

The circular economics of constructions

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Abstract. *Construction has been and represents one of the most targeted areas of activity in the economy, starting from the market value and reaching the economic policies that regulate them. This paper analyzes the evolution of the construction sector and brings into discussion a new concept, namely that of recycling constructions that are restructured, demolished or undergoing technical changes (Mahpour, 2018). This new principle was launched with the new approaches specific to the green and circular economies due to the need to reduce the gap between needs and resources (Liu et al., 2021). Moreover, the most important factor that determines the permanent development of the real estate and construction field is the growth of the population in the last 30 years at a global level, which has been an ascending one, but also the formation of developed economic centers such as the big capitals or the already developed areas. People have been prone to access the already existing infrastructure in the logistically and economically evolved areas, rather than focusing on the formation of new areas, which has led to the migration and centralization of the workforce in certain geographical areas (Hossain et al., 2020).*

Keywords: construction, recycling, development, policies, regulation.

JEL Classification: L70, L74, L78, L79, L80.

1. Introduction

The process of development, of building a building can be characterized by three main cycles. The first cycle represents the beginnings of the construction plan. At this stage it is determined what elements will or will not be kept from the old building and what are the infrastructure elements that the company needs to carry out the plan to the final. This includes elements characteristic of a building such as providing the necessary distancing between the adjoining buildings, the foundation large enough to have stability, as well as the analysis of the soil and the environment. In the second cycle, the architecture of the building develops (Bao et al., 2019). This includes elements such as the materials used to carry out the necessary infrastructure, but also factors such as the remodeling of the elements needed to build the infrastructure (Christensen, 2021).

The third cycle is that of actual development, in which the materials are used to build the building itself. At this stage, the specific elements of the circular economy appear by reintroducing the materials that can still be used to recover part of the old building (Mahpour, 2018). All these elements depend, to achieve the place, on 4 large factors. The most important is the human factor, which is represented in this situation by the population in society that determines the demand in this market. The second important factor is the economic one, which requires a healthy and stable economic environment that allows builders to carry out the plan (Benachio et al., 2020).

This is one of the most important factors, being the one that will subsequently lead in unfavorable situations to price increases. Given the long period of time that a construction needs to be completed, the possibility of changing certain prices increases significantly, hence the need for stability and forecasting (Çimen, 2021). The third factor is related to the construction environment, which is the most volatile element of all four. It is about the environmental policies adopted, about the safety rules that the state imposes, but most importantly about the environmental policies adopted by the authorities. Even if it is not directly about a price increase, those changes have the ability to reduce the flexibility of the companies in the field and to reduce their capacity for response and flexibility, leading in certain situations even to the bankruptcy of the company. The fourth and determining factor for the work in question is that relating to the quality and quantity delivered (Liu et al., 2021). Currently there are a lot of economic agents looking to reduce the quality of materials to increase the amount they can offer. The lack of security and control policies are key elements of the acceptance and propagation of these elements (Benachio et al., 2020).

The possibility of accessing materials already used previously, of saving time and resources by collecting real estate waste and attracting it into the new form of use may lead to the formation of a framework conducive to increasing the quality and discouraging unfair practices by resorting to materials that are inferior in quality (Mahpour, 2018).

The main problem of housing is that a record of decreasing volume will lead to an increase in the total value of construction production, due to an increase in living space for a person.

The other types of constructions are influenced by the change in technologies, of the old industrial buildings that no longer have utility in the modern economy and can no longer bring added value only by dismantling them (Bao et al., 2019).

Moreover, the development of this market segment in the modern economy is also influenced by factors such as the growth of foreign investments, loans granted from banking or investment institutions at European level such as BEARD, access to substantial, European or national or local, or private ones. To be able to organically develop such an infrastructure requires large investments and balance in the market (Hossain et al., 2020). For this reason, the reuse of poor construction materials, being currently already high constructions, the machines and the prolonged working times being factors that generate additional costs that most investors do not agree to pay (Mahpour, 2018). In order to bridge this gap between what is wanted to be done and what is actually happening, the cost of using building materials already integrated in certain areas must be lower than that of purchasing new raw materials. In the case of a contract, the economic law shows that economic agents will continue to use the most financially efficient possibilities. This does not require investment in infrastructure, but in research into equipment, machinery and mechanisms for processing new concepts.

2. Literature review

The construction sector generates a considerable volume of waste every year that can reach up to 40% in industrialized countries, almost all of which comes from rehabilitation or demolition of buildings. Therefore, this waste is a key issue, and changing the way we manage the use of building materials is crucial (Ruiz et al., 2020). There are, however, raw materials, waste, that can be recycled indefinitely. But recycling is a process that requires a high level of expertise and innovation, as recovered materials can often be contaminated. First of all, this waste must be sorted and subjected to special treatments, such as glass (Çimen, 2021). In theory, it can be melted over and over again, without changing its properties, but specialists in the field state that several types of glass should not be recycled at once. It is important to take into account the different characteristics of the material depending on each application, which should not be altered. Flat glass used in construction or windscreen glass must retain high transparency following the recycling process, so they cannot be mixed with tinted glass.

Thus, the recycling process of building materials is governed by a number of factors: the composition of the product, the level of contamination and the ability of the industrial process to turn the waste into a secondary raw material identical in terms of properties to the initial one (Hossain et al., 2020). The circular economy is a priority and is now focused on developing new solutions for the recycling of materials. The major challenge is the use of our materials in the construction or renovation of as many buildings as possible, while reducing the waste of resources and contributing to the protection of the environment. The transition to the circular economy is not just a necessity. This is an opportunity to provide

solutions and products that meet the needs of current and future generations, related to performance, sustainability or well-being, and to protect the future of our planet (Çimen, 2021).

The raw materials present on the planet are a scarce and, in many cases, unrecoverable resource, which is why the current consumption model destroys many of these resources. Investment in research is therefore necessary and, in this way, new production models should be promoted, where possible, based on the reassessment and re-use of industrial waste, encouraging the study and search for new markets for these resources recovered, considered as waste (Çimen, 2021). In this way, industries are encouraged to adapt to the circular economy model with the environmental, social and economic benefits so necessary for our planet.

Traditionally, the productive model that has supported the growth system of our society has been based on the use of various available resources that, after their introduction into the production chain and their subsequent incorporation into the consumption chain, have lost their properties becoming waste, the inevitable destination of which is the landfill. This is where the paradigm of the linear economy that prevails in today's productive industry comes from.

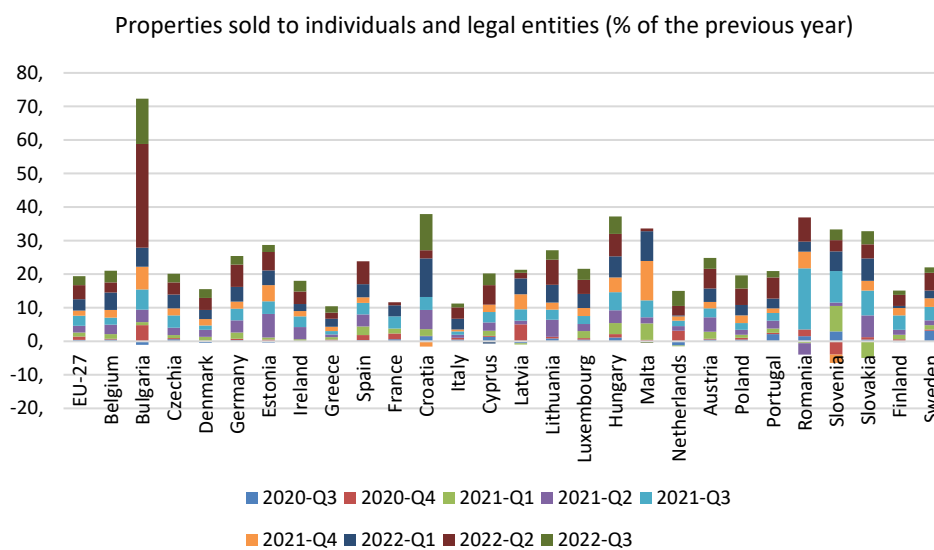
The main problem behind this linear system is the commitment to the capacity to assimilate resources, through consistent pollution, the accumulation of waste without use, the exploitation of resources that exceed the regeneration rate and the depletion of resources due to excessive consumption (Liu et al., 2021). The fundamental key to initiating the waste transition process is the synergy between waste generated by a technological process and renewable useful waste. Waste avoidance, greening, reuse and other similar measures could save EU companies 8% of their annual turnover, while reducing total annual greenhouse gas emissions by 2-4%.

The main objectives currently of the circular economy promoters are to raise awareness about the circular economy in the construction sector, to reduce the production of waste from construction materials, to reduce construction waste by re-incorporating it into the value chain, to provide information on the possibility of re-evaluation of each element, free access to software for consultation and use of techniques or methods of re-use of building materials (Benachio et al., 2020).

3. Data analysis

At the expense of recent economic conditions and economic imbalances that have arisen as a result of labor market volatility, be it technological development or the impact of the pandemic on social stability, the number of buildings that have been sold has increased significantly (Górecki et al., 2019). Mostly, the data show that this happened relatively uniformly across the geographical area of a country, being about the possibility and encouragement of working from home by most companies, but also from the need for individuals to invest in assets with a high safety risk. Moreover, in the period 2019-2012,

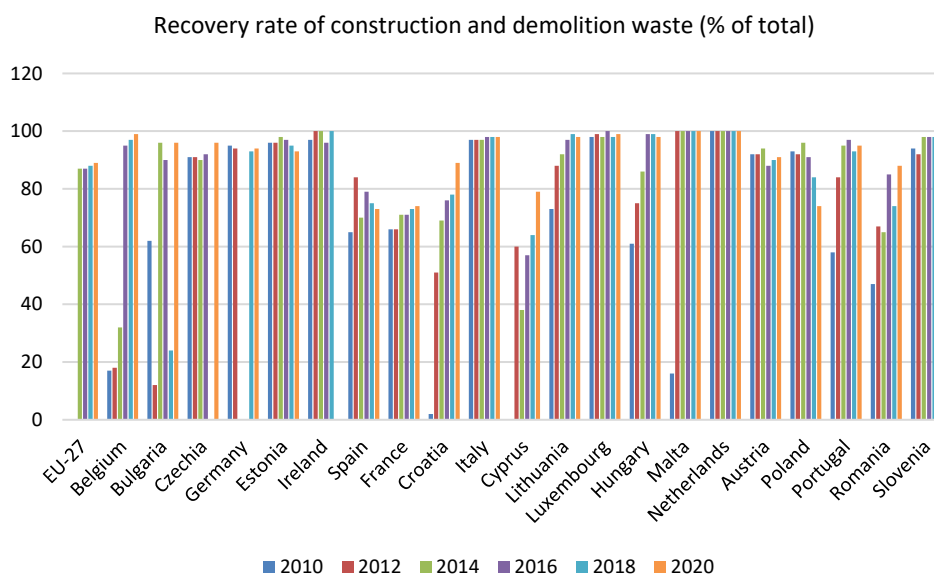
the price of real estate decreased significantly, which encouraged the population to access loans in order to become owners. The countries where the construction sector has developed the most are those in eastern and south-eastern Europe, being about policies and legislation that are more accessible to the rest of the member countries (Ruiz et al., 2020). At the same time, the countries that have the highest construction rate recorded are recognized as the countries that also have the highest share of owners for their own homes, with the majority of constructions in economically developed countries at European level consisting of office space and areas for commercial activities and less for areas intended for residential complexes (Christensen, 2021). A good indicator is the nature of the types of constructions, in particular the destination they have for their daily activity. The market economy implies an environment favorable to the development of economic activity and automatically of entrepreneurship, which is why it is normal that in most of the European Union, the most numerous constructions are intended for office spaces. Moreover, the mobility of the human factor has led to an increase in demand for living spaces, which leads to a higher volatility and to the need for builders to foresee the need for free apartments (Bao et al., 2019).



Source: Authors own processing of data from Eurostat database.

Mirrored, the two graphs display the countries from side to side in different order. The most economically developed countries also have the most complete and clear set of laws for the construction sector. As a result, it is normal to identify developed areas with a high degree of collection and recycling of raw or residual materials (Liu et al., 2021). It is important to note that most of the reuse processes of raw materials consist of modern buildings, which can be reused, such as glass buildings or those that are in the process of being executed and have not been completed. A share of about 27% at European level is represented by different buildings, dwellings or construction sites that have not come together to be

completed, thus being seen by the performing economies as a clear source of raw materials that can be reintroduced into the circuit. There can be no equate between developed and early economies. Countries such as Romania, Bulgaria, Hungary, Slovakia or Slovenia have the highest number of interwar buildings, as these are buildings made of stone or massive materials that contain several defects or sections that are severely damaged and cannot be recovered or upgraded. These buildings are of the nature of those administered by the State, which are no longer the object of work of some institutions, nor can they be redeveloped for financial reasons. These objects represent an opportunity only by their simple land, by their simple settlement, being of great importance.



Source: Authors own processing of data from Eurostat database.

The circularity of constructions largely depends on how they are designed in the first instance, on how they were designed and built. In order to reuse the materials from the current constructions, they must be thought out from the design stage in order to be able to find them in a later direction from the beginning. As a result, the circular economy-specific process is now gaining importance (Christensen, 2021). The focus should be on how the work will be carried out from now on, without focusing on how things have been done. From a technical point of view, a process is designed to have effects based on a predominant cause, in this case being the nature of the raw material.

4. Conclusion

The idea of a circular construction sector is based on an economic model that aims to use products for as long as possible and reduce waste - through reuse and recycling - while stimulating social, economic growth and prosperity. All over Europe, architects consider

the reuse of materials by other users and the recycling of waste, which are the main qualities of a circular construction economy (Christensen, 2021). A third of them even expect to achieve a fully circular construction economy by 2030.

The development of the construction sector based on the circular economy presents a long-term plan, which is influenced by several factors such as the current legislation, both at European and national level, but also the volatility of prices, the technological evolution, the capacity of the control bodies for the careful supervision of the activity and many others (Górecki et al., 2019). Being a dynamic field, which is in a permanent change and change, but also considering the fact that the recurrent activity is a long-term one, taking a longer period of time to be able to align the periods of change – regardless of their constraint nature – with the business model and the trajectory that the big companies draw.

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