building. Moreover, when it is a low energy or "zero energy" building, these saving allow a break-even in the overall project costs on a long term perspective.



5. **Increasing competitiveness through innovation in sustainable construction**: the "lead market initiative" identified sustainable construction as one of the lead markets for strengthening the European competitiveness in a knowledge-based economy. New buildings are more adapted to include these principles in their design than refurbishing the existing ones.

DRIVERS

The choice of a rebuilding activity should be based on detailed consideration of the main drivers of choice:

1. **Good time for rebuilding**

   - **Can I afford a limited period of inoccupation**? Acquiring a building is the best occasion for thinking about a rebuilding operation. Living in the midst of renovations is well known to be a dramatic experience. Of course, the operation is also easier when addressing to second houses

   - **Was the building abandoned or the structure not used**? Abandoned buildings are more vulnerable to the proliferation of hidden problems and problems could easily arise shortly after the end of the refurbishing process. Stability and functionality could also be jeopardised by bad maintenance and the effects of improper use

   - **Have my needs changed**? The needs of the owner (in terms of use but also from a functionality point of view) vary with time. Structures that were not designed with a flexible approach prove to be difficult to adapt to a new situation

2. **Quantifiable parameters to be taken into account**

   - **When does the building have to be ready**? Thanks to the industrialised process of precast concrete elements, the construction work is fully planned ahead of time, including the delivery date of the finished building. In addition, by using these elements as both structural and non-structural building envelop, the overall rebuilding time is dramatically reduced.

   - **Will I spend a lot in energy**? An energy audit should be made on the existing building and on the new one in order to compare the expected running costs for the two solutions. The expected savings should be deducted from the initial cost in order to assess the real costs of the rebuilding operation.

   - **Did I assess the environmental impact**? Do not overlook the fact that structures always have an environmental impact and that society is also increasing its environmental awareness. Therefore, the most efficient option must be chosen to offer to the users buildings with the best environmental performance possible. This could be taken into account in the decision process with a weight that depends on the sensibility of the owner.

   - **Be careful with the presence of dangerous substances**. Whether dangerous substances like asbestos are detected in the existing building, the removal procedures can be very long and costly.

   - **How long it will take to get return to your investment**? If the objective is to profit from the structure or work for a longer time, the most favourable choice is rebuilding. In terms of overall costs, this can be more economic than several refurbishment operations.

   - **What would be the advantage of increasing the usable space**? Increasing the total height and/or decreasing each floor's height would allow to better use the available land and improve the final value within the same boundaries.

3. **Non-quantifiable parameters to be taken into account**

   - **Which cultural heritage do I want to preserve**? On one hand, the natural and cultural heritage of the community affected by the construction work must be respected and preserved. 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.

   - **Which modification of the landscape is required**? On the other hand, some areas have been critically disfigured by unwise choices in the past. In this case, the rebuilding option allows a completely new approach that respects the natural environment.

CONCLUSIONS

1. **Rebuilding is a real alternative**: following the needs of the user and his sensitivity to the above mentioned advantages and drivers, the rebuilding alternative is more valuable than the refurbishing one for social, economic and environmental reasons.

2. **Society requires public support**: For all the above mentioned reasons public administration is expected to support the rebuilding and renewing of the infrastructure stock by offering fiscal incentives and other stimulus to encourage this activity given that it constitutes global welfare for our society.

Rebuilding or Renovation in practice

The latest European Policy developments such as Resource Efficiency Roadmap or Energy Efficiency Directive acknowledge the huge capacity of buildings in decreasing greenhouse gas emissions and building an energy efficient future. In our fight for a low carbon economy and for a resource and energy efficient Europe, we may mistakenly look for easy and quick solution showing results already in a short-term.
Renovation and refurbishment are handy solutions in cases, where buildings are relatively new; the building doesn't have major structural damage, doesn't contain any dangerous substances and will have the same functional use. In most of the cases, of course, when the building has severe structural damage, it is obvious that renovation won't help. Rebuilding can be the most cost-effective solution in a long run. Despite of having high initial cost, investments will pay off in a long term by low energy use of the new building.

Partly thanks to BIBM advocacy, the Energy Efficiency Directive wisely mentions the deep renovation option besides renovation. Deep renovation indeed includes major structural change in the building – either reached by renovation or rebuilding- that significantly reduces both the "delivered and the final energy" consumption of the construction compared with the pre-renovation level.

Case Studies

In the next, four case studies will be presented highlighting the main decision factors in the choice whether to rebuild or renovate and underpinning that Rebuilding can be the most cost-effective solution.

1. **SpareBank1 SMN**

The Norwegian Bank "SpareBank 1 SMN" decided to re-establish their headquarters in Trondheim, Norway in 2008. They faced to the question whether refurbish the existed building or replace it with a new one. Life cycle Analysis and Life Cycle Costing approach was used to assess economic, environmental and social impact of both solutions. It incorporates the initial capital costs, the demolition cost and the entire annual cost for Managing, Operation, Maintenance and Development (MOMD).The environmental assessment focused on energy and greenhouse gas emissions. An energy audit were made on the existing building and on the new one in order to compare the expected running costs for the two solutions. The expected savings then were deducted from the initial cost in order to assess the real costs of the rebuilding operation.

The results showed that from a climate point of view the most favourable strategy is to replace the existing construction and build a new construction. Even though the impact of the new construction is higher than the impact of refurbishment, this will be remunerated by the low operational cost of the new building. The graph below shows that the demolishing payback time is approximately 14 years.

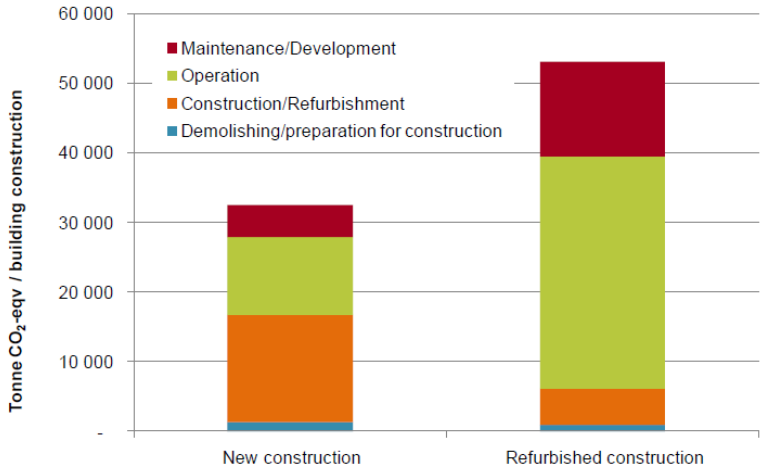
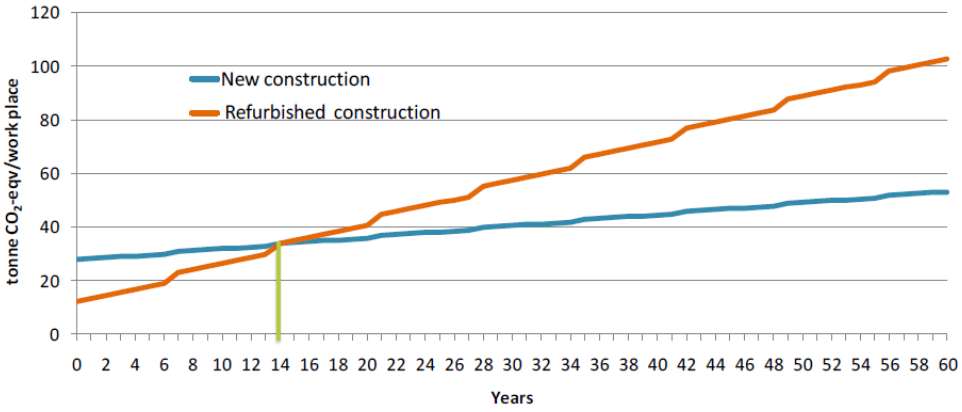


Table 1: Results of the Norwegian study



Graph 1: Payback time of demolition

The results confirm that one can accept a heavier environmental load in the construction phase if the way the combination of building materials and solutions are affecting each other increase the adaptability of the construction and therefore reduce the emissions during the life time of the building.

2. German case study

A **German study** has been prepared by Prof. Dr. Anton Maas[1] in 2010 on Substation of existing buildings as an alternative to refurbishing. The results of his study confirm that

- with the Rebuilding solution, the German Federal Government climate targets are much easily reachable than with the renovation option. In a word, Rebuilding has advantage in ecological and economic sustainability.

[1]The study can be ordered at the Bundesverband Baustoffe, Steine und Erden (available only in German), Tel: 0049 – 30 -726 19 99-0, info@bvbaustoffe.de

- Rebuilding offers a greater potential of quality architecture, therefore it is a better option to achieve social sustainability.
- Rebuilding fits better to the demand of free mobility of the elderly (barrier free buildings). Costs of "restructuring" existing buildings are much higher than in new buildings.

3. University of British Columbia

The University of British Columbia (UBC) uses a renovation price cut-off point at 67% of rebuild value in deciding whether to refurbish or replace its buildings. The method was established approximately 10 years ago in agreement between UBC and the Province of British Columbia. It was specifically put in place to help identify suitable buildings for the UBC ReNew program, a major initiative funded jointly by the University and the Provincial government, to refurbish and modernize aging learning and research facilities at the UBC Vancouver campus.

The method was based partly on experience, review of practice in other jurisdictions on one hand, and on the theory of building component cost breakdown on the other hand, which shows that the cost for building elements that can logically be retained, such as concrete structure, add up to approximately 33% of overall building cost. If refurbishment cost more than 2/3rds the new price (67%), the University deconstructed the original structure and rebuild it.

This approach allowed UBC to be highly successful at revamping academic buildings on its campus. UBC has undertaken 12 major building renewals over the past 8 years as part of the UBC Renew program and have been under the 67% threshold with actual final costs for all but 2 of the projects. In the latter two cases, the university decided to build new rather than renew because the cost exceeded the 67% threshold.

In the first phase of the UBC ReNew programme, the university mitigated $77 million of the deferred maintenance cost.

4. Belgian case study

This case study is the most recent one (June 2012). The **Belgian example** present the old building of the Belgian Parliament built in 1843. From a historical and social heritage point of view, the building is a precious one. The quartier is filled with old, renovated buildings, and the mentioned building is perfectly symmetric with neighbouring one situated on the other side of the road. A study has been carried out and despite of all of these aspects, the most cost effective way is Rebuilding. The new design will be classic in order to accent the symmetric with the neighbouring building. However, the new construction will ensure a better indoor climate and lower energy use. Even though details of the new construction still unknown, we can expect that precast concrete will be the selected construction material, because it easily allows the faithful reproduction of the existing style.

Conclusion

The decision of whether to Rebuild or renovate a building is a complex issue. The case studies show decisions can be based on several different parameters. LCA and LCC approaches are ideal solutions to predict which solution fits better to one's need. However, social and cultural heritage and economic considerations also have to be taken into account. The case studies confirm that when it comes to major renovation, the Rebuilding option has to be considered before any decision taken.

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