



## Strategic approach to the project of reconstruction after the earthquake in Zagreb and legal frame

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### Abstract

In 2020 the Republic of Croatia was hit by two strong earthquakes and a number of weaker ones that followed. The first strong earthquake occurred in March (5,2 Richter) with the epicenter in Zagreb, the capital of the Republic of Croatia. The center of the city, which consists of structures built during the transition from 19th to 20th century, was heavily damaged, as well as many family houses in the suburban area. The load bearing structure of the damaged buildings is mostly built out of brick with wooden beams, this was not built taking into account possible dynamic stresses nor the effect of horizontal force on buildings [1]. In many buildings the tenants have left and looked for alternative accommodation. In the preliminary inspections of the buildings, the following was determined [2]: inoperable 1.311 buildings; temporarily inoperable 4.896 buildings; operable 18.790 buildings. The city center is densely populated (14.956 people/km<sup>2</sup>) and according to the latest population census it counts c. 68.000 people [3]. In the city center many public purpose buildings have been damaged (schools, university, kindergartens, courts, administrative buildings, museums, churches, hospitals...) and multistorey buildings, many of which are culturally protected historic buildings (or are located in a zone of such protection), whilst the suburban area mostly consists of family houses [4]. The status of the buildings - multistorey buildings were not maintained (including public purpose buildings), as a consequence of poor maintenance dating back to the times of socialism (buildings are mostly uninsured and people socially mixed) and the effect of the earthquake which caused significant borderline damage. From the aforementioned it can be observed that many buildings have suffered significant damage during the earthquake, and could collapse at a moment's notice, and that the typology of the buildings is extremely heterogeneous, ranging from family houses to culturally protected historic buildings. Afterwards and close to the time of registering this paper, there has been another, stronger earthquake (6,2 Richter) in the Sisačko-moslavačka region which caused a lot of damage and loss of human life. This earthquake has also affected Zagreb due to its proximity of 58 km. In this situation, the typology of buildings is completely different and consists mostly of family houses. There are 42.557 buildings registered for inspection [5].

**Key words:** earthquakes, reconstruction, strategy, goals, legal framework

# 1 Strategy and goals of the reconstruction

Based on significant experience, starting with the reconstruction of Dubrovnik after a strong earthquake (in 1979) and Ston (in 1996) and the large post-war reconstruction (1996 – 2005), flooding (in 2015) and landslides (in 2017) which occurred in the Republic of Croatia, as well as knowledge of foreign natural disasters [6] [7] [8], reconstruction goals have been set strategically after the latest earthquakes. The analysis of the damage and the general status of the buildings were pointing to a great potential of danger of collapsing for a great number of buildings in a densely populated part of the city with an exodus of a greater number of people, this required quick action following the 4R principle (Rapid Response, Rapid Repair [9]). Following the choice of such strategic direction, the short-term and long-term goals were set:

- a) Short-term goals – rapid reconstruction of buildings which have lost their minimal earthquake resistance ability taking into account their original date of construction, in order to protect the health and lives of the users of these buildings, but also passersby.
- b) Long-term goals – protection of the historical urban totality of the city, total reconstruction of public purpose buildings and culturally protected historic buildings, programs for total reconstruction of the urban totality of the City of Zagreb.

There are many challenges when it comes to a rapid reconstruction of a great number of multistorey buildings which stem from the heritage of problematic interowner relationships (predominant situation: one flat – one owner), unsolved ownership statuses, unregistered ownership documentation, etc. Furthermore, it is important to keep in mind the inefficient (and undercapacitated) companies which manage buildings, low funds on the accounts of buildings, social mix of tenants (the same building houses extremely rich and poor tenants) as well as a number of situations of mixed purpose buildings. One must not also forget the unprofessional remodelling in buildings, which people have done throughout the past.

With such a picture of state, rapid reconstruction of thousands of buildings with thousands of tenants is only possible with a clear vertical government organisation. The cost estimate of the basic reconstruction is EUR 5,6 bn. Due to heritage, financial government support is necessary.

# 2 Legal framework for the reconstruction

The Ministry of Physical Planning, Construction and State Assets has immediately after the earthquake created an analysis and strategy for the reconstruction and has started working on the creation of the legal framework. The buildings could not be left to the co-owners alone to reconstruct depending on their mutual agreement and financial ability. The buildings represent a danger to the lives and health of their users and passersby.

On the basis of all experience (legal / organisational / construction), the Law for the reconstruction of buildings was initially written taking the 4R principle into account and was aimed to be legislated utilising urgent procedures so that the summer time could be used for the construction work. Unfortunately, the stated key elements were not implemented and with that the Law [10] was legislated in full procedure which will significantly delay the reconstruction.

The Law regulates a number of questions regarding the financing of the reconstruction, the decision of reconstruction, replacement and temporary accommodation, minimum necessary experience of engineers, shortened procedures in construction, process control, etc. and there are two possibilities for reconstruction: self-reconstruction for those who can organise on their own in order to decrease the pressure on the government-organised reconstruction which envisages a refund for the justified costs; and the government-organised reconstruction. It is up to the owners in both cases to finance the costs of the interior and exterior repair for which it is aimed to set up a special program of help as a next step. What is more, there are also bylaws for the purpose of the reconstruction in which the procedures are detailed, and which do not have to undergo a long procedure of legislation such as a law would.

### 3 Conclusion

Natural disasters of the highest intensity, especially earthquakes, affect a large number of people and there are damages to structures. In any case, there are many open questions with regards to human life and material damage. Globally, a lot of experience has been accumulated on the topic over the years and it is important to apply them taking local specifics into account. In such a situation, it is necessary that the economy, profession and politics act in a synergy, more than ever before.

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