

13th International Conference on Data Envelopment Analysis

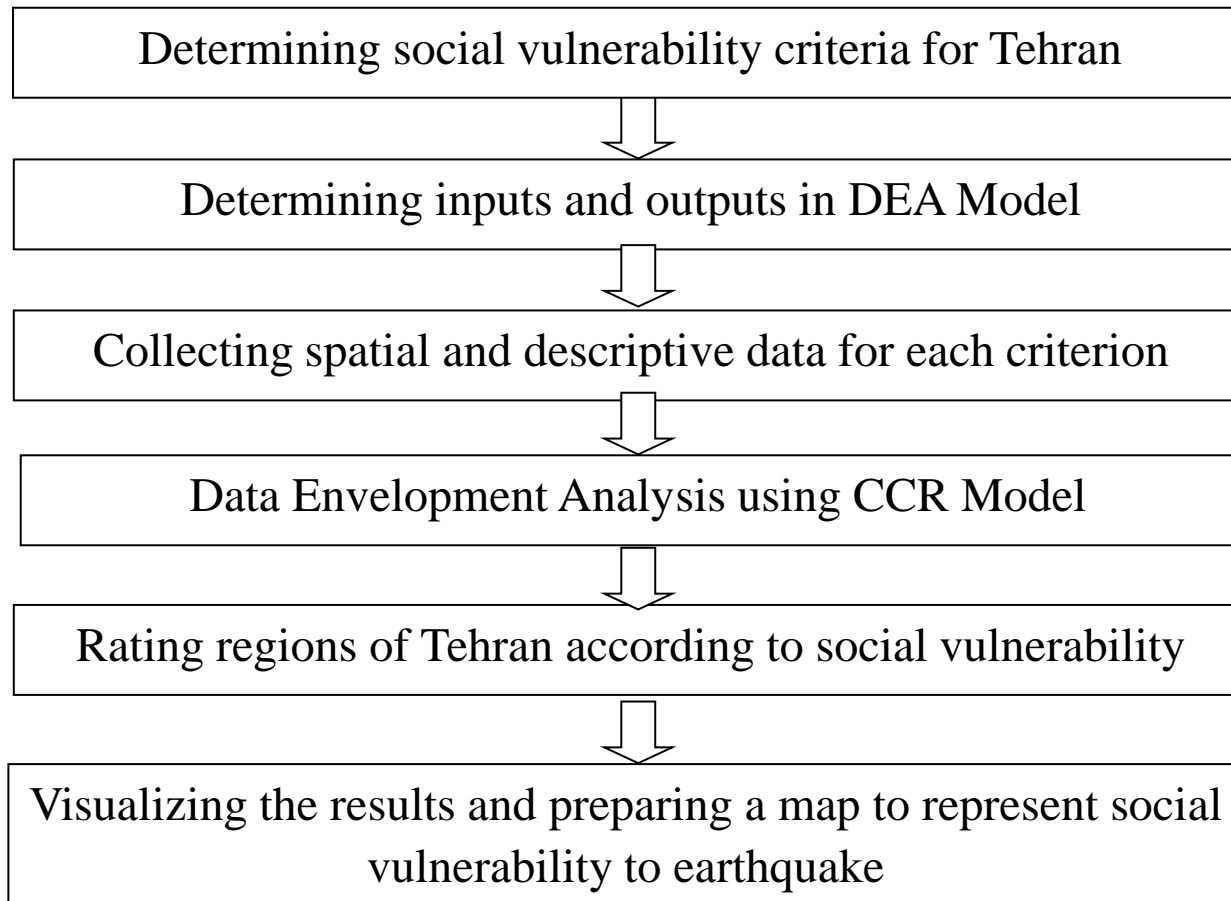
Demand and Supply Evaluation of Urban Facilities Needed for Management of Tehran after an Earthquake: a DEA approach

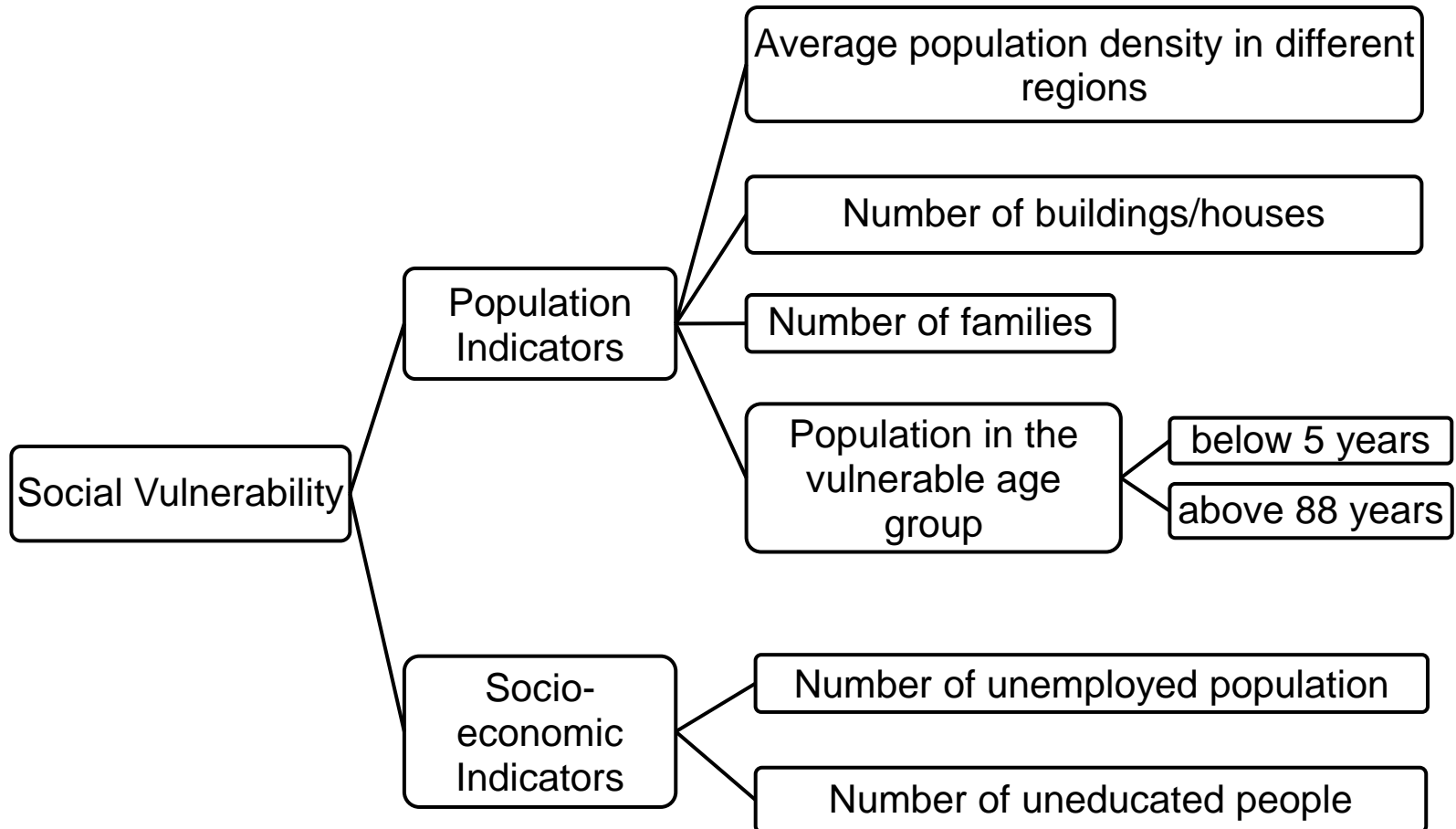
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- Spatial distribution and accessibility of victims to urban facilities such as health centers, highways and streets is one of the important issues for management of the crisis caused by an earthquake.
- DEA (as a multi-criteria analysis method) and spatial analysis can be utilized to evaluate the balanced distribution of urban facilities.
- DEA can use to model the balance of supply and demand, lack of supply or excess demand in every region of the Tehran (as DMUs).

- Output-oriented CCR model is used.
- The 22 regions of Tehran were selected as the decision-making units (DMUs).
- The DEA-Solver software was used to determine the overall performance of DMUs.

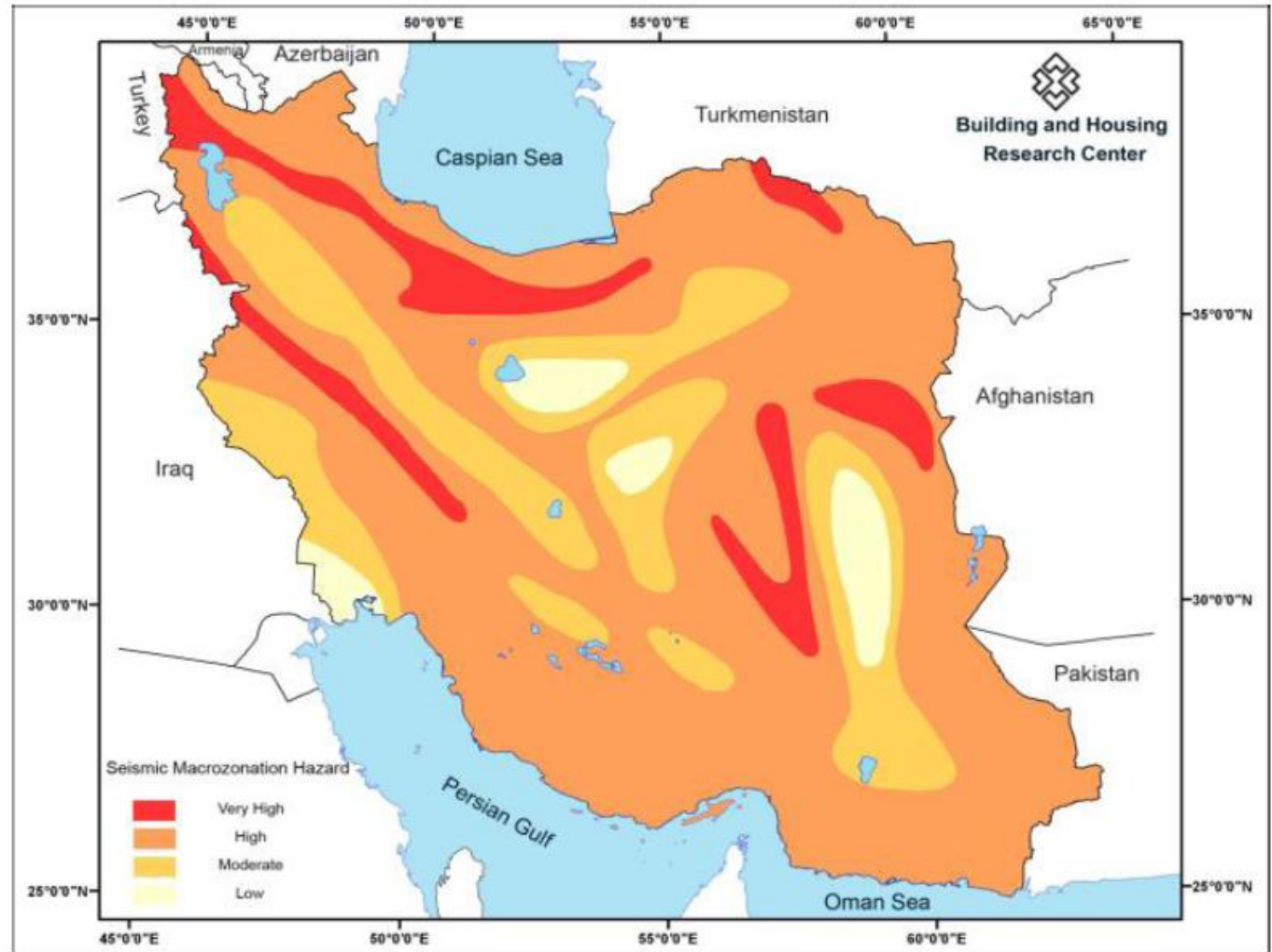




- The Great Tehran, capital of Iran, located in the foothills of the Alborz Mountains, a part of the Alps-Himalayan orogenic belt.
- It has a high seismic potential and numerous active faults.
- According to the data achieved from the past earthquakes, Tehran has suffered from many powerful earthquakes with return period of 150 years.
- Since 1830, Tehran has experienced no major earthquake
- Seismologists anticipate the occurrence of a great earthquake in Tehran in the future (JICA, 2000).

Case Study: Tehran, Iran

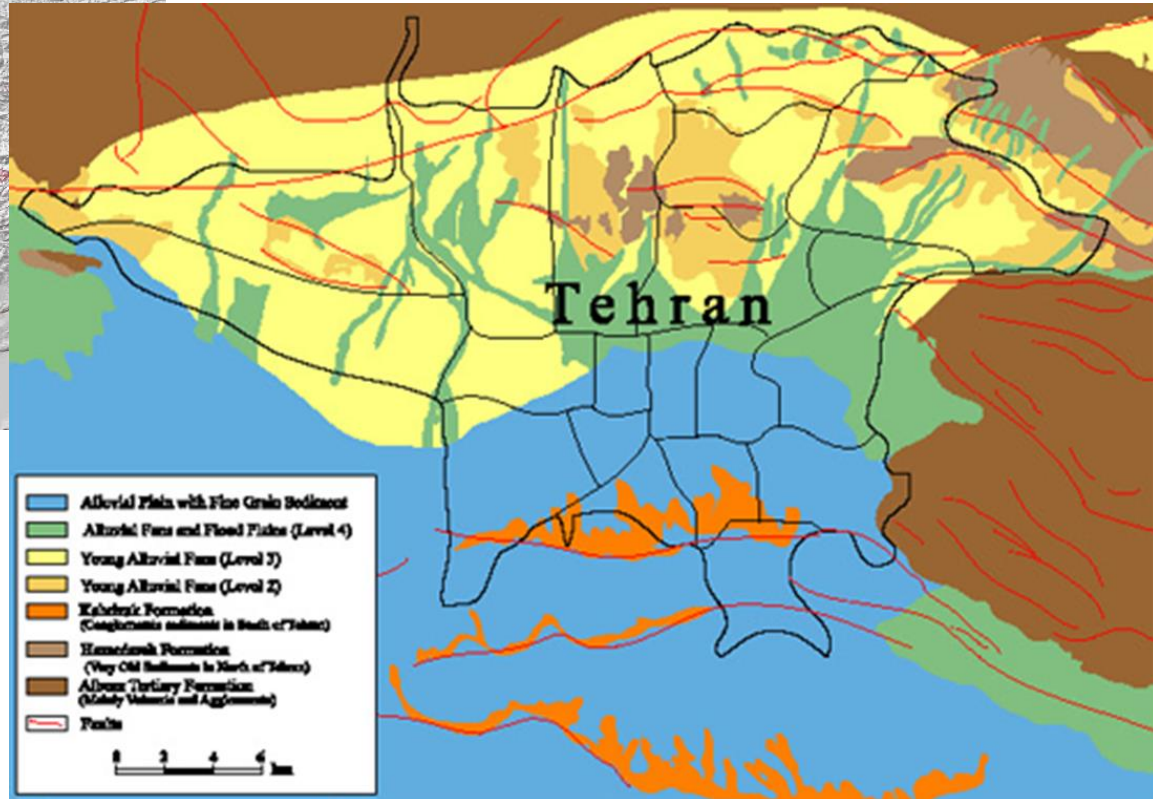
Seismic hazard zoning map of Iran (Moinfar et al, 2012, WCEE)



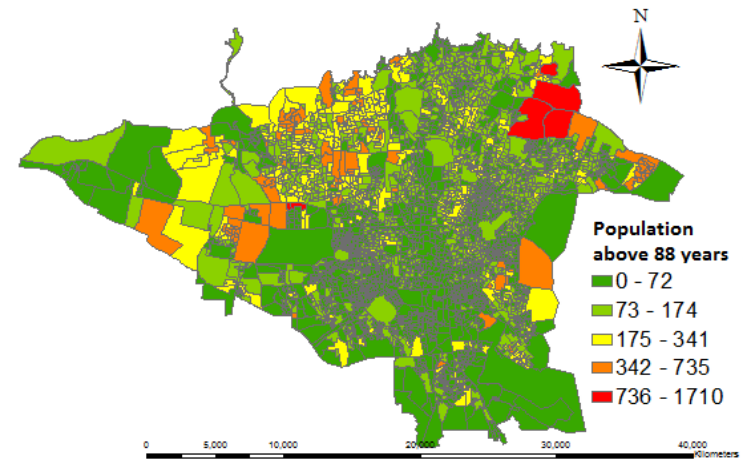
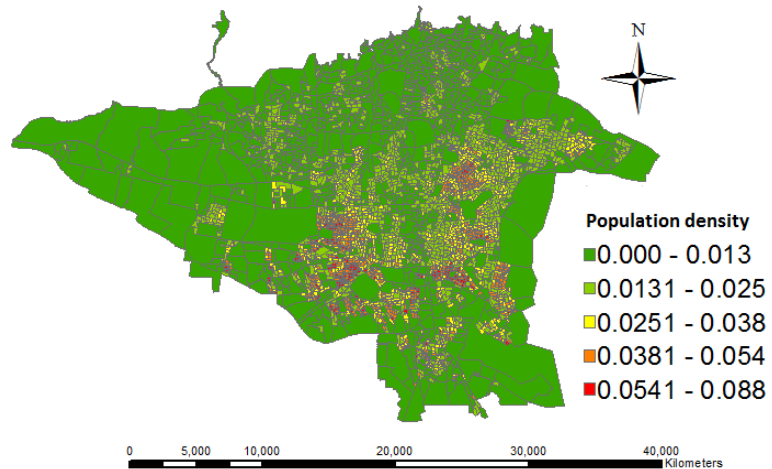
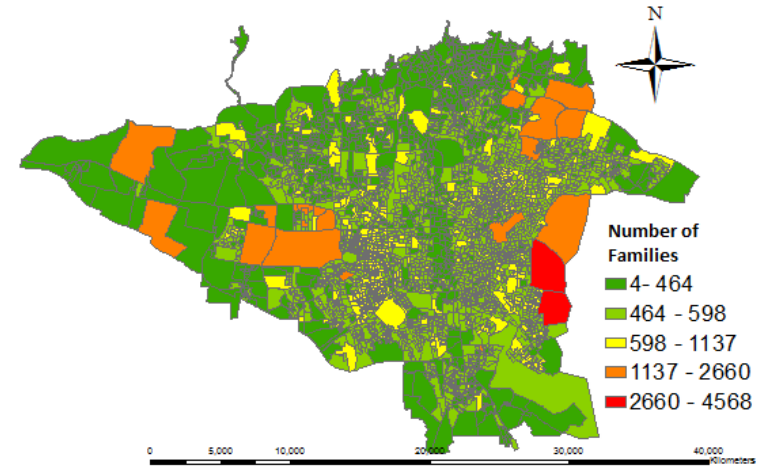
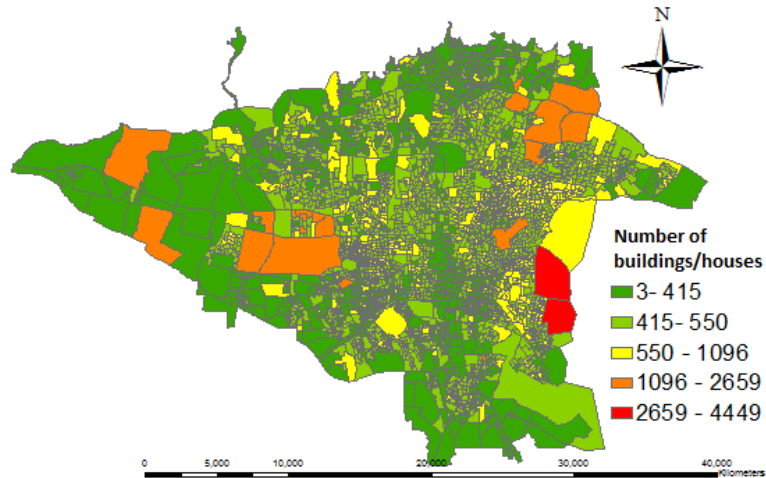
Fault map of Tehran region

Geological Survey of Iran
Seismotectonic group
Talebian M., Ghorashi M., Nazari H.

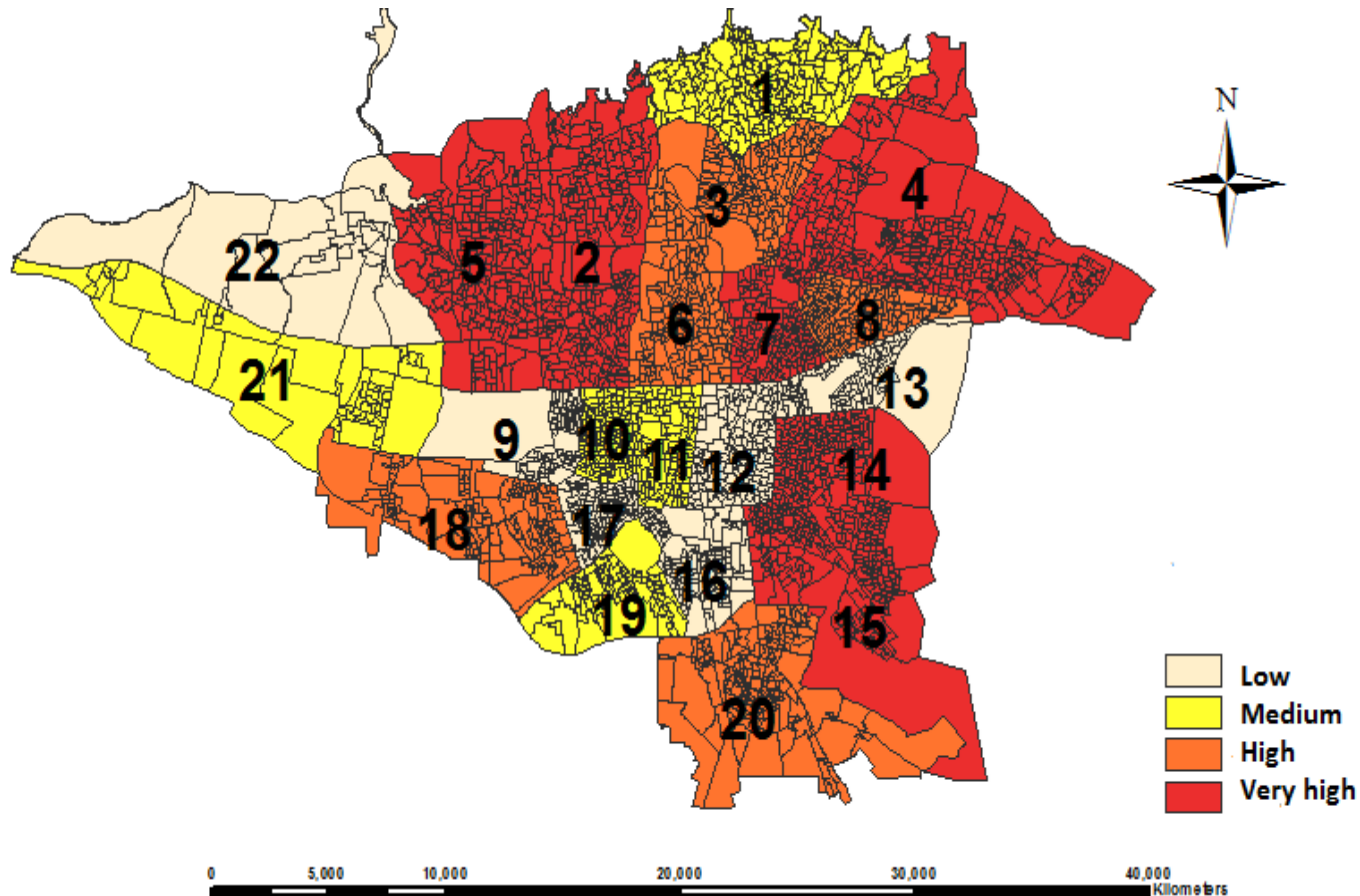
CASPIAN SEA



Results: Factor maps as the input of DEA model



Results: Social vulnerability map of Tehran



regions 9, 13 and 22 have good balance between supply and demand of the facilities.

Table 1: Efficiency of each municipality region (DMU) for management of the Tehran after an earthquake

DMU #	Overall Efficiency score	Rank based on social vulnerability (Ascending)	DMU #	Overall Efficiency score	Rank based on social vulnerability (Ascending)
22	1	1	20	0.46	12
9	1	2	6	0.45	13
13	1	3	3	0.42	14
12	0.96	4	18	0.42	15
17	0.89	5	8	0.40	16
16	0.82	6	14	0.33	17
19	0.61	7	5	0.32	18
10	0.57	8	2	0.31	19
11	0.53	9	7	0.30	20
21	0.51	10	15	0.27	21
1	0.50	11	4	0.21	22

- DEA as a multi-criteria evaluation method to determine vulnerability to earthquake
- DEA, contrary to other methods like AHP, lets to obtain the weights of criteria by the method itself, and to avoid the inclusion of subjective preferences.
- Integration of the DEA with GIS enabled us to add spatial criteria to the DEA method.
- Further studies are suggested to focus more accurately on factors influencing social vulnerability to earthquake and pay more attention to sustainable and cultural-religious development in further studies.