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## Approach to the integrated urban revitalisation of the Zagreb urban agglomeration after the 2020 earthquake

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### Abstract

Many European cities are facing problems of decline in parts of the urban fabric due to socio-economic changes. Urban space is a 'living tissue' that is constantly changing due to numerous factors such as technological progress, demographic change, the need for housing and business space, etc. Just like any living organism, urban space experiences its 'birth', growth and decay. Urban decay is not only characterized by negative morphological or constructional elements, but also by negative socio-economic, cultural and economic processes. The neglected area mainly records a demographic decline, a change in the demographic structure, a socio-economic decline and a loss of attractiveness for economic investment. In order to avoid the final scenario of complete decay and decline of urban space, it is necessary to integrate urban revitalisation measures. The idea of urban revitalisation is emphasized as a necessary need to return 'life' to neglected, stagnant or declining urban spaces. In most cases, urban revitalisation includes measures of socio-economic, cultural, ecological and economic revitalisation, which is why such a process is also called integrated urban revitalisation. The earthquakes that occurred in the spring and winter of 2020 in the wider Zagreb area further strengthened the need to solve the problem of urban renewal. Given that the area most affected by the first earthquake was the area of the Zagreb Urban Agglomeration, this paper aims to explore the basis and need for broadly integrated urban revitalisation. The paper describes the concept components of integrated urban revitalisation, which consists of the elements of urban renewal, brownfield regeneration, circular management of space and buildings and nature-based solutions (NBS). Implementation of these concepts was emphasized as necessary after the earthquake in 2020. These elements are presented in relation to the potential of the Zagreb Urban Agglomeration and in accordance with the EU guidelines. The paper provides guidelines for a more advanced implementation of integrated urban revitalisation, which is much needed in the Zagreb Urban Agglomeration.

**Key words:** integrated urban revitalisation, Zagreb Urban Agglomeration, Zagreb, earthquake, reconstruction, revitalisation, recommendations

# 1 Introduction

Urban space is a '*living tissue*' that is constantly changing due to numerous technological, social, economic and environmental factors (such as technological progress, demographic change, the need for residential and business space, the development of architectural styles, etc.). Just like a living organism, urban space experiences its '*birth*', growth and decay. Urban decay has not only negative morphological or constructional elements, but it is also related to negative socio-economic, cultural and economic processes. The neglected area mainly records a demographic decline, a change in the demographic structure, socio-economic decline and a loss of attractiveness for economic investment.

In order to avoid the scenario of decay and decline of urban space, it is necessary to integrate measures of its '*revival*' and '*rebirth*'. In the professional literature, many spatial and strategic planners, politicians and other spatial development decision-makers call this process *urban revitalisation*. The idea of urban revitalisation is emphasized as a necessary need to return '*life*' to neglected, stagnant or declining urban spaces. In most cases, urban revitalisation includes measures of socio-economic, cultural, ecological and economic revitalisation, which is why such a process is also called *integrated urban revitalisation*.

As in most countries that have gone through or are still going through the process of transition from socialist to market economy, there are areas in Croatia that once had intensive economic or social functions, but today they are experiencing a setback. The City of Zagreb and its wider environment, which is now considered its agglomeration, recorded an intense urban, economic and demographic development after the World War II, which is why numerous urban areas today are in need for integrated urban revitalisation. Through the establishment of the Zagreb Urban Agglomeration, the idea of integrated urban revitalisation can become a very successful large-scale process, supported by the European Union funds and the mechanism of integrated territorial investments [1].

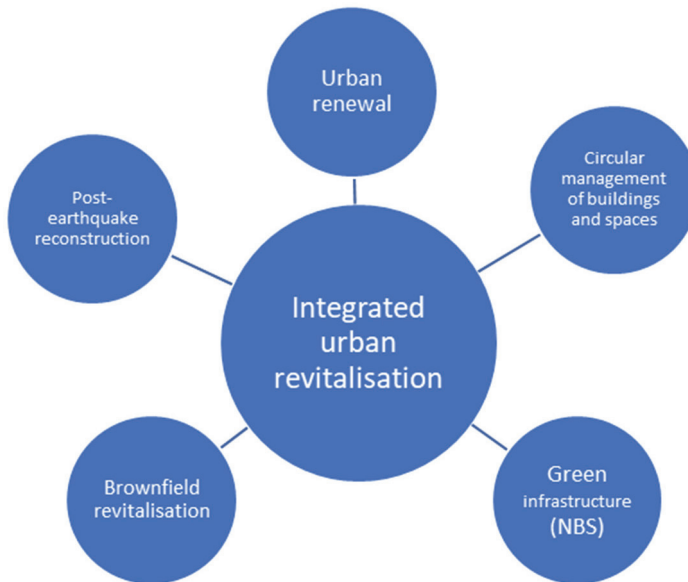
The Zagreb Urban Agglomeration extends through three counties in Croatia - the City of Zagreb, the Zagreb County and the Krapina-Zagorje County. The Agglomeration was organized in order to harmonize the further development of the area, which is characterized by strong socio-economic interactions on a daily basis, large shares of daily migrants, large exchange of products and services and prominent functional interaction. The Zagreb Urban Agglomeration includes 30 units of local self-government, 11 cities and 19 municipalities, and the seat of the Agglomeration is the City of Zagreb [2]. It should be noted that the development indicators of cities and municipalities vary. These variations should be considered in further development planning in order to achieve greater equality, as well as awareness of the diversity of development opportunities. Due to its long history of industrialization, the Zagreb Urban Agglomeration today records a large number of buildings, structures, spaces and urban units that are experi-

encing urban stagnation and decay, characterized by a large number of neglected and abandoned locations. For example, in the recently published publication '*Overview of brownfield areas of the Zagreb Urban Agglomeration*' [3], a total of 84 locations were identified and evaluated on a total of 529.25 ha of area which need some form of revitalisation. Most locations were situated in the densely urbanized fabric of the City of Zagreb, but significant number of locations is also noted in other cities and municipalities of the Zagreb Urban Agglomeration. Such identification and evaluation are the foundation and priority of future integrated urban revitalisation. Interest in the renovation of brownfield sites is confirmed by the fact that by 2020, a large part of ITI funding was intended for the renovation and revitalisation of brownfield facilities. However, renewal of brownfield infrastructure only is not sufficient. Approach to revitalisation needs to comprise a broader aspect of urban renewal as a process that includes factors of general economic, socio-economic, social and environmental development during the physical reconstruction and renovation of buildings and urban spaces. Integrated urban revitalisation can be considered through the goals of designing city centres, rebuilding neglected areas, improving housing conditions, solving traffic problems, building new public facilities, strengthening urban identity, circular management and the application of SMART solutions. The consequences of the earthquake in March 2020 further emphasized the need for a more adequate approach to the integrated urban revitalisation of the Zagreb Urban Agglomeration.

## 2 Integrated urban revitalisation approach

The concept of integrated urban revitalisation was initiated in the previous financial period of the European Union 2014-2020 as an idea of urban renewal or revitalisation that contributes to sustainable urban development through strengthening the social, economic and / or environmental characteristics of cities. This concept represents restructuring of neglected urban areas, individual city districts and / or buildings, and areas threatened by urban decay. This concept of integrated revitalisation is an incentive for renewal in market conditions in order to achieve the full potential of the land, and at the same time to achieve goals of economic, social and environmental development. Therefore, the goal of integrated urban revitalisation is not only to improve the existing physical infrastructure and / or space, but also to improve the general socio-economic environment. Due to the overlap of several goals and directions of development, revitalisation should be approached in an integrated and intersectoral way. Sector-oriented planning, which would contribute exclusively to the objectives of one element of sustainable development (economy, society or space) and which does not respect all spatially relevant social, economic and cultural factors of the target areas of intervention, would result in unequal urban development which prefers one sector while others stagnate or regress [1]. An integrated approach in the development of revitalisation projects would ensure the nivelation of gentrification, which is a process of enhancing

socio-economic attractiveness of certain parts of the city but removing its cultural identity [4]. Also, it would avoid the consequences of social polarization [5]. In the long run, a sustainable approach to the problem of reconstruction and revitalisation after earthquake should involve the usage of the existing urban structure and buildings aiming to their preservation, while taking into account sustainability and environmental protection, application of new technological solutions and reduction of energy consumption. In order to define the concept of integrated urban revitalisation more clearly, the following graphic presentation combines five basic elements.



**Figure 1. Elements of integrated urban revitalisation in the area of the Zagreb Urban Agglomeration**

## 2.1 Urban renewal

Urban renewal is the term most often used for the concept of long-term systematic transformation of individual parts of urban space. Čaldarović and Šarinić [6]<sup>[6]</sup> state that urban renewal is an umbrella term consisting of the processes of urban regeneration, reconstruction and revitalisation, which are related to social, structural and functional change of a certain part of the city, encouraged by individual (private) or public initiatives or by their combination. According to CEMAT [7]<sup>[7]</sup>, urban renewal aims to improve a neglected urban region by implementing large-scale projects related to housing, services, transport systems, recreation areas, etc. The costs of urban renewal are very high but they represent long-lasting and long-term investments.

Jukić et al. [8]<sup>[8]</sup> state the reasons for initiating urban renewal projects, including: economic transition; new way of life; standard and quality of life; age and dilapidation of

buildings; neglected housing stock; changes in the use of existing buildings; economic unsustainability of urban areas or housing stock; conversion and introduction of new facilities at brownfield sites and modernization of infrastructure. In the same study, important goals of urban renewal in the area of the Zagreb Urban Agglomeration were identified, including: reconstruction of urban centres; restoration of neglected areas; condition improvement of the existing housing; solutions for substandard parts of cities, especially inner courtyards; preservation of a quality city fund; solution of traffic problems; construction of new public facilities; affirmation of existing and planning of new public spaces; circular economy and application of new technical approaches and technological solutions.

## 2.2 Circular management of spaces and buildings

In recent years, the idea of circular management of space and buildings has intensified. It considers the renovation and / or adaptation of existing neglected or underused spaces in order to avoid the expansion of urban areas and new construction on previously green areas. This idea is in line with European environmental initiatives such as the European Green Deal [9]<sup>[9]</sup> and the '*zero net-land take by 2050*' (the goal of striking a balance between building and regenerating natural spaces, i.e. avoiding new construction). The basic elements of circular management of space and buildings include the renovation of abandoned and / or neglected spaces and buildings, extension of their durability, planning of new buildings in accordance with the circular economy, increase in energy efficiency of buildings, reduction in construction waste, as well as finding solutions to increase the use of space through time management of use. The Ministry of Physical Planning, Construction and State Assets and the Faculty of Architecture, University of Zagreb are in the process of drafting a national Program for the development of circular management of space and buildings for the period 2021–2030 [10]<sup>[10]</sup>, which aims to develop sustainable, inclusive, safe and resilient cities by encouraging the reuse of buildings and spaces, while containing pre-defined elements. In the context of integrated urban revitalisation, the most interesting is the first special objective of the Program aimed at developing a methodology that will be used in determining the needs and possibilities of circular renovation of unused spaces and buildings, as well as zones. The same objective proposes the development of a model of intervention measures in space according to the criterion of coverage:

- XL - urban renewal of a part of the city, more functional units, revitalisation of demographically emptied areas, ensuring compliance with standards of inappropriately used built spaces
- L - urban renewal of a zone, one functional unit
- M - abandoned buildings
- S - individual abandoned spaces within the buildings in use
- XS - measures to increase the intensity of the use of buildings.

## 2.3 Green infrastructure (NBS)

In the area of the Zagreb Urban Agglomeration, a significant lack of public green areas as well as problems of air pollution and heat islands have been recorded<sup>[2]</sup>. The solution is the integration of green infrastructure that offers a wide range of ecosystem services such as increasing air quality, creating space for recreation and adaptation and resilience to climate change. According to the definition of the European Commission [9], green infrastructure is a strategically planned network of natural and semi-natural areas with other environmental features, designed and managed to deliver a wide range of ecosystem services and functions such as water purification, air quality, space for recreation and climate mitigation and adaptation. A green infrastructure network can improve environmental conditions, and thus the health and quality of life of citizens. In parallel with the development of the circular management development program, the Ministry of Physical Planning, Construction and State Assets in cooperation with the Faculty of Architecture, University of Zagreb is in the process of developing a national Program for the development of green infrastructure in urban areas for the period 2021 to 2030 [11]. The program aims to establish sustainable, resilient, safe, comfortable and orderly cities and municipalities in the Republic of Croatia. It will create the preconditions for a better life quality and health of citizens and contribute to sustainable social, economic and spatial development. The program has been developed in accordance with the European Union Green Infrastructure Strategy<sup>[12]</sup> and the European Green Deal [9].

## 2.4 Brownfield revitalisation

One of the most important aims of integrated urban revitalisation of many cities is addressing the issue of brownfields in the spatial structure of urban areas. In the process of deindustrialization of urban spaces, a very small number of brownfields has been revitalized and converted, with unresolved property relations standing out as the most prominent obstacles [13]. Brownfield sites represent unused, underused or abandoned areas that have been affected by former land-use or the surrounding area. Such spaces represent an important resource of integrated urban revitalisation. Their renovation is in line with the goals of green development and circular management of space and buildings since they give new values to the already built land, while avoiding construction on natural and unbuilt soil. For the purposes of strategic development direction, Zagreb Urban Agglomeration Development Strategy for the period up to 2020 was developed in 2017 [2]. The Strategy recognized the importance of revitalisation of brownfield areas through measure 3.4.3. *Restoration of brownfield sites*. For the period until the end of 2020, a financial allocation of ITI funds in the amount of 21 million euros was planned for the renovation of brownfield sites of the Zagreb Urban Agglomeration.

## 2.5 Post-earthquake reconstruction

Post-earthquake reconstruction is a long-term process that includes the preparation of temporary housing solutions for people whose homes have been damaged, damage assessment, preparation of measures, development of rehabilitation and reconstruction plans, implementation of material damage rehabilitation, reconstruction of buildings and seismic strengthening of buildings. For example, Italy suffered a major earthquake in 2016 with great material damage, and a prompt reconstruction plan was drawn up that continues today [14]. The earthquake on March 22, 2020 hit the area of the Zagreb Urban Agglomeration quite hard, causing great material damage to residential and public buildings. Most of the damaged buildings are located in the centre of the City of Zagreb (in the area of the historic urban core), which has been longing for integrated urban revitalisation for many years. At the same time, great damage was recorded on buildings of great importance for cultural heritage [15]. An additional earthquake that occurred in the Petrinja area in December 2020 caused further damage. These earthquakes confirmed the fact that the consequences and damage would be enormous if an earthquake of higher magnitude occurred in the Zagreb Urban Agglomeration. Therefore, the need for seismic construction of new and renovation of old buildings (seismic strengthening of buildings) was emphasized<sup>[16]</sup>. Seismic retrofitting is a series of modifications that can be carried out on existing buildings to make them more resistant to seismic activities and associated changes in the ground. The goals of seismic reinforcement of buildings include increasing the safety of building users and citizens, increasing the durability and stability of buildings, increasing the functionality of buildings, etc. [17].

In order to structure and organize the reconstruction of the damaged area, which includes the entire area of the Zagreb Urban Agglomeration, the Act on the Reconstruction of Earthquake-damaged Buildings in the Territory of the City of Zagreb, Krapina-Zagorje County, Zagreb County, Sisak-Moslavina County and Karlovac County (OG 102/20, 10/21) [18] as well as the Program of Reconstruction Measures for the Earthquake-damaged Buildings in the area of the City of Zagreb, Krapina-Zagorje County, Zagreb County, Sisak-Moslavina County and Karlovac County (OG 17/21) [16] were adopted. Although being a prompt solution, there is a lack of structured strategic approach to the renewal and revitalisation of space, which includes elements of socio-economic, social, economic, architectural and other forms of development. However, it should be pointed out that the same Act<sup>[18]</sup> provides foundation for the development of a Program for the complete restoration of the historic urban core of the City of Zagreb, but not for the other areas of the Zagreb Urban Agglomeration that also need a planned and strategic approach to revitalisation.

### 3 EU guidelines

The European Union, through its legislation and strategic directions, encourages the Member States to adopt the concepts of sustainable development. The incentives are largely related to the co-financing of projects through multiannual financial frameworks. The European Union has started the implementation of the new multiannual financial framework 2021-2027. One of the preconditions for the allocation of funds and the agreement between the EU and the Republic of Croatia is the drafting of the National Development Strategy until 2030 [19]<sup>[19]</sup>, the implementation of which will begin in 2021. Given the overall situation with the global pandemic COVID-19, the European Union has prepared a special mechanism for recovery and resilience of the European economy from the effects of the pandemic - '*NextGenerationEU*'. The Republic of Croatia is currently developing a National Recovery and Resilience Plan that will serve as a basis for funding from the mentioned mechanism [20]. It is important to note that the EU, through this mechanism, encourages the rapid stimulation of the European economy at the local level. For this reason, a defined '*renovation wave*' will be focused on job creation in construction, reconstruction and other related sectors. Regulatory and financial support, such as doubling of the program portion for sustainable infrastructure from the InvestEU fund, will seek to at least double the annual renovation rate of the existing building stock. Member States will be able to use funds from the Recovery and Resilience Mechanism for this purpose. This will save on energy bills, ensure healthier living conditions and reduce energy poverty [21].

European Green Deal [9] represents a framed and structured aspiration of the European Community to make Europe the first climate-neutral continent without net greenhouse gas emissions by 2050 and with no economic growth dependent on non-renewable resources. Thus, the Green Deal is an action plan to improve resource efficiency by moving to a clean circular economy, to restore biodiversity and to reduce pollution. Within the action plan, in the context of integrated urban revitalisation, the topic of construction, use and renovation of buildings is particularly important. The Green Deal states that Member States should be involved in a '*renovation wave*' of public and private buildings to address energy efficiency and energy poverty. Most importantly, there is an initiative under the European Green Deal that encourages programs that could consolidate reconstruction work into larger blocks to benefit from better funding conditions and planned reconstruction. Special attention will be paid to the renovation of schools and hospitals as the funds saved thanks to building efficiency will be available to support education and public health.

The SUPER project was implemented within the ESPON program with the aim of determining the most optimal form of sustainable urbanisation and sustainable land use. A guide<sup>[22]</sup> for all spatial planners, policymakers and decision-makers related to sustainable spatial development was developed as a result of the project. The guide is intended as a set of instructions for planners regarding the direction of spatial development in or-

der to achieve goals of sustainable spatial development. Of the many recommendations made by SUPER researchers, of particular interest for the integrated urban revitalisation project is the idea of regeneration, which has the potential to improve unused and problematic urban spaces such as brownfields. The aim of regeneration is to improve the economic, environmental and social quality of the area and the local community, promoting long-term sustainable development. Successful interventions that support regeneration are mainly those that integrate the concepts of '*reuse*' and '*long-term sustainable development*'. The most important positive success factors are: (i) adopting a long-term vision, (ii) integrating the concepts of reuse and integrated sustainable development, (iii) addressing environmental, economic and social issues at the same time. The Urban Agenda for the EU is an integrated and coordinated approach to addressing the European Union's urban dimension. The Urban Agenda consists of partnerships, from which is the most important to mention the Partnership on the Circular Economy and the Partnership on Sustainable Land Use and Nature-Based Solutions (NBS). Together, these two partnerships have developed a '*Handbook on Sustainable & Circular Re-use of Spaces & Buildings* [23] to address the potential for re-use of buildings and spaces that have been abandoned or underused. The manual offered possible solutions for management models on renovation and circular management projects of buildings and space. With the emergence of new challenges, competencies and roles in the implementation of circular management of buildings and space, the focus of academic research and policy innovation has gradually shifted from short-term interventions to long-term strategies and methodologies of adaptive reuse. In response to such a transformation, individual cities and regions have begun to generate various management models to manage the reuse of buildings and space. As one solution, the Handbook highlights urban reuse agencies. Management agencies have recently emerged to systematize derelict and abandoned properties, prepare the necessary steps for their reuse, and establish a network and dialogue of property owners, potential users and local authorities interested in creating accessible spaces for entrepreneurs, community initiatives and community groups. The innovative management model was organized by the municipality of Prato (Italy) through the Urban Agency for Reuse. The Agency has made it easier for local governments to define and implement a circular management strategy at the local level. The Agency can act as a driver of functional transition of parts of the city aiming to manage public and private spaces and buildings included in the program of urban reuse, as well as connecting the demand for new functions of privately-owned real estate. This model is highlighted as a good example that is applicable in many urban areas, including the Zagreb Urban Agglomeration.

## 4 Conclusion

The need for integrated urban revitalisation of the Zagreb Urban Agglomeration is becoming a priority of urban development and it represents a long-term process. In accordance with the strategic directions of development of the Zagreb Urban Agglomeration, revitalisation must integrate comprehensive spatial planning in order to achieve broader spatial development goals. There are five key themes that unite the concept of integrated urban revitalisation: urban renewal, circular management of buildings and spaces, green infrastructure (NBS), brownfield revitalisation and post-earthquake reconstruction. The harmonization of these topics during revitalisation must be supported by measures of socio-economic, environmental and cultural revitalisation, which follow the mentioned topics. Rational use of space is a prerequisite for achieving sustainable development.

Sustainability of urbanisation and land-use while giving priority to the renewal and revitalisation of used urban space over the use of new and natural land, have become European and national priorities. The biggest role is played by brownfield revitalisation and circular management of space and buildings because it encourages the efficient use of spatial resources while reducing the need to expand construction areas to currently unbuilt areas, while improving the energy performance of buildings. The development of green infrastructure would ensure favourable ecosystem services (improvement of air quality, creation of recreational space, resilience to climate change, improvement of the quality of life of citizens, etc.). The European Union's focus in the new multiannual financial framework is on the digital and green transition. For this reason, it is necessary to largely integrate measures for the development of green infrastructure with the activities of integrated urban revitalisation in the Zagreb Urban Agglomeration. With the aim of a concise approach to reconstruction and revitalisation, it is necessary to harmonize activities on wider post-earthquake reconstruction and integrated urban revitalisation. Furthermore, it is essential to integrate seismic retrofitting measures for buildings that are at risk of permanent damage due to potential new earthquakes.

To manage such a lengthy process, the Urban Agenda for the EU offers a solution through the development of management models such as urban reuse agencies that plan and manage the process of circular management of space and buildings through renovation, conversion and use of built land. Due to its specifics, the urban agglomeration needs a structured management model that will unite the efforts of the involved local self-government units in the process of reconstruction and revitalisation of the area after the 2020 earthquake.

An important aspect of the successful implementation of urban renewal projects lies in the active participation of all stakeholders involved, from the owners to the final decision-makers. The participation of the local community is necessary in the projects of urban renewal and revitalisation of urban spaces, because it is the local population and citizens that form the identity of the space and the basis of every type of development.

Partnership with citizens enables informing all stakeholders about the needs and attitudes of residents when planning urban renewal and enables possible modifications during the process of its implementation.

The '*renovation wave*' will occur in many cities of the European Union, driven by numerous EU guidelines, strategies and funds. The Zagreb Urban Agglomeration can take advantage of the favourable moment and the availability of EU funding sources for integrated urban revitalisation after the aftermath of the earthquake, respecting the strategic and participatory approach. Factors for the successful implementation of integrated urban revitalisation include three basic pillars: (i) development of a comprehensive and long-term vision of integrated urban revitalisation; (ii) upgrading post-earthquake reconstruction with five key themes of integrated urban revitalisation; (iii) parallel contribution to sustainable development by addressing environmental, economic and social issues.

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