

**URBANISTIC ASPECTS OF POST EARTHQUAKE RECONSTRUCTION AND RENEWAL - EXPERIENCES OF SKOPJE FOLLOWING EARTHQUAKE OF JULY 26, 1963**

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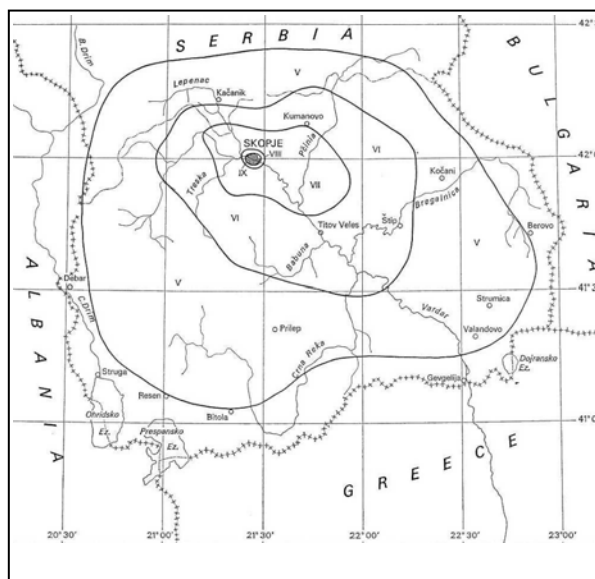
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**ABSTRACT**

**The Earthquake and Effects**

In the early hours of July 26th, 1963, Skopje was struck by one of the most severe catastrophes in its history. Though the history of Skopje has already recorded several catastrophic earthquakes (518, 1555), in the earthquake of July 26 (Fig. 2), 1,070 of its citizens perished; more than 3,300 were seriously injured and about 76% of the inhabitants were left homeless. At this difficult moment, the entire town was in ruins on a constantly trembling ground. The entire territory of Macedonia (25,713 sq. km.) was shaken with intensities varying between V and IX MCS (Fig. 1), exceptionally with IV.

Damage to the building wealth was tremendous. The functional losses of total residential gross building area of 1,630,609 sq.m. (family houses included) were estimated at 76.8% leaving about 75.5% of Skopje's inhabitants homeless (Table 1).



**Fig. 1. Seismic Intensity Map of July 26, 1963 Skopje Earthquake**



<b>Date</b>	<b>July 26, 1963</b>
<b>Time, (GMT)</b>	<b>04:17:11</b>
<b>Epicentral latitude</b>	<b>42° 00.5' N</b>
<b>Epicentral longitude</b>	<b>21° 27.3' E</b>
<b>Hypocentral depth (km)</b>	<b>5.0</b>
<b>Magnitude (M)</b>	<b>6.1</b>
<b>Epicentral intensity (MCS)</b>	<b>IX</b>
<b>Released energy (ergs)</b>	<b>5x10<sup>22</sup></b>

**Fig. 2. Basic Characteristics of July 26, 1963 Skopje Earthquake**

About 22.6% of buildings remained non- or slightly damaged, so only that could be used for intended function immediately after the earthquake. Public buildings, schools, hospitals, industrial and other public buildings suffered also very heavy damages, similar to those experienced by the residential building stock.

The total direct losses estimated by the Federal Commission of the Government of former SFRY amounted at 1.0 billion 1963 US Dollars. The restitution value of direct material losses was estimated at 1.2 billion US Dollars which amount corresponded at about 15% of the GDP of former SFR Yugoslavia for the fiscal year of 1962. The 1962 economy of SR Macedonia participated in GDP of former SFRY by 10%, thus the direct losses caused by July 26 Skopje earthquake amounted at about 1.5-2.0 GDP of SR Macedonia.

**Table 1. Loss of Dwelling Houses, Dwellings and Net Living Area**

Damage State	Residential Building Stock (%)	Apartment Stock (%)	Net Living Area (%)	Inhabitants Involved (%)
<b>Unusable</b>	<b>77.4</b>	<b>75.1</b>	<b>76.8</b>	<b>75.5</b>
Destroyed	11.3	9.2	7.0	8.5
Heavily Damaged	44.1	33.0	29.9	36.4
Damaged	22.0	32.9	39.9	30.6
<b>Usable</b>	<b>22.6</b>	<b>24.9</b>	<b>23.2</b>	<b>24.5</b>
Slightly damaged	16.5	20.1	19.8	20.3
Undamaged	6.1	4.8	3.4	4.2

### Emergency Period

Immediately after the earthquake, the citizens of Skopje, the units of the Yugoslav National Army, the National Militia, and the Civil Defense undertook rescue operations. According to some sources about 10,000 people have been rescued from ruins within first several hours. Apart the rescue teams from Skopje, teams arriving several hours after the quake from other towns of Macedonia and SFR Yugoslavia had assisted search and rescue operations. Several days following the quake, the team from France as well as the army units from USSR, USA, Germany and other countries joined search and rescue operations.

Sanitary centers were organized for handing first medical aid. Wounded and the injured were evacuated to other places where they received complete medical help and care. Urgent assistance was organized coming from all parts of SFR Yugoslavia in various ways (food, tents, blankets, medicaments, blood plasma; health care and rescue teams, etc.) which significantly contributed to rapid restoration of the basic living conditions, prevention of the appearance and spreading of epidemic diseases, etc. Invaluable was the help of the Yugoslav National Army, the youth and humanitarian organizations.

The evacuation of citizens, businesses, industry, other vital political and administrative functions of the City and of the Government of Macedonia, including the Government itself, were performed in accordance to the priorities and the decisions made by the City Assembly of Skopje, i.e:

- o About 140,000 aged citizens, mothers with small children and children at an age of less than 15 years were evacuated for a period of 3 to 9 months to resort areas and larger towns in the SR Macedonia as well as the other republics of SFR Yugoslavia;
- o Accommodation of the citizens and their families was organized in temporary tents settlements installed in the parks and other green areas of the city, as well as in the non-damaged buildings, with their relatives, in Skopje or neighboring towns (Kumanovo, Tetovo, Titov Veles);
- o Evacuation of medical centers, hospitals, supplying centers, light industrial companies (textile, metal products, etc.) local and republic government administration was organized in neighboring towns, and later in temporary prefabricated buildings and tents erected in the city.

Most of the population, businesses, industrial activities, administration, etc. were accommodated back to the city within 3 - 6 months after the earthquake, mostly in the new prefabricated settlements and repaired and strengthened damaged buildings.

## **Reconstruction Period**

As soon as the emergency was under the control, the City Assembly adopted a Temporary Program for Renewal and Rebuilding of Skopje (November 22, 1963), the implementation of which provided favorable conditions for technically consistent and economically sustainable long-term city reconstruction and development that complied with the new Urban Renewal Program.

The long-term reconstruction policy of Skopje, formulated by the Program for Renewal and Rebuilding of Skopje, was defined based on: (1) Scale and the character of the caused destructions; (2) Achievements accomplished by implementing Temporary Program for Renewal and Rebuilding in the period of 1963-64; (3) Revision and solution of problems inherited from previous City development periods; (4) Identified potential long-term adverse effects; (5) Needs for proper development and sustainable urban policy in the forthcoming period; (6) Results of the voluminous geological, seismological, urbanistic and other studies; and, so forth.

On these ground, the main objectives to be achieved by 10 years Renewal and Rebuilding Program were set up as follows: (1) Assurance of necessary conditions for realization of Program for Renewal and Rebuilding – qualification and quantification of seismicity and other environmental potentially constraining factors according to the new urban plan; (2) Accommodation of citizens rendered homeless; (3) Renewal of the economy and enhancement of the degree of its participation, structure and accumulation in reconstruction process; and, (4) Renewal and reconstruction of other structures of the social standard.

The ten-year renewal and reconstruction of residential sector distinguishes two periods: (1) 1964-1965 – period of intense construction of prefabricated apartment settlements for rapid amortization of problems created in residential sector. In this period a total of 22,250 new apartments have been built, in 17 newly developed prefabricated suburbs settlements and about 16,000 damaged apartments in the central part of the city were repaired and strengthened; and, (2) 1966-1973 – period of reconstruction of the city following the strategy and land-use regulations formulated by newly elaborated and adopted urban plan (Master Plan of Skopje) and the Detail Urban Plan for the City Center. During this period 13,250 apartments have been built in the central part of the city, while another 4,500 apartments were under the construction by July 26, 1973.

In total, 35,500 apartments were built during 10-year period of intense reconstruction and rebuilding of Skopje. In addition, citizens of Skopje built 4,250 apartments, as private family houses, by engaging their individual financial resources combined with favorable crediting policy.

The traffic network, compared to 1963, was enlarged for over 2.8 times. In 1973 it amounted at 420 kilometers with mainly asphalt roads and sidewalks, out of which 123 km main roads (877,000 sq.m. roads, 308,000 sq.m. sidewalks, 108,000 sq.m. bicycle tracks). The earthquake required radical changes and reconstruction of the Skopje railway network, with the most important feature being a complete separation of the passenger and freight railway traffic.

The global growth of the economy in the period 1963-1973 was quite evident, being a result of significant investments. The social product increased by 713%; the national income increased by 677%; the net salaries reached growth of 827%; the funds increased by 100%; the employment increased by 153%.

### **Source of Funds for Renewal and Rebuilding**

Funding of renewal and rebuilding of Skopje was provided on the base of:

- Federal Law for elimination of the consequences of disasters, including urgent financial aid measures provided by the Federal Government of SFR Yugoslavia (Fund of Federal Reserves), Republic Government of SR Macedonia and City of Skopje authorities;
- Federal Law for establishment of Federal Fund for Renewal and Reconstruction of Skopje (September 1963) – realized in the period 26 July 1963 to 31 December 1964 through the Temporary Program for Renewal and Reconstruction of Skopje with allocated total amount of 1,566 million YU Dinars (~224 million US Dollars, 1 US Dollar = 7.00 1963 YU Dinars);
- Republic Law for establishment of Fund for Renewal and Reconstruction of Skopje (March 1965) – realized in the period 1965-1973 through the Program for Renewal and Reconstruction of Skopje with allocated total amount of 6,190 million YU Dinars (~885 million US Dollars), the funds of the Temporary Program included;
- International aid from 82 countries worldwide - with total amount of 348 million YU Dinars (~49.6 million US Dollars) and domestic (national) aid – with total amount of

157 million YU Dinars (~22.5 million US Dollars); both realized in the period 1963 – 1973 through the solidarity fund called Fund for Assisting Renewal and Reconstruction of Skopje

The Skopje earthquake was the unique one among the catastrophic earthquakes in the past 44 years in Europe and the Mediterranean region. It triggered a high attention and awareness of population, governments, scientists and engineers on the needs for organized, consistent and continuous earthquake disaster prevention and management. Earthquake catastrophes were no longer only a scientific problem, they were recognized as a serious economic, technical, political and social problem not only for the region stricken, but also at the national and international level.

The intended presentation will be focused on relevant aspects of short- and long-term management strategies of adverse socio-economic effects caused by July 26, Skopje earthquake and relevant urbanistic aspects of Skopje's post earthquake reconstruction and renewal.