Assessing the Social Resilience of Rural Areas against Flooding using FANP and WASPAS Models (Case Study: Chardange District of Sari County)

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1 Introduction
The occurrence of natural disasters such as floods and earthquakes leave a number of damaging effects in the majority of geographical regions, particularly in rural areas. Given their close connection to the natural environment and their limited capacity, rural areas are more vulnerable compared to urban regions. The essential assets and properties of rural residents are reduced by annual floods which destroy agricultural products, houses, infrastructure, and machinery. Consequently, today’s conditions make governments shift from focusing on reducing vulnerability to increasing resilience against disasters in order to decrease the effects of natural hazards.

The purpose of the present study is to assess the villages in Chahardangeh region in terms of social resilience against flood. The aim is to offer a number of practical solutions in line with increasing social resilience and ultimately, reducing the severity of damages caused by floods. Accordingly, this study seeks to provide answers to the following questions: What are the most significant social resilience indices in villages under study? What are their significance coefficients? What are the conditions of investigated villages in terms of social resilience?

2 Review of Literature and Theoretical Framework
There has been numerous studies conducted on the area of social resilience. Having conducted a study on the social resilience indices of Farahzad District against earthquakes, Heydarian, Rahimi, Fathollahi and Ghafoori (2017) concluded that indices including awareness, knowledge, and social dependency had the highest and lowest effects on the social resilience of this district, respectively. Ebadallahzadeh Maleki, Khanloo, Ziyari and Shaliamin (2017) assessed social resilience in Ardabil City and ranked districts including Touy, Gazran, Aali Ghapou, and Owjadkhan from the 1st to 4th, respectively. Mobaraki, Lalepur and Afzalgorooh (2017) analyzed various dimensions of resilience in Kerman City in addition to institutional, economic, and physical indices. Saja, Teo, Goonetilleke and Ziyath (2018) proposed the “5S model” which involves social structure, capital, mechanism, equity, and beliefs as a comprehensive and compatible
framework to measure social resilience. WASPAS technique, however, was employed in the present study which is a combination of weight accumulation and production model and is based upon objective methods in order to assess social resilience; It is more accurate and sensitive compared to other independent methods. Moreover, while the concept of resilience has been discussed through viewing the physical, economic, institutional, administrative, environmental, and social dimensions in previous research simultaneously, the concept is examined in the present research exclusively through a social outlook and with respect to the flooding crisis.

3 Method
The present study was conducted using a descriptive approach with applied purposes. Data were collected using library and field studies. The total population of the study included a number of villages in Chahardangeh region, most of which are subject to floods. According to the official 2016 census, the total population of rural areas under examination is approximately 1435; however, the sample population of the study was calculated 303 using Cochran’s formula. They were selected via stratified random sampling. The validity of questionnaires was confirmed through the comments of experts; its reliability was also indicated as 0.83 using Cronbach’s Alpha in the SPSS software. Finally, data were analyzed using the FANP model and WASPAS technique.

4 Results and Discussion
In this study, the weight of indices were indicated using FANP model. Subsequently, factor analysis was carried out using 24 candid indices (according to theoretical research) via the SPSS software. Ultimately, factors were named using the 5S model of social resilience proposed by Saja et al. (2018). Given the relative significance coefficient of indices, the highest and lowest effects in social resilience across Chahardangeh region belong to neighborhood bonds and willingness to help against disasters with values of 0.0935 and 0.0061, respectively.

Results obtained from WASPAS calculations showed that the highest extent of social resilience against flood belong to Araa and Chaharroudbar villages with values of 0.9184 and 0.9126, respectively, while the lowest value belonged to Zekryakola village with a value of 0.6597.

5 Conclusion
The results obtained in this study according to the FANP model demonstrated the unequal coefficients of social resilience indices. On the other hand, results obtained from the WASPAS model in assessing the extent of social resilience also showed that the studied villages are at different levels in terms of social resilience. Between villages including Araa, Aliird, Chalou, and Chaharroudbar with high extents of social resilience and villages including Bard, Bandbon, Tillebon, Zekryakola, Saeid Abad, and Ghalehsar with low extents of social resilience, there are a number of differences in terms of social resilience indices which are listed below:
Overall, villages including Araa, Aliird, Chalou, and Chaharroudbar has a younger mean age compared to villages including Bard, Bandbon, Tillebon, Zekryakola, Saeid Abad, and Ghalehsar; therefore, the former group would have a more positive reaction in times of crisis.

Social interactions in villages including Bard, Bandbon, Tillebon, Zekryakola, Saeid Abad, and Ghalehsar has been reduced majorly due to housing instabilities which indicates the lower resilience of these villages in the social aspect.

In villages including Bard, Bandbon, Tillebon, Zekryakola, Saeid Abad, and Ghalehsar, only 46% of the respondents were willing to cooperate after crisis; according to these respondents, the reason for their unwillingness was lack of necessary knowledge in this context.

As a result of the lack of knowledge and awareness, people in villages Bard, Bandbon, Tillebon, Zekryakola, Saeid Abad, and Ghalehsar, saw crisis management as the sole responsibility of governmental bodies. Only 30.7% of the respondents were willing to form NGOs to cooperate before, after and during the occurrence of floods.

Subsequently, the following recommendations are listed in line with increasing social resilience in order to induce more flexibility among rural residents during possible occurrences of floods:

- Increasing the local knowledge and the awareness of rural residents with respect to the dangers of flood through attempts made by rural management and Islamic Councils of rural areas;
- Providing suitable platforms for the participation of rural residents through holding flood maneuvers with operational and educational purposes rather than exhibitive;
- Altering flood paths so that the properties and belongings of rural residents such as houses, animals, and farming and gardening lands remain unharmed;
- Holding seminars, workshops, and educational courses on how to prepare and confront possible floods in order to designate and operationalize social resilience indices.

Keywords: Social Resilience, Flooding, FANP, WASPAS, Chardange

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