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DEVELOPMENT OF MATHEMATICAL MODEL OF INTELLECTUAL BUILDING IN BAKU CITY

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Now all over the world the building boom which has not laid aside and a city of Baku is observed. At the same time today the idea of construction of the intellectual house is very actual. In article attempt to look at these questions from the point of view of the system analysis is undertaken. From the point of view of the theory of systems carefully are surveyed all conditions, which necessary for the modern building in the Baku and the hierarchical structure of this problem is constructed. At construction of such structure is used «The method of the analysis of hierarchies», offered by the American mathematician T. Saaty [1, 2].

The Republic of Azerbaijan is located on eastern part of Great Caucasus and occupies an 86,600 km^2 territory. Land border countries: Russia, Turkey, Iran and Armenia. Seaside countries: Russia, Iran, Turkmenistan, and Kazakhstan. The basic regional and global problems are:

- Increasing level and continuous pollution of the Caspian Sea and their damage on marine and coastal ecosystems.
- Transboundary pollution of Kura river and misuse (irrational use) of its resources.
- Biodiversity of the region, its protection and sustainable usage.
- Climate change and ozone layer depletion.

Located at the Absheron Peninsula, Western shore of Caspian Sea, Baku city is the capital of the Republic of Azerbaijan. Historically Baku was one of the large oil provinces of the world. Oil industry plays an important role in the economy of the Republic of Azerbaijan. Signed on September 1994 between SOCAR and 11 leading oil companies the Contract of the Century soon became reality. Therefore, as many other cities of the world Baku is facing the problems of today's construction boom. From the point of view of the theory of systems, building questions in a city of Baku, it can not be considered away from the above-stated problems. Construction just like other complicated systems is dependent on a variety of inside and outside factors. Sometimes, it is not possible to take into account the effects of all these factors entirely. We propose a mathematical model to solve the above mentioned problem.

Based on the studies carried out earlier, the following factors should be taken into account during designing and construction of buildings in Baku and Absheron peninsula. Now we result in brief the basic conclusions made at carrying out of the analysis.

Climate

- Total solar radiation in Absheron peninsula changes from 130 through 135 kilocalorie/sm^2 per year.
- The average number of atmospheric precipitation is 227 mm per year.
- The relative humidity in major part of Absheron peninsula including Baku city is within 66-81%.

Wind

- Absheron Peninsula is located at the southern part and right perpendicularly to main coastal line of the Caspian Sea coinciding with north-south topographic channel that forms turbulence of air streams.
- Average annual wind velocity exceeds 6m/second. Wind velocity exceeds 15 m/second more than 100 days/year.
- Wind intensifies evaporation from water surface and soil, especially at depths of 1-2 meters.

Ground water level

- According to available statistical data, there is a trend in ground water level's mode caused by intensive technogenous impact on underground water. This trend changes from -0,03 to +0,63 mm/year. Sometimes, it reaches 20 mm and more within the territory of Baku city.
- Baku's geological conditions characterized by the presence of ground waters at 20 m depths and more in rocks. That usually causes landslides.
- Landslides in some areas reach between 5-10, 17-20, 5-30 m.

Landslides

- There were several landslides in Baku area during the last fifty years (1974, 1996, 2000, 2003, and 2005).
- The landslide occurred on March 2000 damaged 17 buildings and 100 facilities. Approximately 43 property buildings became useless. Therefore, landslide is one of the key factors that should be taken into account during town-planning activities in Baku and Absheron peninsula.

Earthquakes

- The earthquakes which affect Baku city include The Caspian Sea Earthquake (its epicenter is about 100 km of Absheron Peninsula) and The Shamakhy Earthquake (1902).
- The Caspian Sea Earthquake broke out in 1961 and 1963. The shake was recorded as seismic intensity VI-VII of MSK-64 (international seismic intensity established in 1964).
- Recently, a big earthquake of M 5.8 (magnitude 5.8) occurred in Baku on November 25, 2000, which seriously damaged the Baku city region.

Some indicators of these earthquakes are shown in the Table 1.

Table 1

	gal	**kine**
Shamakhy earthquake (1902)	250-600	30-60
Earthquake in Baku (1963)	400-800	15-90
Earthquake in Baku (2000)	80-150	5-15

In order to study seismic risk in Baku city a joint project was carried out in the International Ecoenergy Academy in cooperation with Japanese Kobe University. Results of studies show that more than a half of buildings in Baku is likely to collapse if an massive earthquake with its epicenter at Baku or coastal area occurs. So much Baku is under very high seismic risk. Therefore, the countermeasures should be taken into consideration during designing of buildings and facilities to verify of soundness and earthquake resistance.

Mud Volcanoes

- Recently occurred mud volcanoes resulted in motion of 3 km^2 area in Absheron Peninsula.
- Since the last century such events has occurred more often due to the beginning of industrial oil production.
- Penetration of water from basins, water supply and sewerage systems into the ground and absence of an appropriate drainage system are also the other reasons of mud volcanoes.

Method of the analysis of hierarchies intends the representation of a studied problem in the hierarchical form. This method consists of the decomposition of a problem to more simple content parts and the further processing judgments by the person making decision, on the basis of pair comparisons. On the basis of the above-named analysis following elements of hierarchical structure of a problem have been defined:

Factors: ground water level; construction materials; influence of buildings on environment; architecture traditions; anthropogenic factors.

Criteria: usage of radiation ally safe construction materials; utilization of alternative energy; registration of earthquake risks and landslides; power safety; observance of a transport infrastructure; economic and power efficiency of a building; observance of building norms and rules; observance of sanitary-and-hygienic norms.

Policies: intellectual buildings; economically cost saving building; ecologically clean buildings; safety required buildings.

Alternatives: skyscrapers; earthquake resistant buildings; landslide resistant buildings.

The method of the analysis of hierarchies is based on the expert estimation. From among experts in the field of an investigated problem is organized the commission of experts, which answers both for construction of hierarchical structure of a problem, and for carrying out of paired comparisons for different levels of hierarchical structure. Paired comparison is spent on the basis following specially developed estimation scale [2].

Table 2

Intensity	Definition
1	Equal importance
3	Easy dominance one factor concerning other factor
5	The essential or strong dominance
7	The considerable dominance
9	Very strong dominance
2, 4, 6, 8	Intermediate decisions between two next judgements
The inverses of the above-stated numbers	

For the decision of a problem considered in this article in the International Ecoenergy Academy has been created the commission of experts. Into this commission were included well-known experts from the corresponding areas. In close interaction with experts of this commission has been constructed the hierarchical structure of a considered problem, which represented on fig.1.

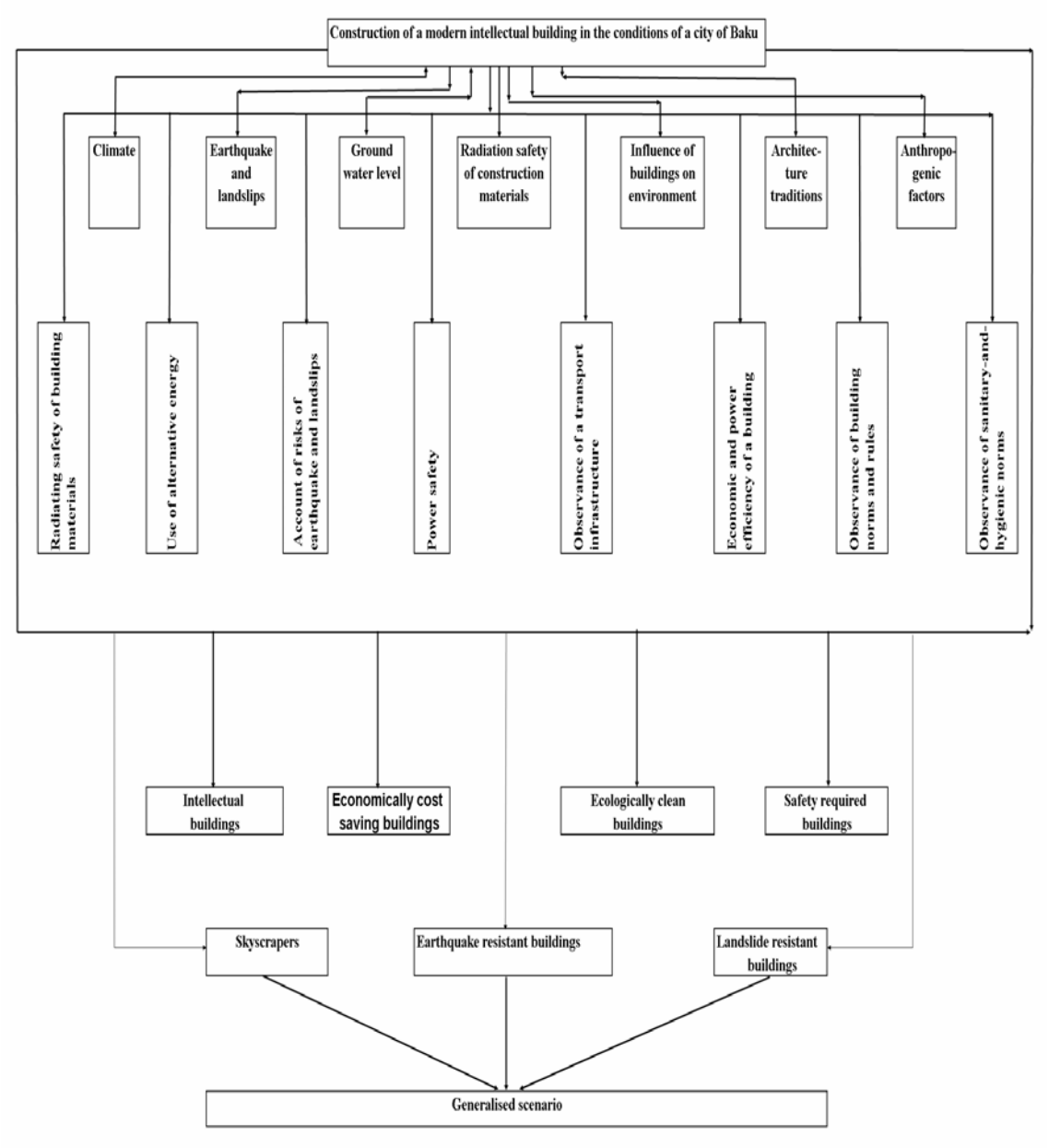

Fig. 1

After formation of hierarchical structure, on the basis of an expert estimation and by means of a technique developed in work [3], it is supposed to investigate questions of building and working out of forecasts for intellectual buildings in a city of Baku.

Literature

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