**Assessment of environmental risk of Salty, Sweet and Minab Rivers International Wetlands**

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abstract

Wetland ecosystems, especially marine coastal wetlands of the most important and also the most vulnerable are the world's environmental resources. Which has always been sensitive to the fragility of coastal areas, high population density and intensive human activities are faced with the threat of destruction. Based on this, monitoring the trend of the changes in wetlands and their surrounding lands can be effective in the management of these valuable ecosystems. Investigating the environmental risk is a suitable instrument for evaluating and ensuring understanding of the relationships between stressor factors and environmental effects especially in wetland ecosystems. In general, application of methods of evaluating environmental risk is one of the important tools in studying environmental management along with identifying and mitigating potential environmental damaging factors in wetland regions in order to achieve sustainable development. Today, multi-criteria decision-making methods are employed in evaluating the risk in many studies.This study is based on multi-criteria decision-making methods to identify and analyze the risks threatening Tyab- Minab International wetland located in Hormozgan province was conducted.

Based on the methodology to identify and prioritize risks Delphi, AHP and TOPSIS techniques were used to determine the risk priority number. In the first phase of this study, to identify and screen the main criteria of project selection, Delphi method was used. In this study, the panel of interest was determined based on a combination of experts with different expertise and out of a sample of 20 individuals, in which experts with various expertise gave a score from 1 to 5 (Likert scale) to each criterion. In this way, 32 criteria were identified as the most important and considerable risk for Minab Wetland and further proceeded to the second phase for prioritization and analysis. In this stage, multi-criteria decision-making methods were used, in which hierarchical analysis process was employed for prioritizing the criteria using Expert Choice 11 software. The indices of risk evaluation including the impact intensity, incidence probability, and the sensitivity of the receptive environment in environmental risk evaluation of wetlands do not have an equal value and significance. For this purpose, to weight the factors effective in estimating risk level and for prioritization of risk options, the technique for order of preference by similarly to ideal solution (TOPSIS) and Excel software were benefited from for calculations. The spectrum of scoring to each of the indices of incidence probability, impact intensity, and the sensitivity of the receiving environment was chosen from very low (1) to very high (9) based on hour spectrum. Following investigation of the types and frequency of indices along with the method of score determination of these indices, three indices of risk intensity (C1), risk incidence probability (C2), and the sensitivity of the receiving environment (C3) were chosen for risk ranking using TOPSIS model. Next, after determination of risk priority number using TOPSIS, the risk levels were calculated and evaluated using normal distribution method for each risk. To determine the degree of risk-taking, risks are organized in a descending order, where the elements of the number of the class and the length of the class are determined based on Relations 1 and 2 (n is the number of risks). Next, the risks are categorized based on these classes. Considering the concept of ALARP, the risks under investigation are divided into high risks, medium risks, and low risks. In this study, considering the number and length of classes, the studied risks were categorized in six levels (critical, intolerable, considerable, medium, tolerable, and trivial risks).

the number of classes=1+3.3 log (n)

(2)

(1)

the length of the classes= the greatest risk value - the smallest risk value/the number of classes

In the first step, the final indices of the wetland's environmental risk were identified and the development of hierarchical tree and classification of the risks threatening wetlands along with their incidence probability in two groups of natural and environmental criteria was performed. Eventually, the final weight of criteria resulting from paired comparisons was obtained in Expert Choice 11 to achieve the score of incidence probability of each risk. Based on the results, among the natural, social, economic, physiochemical, biological, and cultural criteria**,** drought and climate change,increase urban and rural development, Smugling of fuel, oil pollution, reduce the density of vegetation, indiscriminate exploitation of groundwater were of high priority**.** The results obtained from ranking the the risks threatening Minab Wetland using TOPSIS suggest thatoil pollution, dam construction upstream, persistent drought and climate change, and sometimes alcohol and fuel smuggling and illegal overfishing the priorities are first to fifth. Also Results showed that the respectively based on (Cj+) oil pollution (0/9109), dam construction (0/8121), the drought and climate changes (0/8063) and the smuggling of fuel (0/7520) are in Unbearable level.

Overall, the results indicated that same as this research, wetland ecosystems are subject to many threatening factors, resulting in ecological imbalance and abnormal appearance of the wetland, putting the wetland entity into danger of extinction in terms of fauna and flora.

Nowadays, for assessment of environmental risk, various methods are used, each of which has positive and negative points given the studied environment and the conditions governing it. Therefore, one cannot reject or approve one method with total confidence. By employing novel methods in risk evaluation, the intensity of risk incidences and, in turn, the damages and losses incurred to the environment can be prevented or at least mitigated. Further, it is also possible to move in line with proper and optimal management of environmental resources, especially wetlands and with sustainable development. Undoubtedly, understanding and recognition of the factors threatening wetlands, according to the importance and the impact of them, Prevent and cope with the threats and accurate project preparation and implementation of wetland conservation plans and environmental management.

***Key words*:** Risk Assessment, Wetlands International, Environment, AHP, TOPSIS

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