SEISMIC RISK ASSESSMENT IN ARMENIA

Hovhannes Khangeldyan
Head of National Crisis Management Center
Rescue Service
Ministry of Emergency Situations of the Republic of Armenia

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Armenia is landlocked in the South Caucasus, located between the Black and Caspian Seas, Armenia is bordered on the north and east by Georgia and Azerbaijan, and on the south and west by Iran and Turkey.

The Republic of Armenia, covering an area of 29,743 square kilometers is located in the north-east of the Armenian Highland. The terrain is mostly mountainous, with fast flowing rivers and few forests. The climate is highland continental, which means that Armenia is subjected to hot summers and cold winters.

The land rises to 4,090 meters (13,419 feet) above sea level and no point is below 390 meters (1,280 ft) above sea level.

Located on the Alps-Himalaya seismic zone, Armenia has historically been prone to earthquakes.
ARMENIA: GEOGRAPHICAL AND SEISIC CONTEXT

The last devastating earthquake in 1988 rocked Spitak, killing 25,000 people and injuring 19,000, severely damaging 517,000 homes and causing an estimated economic loss of US$15-20 billion in Northern parts of the country.

Floods in the country also pose serious danger. For instance, flooding in 2010 caused an estimated US$10 million in damage. However, this list of natural disasters is not complete; Armenia also faces other hazards such as droughts, hail storms and landslides.
Map of buildings’ destruction risk in Gyumri City during the earthquake with intensity of IX (0.40g)

Map of fire occurrence risk in Gyumri

- **no risk**
- **below moderate**
- **moderate**
- **above moderate**
- **high risk**
Maps of risks in Vanadzor city as a result of earthquake with intensity of IX

Risk of building destruction

Risk of fire occurrence

Risk of human losses
EARTH RUPTURE IN THE RESULT OF SPITAK EARTHQUAKE IN 1988
ARMENIA: MANAGEMENT AND COLLABORATION IN CRISIS MANAGEMENT SECTOR FROM 2011
The first steps - preliminary assessment of seismic risk of Yerevan City area.

Follow up works aimed at seismic risk assessment in the country started in 2005. Seismic risk was assessed for the areas of 19 towns.

In 2010-2011 in the frame of JICA Project (“Assessment of Seismic Risk and Planning of Risk Management in the Republic of Armenia”) Japan specialists with participation of Armenian specialists assessed in details the main components of seismic risk of Yerevan territory. The risk of destruction of almost all the most common types of buildings, human, material and other losses was assessed through development of different scenarios.

In 2010 in the scope of a UNDP project the Scientific-Research Company “Georisk” with participation of the RA Ministry of Emergency Situations, the Institute of Geological Sciences of the National Academy of Sciences of Armenia assessed the seismic risk of Gyumri and 6 other towns of Armenia (using ELER software (procedure for earthquake loss estimation) for different seismic scenarios).
SPECIFIC FEATURES OF THE RA MES METHODOLOGY FOR ASSESSMENT OF SEISMIC RISKS OF CITIES

- Statistical data on 1988 Spitak earthquake consequences and classical approaches indicated in the preceding slides were used for the assessment of seismic vulnerability of the main types of buildings.

- When assessing city risks, the territory was divided into symbolic plots by prevailing types of buildings rather than geometrical shapes as usually was the case before. Seismic hazard was based on the maps of seismic micro-zoning.

- Quantitative assessment of two very important values, related to risk of building destruction and population vulnerability uses the formula presented in the work (Balasanyan, Nazaretyan, 2004):

\[ K_R = \frac{I_{hz}}{I_{rL.r}} \]

- \( K_R \) – rating of building destruction,
- \( I_{hz} \) – intensity of seismic action;
- \( I_{rL.r} \) – seismic stability of buildings, expressed in points of MSK–64 scale;

\[ K_s = \frac{S_b}{S} \]

- \( K_s \) - rating of building destruction,
- \( S_b \) – development area with various degrees of destruction risk
- \( S \) – total development area, expressed in m².
ARMENIA NATIONAL DISASTER RISK MANAGEMENT PROGRAM

The Government of Armenia has recognized the importance of disaster risk management, highlighting that natural hazards threaten the country’s development.

In this regard, the World Bank Group has offered support to further advance disaster resilience in the country by launching the Armenia National Disaster Risk Management Program.

The Program was made possible with the financial support of the Japan-World Bank Program for Mainstreaming Disaster Risk Management in Developing Countries (through the Global Facility for Disaster Reduction and Recovery (GFDRR)) and other donors. It will also work in close cooperation with other development partners, such as UN agencies, International Financial Institutions, bilateral agencies, and civil society organizations working in Armenia.
The funding is US$1.75 million with a duration of 2.5 years, and started from 2015.


The National Disaster Risk Management Program is aimed at supporting the Government of Armenia to further advance disaster resilience by: (1) improving disaster risk information; (2) enhancing disaster risk reduction; (3) strengthening disaster preparedness; and (4) improving understanding of fiscal disaster risks and risk financing options.

In particular, the ANDRMP has implemented DRM capacity assessment and planning for national DRM Strategy revision; considerable upgrading of the Armenia Probabalistic Seismic Hazard Map; provision of a report on national simulation drill exercise, as well as development of urban planning guidelines for local municipalities.
Armenia is carrying out disaster preparedness drills in separate cities starting from 1999. This year the Government of Armenia is planning to hold a national drill on December 7, 2016 as a day of remembrance of the great 1988 earthquake and as a day of disaster preparedness.

**Lessons learnt:**

- The scale of highly organized and efficiently implemented drills on residential, communal, municipal and national levels. The level of importance the community pays to disaster preparedness, such as details concerning the mapping of residents in a certain buildings based on age, physical and mental conditions, etc.

- The high sense of responsibility, comprehension of disaster risks and high level of participation by each member of population that possess a very real and serious character, resulting in organized behavioural patterns in case of disasters.
The importance of including the disaster preparedness and behavior patterns starting from early childhood education. Children are our future, thus the school not only as a physical construction but also as living organism is in the center of attention starting from risk preparedness to becoming the main evacuation point in case of disasters.

The benefits of decentralized municipal government sector result effectively on the management of disaster risk management and prevention and early warning within each city.

The availability of wisely distributed and well-informed evacuation points and evacuation maps that are applied during the simulation drills.
THANK YOU FOR YOUR ATTENTION.