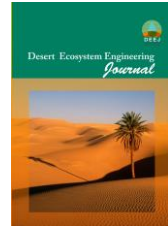




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## Desert Ecosystem Engineering Journal

Journal homepage: <http://deej.kashanu.ac.ir>

## Prioritizing effective factors on dust through DPSIR model and decision-making methods in Rigan city, Kerman province

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Received: 16/05/2018

Accepted: 22/12/2019

### Extended Abstract

**Introduction:** As a serious threat for human societies, especially in arid and semi-arid regions, dust storm is an irreversibly destructive phenomenon with irreparable effects. Being caused by dust storms and the movement of fine soil particles, desertification and wind erosion are two important environmental crises in arid and semi-arid areas which may bring about some social and economic consequences including an increase in migration of people, especially the elites, unemployment, sharp reduction of revenues in various urban and rural jobs, decrease of crops production, tourism downturn, disruption of air transportation, closure of training and recreation centers etc. In this regard, considering the detrimental effects incurred by dust storms on the health and economy of a society and the climate change, it should be noted that understanding the nature, origin and effects of dust storms could play an important role in identifying and setting its control methods. This study, therefore, sought to investigate the causal relationships between the influential factors on dust storms as identified by the DPSIR model, weighing the identified criteria and indices by the experts via the AHP technique, and ranking the specified strategies by TOPSIS in Rigan city, Kerman province.

**Materials and Method:** Based on the review of the related literature and the data collected from field observations, the cyclic causes of wind erosion were examined, using the DPSIR framework. The criteria and indices identified by administering a standard questionnaire were confirmed by experts (selected from those working in departments of Environment, Natural Resources, Agricultural-Jahad, Environmental Health, Urban Planning, and some University lecturers and faculty members). Validity and reliability of the data were measured by SPSS software. The criteria selected for analyzing the data are the same as the four main elements of the DPSIR model: the driving force, pressure, state, and effect, each containing a number of indices which are as follows: the driving force indices include the population growth, inward immigration, land use, natural resources management, increase in water demand, public awareness and, urban development; the pressure indices are health, security, immigration, employment status, income status,

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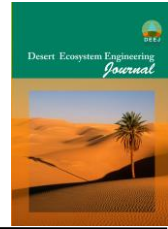
DOI: 10.22052/deej.2020.9.26.11



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investment, agriculture, and the environment; the state indices comprise of the land use change, environmental degradation, utilization of water resources, rising diseases, inward immigration, social welfare decline, destruction of agricultural products, soil degradation, and air pollution; the effect indices include Destruction of cities beauty, immigration from villages, rise of respiratory diseases, destruction of natural resources, expert migration, landform change, increase of Particulates, drought, and the downfall of agricultural productivity. The criteria and indices were then weighted by AHP method through Expert Choice Software and finally, the proposed strategies were ranked according to TOPSIS method.

**Results:** Having applied DPSIR model, the cycles of the influential factors on dust storms were examined, followed by the weighing of the identified criteria, and the indices confirmed by the experts, using AHP technique through the Expert Choice software. The results of the study indicated that the driving force with the weight of 0.379 was, from among the four criteria, ranked first, followed in turn by pressure with the weight of 0.257, the state with the weight of 186, and the effects with weight 160/0. On the other hand, the findings showed that out of the final indices weights, Population growth with the weight of 0.75 ranked the first, and increase of water demand, and the environment were ranked second and third with weights of 0.67 and 0.059 respectively. Finally, the TOPSIS method was used to rank the responses whose results were turned out to be as follows: 1-Proper management of water resources (592/0); 2- Preventing dam construction (5/175); 3-Pebble mulch (0, 75%); 4. Not applying inefficient models, especially in agriculture (519/0); 5. Enforcing existing laws regarding environmental protection (494/0); 6- conducting seedling operations (427/0); 7- Increasing public awareness (0.415); 8. Mulching (0.440) 9. Constructing sediment trap (0.339); 10. Using Biological wind-break systems (0.346).

**Discussion and Conclusion:** As a potential threat to human survival, dust phenomenon is considered as one of the most important environmental crises in arid and semi-arid regions. Kerman province includes more than 17.6 percent of the Iran's desert lands, the most significant part of which are located in its eastern regions including Rigan, Fahraj, Norshshir, and Bam that comprise of 1302,000 hectares desert lands, accounting for more than 55 percent of the province's total desert areas. Due to such causes as frequent droughts, seasonal drying of rivers, lack of suitable vegetation, and high evaporation, Reagan city experiences a large number of dust storms annually. In present study, DPSIR model was found to be effective in identifying, from among the various factors suggested by the experts, the most important factors affecting local dust. It is consistent with the results found by Khatibi et al (2015) who emphasized the necessity of using this model in solving environmental problems. In the same vein, Salehi and Zebbardast (2016), with the cooperation of the Tehran environmental organization, identified and categorized the factors affecting air pollution in Tehran city in the current state of affair, using the causative-effect chain model (DPSIR). The findings of the current study showed that the driving force with the weight of 0.397 had the highest weight, followed by the pressure (0.275), state (0.186), and effects (0.160) respectively. In fact, it was found that accurate identification of the driving forces in each region could be a great help in solving their problems which is consistent with the results found by Jafarzadeh Haghghi Fard et al. (2013). As for the final weighting, the findings suggested that population growth with a weight of 0.5 was the most important index, a fact that corresponds with the findings reported by Shahi et al. (2018) and Nemati and Sardari Leather (2017). The results of this study also indicated that the proper management of water resources in different areas and the utilization of nature elements were of high importance.

**Keywords:** Natural Disasters, Driving Forces, Pressures, State, Impacts.