Global J. Environ. Sci. Manage., 2(1): 49-60, Winter 2016
DOI: 10.7508/gjesm.2016.01.006

CASE STUDY

Stepwise strategic environmental management in marine protected area

A. Padash[1,], S.A. Jozi[2], S.M.B. Nabavi[3], B. Dehzad[4]*

[1]*Department of Environmental Planning, University of Tehran and Department of Industrial Ecology, ACECR-Sharif University Branch, Tehran, Iran*

[2]*Department of the Environment, Faculty of Technical and Engineering, Islamic Azad University, North Tehran Branch, Tehran, Iran*

[3]*Department of Marine Biology, Faculty of Oceanic and Marine Science, Khormshahr University of Marine Science and Technology, Khuzestan Province, Iran*

[4]*Department of Geology, Faculty of Earth Science, Shahid Beheshti University, Tehran, Iran*

Received 10 September 2015; revised 13 October 2015; accepted 29 October 2015; available online 1 December 2015

ABSTRACT: In recent decades, necessity to protect environment has been a serious concern for all people and international communities. In appropriate development of human economic activities, subsistence dependence of the growing world population on nature decreases the natural diversity of ecosystems and habitats day by day and provides additional constraints for life and survival of wildlife. As a result, implementation of programs to protect species and ecosystems is of great importance. The current study was carried out to implement a comprehensive strategic environmental management plan in the Mond protected area in southern Iran. Accordingly, the protected area was zoned using multi criteria decision method. According to the numerical models, fifteen data layer were obtained on a scale of 1:50,000. The results revealed that 28.35% out of the entire study area belongs to nature conservation zone. In the following step, in order to offer the strategic planning using strength, weaknesses, opportunities and threats method, a total number of 154 questionnaires were prepared and filled by the relevant experts. For this purpose, after identifying the internal and external factors, they were weighted in the form of matrices as; internal factor evaluation and external factor evaluation. Analytical hierarchy process and expert choice software were applied to weight the factors. At the end, by considering the socioeconomic and environmental issues, the strategy of using protective strategies in line with international standards as well as a strong support of governmental national execution with a score of 6.05 was chosen as the final approach.

KEYWORDS: *Analytical hierarchy process (AHP); External factor evaluation (EFE); Internal factor Evaluation (IFE); Mond Protected Area; Multi criteria decision method (MCDM); Strength, Weaknesses, Opportunities and Threats (SWOT)*

INTRODUCTION

Human conflict with nature causes lots of detrimental problems. Biodiversity loss, environmental pollution and continuous exploitation of environmental resources are mainly caused by human conflicts with nature. Restoration capacity of biosphere is gradually filled by this matter. These problems are rooted in improper use of land, incorrect management or wrong operational methods. In overall, these matters indicate irrational use of lands. Presently, conservation of nature and biological resources is of great importance (Hinchliffe, 2008). According to Kearney *et al*. (2012) an initial, internationally agreed definition, developed for terrestrial systems, known as protected areas consisted

*Corresponding Author Email: *apadash@ut.ac.ir*
Tel.: +98 21 6607 5177-8; Fax: +98 21 6607 5177

Note. Discussion period for this manuscript open until March 1, 2016 on GJESM website at the "Show Article".

of a "defined area which is designated or regulated and managed to achieve specific conservation objectives". There are two different viewpoints about the function of protected areas. The conventional wisdom considered protected areas as a factor reducing local economic welfare by restricting land use choices. The other insight takes protected areas as an agent improving socioeconomic outcomes in the countries (Sims, 2010). McDonald and Boucher (2011) predicted a bright future for the protected areas. They declared that global land protection could reach 15–29% of the Earth's surface by 2030. As Leroux *et al*. (2010) stated, the World Database on Protected Areas (WDPA) recognizes 102,290 areas, covering 12.9% of the earth's land surface. According to Lockwood in 2010, the 'top-down' model has been by replaced by diverse forms of collaborative management, partnership arrangements, delegated authority and community management in protected areas over the last few decades. Conservation of protected areas is a strategy resulting from studies and environmental planning in the recent century (Oldfield *et al*., 2004; Borge Johannesen, 2007; Tuvi *et al*., 2011). Nowadays, extensive planning is beneficial to increase the number of protected areas and level of sustainable development (McDonald and Boucher, 2011). Moreover, it is of great significance to have another concept for protected areas instead of islands of nature and also increase their actual ability and performance (Meyer, 2007; Lockwood, 2010; Martín-López *et al*., 2011; Bennett *et al*., 2012). Unsustainable development of economic activities, dependence of large number of growing world population on nature lead to reduction of ecosystems and habitats' diversities and restrictions for survival of wildlife (Brandon *et al*., 2005; Ezebilo and Mattsson, 2010). Habitat degradation is considered as the main cause of threatening species (Bertzky and Stoll-Kleemann, 2009). It is impossible to protect these resources broadly because of financial and economic issues. Therefore, conservation programs for species and ecosystems are only restricted to specific areas which are known as protected areas. Protected areas are defined as a land which has strategic value in terms of conservation in order to preserve, restore and rehabilitate animal and plant life and prevent the gradual destruction of them.

Iran is a vast country with abundant natural attractions. Geological conditions, edaphic, climatic and biological factors are considered as the most important factors in establishing biodiversity in Iran. Research studies are essential in these areas owing to the fact that these areas are of great value for educational, research, recreational and tourism matters. Environmental analysis is a critical part of the strategic environmental management planning process (Nouri *et al*. 2008). Thus, various studies such as environmental impact assessment, ecological capability evaluation and comprehensive and strategic management studies are being conducted in protected areas. Strategic environmental assessment and management is one of the most important elements of management systems. The strengths, weaknesses, opportunities, and threats (SWOT) framework is proposed by many as an analytical tool which should be used to categorize significant environmental factors both internal and external to the organization (Nouri *et al*. 2008). SWOT analysis is a qualitative examination that pinpoints internal and externals factors at play in a specific environment that helps in understanding the status and formulates follow-up strategies (Chang and Huang, 2006; Kajanus *et al*., 2012). Proper and effective use of strategic environmental planning and management will have positive effect on control of technical and non-technical characteristics, final results and organizational outcomes. Various definitions of strategic management are given as follows:

Involves the formulation and implementation of the major goals and initiatives taken by a company's top management on behalf of owners, based on consideration of resources and an assessment of the internal and external environments in which the organization competes (Nag *et al*. 2007). Fundamental skills including interaction skills, allocation, monitoring and organizing are helpful for organizations to react properly in face of changing conditions instead of replying to competitive forces and they help organizations to achieve their goals (Rosen, 2003). Strategic environmental planning and management is one of the most important elements of management systems in organizations; strategic management is art and science of compilation, implementation and evaluation of decisions and multiple tasks which enables environmental organizations to achieve their objectives.

Due to the importance of proper management of protected areas, the current study was conducted with the aim of sustainable management of a coastal and marine protected area in southern Iran. It presents a

stepwise procedure towards sustainable management of protected areas and shows the suitability of the approach integrating multi criteria decision making (MCDM) and SWOT. To improve the incomplete analysis inherent to SWOT, attempts for quantified analysis through coupling SWOT with MCDM methods have been increasingly reported (Lee and Lin, 2008; Amin *et al.*, 2011; Gao and Peng, 2011; Svekli *et al.,* 2012). The obtained results would be extended to the other areas involving with the same managerial issues. This study has been performed in Mond Protected area, in Bushehr Province of Iran in 2004.

MATERIALS AND METHODS

Study area

Mond was approved as a protected area according to NO.73 legislation of Environment Council (Mostafavi *et al.,* 2004). Mond protected area is considered as a coastal-marine protected area and is located on Bushehr Province. It is extended between latitudes 27°152 –28°452 N and longitudes 51°152 –51°352 E. There are 14 villages and towns within and in margins of the study area as well as two environmental monitoring stations (Mostafavi *et al.,* 2004). Four drinking pools have been established so as to protect wildlife. Fishing dam and waterfront in the western part of the protected area have created special eco-systematic effects in the region (Fig. 1). The estuaries in protected area and Mond river estuary are located close to four islands of Khan, Tahmadun, Nakhilo and Amalgram. In the study area, habitats have lots of biological and growing restrictions such as lack of sufficient moisture, instability of ecological balance and lack of resilience capability. In this region, there are 140 plant species, 242 animal species (including 158 species of terrestrial vertebrates and 84 aquatic species) due to mangrove forests. Mangrove forests make this area unique. Species with high ecological value such as all kinds of reptiles, wild cats, rare species of birds and reproductive site for gazelles are considered as the region natural potentials. In protected areas, there are areas which have ecological values and are proper for ecotourism purposes. Ecotourism programs are helpful to provide appropriate guidelines for protection and sustainable use of these resources. The Mond area can be phytogeographically classified within the Sahara-Sindian region (Leonard, 1981-1988). However, it can also be classified in the Sudanian region (Zohary, 1973).

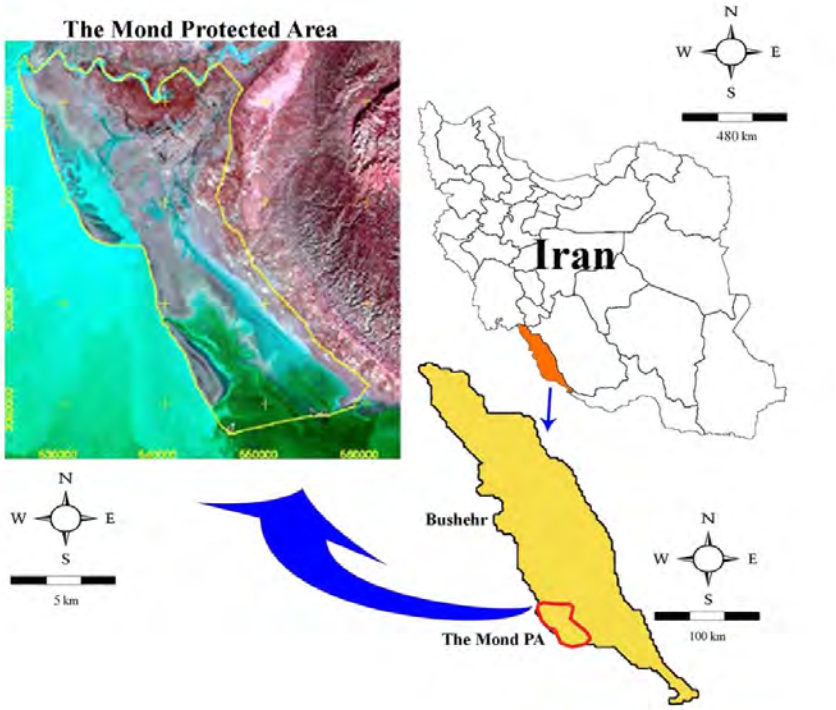

Fig. 1: Geographical location of the Mond Protected area in the coastal zone of Persian Gulf of Iran (Department of Environment, Bushehr Province, 2012)

Methodology

For strategic planning, it is essential to gather sufficient and comprehensive information about the considered region. Using multi cvaluation method (MCEM), zonation of Mond district was done based on ecological capabilities.

The stages for this method are as follows:

A) Identification and preparation of data layers;
B) Preparation of integration model of data layers;
C) Determining the weight of variables for recreational development model;
D) Comparing the ecological capability of the region in order to establish various zones.

Seven zones were determined in Mond protected area based on Iistructions of International Union for Conservation of Nature and Natural Resources (IUCN). These are as follows: 1) Safe zone; 2) Protected zone; 3) Extensive outing zone; 4) Focused outing zone; 5) Reconstruction zone; 6) Special uses zone; 7) Cultural-historical zone. Digital data layers were developed in Arc-GIS 9.3 software at 1:500'000 scale. Alphabetical models were prepared for the zonation of safe zone. In addition to IUCN guidelines, the buffers and characteristics of the study area were also considered in these models. The Eq. 1 was used for integration of data layers in order to determine suitability of each zone (Rezakhani and Zaredar, 2011).

$$S = \sum_{i=1}^{n} W_i X_i \times \prod_i C_i \quad (1)$$

Where

S: Suitability of the areas for the desired zone
W_i: The weight of each layer
X_i: The intended fuzzy layer which is called factor
C_i: Boolean layer which is called constraint

The value of fuzzy layers is between 0 and 1. The constraints represent absolute inappropriateness of an area for specified uses. For instance road buffer, prohibiting construction in the watershed areas and distance from sensitive habitats. Constraint layer is only defined by zero or one. Zero indicates inappropriate areas while one shows suitable areas (Zaredar *et al*., 2010). In this research, weighted linear combination method was used to weight the layers. For this purpose based on alphabetical models, Zones of Mond protected area were determined which they were consisted of fifteen layers of information as follows: physical resources (altitude, slope, geographical direction, hydrology, soil and geology), biological resources (type and density of vegetation, reproduction areas for gazelles, ecosystem diversity and sensitive habitat areas) and economic-social resources (human settlements, land being cultivated, and local access roads). In addition to the mentioned layers, distance from road, distance from permanent settlements and distance from the land under cultivation in this model were considered as constraints. Then, the result of overlapping evaluation of information layers was multiplied to the constraints (Boolean). Accordingly, as the first output layer, Mond river and 100 m. distance from it and coastal map with 100 m. buffer were separated. Extent of mangrove forests was specified by using vegetation type and density layer and the buffer of 200 m. distance was considered for it. The recent three layers by using reclassification command in Arc-GIS software were determined as number 255 for intended areas and number zero for the areas out of it. These numbers are anticipated with the usage of Arc-GIS software according to the definition of Arc-GIS software of fuzzy scoring for raster maps. Vegetation type and density layer and ecosystem diversity layer which had previously been prepared were classified by using stretching method. For reproductive sites of gazelles, 300 m. distance was considered and number 255; the highest possible score was given to it in terms of conservation importance. Soil layer was classified based on erosion sensitivity and ability of plant growth and it was scored by using stretching method in the range of 0 to 255.

Thereby, all the layers were standardized and placed in the range of 0-255. Analytical hierarchy process (AHP) was used for weighting data layers in MCE method. Weights were classified by using competence method by delphi group in accordance with the pattern of method based on preference numbers 1 to 9. In this way, value of layers was compared pair wisely. Besides, consistency ratio was used to determine whether weighting was logical or not. This matter was conducted through sensitivity analysis by Arc-GIS. In overall, when consistency ratio is close to zero, it shows that weighting is logical. After determining the weight of the factors, the data layers were integrated based on linear model. Classification of information layers along with analysis of MCE was also considered for integration of data layers. Various zones were determined. In order to implement SWOT techniques for environmental strategic management, the following steps were carried out according to comprehensive

framework for strategy formulation. In the first stage, mission and macroeconomic objectives of regional priorities were prepared relying on the mission of Department of the Environment (DOE) and international protection indices. In the second step, internal and external factors were checked. For this purpose, effective factors on environmental management system were identified and analyzed. Finalizing list of internal factors (strengths and weaknesses) and external factors (opportunities and threats) were carried out by using expert questionnaire with Delphi method.

1. Having at least 10 years of activity in Mond Protected area system.
2. Having at least relevant undergraduate degree.
3. Being an expert in administrative, supervisory or scientific matters in the region.
4. Understanding limitations, problems, opportunities and threats of the region.

Taking the conditions into consideration, a statistical sample of 36 experts was gathered. Following the administered arrangements, the questionnaires were distributed in the specified deadline in office and Mond Protected area under supervision of inspection team. Required instructions, weighting and prioritization were given to the expert group so as to use AHP. For this purpose, after finalizing internal and external list of factors, preference matrix was separately prepared. In this way, the characteristics of each factor were placed in the row and column of primary matrix. Then, all the parameters were compared with each of criteria in higher level pair wisely, once for internal factors and the other time for external factors. Expert choice software was als applied for calculation of the relative weight of criteria and alternatives owning to the fact that mathematical calculations were so time-consuming and complex for each matrix. For this purpose, a hierarchical structure was formed and weights of criteria in rows and columns of preference matrices were imported to the software. Finally, weights of criteria relative to each other and the final weight of options were calculated (Kurttila *et al*., 2000; Halla, 2007). The matrix of external and internal factors was adjusted in the first column of internal and external list. In the second column, weights of each factor in the mentioned tables were completed in a way that the overall weight in each table was normal and equal to one (Paliwal, 2006; Nikolaou and Evangelinos, 2010; Sariisik *et al*., 2011; Zhang, 2012). In the third column, the following process was done for weighting: the value of 4 (the most importance) to 1 (the least importance) were given to each factor based on the opinions of respondents (Arslan and Deha Er, 2008). In the fourth column, rhythmic weight of each factor was obtained by multiplying the second column to the third column (Qingwei, 2012). Eventually, the total weighs of whole series were calculated (Tables1 and 2). Thus, the second stage of framework (input stage) was performed by forming internal factor evaluation matrix and external factor evaluation matrix. In the third stage, implementation phase considering the mission of organization, the main internal factors (strengths and weaknesses) and the main external factors (opportunities and threats) were adjusted using SWOT matrix and internal and external matrix in order to identify strategies in line with organization's mission and factors (Fig. 3). In the fourth stage, various strategic options were identified in order to make decisions using quantitative strategic planning matrix. In the previous stage, they were analyzed, implemented and judged with objective methods and without bias. In Table 4, the impact of internal and external factors on proposed strategy was predicted attractiveness score of each strategy was in range of one (least attractiveness) to the four (attractiveness or feasibility).

RESULTS AND DISCUSSION

According to the numerical models, fifteen data layer were obtained on a scale of 1:50,000 including: physical resources, biological resources and socio-economic resources. After weighing the components of the protective data layer, integration of different layers based on linear models were used:

CONSERVATION=((0.0499*[mond1])
+(0.0262*[coast1])+(0.0556*[harra1])+
(0.0642*[plants1])+(0.0209*[density1])+
(0.0903*[p_diversity])+(0.1449*[habitate1])+
(0.1897*[a_diversity1])+(0.0716*[e_diversity])+
(0.2736*[gazelle1])+(0.0132*[soil1]))*
([farm1]*[roads1]*[villages1]).

In Fig. 2, conservation and recreational zones and other zones of the Mond protected area were obtained. The area of protected zone was about 30.35 of the entire study area. The area of recreational zones was about 24.10 of the entire study area.

The obtained findings were extracted from strategy

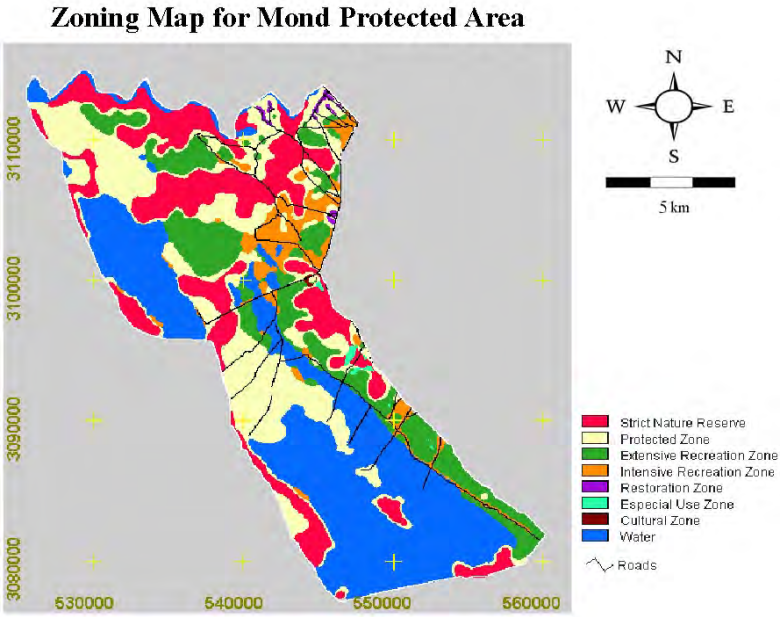

Fig. 2: Zoning Map for Mond Protected Area

Table 1: Matrix of external factors

External Factors:	Ratio	Degree	Score
Opportunities			
Financial support of development of Land and Sea Protection in National and international level	0.15	4	0.6
Developing standards for quality and quantity protection of animal and plant species on land and sea	0.15	3	0.45
Utilizing new technologies for sustainable development in the region	0.10	3	0.3
zoning the area in order to develop protection and promote protected area to national-marine park	0.05	3	0.15
Campaign development and crisis management together with environmental impact assessment and risk management in Mond protected area	0.05	3	0.15
Threats			
Developing petroleum and industrial activities in the region	0.15	1	0.15
Failure to establish Integrated Coastal Zone Management	0.15	1	0.15
illegal exploiters (hunters) in the area	0.10	1	0.10
Considering as insignificant part in the international areas due to incompatibility With Global standards	0.05	1	0.05
Lack of community awareness of biological values in the area and economic abuse by institutions and organizations (profit seekers) in order to develop their own axes	0.05	2	0.10
Total	1	-	2.20

EFE= 2.20

framework, meetings and negotiations with 154 experts and usage of statistical softwares. The obtained results from the assessment of external factors by expert team indicate that financial support for conservation development is considered as the most valuable opportunity with weight of 0.60 and developing safety standards is the second important priority in leading regional opportunities with weight of 0.45 (Tables 1 and 2). The oil and gas activities and failure to establish integrated coastal zone management are the most important external threats for the region with the weight of 0.01. In this field, it is

Table 2: Matrix of internal factors

Internal Factors: *Strengths*	Ratio	Degree	Score
Geographic location of Mond Protected area in Persian Gulf	0.05	4	0.2
Climatic conditions and beautiful landscape in the region, possibility of outing and tourism in the region.	0.10	4	0.4
Plant and animal species with international conservation value like mangrove forests and coral marine	0.15	4	0.6
The possibility of creating a natural biosphere reserve	0.10	3	0.3
Suitable conditions for growth of fish, birds, mammals and plants	0.10	4	0.4
Weaknesses			
Lack of legal, governmental and applicable support tools and deployment	0.05	1	0.05
Status of guards in Mond Protected area	0.05	1	0.05
Insignificant protection facility in Mond Protected area	0.10	1	0.10
Poor cooperation of government and organizations with media for informing values and attractions of area	0.15	1	0.15
weak safety standards in the region	0.15	2	0.3
Total	1	-	2.40

IFE = 2.40

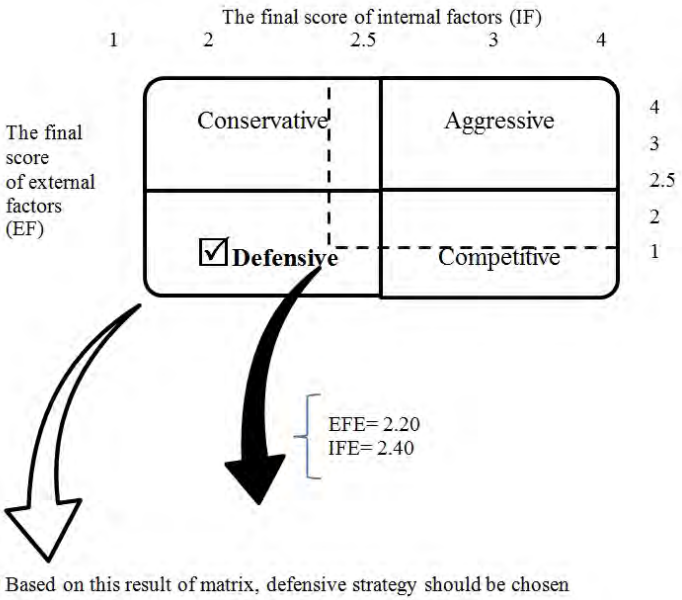

Fig. 3: Current status of environmental management in the area internal and external matrix (IE)

necessary to identify funding and provide research projects. Plant and animal species and ecological value such as mangrove forests and marine corals with the weight of 0.06 is considered as the most valuable strength of the region. It is interesting to note that low conservation standards, constraints and lack of support by Iran Department of the Environment (DOE, 2012) is the greatest weakness in the region with the weight of 0.15. Accordingly, external factor evaluation (EEF) is 2.20 which it is lower than 2.5 and it shows that the weaknesses of the area are more than its strengths. Internal factor evaluation (IEF) is 2.40 which represents that the threats of the area are more than its opportunities.

Table 3: SWOT matrix

Strengths points	*Weakness points*
1. Geographic location of Mond Protected area In Persian Gulf 2. Climatic conditions and beautiful landscape in the region, possibility of outing and tourism in the region 3. Plant and animal species with international conservation value like mangrove forests and coral marine 4. The possibility of creating a natural biosphere reserve 5. Suitable conditions for growth of fish, birds, mammals and plants	1. Lack of legal, governmental and applicable support tools and deployment 2. Status of guards in Mond Protection area 3. Insignificant protection facility in Mond Protected area 4. Poor cooperation of government and organizations with media for informing values and attractions of area 5. weak safety standards in the region
Aggressive strategies	*Conservative strategies*
1. Conversion of Mond Protected area to the national-marine park in order to enhance regional development 2. Increase tourism opportunities in the region. 3. Developing strategic planning of environmental risk assessment in the region 4. Equipping regional infrastructure for protection	1. Promoting protective measures and indicators in the region 2. Utilizing financial, physical and human liabilities and facilities 3. Using new technologies In the region
Competitive strategies	*Defensive strategies*
1. The development of conservation strategy in the region by establishing natural biosphere reserve 2. Legal restrictions In oil development 3. Preparation of integrated management document in the region 4. Implementation of one in a thousand industries in order to protect the area 5. Taking contribution of individuals and local communities for conservation purposes	1. Create attractive environment for guards 2. Extensive partnerships with academic and research centers in order to promote conservation measures 3. Using conservative approaches in line with international standards with governmental, national and executive support

Analysis of current environment management in the Mond protected area for final score of external and internal factors leads to IE Matrix. In this matrix, IEF is X axis (horizontal axis) and EFE is Y axis (vertical axis). As it is clear, the intersection of these two axes is in defensive position. This means that the regional threats are more its weaknesses. As a result, some strategies should be considered so as to solve the weaknesses and increase the efficiency of strengths.

Due to defensive strategies of the region, IE Matrix is adapted to SWOT matrix in order to develope implementation of leading strategies to use the best defensive strategy for regional environmental management (Fig. 3). As it can be seen, the results of expert team analysis in SWOT matrix are consisted of 4 aggressive strategies, 3 conservative strategies, 5 competitive strategies and 3 defensive strategies (Table 3). In addition, quantitative analysis is done regarding priority of WT strategies and based on defensive strategies. It is notable that SWOT matrix is a helpful tool to minimize weaknesses and threats by using the best strengths or opportunities in each strategy.

In a strategic planning process, different strategies have been studied and the best of them are selected. It is important to note that the best strategic decisions are not necessarily approved by all decision makers. However, the integrity for intuitive judgment and logical analysis should be considered in using comprehensive framework for strategy formulation. In this way, scientific and quantitative analysis is used for identification and selection of strategies. While intuitive judgments, discussing and considering opinions of experts in this study should be considered in this method. According to different presented stages, the results of quantitative planning are analyzed in this section in order to have strategic planning. As it was specified in Table 4, quantitative strategic environmental planning was to calculate the effect of other internal and external factors on strategies of selected environment as competitive. In addition to preparation of all internal and external factors, reinforcing effect or preventive effect in each factor was taken into consideration as attractiveness score (Table 3) for selection of executive strategy. These effects were scored from 1 to 4. Total attractiveness score (TAS) was calculated by multiplying absorption score (AS) to weight of each factor (derived from IFE and EFE

Table 4: Matrix of quantitative strategy planning

Main Factors:	Coefficient weight	First strategy		Second strategy		Third strategy	
Opportunities		AS	TAS	AS	TAS	AS	TAS
Geographic location of Mond Protected area In Persian Gulf	0.15	4	0.6	4	0.6	4	0.6
Climatic conditions and beautiful landscape in the region, possibility of outing and tourism in the region.	0.15	3	0.45	3	0.45	4	0.6
Plant and animal species with international conservation value like mangrove forests and coral marine	0.10	3	0.30	2	0.20	3	0.30
The possibility of creating a natural biosphere reserve	0.05	4	0.20	4	0.20	2	0.10
Suitable conditions for growth of fish, birds, mammals and plants	0.05	4	0.20	4	0.20	3	0.15
Threats							
Developing petroleum and industrial activities in the region	0.15	2	0.15	2	0.30	2	0.30
Failure to establish integrated coastal zone management	0.15	2	0.15	2	0.30	3	0.45
illegal exploiters (hunters) in the area	0.10	1	0.10	1	0.10	2	0.20
Considering as insignificant part in the international areas due to incompatibility with global standards	0.05	2	0.10	2	0.10	2	0.10
Lack of community awareness of biological values in the area and economic abuse by institutions and organizations (profit seekers) in order to develop their own axes	0.05	2	01.0	2	0.10	2	0.10
Strengths							
Geographic location of Mond Protected area In Persian Gulf	0.05	4	0.20	4	0.20	4	0.20
Climatic conditions and beautiful landscape in the region, possibility of outing and tourism in the region.	0.10	3	0.30	4	0.40	4	0.40
Plant and animal species with international conservation value like mangrove forests and coral marine	0.15	4	0.60	4	0.60	4	0.60
The possibility of creating a natural biosphere reserve	0.10	4	0.40	4	0.40	4	0.40
Suitable conditions for growth of fish, birds, mammals and plants	0.10	4	0.40	4	0.40	4	0.40
Weaknesses							
Lack of legal, governmental and applicable support tools and deployment	0.05	1	0.05	1	0.05	3	0.15
Status of guards in Mond Protection area	0.05	1	0.05	1	0.05	2	0.10
Insignificant protection facility in Mond Proteceted area	0.10	1	0.10	1	0.10	2	0.20
Poor cooperation of government and organizations with media for informing values and attractions of area	0.15	1	0.15	1	0.15	2	0.30
weak safety standards in the region	0.15	1	0.15	1	0.15	3	0.45
Total	1		4.75		5.45		☑ 6.05

☑ Therefore, the third strategy was chosen

Tables). The preference for implementation of each strategy was determined from summing total attractiveness scores of each strategy from internal and external factors:

1. Motivation of game guards
2. Extensive partnerships with academic and research centers in order to promote conservation measures
3. Using conservative approaches in line with international standards with governmental, national and executive support

CONCLUSION

The main purpose of preparation and implementation of environmental management plans is to control environmental conditions efficiently and to have better life. It is notable that management plans need strategic analysis in long term. Experiences and abilities of individuals and also organizations should be considered for decision making and providing development strategies. As an environment manager, it is necessary to analyze the effects of attractiveness scores for each of 20 factors on three obtained

Table 5: Level of priority based on presented strategy

Presented strategies	TPEN	LOP
Using conservative approaches according to international standards with governmental, national and executive support	6.05	High
The extensive partnerships with academic centers in order to promote conservation measure	5.45	Medium
Motivation of game guards	4.75	Low

strategies and also to determine the best strategy. According to four specified points (strengths, weaknesses, opportunities and threats) and three obtained strategies, it can be said that financial support for developing protection has the highest attractiveness as an opportunity in the region. It is representative of the fact that experts consider this matter as an important factor. Developing standards for qualitative and quantitative protection of plant species is the second most attractive factor as the opportunity and it has 0/15 weight. Regardless of the output scores, it can be concluded that development of conservation measures are the most significant factors in experts' points of view for prioritizing the optimal strategy. Based on defensive strategy, the following strategic approaches are respectively important as the inputs of quantitative strategic planning matrix in (SWOT) matrix:

1. Motivation of game guards
2. The extensive partnerships with academic centers in order to promote conservation measures
3. Using conservative approaches according to international standards with governmental, national and executive support

Based on the following total priority evaluation number (TPEN), the level of priority (LOP) strategy arrange as the following high, medium and low priority level (Table 5).

From three presented strategies, "Using conservative approaches in line with international standards with governmental, national and executive support" has the highest score (6.05) and "Extensive partnerships with academic centers in order to promote conservation" is the second important strategy (5.45).

Thus, "Using conservative approaches in line with international standards with governmental, national and executive support" with (6.05) score was considered as the first priority and high recommended strategy for development of strategic planning in Mond Protected area. Therefore, the manager should consider fundamental plans for development of areas for conservation approach in the area. The following results were obtained from analysis of experts:

- Despite various threats in the region, this area is considered as natural reserve and it has various species and pristine landscapes.
- Government does not sufficiently support natural resources in this region despite intense destruction because of construction of petroleum sites and large investments for oil extraction.
- One of the main concerns of local communities and experts is excessive development in the region. Not considering sustainable development leads to destruction of the area in the near future.

To develop conservation of Mond Protected area especially in the coastal areas, the following cases are suggested:

- Using maximum power in order to attract financial support in national and international level for development of terrestrial and marine conservation.
- Studies and researches related to protective measures in the similar coastal area in the world for implementation of these measures in the region.
- Planning for the zonation of the area in order to identify ecological sensitive areas and increase the level of conservation.
- Utilization of new technologies and protective approaches for sustainable development in the region;
- Increasing environmental awareness of local people, stakeholder institutions such as Department of Transportation, Ministry of Petroleum; Ministry of Industry; Security Forces and Iranian Revolutionary Guards and also private industrial sectors in the region which industrial waste and wastewater are discharged to Persian Gulf and water resources.
- Developing plans and performing practical measures in relation with protection of marine environment in the region in collaboration with countries of the region.
- Implementation of monitoring plans and periodic measurement of environmental pollution, health assessment and population biomarkers in the region.
- Conducting studies about environmental impact assessment and risk management in Mond Protected

area and Persian Gulf and also formation of crisis management committee.

- Establishment of health, safety and environmental management system (HSE-MS) in the region.
- Establishment of integrated coastal zone management (ICZM) for coastal areas in Mond Protected area
- Introducing unique and attractive landscapes and making facilities for recreational and tourism in the region for citizens and foreign tourists.

The MCE is a powerful method to support decision-making in management of natural resources. It provides the possibility of involving qualitative and quantitative criteria in decision-making process. Among other advantages of the method can be pointed to the ease of use, being time-consuming and cheap. Finally, MCE can be considered as an appropriate method in management of protected areas due to its extraordinary capability for handling the opinion of different stakeholders in a systematic manner. The patter presented in this research can be extended to the other regions with the same issues and situations by adding or subtracting different criteria.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

REFERENCES

Amin, S.H.; Razmi, J.; Zhang, G., (2011). Supplier selection and order allocation based on fuzzy SWOT analysis and fuzzy linear programming. Expert Sys. Appl., 38: 334-342 **(10 pages).**

Arslan, O.; Deha, Er I., (2008). SWOT analysis for safer carriage of bulk liquid chemicals in tankers. J. Hazard. Mater., 154: 901-913 **(13 pages).**

Bennett, N.; Harvey Lemelin, R.; Koster, R.; Budke, I., (2012). A capital assets framework for appraising and building capacity for tourism development in aboriginal protected area gateway communities. Tourism Manage., 33: 752-766. **(14 pages).**

Bertzky, M.; Stoll-Kleemann, S., (2009). Multi-level discrepancies with sharing data on protected areas: What we have and what we need for the global village. J. Environ. Manage., 90: 8-24. **(16 pages).**

Borge Johannesen, A., (2007). Protected areas, wildlife conservation, and local welfare. Ecol. Econ., 62: 126-135 **(9 pages).**

Brandon, K.; Gorenflo, L. J.; Rodrigues, A.S.L.; Waller, R.W., (2005). Reconciling biodiversity conservation, people, protected areas, and agricultural suitability in Mexico. World Dev., 33: 1403-1418 **(16 pages).**

Chang, H.H.; Huang, W.C., (2006). Application of a quantification SWOT analytical method. Math. Comput. Model., 43: 158-169 (**12 pages**).

DOE, (2012). Comprehensive Environmental Studies of Mond Protected Area. Department of the Environment, Research Project. Bushehr, Iran **(188 pages).**

Ezebilo, E.E.; Mattsson, L., (2010). Socio-economic benefits of protected areas as perceived by local people around Cross River National Park, Nigeria. Forest Policy Econ., 12:189-193 **(5 pages).**

Gao, C.Y.; Peng, D.H., (2011). Consolidating SWOT analysis with nonhomogeneous uncertain preference information. Knowl-based Syst., 24: 796-808 **(14 pages).**

Halla, F., (2007). A SWOT analysis of strategic urban development planning: The case of Dares Salaam city in Tanzania. Habitat Int., 31: 130-142 **(13 pages).**

Hinchliffe, S., (2008). Reconstituting nature conservation: Towards a careful political ecology. Geoforum, 39: 88-97 **(10 pages).**

Kajanus, M.; Leskinen, P.; Kurttila, M.; Kangas, J., (2012). Making use of MCDS methods in SWOT analysis: lessons learnt in strategic natural resource management. Forest Policy Econ., 20: 1-9 **(9 pages).**

Kearneya, R.; Farebrotherb, G.; Buxtonb, C.D.; Goodsellc, P., (2012). How terrestrial management concepts have led to unrealistic expectations of marine protected areas. Mar. Policy, 38:304-313. **(10 pages).**

Kurttila, M.; Pesonen, M.; Kangas, J.; Kajanus, M., (2000). Utilizing the analytic hierarchy process (AHP) in SWOT analysis — a hybrid method and its application to a forest-certification case. Forest Policy Econ., 1:41-52. **(11 pages).**

Lee, K.; Lin, S., (2008). A fuzzy quantified SWOT procedure for environmental evaluation of an international distribution center. Inform. Sci., 178: 531-549. **(19 pages).**

Leonard J., (1981-1988). Contribution a l'étude de la flore et de la végétation des déserts d'Iran. Fasc 1-9. Meise. **(9 pages).**

Leroux, Sh. J.; Krawchuk, M.A.; Schmiegelow, F.; Cumming, S.G.; Lisgo, K.; Anderson, L. G.; Petkova, M., (2010). Global protected areas and IUCN designations: Do the categories match the conditions?. Biol. Conserv., 143: 609-616. **(7 pages).**

Lockwood, M., (2010). Good governance for terrestrial protected areas: A framework, principles and performance outcomes. J. Environ. Manage., 91(3): 754-766. **(15 pages).**

Martín-López, B.; García-Llorente, M.; Palomo, I.; Montes, C., (2011). The conservation against development paradigm in protected areas: Valuation of ecosystem services in the Doñana social–ecological system (southwestern Spain). Ecol. Econ., 70: 1481-1491. **(11 pages).**

McDonald, R. I.; Boucher, T. M., (2011). Global development and the future of the protected area strategy. Biol. Conserv., 144: 383-392. **(10 pages).**

Meyer, C. G., (2007). The impacts of spear and other recreational fishers on a small permanent Marine Protected Area and adjacent pulse fished area. Fish. Res., 84: 301-307. **(8 pages).**

Mostafavi, H.; Kiabi, B.; Mahini, E.; Mehrabian, A.; Naghinejhad, E., (2004). Ecological Evaluation of Mond Protected Area. Corporate scientific project between Department of the Environment of Bushehr Province and Shahid Beheshti University. Bushehr **(133 pages).**

Nag, R.; Hambrick, D.C.; Chen, M.J., (2007). "What is strategic management, really? Inductive derivation of a consensus definition of the field" (PDF). Strategic Manage. J., 28(9): 935–955. **(16 pages).**

Nikolaou, I.E.; Evangelinos, K.I., (2010). A SWOT analysis of environmental management practices in Greek Mining and Mineral Industry. Resour. Policy, 35: 226-234. **(9 pages).**

Nouri, J.; Karbassi, A. R.; Mirkia, S., (2008). Environmental management of coastal regions in the Caspian Sea. Int. J. Environ. Sci. Tech., 5(1): 43-52. **(10 pages).**

Oldfield, Th.E.E.; Smith, R.J.; Harrop, S. R.; Leader-Williams, N., (2004). A gap analysis of terrestrial protected areas in England and its implications for conservation policy. Biol. Conserv., 120: 303-309. **(7 pages).**

Paliwal R., (2006). EIA practice in India and its evaluation using SWOT analysis. Environ. Impact Asses., 26: 492-510. **(19 pages).**

Qingwei F., (2012). Research on Health Human Resources of the Forest Industry Region in Heilongjiang Province Based on SWOT Analysis. Procedia Environ. Sci., 12: 1034-1039. **(6 pages).**

Rezakhani, P.; Zaredar, N., (2011). Indoor winter recreational site selection in arid and semi-arid mountainous regions. International Conference on Environmental Science and Development Proceeding Book 220-223. **(4 pages).**

Rosen, R., (2003). Strategic Management. Pearson Education Limited: 123-130. **(8 pages).**

Sariisik, M.; Turkay, O.; Akova O., (2011). How to manage yacht tourism in Turkey: A swot analysis and related strategies. Procedia – Soc. Behav. Sci., 24: 1014-1025. **(12 pages).**

Sims, K. R.E., (2011). Conservation and development: Evidence from Thai protected areas. J. Environ. Econ. Manage., 60:94–114. **(20 pages).**

Svekli, M.; Oztekin, A.; Uysal, O.; Torlak, G.; Turkyilmaz, A.; Delen, D., (2012). Development of a fuzzy ANP based SWOT analysis for airline industry in Turkey. Expert Syst. Appl., 39: 14-24. **(11 pages).**

Tuvi, E.-L.; Vellak, A.; Reier Ü.; Szava-Kovats, R.; Pärtel, M., (2011). Establishment of protected areas in different ecoregions, ecosystems, and diversity hotspots under successive political systems. Bio. Conserv., 144: 1726-1732 **(7 pages).**

Zaredar, N.; Kheirkhah Zarkesh, M.; Jozi, S. A.; Ghadirpour, A. (2010). Investigation of fuzzy as well as Boolean logics application in land evaluation (case study: TALEGHAN basin-Iran), International Conference on Environmental and Agriculture Engineering (ICEAE), Japan **(6 pages).**

Zhang X.M., (2012). Research on the Development Strategies of Rural Tourism in Suzhou Based on SWOT Analysis. Energy Procedia 16: 1295-1299 **(6 pages).**

Zohary M., (1973). Geobotanical Foundations of the Middle East. 2 vols. Gustav Fischer Verlag Press, Stuttgart, Swets and Zeitlinger, Amsterdam.

AUTHOR (S) BIOSKETCHES

Padash, A., Ph.D. Candidate, University of Tehran and researcher in the Department of Industrial Ecology in Academic Center for Education, Culture and Research, Sharif University Branch, Tehran, Iran. Email: *apadash@ut.ac.ir*

Jozi, S.A., Ph.D., Associate Professor, Department of the Environment, Faculty of Technical and Engineering, Islamic Azad University, North Tehran Branch, Tehran, Iran. Email: *sajozi@yahoo.com*

Nabavi, S.M.B., Ph.D., Professor, Department of Marine Biology, Faculty of Oceanic and Marine Science, Khormshahr University of Marine Science and Technology, Khuzestan Province, Iran. Email: *smbnabavi@gmail.com*

Dehzad, B., Ph.D., Associate Professor, Department of Geology, Faculty of Earth Science, Shahid Beheshti University, Tehran, Iran. E-mail: *bdehzad@gmail.com*

How to cite this article:
Padash, A.; Jozi, S.A.; Nabavi, S.M.B.; Dehzad, B., (2016). Stepwise strategic environmental management in marine protected area. Global J. Environ. Sci. Manage., 2(1): 49-60.

DOI: 10.7508/gjesm.2016.01.006

URL: http://gjesm.net/article_14700_1931.html