



Presentation of Coastal Environmental Management Plan by using SWOT/AHP methods

^{1*}SHARIFIPOUR, R; ²MAHMUDI, B

¹ Savadkooh Branch, Islamic Azad University, Savadkooh, Iran

² M.Sc of Forestry, University of Sari, Iran.

ABSTRACT: The provision of environment management plan and formulating the environmental strategies of coastal regions are the most essential measures required for the integrated management of coastal regions. For this purpose, this research has been conducted using two goal-oriented and problem-oriented approaches in order to determine the planning perspective and problems approach in order to determine bottlenecks respectively. At first, the vision, mission, and objective of developing the environmental management of the eastern coasts of Mazandaran by SWOT (Strengths-Weaknesses-Opportunities-Threats) method have been determined. Thereafter, with using of analytic hierarchical process (AHP) method and EC (Expert chose) software have been applied to prioritize the strategies. At last, the environmental plan and projects of this region was provided based on the objectives. According to this research, the macro-strategies of SO, WO, ST, and WT have been identified in the said order as the priorities of the environmental planning of the region. The SO strategies including the protection of aquatics, integrated management of rivers and surface waters, and the development of coastal tourism as well as the most prioritized one, which is the optimal management of environment and sensitive ecosystems of coastal regions have been studied. In general, in this research 18 environmental strategies classified into four strategic classes have been defined. According to the six objectives, 10 plan, and 16 projects have been defined for the environmental management plan of the eastern coasts of Mazandaran Province. @JASEM

Coastal management traditionally involved design and construction to provide safety from the sea, military defense and safe transportation. It will continue to be involved in design and construction of sea defenses, harbors and marinas. However, modern coastal management involves much more than transportation and protection from the sea. Issues such as water quality, dispersion of pollutants and the proper management of the coastal ecosystem have become important. In fact, the actual design of shore structure is now only a small aspect of coastal management (William Kamphuis, 2010).

Coastal region is the place of sea and land connection and it is the common area of 2 ecosystems with their distinct allocations. Coastal environment is the developed natural system and it comprises the most complex productive ecosystems on the earth (Sharifipour et al, 2008). This region is the vulnerable area and it is the last place which receives the sea and land polluting and it is encounter with the gathering of polluting and its potential treats (Majnoonian 2004). Coastal waters are important for many reasons:

1. People like to live near the coast. 38% of the world's population lives within 100 km of the coast. (Small & Cohen, 2004). According to forecasts by 2020 this figure is equal to the adult population of earth (Edgren, 1993.)
2. Many people like to go to the beach for recreation and relaxing and coastal activities such as canoeing and kayaking, bird watching, swimming, sport fishing, and tourism. (Crossett, 2004).
3. Coastal areas are a physical buffer protecting communities near the coast from storm surges and flooding.
4. Most of the important oceanic fisheries are on the continental shelf close to the coast.

*Corresponding author

5. Most of the oil and gas taken from the sea floor

comes from the continental shelf and slope.

6. Estuaries are the nursery for many fish and shellfish, and they are home for much wildlife. (Steward, 2009).

The management of coastal resource is integrally related to every country's economy. In developed countries, the coast has often been the machine that drives a country's economy, but there also coastal tourism has become an important generator of wealth. In developed countries, struggle for survival is no longer a primary concern and therefore, in addition to economic considerations, there is also an interest in quality of life. This is expressed primarily by private citizens and environmental movements and often pits them against government and business (William Kamphuis, 2010). But In developing countries, such as Iran, coastal zone has great economies value, as a resource for food production and basic industry and it has probably also become an income generator through tourism.

Considering the aforementioned characteristics, such scope that cannot be managed using the executive management so requires strategic management approach or strategy for managing the environment. So the kind of programming environment should be kind of strategy.

Necessity of having a strategic plan for the environment comes from there, according to the Fifty principle that our constitution should environment for the growing social life will keep the next generation and therefore require long-term planning is indispensable.

Long-term planning of the important features of strategic planning is considered.

According to this matter in this study using Environmental Strategies, Environmental

Management Plan were developed for east coast province of Mazandaran

MATERIALS AND METHODS

Mazandarn province coastline length is approximately 462 kilometers that is located west to East along the Caspian Sea. 43 Percent of cities this province is located in coastal Caspian Sea. The region under study in this research is the eastern coasts of Mazandaran in the North of Iran, Contain of Goibar, Sari, Neka, Behshhr and Galogah cities. Extend of studying area is about 1176.84 Km² that is limited, to Bandare-gaz city in Golestan province and Babolsar city in mazandaran province (figure 1).

3. *Data entry to EC software and normalization and determination of priorities:* in this stage are determined importance coefficients strategies with use of EC software. Also are checked the consistency of the judgments according to adaptation coefficients. Finally, plan and environmental projects were determined with considering of more important strategies.

RESULT

According to problem- oriented approach and base on data gathering of the region under study and use of satellite image, was prepared land-use map in GIS software. (figure 2).

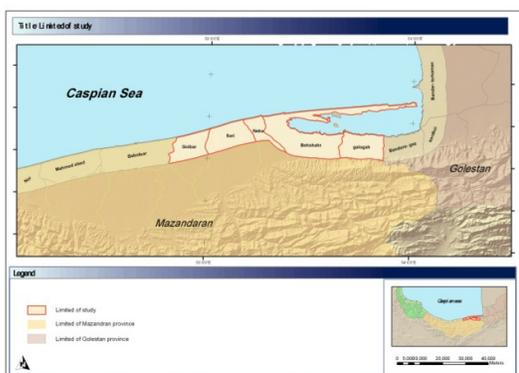


Fig1. Limited of study area

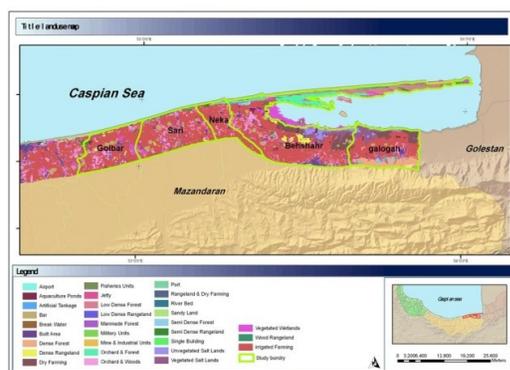


Fig2. Land-use map

Table 1. Interpretation of values in matrix

Intensity of Value	Interpretation
1	Requirements i and j are of equal value.
3	Requirement i has a slightly higher value than j.
5	Requirement i has a strongly higher value than j.
7	Requirement i has a very strongly higher value than j.
9	Requirement i has an absolutely higher value than j.
2, 4, 6, 8	These are intermediate scales between two adjacent judgments.

alternatives for reaching it, and the criteria for evaluating the alternatives

2. *Establish priorities matrix among the criteria of the hierarchy:* making a series of judgments based on pair-wise comparisons of the criteria according to table 1.

Compared land use map with Land use zoning based on ecological potential coastal north of Iran (ICZM, 2009), (figure 3), and so were obtained Strengths-Weaknesses-Opportunities-Threats points of region.

In this research, has been used two approaches including goal-oriented approach (determining vision for planning) and problem-oriented approach (determining the problems and bottlenecks). At the first, reviewed coasts environmental strategies were identified by use of SWOT (Strengths-Weaknesses-Opportunities-Threats) method (David, 1999), then were defined priority of strategies with use of AHP (analytic hierarchical process) method (Saaty, 2008) and EC (expert chose) software. Steps as follows:

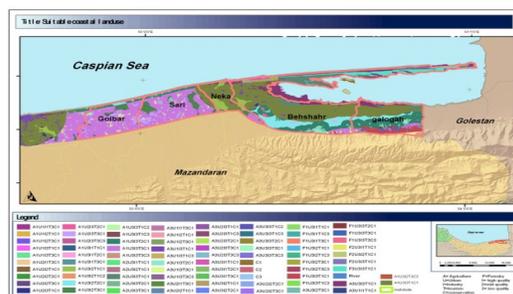


Fig3. Suitable coastal land-use

1. *Create a hierarchy of decision trees:* basic level of this tree, is decision goal, in next level the

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In continue, according to SWOT (Strengths-Weaknesses-Opportunities-Threats points) table, were developed strategies (Table, 2).

Table 2. Strengths-Weaknesses-Opportunities-Threats points and strategies

Internal factors	Strengths(S)	Weaknesses(W)
External factors	1. Deployment along the Caspian Sea 2. Suitable climatic conditions and the presence of sufficient water resources 3. Suitable areas of natural and human for tourism absorber 4. Miankale wetland and variety ecosystem	1. High density residential areas in the risk and fluctuations water sea 2. soil severe erosion and high seismicity and high earthquake 3. Growing pollution and lack of proper systems of waste disposal or waste water treatment 4. Improper use and over capacity of ecosystems of coastal areas
Opportunities(O)	S1O1. Protection of marine reserves S2O2. Integrated management of rivers and surface water S3O3. Coastal tourism development S4O4. Optimal management of the environment and sensitive ecosystems	W1O1. Popular participation in rebuilding fish stocks W3O2 - observance provincial and national standards in environmental protection W4O4. Preserve, restore and creation criteria for exploitation of natural resources and environmental W4O3. Restore damaged ecosystems with the aim of developing ecotourism W1O4. Local people's participation in the exploitation of natural resources and appropriate protection
Threats(T)	S1T1. making criteria and standard for construction with emphasis on natural resource conservation and environmental buffers S2T2. participate attract people and private sector in exploitation of water resources S3T3. Economic exploitation from ecotourism activities through revive damaged ecosystems S4T3. Applicable management plans in order to properly use natural resources and cultural S2T1. Water resources management plans and Watershed Management	W4T3. Coordination among the relevant agencies to organize the situation and Tourism Environment W1T1. Water recourse management W3T2. Development of pollution control facilities in industrial towns and mining zone W3T3. Credit allocation and control required to reduce coastal pollution W2T4. Environmental disaster management

Strategies derived in the form of questionnaires hierarchical analysis were filled by experts and scholars on matters related to the environment. The results were entered to EC software, then coefficients Significance of each strategy was obtained (Figure,4).

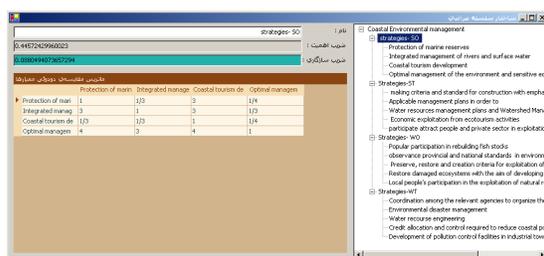


Fig.4, sample of EC Software and determination of coefficients Significance

Strategies (SO) with coefficients Significance (0.44) in the first priority, Strategies (WO) with coefficients Significance (0.28) in the second priority, Strategies



Fig.4, coefficients Significance of strategies

According to goal-oriented approach were determined vision, mission and objectives of this management plan;

Vision of coastal environmental management plan: Based on Integrated Coastal Management Plan (2009), in 1404 the following conditions will be created in coastal areas. "There is healthy water in

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coast of Iran, without any risks for swimmers. Environmental Quality shows that environmental standards in all parameters are within acceptable limits. Diversity of flora and fauna species is coordinated with diversity of ecosystems and Population of endemic and protected species has improved. Exploitation of coastal resources is limited to ecological capacity and for all coastal areas has been prepared environmental management plan and all of users of beaches have environmental code”

Mission of coastal environment management plan:

According to Integrated Coastal Management Plan (2009), Environmental management of coastal areas of the Iran is a process that makes sustainable development and protection of coastal areas and protection of diversity. For this purpose, this management will create suitable coastal stability through the more efficient planning and over time will act to improve the beach environment.

Objectives of Coastal Environmental Management plan: The most important objective of coastal management plan in Iran, which presented in the Integrated Coastal zone Management Plan (2009), as follows:

- Preservation of coastal ecosystems, aquatic reserves and surface water to achieve sustainable development
 - Environmental management based on principles of sustainable development
 - Protection of biological and ecological resources of marine environment in the country against the destruction and exploitation of biological resources and pollutants
 - Increase of tourism demand and tourism capacity with regard to environmental condition
 - Environmental protection against disaster
- Finally, according to two approaches, were determined plan and environmental projects for more important strategies (Table, 3).

Table 3. plan and environmental projects for more important strategies

Objectives	Strategies	Plans	Projects
Preservation of coastal ecosystems and aquatic reserves to achieve sustainable development	S1O1	-Conservation, reconstruction and exploitation of the Caspian Sea reserves	-Review of aquatic biodiversity Monitoring of alien and invasive species
	W1O1	Public education to protect aquatic resources	-Supporting non-governmental organizations and people in rebuilding fish stocks
Preservation of surface water to achieve sustainable development	S2O2	-Reorganizing rivers	-Determination of set bed limit rivers -Compiled a comprehensive program to protect rivers
	S2T2	-Strengthening people's participation in the correct operation of water resources	- Estimated up specialized courses at the community level based on need and subject
Increase of tourism demand and tourism capacity with regard to environmental condition	S3O3	-Identify tourism attractions with emphasize of ecotourism	- feasibility of Coastal activities -Creation of marine parks in the form of tourism master plan
	S3T3	-Reorganizing of natural areas of coast	-Economic valuation of natural ecosystems for tourism activities in coastal areas
Environmental management based on principles of sustainable development	S4T3	-Organize the exploitation of natural resources, coastline and sea	determination of desired coastal land-use
Environmental protection against disaster	W2T4	-Preparedness against natural disasters in coastal areas	-define methods for environmental protection against environmental hazards - Providing methods to control of rising of Caspian Sea water
Protection of biological and ecological resources of marine environment in the country against the destruction and exploitation of biological resources and pollutants	W3T2	-Reorganization of pollutant industries in towns and industrial areas	-site selection of industrial units and define of new industries projects - determination of volume and type of Mineral wastewater in the cities beaches
	W3T3	-Reduce pollution and monitoring on replacement land-use	-Feasibility study of wastewater treatment systems in coastal city -Studies and implementation of waste management master plan and water pollution

DISCUSSION

Regarding to comparison was done between now land-use and suitable land-use in study area can be concluded that there are some conflict between land-uses and activities, for example; some areas with conservation capability were covered with incompatible land-use, such as port, so it is necessary that development in these

areas implement with more carefully and according to a management plan.

So, according to results were obtained, Strategies (So) that are actually most of the type of development approaches, were identified as a priority environmental planning in study area. The development in this strategies will done regarding to

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the requirements and the protection of environmental resources. In this type strategy, optimal management of the environment and sensitive ecosystems is first priority. Then there are strategies (WO), in these type strategies, Preserve, restore and creation criteria for exploitation of natural resources and environmental with coefficients Significance 0.52 is first priority, in strategies (ST), Applicable management plans in order to properly use natural resources and cultural with coefficients Significance 0.35 is first priority, and in last priority of type strategies, there are strategies (WT), that in these type strategy, Development of pollution control facilities in industrial towns and mining zone, with coefficients Significance 0.35 is first priority.

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