Structural-Interpretive Modeling Factors Affecting the Physical and Social Resilience of Shiraz to Natural Disasters of Flood

Noori, M [a]., Rezaei, M.R [b,1]., Asgari, E [c]

[a] PhD Student of Geography & Urban Planning, Yazd University, Yazd, Iran.

[b] Associate Professor of Geography and Urban Planning, Yazd University, Yazd, Iran.

[c] PhD Student of Watershed Science & Engineering, Yazd University, Yazd, Iran.

Extended Abstract

Objective: Nowadays, the global view of reducing of damage has changed to increasing disaster resistance and moving towards creating resilient cities. Since natural disasters are unpredictable in terms of shape, magnitude and location, they cannot be prevented. Therefore, the capacity of a system to withstand and recover in the face of natural disasters must be increased. In this regard, the analysis and increase of cities' resilience to natural disasters such as floods has become one of the most important and extensive areas in urban planning. Flood is the most important natural disaster that has caused many casualties and damages in different parts of the country. Considering the possibility of floods in Shiraz and the importance of resilience, especially against floods, this study was planned with aim to model the most important factors affecting social and physical resilience of Shiraz against floods.

Methods: The present study is applicable and has been developed in descriptive - analytical method. The data collection method is based on documentary studies and field method. In this regard, statistical society were selected through purposive sampling that consists of 50 university professors, experts and managers in the field of crisis management in Shiraz. Indicators for measuring the degree of social and physical resilience were extracted according to the theoretical foundations of the research and After identifying the dimensions and primary factors, they were evaluated using Delphi method and also structural-interpretive modeling (ISM) method was used in order to analyze the data based on the different steps and steps of implementing this modeling method. Structural-interpretive modeling is one of the tools that shows the interaction between different variables in the form of hierarchical relationships.

Results: The results indicate that among the 14 indicators identified based on the Mick Mac analysis, indicators of neighborhood status (C11), location of facilities and facilities (C8), capability and effectiveness (C10) and the degree of trust and solidarity (C9) have weak influence and dependence. These variables have little or no correlation with the system. Indicators of collective action and cooperation (C2), practice (C4), membership in groups and social networks (C13) have high influence, power and dependence, and the kind of action on them changes other variables. Be. The variables of building strength (C1), access status (C7), type of attitude (C5) are more influenced by other factors and are effective and dependent elements. Awareness indicators (C3), acquired skills (C14), acquired knowledge (C6), procurement level (C12) are among the independent (key) variables that have a great impact on the process of physical and social resilience. These variables have high penetration and less dependence.

---

[1] Corresponding author at: Yazd University, Yazd, Iran. E-mail address: mrezaei@yazd.ac.ir (Rezaei, M.R).

Conclusion: The analysis of the resilience of human and environmental systems against natural disasters such as floods is particular importance in achieving urban sustainability. In analyzing and reducing the vulnerability of cities and neighborhoods like Shiraz, we should not only emphasize the physical dimension and characteristics of communities, but also pay attention to social structures and dimensions to empower citizens and prepare for natural disaster. The purpose of increasing the amount of social capital among communities and improving the level of educational programs in order to gain skills and knowledge in the field of natural disaster management such as floods can lead to the creation of effective perspectives in this field. Therefore, the components of social capital and preparedness and prevention measures before the flood crisis are of great importance. Social capital (social essence) facilitates coordination and cooperation in society and is able to encourage people to cooperate and participate in social interactions. Help solve more of the problems in that community. Therefore, recognizing and strengthening social capital (trust, cohesion and cohesion, cooperation and collective action, membership in groups and networks, etc.) can greatly reduce the vulnerability of neighborhoods to floods and resilience. To increase. Also, the high importance of the awareness and practice index indicates that programs and suggestions should be increased in order to increase the level of practice and awareness of residents about the dangers and risks that could endanger their place of residence. Meanwhile, training and raising awareness of potential risks is one of the important components in reducing the effects of accidents, casualties and damages and is one of the principles of resilience that by raising people's awareness, the amount of financial and personal damage is greatly reduced. And society becomes more resilient.

References:

Abdali, Y., Pourahmad, A., Amini, M., Khandan, I (2019). ***Investigating and comparing the resilience of pre-created and planned communities to reduce the impacts of natural disasters (earthquake) (Case study: Nourabad County and Maskan-e Mehr of Nourabad City).*** Scientific- Research Quarterly of Geographical Data (SEPEHR), 28(110), 148-161. ***(In Persian).***

Abdali, Y., Rajaei, S (2020). ***Determining the components of physical resilience in the residential texture of Bojnourd City using Moran's I spatial autocorrelation***. The Journal of Urban Research and Planning, 10(39), 1-16. ***(In Persian).***

Ainuddin, S., Routray, J.K (2012). ***Community resilience framework for an earthquake prone area in Baluchistan,*** International Journal of Disaster Risk Reduction, 2(1), 25-36. ***(In English).***

Arnell, N. W., Gosling, S. N (2016). ***The impacts of climate change on river flood risk at the global scale,*** Climatic Change, 134 (3), 387-401. ***(In English).***

Asgari, E., Mostafazadeh, R., Esmaliouri, A (2017). ***Determining the contributions of river flow hydrograph components in some river gauge stations of Ardabil Province.*** Journal of Irrigation and Water Engineering, 8(30), 56-71. ***(In Persian).***

Atashsooz, A., Feizi, K., Kazazi, A., Olfat, L (2016). ***Interpretive Structural Modeling of Petrochemical Industry Supply Chain Risk**s.* Industrial Management Studies, 14(41), 39-73. ***(In Persian).***

Attri, R., Dev, N., Sharma, V (2013). ***Interpretive Structural Modelling (ISM) approach: An Overview***. Research Journal of Management Sciences, 2(2), 6. ***(In English).***

Azar, A., Bayat, K. (2008). *Designing the ideal business-centric model and working with interpretive structural modeling (ISM) approach.* Journal of Information Technology Management, 1(1), 3-18. *(In Persian).*

Bazrafkan, S., Arvin, M., Shakeri, E. (2018). *Evaluation of resilience dimensions in district 9 in Tehran city by using TOPSIS technique.* Disaster Prevention and Management Knowledge, 8 (2) :187-197. *(In Persian).*

Beilin, R., Wilkinson, C (2015). *Introduction: governing for urban resilience.* Urban Studies Journal Limited, 9 (2), 38-51. *(In English).*

Charleson, A., Kusliansjah, K., Widjaja, P (2018). *Improving the seismic resilience of housing in developing countries: time to transform local government building departments*, MATEC Web of Conferences, 229, 1-7. *(In English).*

Dadashpoor, H., Adeli, Z (2016). *Measuring the amount of regional resilience in Qazvin urban region.* Journal of Emergency Management, 4(2), 73-84. *(In Persian).*

Delake, H., SamareMohsenBeigi, H., Shahivandi, A (2017). *Evaluation of social resilience in urban areas of Isfahan.* Sociology of Social Institutions, 4(9), 227-252. *(In Persian).*

EbadollahzadehMaleki, S., Khanloo, N., Ziyari, K., ShaliAmini, V (2017). *Assessment and evaluation of social resilience in coping with natural disasters Case study: earthquake in historical districts of Ardebil.* Urban Management, 48, 263-280. *(In Persian).*

EbadollahzadehMaleki, S., Khanloo, N., Ziyari, K., ShaliAmini, V (2019). *Prioritization of factors influencing social resilience against natural hazards with an emphasis on earthquakes.* Hoviatshahr, 13(1), 45-58. *(In Persian).*

Fallahi, A.R., Jalali, T (2013). *Resilient reconstruction from the urban design point of view, after 2003 Bam earthquake.* Honhaye Ziba Memari va Shahrsazi Journal, 18(3), 5-16. *(In Persian).*

Faraji, A., Ghorokhlou, M (2010). *Earthquake and urban crisis management (Case study: Babol).* Geography, 8(25), 143-164. *(In Persian).*

GhahroudiTali, M., Majidi Heravi, A., Abdoli, E (2016). *Vulnerability of urban flooding case study: Tehran, Darake to Kan.* Geography and Environmental Hazards, 5(1), 21-36. *(In Persian).*

Govindan, K., Palaniappan, M., Zhu, Q., Kannan, D (2012*). Analysis of third party reverse logistics provider using interpretive structural*, International Journal of Production Economics, 140 (1), 204-211. *(In English).*

Havko, J., Titko, M., Kováčová, J. (2017). *Vulnerability of the city infrastructure as a part of the resilient city concept.* Procedia engineering, 192, 307-312. *(In English).*

Herreria, E., Byron, I., Kancans, R., Stenekes, N (2006). *Assessing dependence on water for agriculture and social resilience.* Canberra: Bureau of Rural Sciences. *(In English).*

Jazayeri, E., Samadzadeh, R., Hataminejad, H (2019). *Assessing the Urban Resilience against the Seismic Risks with Emphasis on Economic, Physical, and Infrastructural Dimensions (A Case Study of the Dist. 12 of Tehran).* Quarterly Journal of Environmental Based Territorial Planning, 12(45), 183-198. *(In Persian).*

Kannan, G., Pokharel, Sh., Sasi Kumar, P (2009). *A hybrid approach using ISM and fuzzy TOPSIS for the selection of reverse logistics provider*, Resources, Conservation and Recycling, 54(1), 28-36. *(In English).*

Karampoor, M., ZareiCheghabaleki, Z., Mirhashemei, A., RostamiFathAbadi, M (2016). *Thermodynamic and synoptic analyses of pick floods caused by showery precipitation in mountainous regions (Ghare Sou Basin).* Environmental Management Hazards, 3(1), 75-90. *(In Persian).*

Karholm, M., nylund, K., Fuente, P (2015). *Spatial resilience and urban planning: Addressing the interdependence of urban retail areas*, cities volume, 36.121-130. *(In English).*

Krausmann, E (2011). *Industrial accidents triggered by natural hazards: an emerging risk issue,* Natural Hazards and Earth System Science. 11(3), 921-929. *(In English).*

Lotfi, H., Mofareh, M., Aftab, A., Majnoony, A (2018). ***The role of good urban governance in increasing the resilience of informal settlements in Iran, Case study: Tabriz megalopolis***. Quarterly of Geography (Reginal Planning). 8:2, 209-224. ***(In Persian).***

Maleki, S., Amanpour, S., Shojaeeyan, A., Razavii, M (2020). ***Surveying and measuring the physical and social resilience to earthquakes (Case study of Izeh City).*** Urban Structure and Function Studies, 7(22), 81-111. ***(In Persian).***

Mayunga joseph, S (2007). ***Understanding and applying the concept of community disaster resilience: A capital-based approach***, a draft working paper prepared for the summer academy for social vulnerability and resilience building, 22-28 july 2007, Munich, Germany. ***(In English).***

Mignot, E., Dewals, B (2019). ***Experimental modelling of urban flooding: a review***, Journal of Hydrology, 568, 334-342. ***(In English).***

Mohaghegh, M., Taghizadeh, A., Karimlou, K (2015). ***Sendai framework for disaster risk reduction (2015-2030).*** Tehran Disaster Mitigation and Management Organization, 46p. ***(In Persian).***

NikmardNamin, S., Barakpur, N., Abdollahi, M (2015). ***Risk reduction of earthquake with emphasis on social factors of resilience (Case study: District 22 of Tehran).*** International Journal of Urban and Rural Management, 37, 19-34. ***(In Persian).***

Nirupama, N., Adhikari, I., Sheybani, A (2014). ***Natural hazards in Ontario, Canada: An Analysis for Resilience building.*** Procedia Economics and Finance, 18, 55-61. ***(In English).***

Nojavan, M., Salehi, E., Omidvar, B., Faryadi, S (2016). ***The study of theoretical approach of natural disaster management in Iran using the concept of meta-analysis.*** Journal of Environmental Science and Technology, 2, 1-15. ***(In Persian).***

Obrist, B., Pfeiffer, C., Henley, R (2010). ***Multilayered social resilience: A new approach in mitigation research***. Progress in Development Studies, 10 (4), 283-293. ***(In English).***

Pashapour, H., Pourakrami, M. (2018). Measuring physical dimensions of urban resilience in the face of the natural disasters (Earthquake) (Case Study: Tehran's 12th District). Journal of Studies of Human Settlements Planning, 12(4), 985-1002. (In Persian).

Patrick, B. C., Michael, P. B (2018). ***Towards resilient cities in Ghana: Urban planners' perspective and strategies***, Futures. 101, 55-66. ***(In English).***

Pourahmad, A., Abdali, Y., Sadeghi, A., AllahGholiPour, S (2018). ***Analysis of resilience components in the central tissue of Hamedan using Moran spatial autocorrelation.*** Physical Sacral Planning, 5(successive 9), 93-106. ***(In Persian).***

Poutaheri, M., Parishan, M., Poortaheri, M., Asgari, A (2011). ***Analysis and evaluation of the most important factors of risk management (Case study: Rural areas of Ghazvin Province).*** Journal of Rural Research, 2(5), 115-150. ***(In Persian).***

Rafeeyan, M., Rezaei, M.R., Asgari, A., Parhizkar, A (2011). ***Explain the concept of resilience and its indexing in community-based accident management.*** The Journal of Spatial Planning, 15(4), 19-41. ***(In Persian).***

RamezanzadehLesbouyee, M (2016). ***Principles and concepts of urban resilience (models and patterns), Deputy for Studies and Planning of Infrastructure and Comprehensive Plan.*** Tehran Studies and Planning Center. ***(In Persian).***

Rashidi, M., Hosseinzadeh, M.M (1398). ***The role of sub-basins overlooking the city in the occurrence of urban floods in Izeh (Khuzestan).*** Geography and Environmental Hazards, 8(1), 42-25. ***(In Persian).***

Rezaei, M. (2011). ***Explaining the resilience of urban communities to reduce the effects of natural disasters (earthquakes) Case study: Tehran metropolis.*** PhD Theses in Department of Geography and Urban Planning, Tarbiat Modares University. ***(In Persian).***

Rezaei, M. (2013). ***Evaluating the economic and institutional resilience of urban communities to natural disasters using PROMETHE technique.*** Journal of Emergency Management, 2(1), 27-38. ***(In Persian).***

Rezaei, M., Rafieian, M., Hosseini, S (2015). ***Measurement and evaluation of physical resilience of urban communities against earthquake (Case study: Tehran neighborhoods).*** Human Geography Research, 47(4),609-623. ***(In Persian).***

RezayeePendari, A., YekehZare, M (2016). ***An interpretative structural model for factors of successful technology transfer in order to achieve sustainable development.*** Management Research in Iran, 20(1), 61-80. (***In Persian).***

River Flood and Flood Working Group (2015). ***Urban Flood risk management.*** National Committee for Natural Disaster Reduction, Ministry of Energy, 66 p. ***(In Persian).***

Sharifinia, Z (2019). ***Assessing the social resilience of rural areas against flooding using FANP and WASPAS models (Case study: Chardange District of Sari County).*** Geography and Environmental Hazards, 8(2), 26-1***. (In Persian).***

The World Bank. (2012). ***Building urban resilience: principles, tools and practice***. ***(In English)***

Yuan, W., Liu, M., Wan, F (2019). ***Study on the impact of rainfall pattern in small watersheds on rainfall warning index of flash flood event***, Natural Hazards, 97(2), 665-682. ***(In English).***