

EARTHQUAKE RISK MANAGEMENT USING NANOTECHNOLOGIES: A STUDY ON CENTRAL PART OF METROPOLITAN TEHRAN

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Using nanotechnology in earthquake risk management in 21st century is an inevitable task due to its multi-dimensional aspects and spread. Nanotechnology increases the human capabilities in confronting hazards and events that cause huge damages in different sectors (Ciutan et al., 2010). Disaster management process plans for confronting with hazards and their consequences in pre event to prepare authorities and organizations for damage reduction (Anbari, 2005). In this management process the responsibilities of authorities and organizations have been defined. But such process is insufficient without applying the new technologies. Considering earthquake risk management as a planned maneuver with assumed practices in different locations and times for evaluating the performance of different involved organizations and personnels in disaster management, nanotechnology is an effective instrument for improving human administration in applying risk management (Syed Abeer, 2012). In this paper, the earthquake risk management through nanotechnology in central parts of Tehran as dense areas with different land-uses such as residential, commercial and health, considering the Ray Fault scenario is discussed.

Based on studies on Ray Fault activities, the central parts of Tehran (regions 11 and 12) have the highest seismic risk (25th and 26th ranks). The seismic risk and damages parameters include earthquake intensity, structural damages, human losses, population density, open spaces and narrow passages. According to the evaluations, these parameters could be scored up to thirty that the thirtieth has the highest level of risk and vulnerability (Figure 1 and 2). Central parts of Tehran are vulnerable to earthquakes due to existing deteriorated urban fabrics, vulnerability of population, structures, shortage of facilities and the vulnerability of hospitals' structure and disaster management centers in times of disaster occurrence. This indicates that if an earthquake of $M_w=6$ happens in Tehran, high volumes of damages will be expected (JICA and CEST 2000).

To decrease the potential damages, instructions based on new sciences and technologies on self-relief and disaster management considering pre-event could be applied such as:

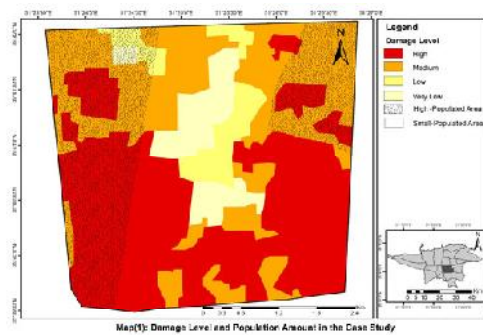


Figure 1. Distribution of gas stations, factories and Workshops in case study area

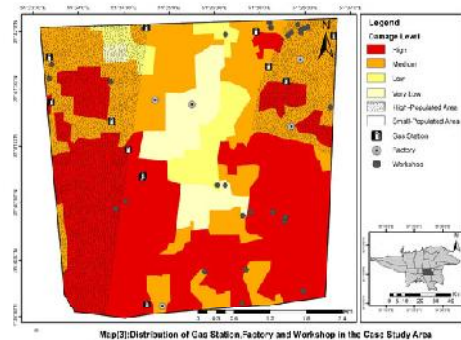


Figure 2. Damage level and total population in case study area

- Using cognitive sciences that is related to human self cognition and his environment and the interactions between people and their environment. Cognitive sciences are effective in increasing self conscious and attention, consciousness, three dimensional perception, muscles control and movement, learning and memories. Also cognitive sciences are helpful in standard interaction between individuals and disaster stricken environment, because the affected environment exert much presures on individuals due to damages, pollution, mental shocks and constraints. This indicates that cognitive sciences could be used by individuals to rescue themselves and other people. (SCCR, 2011)
- Using nano-sensors that is effective in identifying the event by individuals and organizations about event type and damages. This in turn is useful in offering services to rescue affected people.
- Self-treatment in times of hazard occurrence by using nano skin cover for skin treatment is another example of individual disaster management during events. This nano skin cover is a treatment that accelerates the injuries recovery.
- Using alveolar nano polymers in purifying accessible waters and providing the basic needs of disaster stricken people in times of emergencies is very helpful (Jafarpour,1393).
- Since most injuries during emergencies include fractures, using agar nanocomposites is effective in treating such injuries and accelerates the injuries recovery. This is important in returning the active human labour to affected society and eliminates the negative consequences such as being handicapped and depressed in affected society.

REFERENCES

- Anbari M (2005) Investigating Performance of Organizational Society of Rescue and Relief in Managing Bam Earthquake, Volume III, experimental discovering interviews, Red Crescent Society, Iran Helal Institute of Applied Science and Technology
- Ciutan M, Sasu C and Skiba M (2010) Nanomedicine, the future medicine, *Management in Health*, 14(1)
- Japan International Cooperation Agency (JICA) and Centre for Earthquake and Environmental Studies of Tehran (CEST) Tehran Municipality (2000) The Study on Seismic Micro zoning of the Greater Tehran Area in the Islamic Republic of Iran, Final Main Report, Pacific Consultants International and OYO Corporation
- Jafarpour M (1393) Nanotechnology in Water Treatment- Environmental Health IRAN Site
- Syed A (2012) Future Medicine: *Nanomedicine*, JIMSA, 25(3)
- SCCR (2011) Act strategic document of Cognitive Sciences and Technologies, Session 699, Number of notification / 12168/90 / D.Sh, notification date: (2012-01-03)

