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Research Paper

## Optimal Scenarios for Improving the Environmental Resilience of Coastal Cities with a Foresight approach A Case Study the Dayyer Coastal City

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### ARTICLE INFO

**Keywords:**

Environmental Resilience, Foresight, Dayyer Coastal City, Mic Mac, Scenario Wizard.



**Received:**

04 April 2022

**Received in revised form:**

10 June 2022

**Accepted:**

06 August 2022

pp. 17-29

### ABSTRACT

The increase in population and more concentration of diverse economic capital in coastal cities have caused them to be widely affected by various natural and unnatural hazards, and their ecosystems have a vague future. On the other hand, resilience in various dimensions is known as the dominant discourse of scientific circles to deal with the present and future threats to human societies such as cities.

Accordingly, this study has been conducted to improve environmental resilience in coastal cities with a futuristic approach and determine optimal scenarios in a descriptive-analytical method. In this study, to determine the key factors affecting environmental resilience and use data analysis, Mic-Mac software was used, and to extract and present the optimal scenario, the wizard scenario software was used based on the opinion of experts and urban managers and also coastal environmental activists in NGOs.

According to the results, the most influential factors in the environmental resilience of coastal cities are the "reduction of development based on environmental polluting industries" and the "protection of biodiversity in these areas." Also, among the extracted 160 scenarios, Scenario No. 2 was recognized as the optimal scenario with the desirability of all situations related to its driving factors.

Finally, to achieve the research objectives, the necessary suggestions were presented based on this scenario.

**Citation:** Safaeopor, M., & Gankhaki, A. (2022). Optimal Scenarios for Improving the Environmental Resilience of Coastal Cities with a Foresight approach A Case Study the Dayyer Coastal City. *Geographical planning of space quarterly journal*, 12 (2), 17-29.

<http://doi.org/10.30488/GPS.2021.292202.3423>

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## Extended Abstract

### Introduction

According to the available resources and potential, coastal areas provide many benefits, such as fishing, industry, tourism, and transportation activities for their residents. However, increased population growth and displacement towards the coasts and further development of coastal areas have increased pressure on coastal ecosystems and their destruction. Currently, in many parts of the world, natural coastal habitats and coastal resources are overexploited, which can negatively impact ecosystems and livelihoods dependent on them. Currently, the coastal cities of the Persian Gulf are affected by the negative consequences of climate change and environmental problems, such as the increase in pollution, the destruction of habitats, and the removal of natural defense structures to develop cities and create the necessary infrastructure. Furthermore, they are affected by the consequences of oil extraction and related industries such as petrochemicals, the release of effluents and industrial waste into the sea, and sensitive ecosystems such as protected areas. This research has been carried out considering the various existing and future environmental risks for Dayyer coastal city and to investigate the optimal strategies related to improving the environmental resilience of this city with an emphasis on foresight so that based on the results obtained, a practical way to improve the environmental resilience of coastal cities against different types of risks should be used.

### Methodology

This research is practical in terms of purpose and descriptive-analytical in terms of method and nature. The data collection method in this research includes a review of sources, documents, an environmental survey, and a detailed review of related research background. In the following, interviews and a Delphi panel with 35 experts and experts active in government institutions such as municipalities and non-governmental organizations were used to determine the final vital factors. Mic-Mac and Scenario Wizard software programs were exerted to analyze data. Based on the

output of the Mic-Mac software, the relationships between the key components were analyzed in terms of influence and effectiveness, and finally, using the Scenario Wizard software, possible states and scenario space were drawn.

### Results and discussion

Based on the results obtained from the Mic-Mac software, the most impact and the less impressionable factors include "development based on polluting industries," "education and culture," "participation of citizens and volunteer groups," and "development of shipping and commercial activities." Also, the least impressionable and the least impact factors include "access to safety and emergency services" and "access to health and treatment services." In addition, factors such as "biodiversity protection," "tourism development," "population of coastal cities," "pollution caused by effluents and sewage," "use of fossil fuels," "waste management of coastal cities," "development of urban green space," "urban flood management," "coastal land use change" and "NBS or emphasis on nature-based solutions" are known as two-way factors and have the most impact and impressionable. And based on their location above or below the diagonal line of this area, they are divided into target and risk factors. By examining the map and the location of the influencing factors, it can be seen that the environmental resilience of Dayyer coastal city does not have enough stability.

Based on the results of scenario wizard analysis, in scenario 1, all the factors are desirable except for the population acceptance factor in the coastal areas more than the environmental capacity, which can ultimately threaten the desirability of other factors. In scenario 2, all the investigated factors are in a desirable condition, which includes the favorableness of pollution factors caused by industrial and domestic wastewater, which is intended to reduce pollution; reduce the presence of tourists and travelers beyond the environmental capacity; protect biodiversity plays a vital role in the stability of the coastal ecosystem; decrease population density beyond the ecological capacity of coastal

areas; diminish fossil fuel consumption and greenhouse gas emissions; improve the waste situation of coastal cities; reduce the threat of floods; decrease coastal land-use and also emphasizing nature-based solutions such as protecting wetlands, mangroves, coral islands, etc.

In scenario 3, all factors except “the population” and the emphasis on nature-based solutions are in a desirable condition. Based on this, scenario 2 is known as the optimal scenario to achieve the research goals due to the desirable condition of all factors.

### **Conclusion**

Based on the results of this research and using the opinions of urban management experts and environmental issues governing coastal areas, various factors are involved in improving the environmental resilience of coastal cities. Among them, factors such as residents' participation, education, and culture, development based on polluting industries such as oil and gas, as well as shipping and commercial activities in these cities are the most influential factors. Also, key elements such as the acceptance of the population in these areas, the entry of pollution caused by residential and industrial effluents into the coastal areas, the protection of biodiversity, etc. are known as dual factors.

On the other hand, based on the extracted scenarios, scenario 2 is the optimal scenario for improving the environmental resilience

of the coastal city of Dayyer. Therefore, according to the nature of coastal cities in the south of the country, such as Dayyer coastal city, which in addition to its functional role as the city center, has a particular position as the largest fishing port in the country and one of the main centers for transporting goods with the countries of the Persian Gulf, especially Qatar, scenario 2 in Future decision-making plays a vital role in improving the resilience of these areas and finally achieving the goals of sustainable development.

### **Funding**

There is no funding support.

### **Authors' Contribution**

Authors contributed equally to the conceptualization and writing of the article. All of the authors approved the content of the manuscript and agreed on all aspects of the work declaration of competing interest none.

### **Conflict of Interest**

Authors declared no conflict of interest.

### **Acknowledgments**

We are grateful to all the scientific consultants of this paper.