

Challenges Ahead of Integrated Coastal Zone Management in Environmentally Sensitive Islands: A Case Study

A.R. Zarifsanayei*, H.R. Zarif Sanayei¹ and S. Maghsoudi Zand²

Faculty of Environment, University of Tehran, Tehran, Iran

¹Faculty of Engineering, Shahrekord University, Shahrekord, Iran

²Karan Saze Pasargad Consulting Engineering Co, Tehran, Iran

✉ a.r.zarif@ut.ac.ir

Received March 8, 2018; revised and accepted August 6, 2018

Abstract: Small islands around the world encounter special challenges due to vulnerability to acute climates, human-induced activities and pollution. The challenges even become more intricate where the island is located in environmentally sensitive regions. In order to address the problems in coastal areas, Integrated Coastal Zone Management (ICZM) whose concept was born in 1992 during the Earth Summit of Rio de Janeiro, has been recommended by United Nations. This paper focuses on challenges ahead of ICZM in environmentally sensitive islands through Interaction-Stakeholder and Option Matrices. Kish Island is a beautiful small island located in Persian Gulf. With regard to environmental sensitivities and susceptibilities of the island, its ICZM plan requires special attention. The method utilized in this article combines the perception of stakeholders' need and coastal issues with the effects of management interventions. The method developed for Kish's ICZM plan can provide comprehensible tools for decision makers in order to find the sources of conflicts and problems. According to the results, most of the interactions belong to "coastal environment" and "tourism" and also many groups of primary stakeholders are involved by many changes. The results of Option Matrix imply that "environmental legislation and mandatory EIA for any project and any discharge" and also "allocation of some regions to national park" interact with various components of the matrix and many primary stakeholders engage. Finally, some of the obstacles are scrutinized in this study such as: environmental legislation, lack of local environmental standards, lack of enough incentive among primary and secondary stakeholders, etc.

Key words: Kish's ICZM, capacity building, environment management plan, environmentally sensitive island.

Introduction

37% of the world's population lives within 100 km of a coast, while about 50% live within 200 km. It is predicted that three quarters of the world population expected to reside in the coastal zone by 2025; human activities originating from this small land area will impose an excessive amount of pressures on the global system (Burbridge, 2004).

In addition to pressures that the coastal zones around the globe are experiencing, small islands usually engage with extra problems. Small islands around the world face various hazards such as sea-water level rise, hurricanes, human activities over pressure, environmental degradation and pollution. The UN conference on Small Islands Developing States (SIDS) has been held to find common solutions for these vulnerable areas and also it proposed a list of issues

*Corresponding Author

that should be taken into consideration in order to cope with the main problems in small islands (United Nations, 1994).

SIDS are increasingly confronted with the classic “contradiction between economic progress and environmental degradation”. It can be argued that this contradiction is more immediate for small states because of their limited resources and environmental vulnerability (Kerr, 2005). The European Commission defines “ICZM is a dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation. ICZM uses the informed participation and cooperation of all stakeholders to assess the societal goals in a given coastal area, and to take actions towards meeting these objectives. ICZM seeks, over the long-term, to balance environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics” (COM 547 final, 2000).

Iran’s government has chosen the ICZM as a long-term solution to achieve the goal of establishing a sustainable development in the country’s coastal zones. Hence since 2003 to 2005 national strategic plan for coastal area of Iran was studied by Port and Maritime Organization (PMO) of Iran. Since 2005 to 2007, PMO established the framework of Iran’s ICZM plan (Pak and Farajzadeh, 2007). Afterwards many Iranian consultants were contributing in different phases of Iran’s ICZM plan and a series of reports have been completed yet (Dibajnia et al., 2012). Since 2013 detail studies towards implementation of ICZM in Hormozgan province and

Bushehr province have been started and also the studies include small Islands of those provinces in Persian Gulf. Kish Island located in northern region of Persian Gulf, with environmental sensitivities and vulnerabilities, requires special attention, so it has recently been the focus of ICZM study in order to address the needs of various stakeholders in the island. In this paper after describing the features of Kish Island and problems and its relation to national ICZM plan, the challenges ahead of Kish ICZM plan through investigating the appropriate interaction-stakeholder matrix and option matrix are discussed. Finally, the conclusions which could be drawn from this study are presented.

Case Study

Kish Island located in the Persian Gulf 19 km from mainland, with a distance of 250 km west of the strategic Strait of Hormoz, has an area of around 91 km² and perimeter of 40 km and a nearly elliptical shape (Figure 1). Kish is the result of Persian Gulf reef belts. Just in eastern region of the island a narrow band of sandy coast is available, the rest of the coasts are mainly rocky.

Kish located in a narrow strip of tropical vegetation in the Northern Hemisphere, with humidity about 60%, tends to be hot and humid most of the year. Kish’s climate is considered to be a very dry semi equatorial climate. For a 19-year span of time, the median annual rainfall in Kish has been 202 mm and the annual temperature 26.6°. Normally, winds blow from westerly direction. Tidal current speed in depth of 0-4 m is about 0.5 m/s and the current pattern direction (affected by

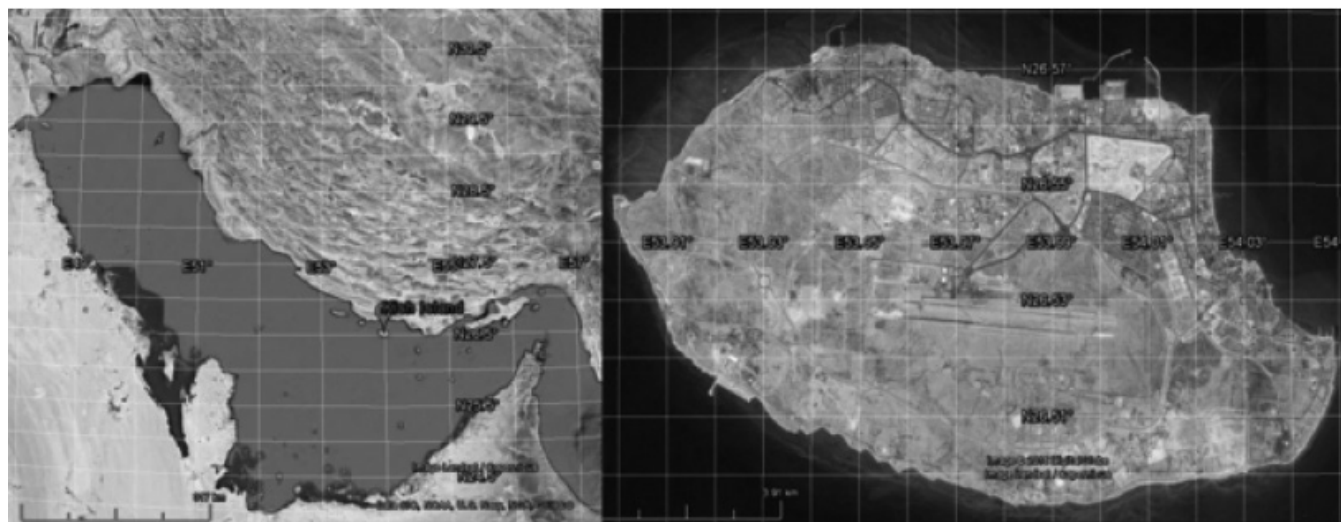


Figure 1: Location of Kish Island in Persian Gulf.

wind, wave and tide) is toward southeast. Tidal range in Kish Island is 1.8 m; maximum wave height is about 3 m and generally waves come from west and northwest. In this island the water depth in north is more than water depth in southern region. Coastal water quality is in satisfactory level because of proximity to Strait of Hurmoz and short residence time of coastal waters.

The quality of ground water is low and the human-induced activities in recent decade increased the risk of ground water pollution; therefore drinking water is supplied by desalination plants which utilize RO and MO methods. Sewerage system covers most regions in Kish Island, the system reaches wastewater treatment plant, and the treated wastewater is consumed for agricultural purposes and irrigation of landscapes as well. Wastewaters generated in areas without access to sewerage system have to be discharged into the septic tanks which will be conveyed to wastewater treatment plants by sewage suction trucks (Naghsh Click, 2006). Kish population in 1998 was 16,600, which reached 22,000 in 2003, showing a 5% annual increase. Currently about 97% of people are non-indigenous people. This rapid immigration rate has mostly been due to very good job opportunities that were the result of the free trade zone policies. Also the proportion of the active population is about 70%.

A recent study has estimated that Kish population will reach 85,500 in the year 2025 (Drees, 2005). A research on social capitals in Hormozgan province shows Kish Island is in poor situation among the islands of this province (Naghsh Click, 2006). Social capital is the information, trust, and norms of reciprocity inhering in one's social networks (Woolcock, 1998). In other words, social capital indicator entails three elements of public awareness, public participation and level of transparency in a society. This small island attracts around 1 million domestic tourists every year that come to the island for spending their vacations not only in winter but also in hot months of summer. Kish has several shopping malls, a multitude of luxurious hotels, recreation centres, sea-sport clubs, and it benefits from some historical and cultural assets like "underground city" as well.

Although, the biodiversity in Kish Island is low, 120 different types of birds, some small animals, unique types of sea-turtles, corals, sponges and stunning types of coral reef fishes exist (Naghsh Click, 2006). The abovementioned attractions illuminate the prodigious potential of eco-tourism development in Kish Island. Kish Island was declared a "free trade zone" by the government in 1989. The Island is governed by Kish

Free Zone Organization. Although KFZO should observe the country's general laws and regulations, it is almost autonomous inside the island territories and all the authorities and responsibilities of the government have been transferred to KFZO.

Proposed Matrices for Kish's ICZM

The vulnerability and limited resources of Kish Island cause different kinds of problems in this area that should be addressed properly in ICZM initiatives. The nature of coastal development and the interactions of stakeholders' activities with different actions, make decision-making process an intricate issue in Kish's ICZM plan. It should be mentioned in providing Kish's ICZM plan coastal engineers, scientists in all disciplines, decision and policy makers have their own perspectives. So to arrive more robust solutions and take appropriate measures, the plan should have a holistic view of stakeholders' perceptions in order to ascertain the source of probable conflicts. In fact Kish's ICZM needs the employment of some specific tools and techniques to facilitate the assimilation and analysis of gathered information for the plan.

In ICZM studies, matrices can provide a structure for prioritizing information and also to ensure discussions become clearly directed and non-sectorally entrenched. Three forms of the matrix are used (Le Tissier et al., 2003):

- Interaction Matrix that provides a means to explore the interactions between the main components of the biological, physical and human environment and their expected changes.
- Stakeholder Matrix provides an overview of the impacts on people of future changes in the coastal area (very similar with the same structure as the Interaction Matrix).
- Options Matrix that can be used to check for stakeholder benefit from proposed management options, filter out options which have strong negative impacts on stakeholders and also enhance management options to maximize stakeholder benefits.

Result and Discussion

In this study, Interaction-Stakeholder Matrix is used to provide a framework for understanding the coast and the impact of management interventions. As mentioned above, Interaction-Stakeholder Matrix contains three types of information: components, changes and people (primary stakeholders). In Kish's ICZM plan

the components are natural or human-made physical elements, which are important features of the Kish's coastline. Changes are significant changes occurring, or expected to occur, which impact significantly on people or coastal resources in the area, and primary stakeholders are those individuals and groups who are ultimately affected by an activity, either positively impacted or adversely impacted in the Island.

Finding applicable elements of the matrix is a vital time-consuming process in order to reach mature one. To do the process many reports, articles, field works and even newspapers have been reviewed with special attention to horizons of Iran's ICZM plan. Also in generating the matrix, a group of trained and experienced experts were consulted and their feedbacks have been used in this paper.

According to the current activities in Kish Island and with regard to their importance, influence, workforce and also GDP, the primary stakeholders were classified into these groups:

- Investors, landowners and dealers
- Employees at governmental entities, social and health welfare sectors
- Employees related to aquatic entertainment
- Environmental protection NGOs (local)
- Fishermen
- Fishing cooperatives (local)
- Local poor people (non-fishermen)
- Maritime cooperatives (local)
- Employees at maritime activities
- Market traders and retailers
- Public service vehicle owners
- Tourists

Miscellaneous groups could have been considered in more detailed classification, but we tried to keep the number of target groups in a reasonable level in order to not overload the matrices and make them easy to be understood for decision makers. Since one of the most important goals of sustainable development is enhancing livelihood of the most vulnerable groups, so attention to the situation of poor people (low income groups) in the matrices is indispensable.

Studied Interaction-Stakeholder Matrix of Kish Island comprises invaluable information for decision makers of Kish's ICZM plan (see Tables 1a and 1b). The symbol “√” indicates that one change has interaction with one component, but at this time it's not clear enough which groups will be affected significantly. For example sea level rise in Persian Gulf which is one of the side effects of climate change definitely interacts with shoreline and dry plain. Generally the matrix identifies

that most interactions are within “coastal environment” components, which itself implies the important role of coastal regions and natural habitats for different stakeholders. For instance, “direct discharge of marine outfalls (a pressure)” causes low coastal water quality and high turbidity which deteriorates the situation of coastal habitats and coral reefs. In addition, these changes have significant influences on the groups of environmental NGOs, tourists and employees related to aquatic entertainments. In other example “more coastal villages” could provide more job opportunities for low income people, on the other hand it needs cooperation of environmental NGOs for environmental education in order to meet environmental standards. Also the above mentioned changes lead to more internal travels in Kish Island that means more taxi drivers are involved. In the matrix “tourism” is a vibrant component and engages many stakeholders and interacts with various changes.

The next form of matrices used in this study is Options Matrix which acts as a check, filter or enhancement mechanism for suggested management options. The proposed options are added to the Interaction Matrix as another category of change. The added rows of management changes are filled in by ticking significant interactions with sub-components. Options Matrix involves assessing the effect of the proposed options on the (primary) stakeholders. At this stage of the ICZM process, management options, which impact on a wide range of sub-components, should be carefully reconsidered.

In Table 2 the key issues of Kish's ICZM plan have been scrutinized using Option Matrix. In producing an option matrix for this environmentally sensitive Island, three major approaches should have been considered. First of all, protection-based approach, which means to

Symbols used in Tables 1a and 1b

\$	Investors, landowners and dealers
em	Employees at governmental entities, social and health welfare sectors
÷	Employees related to aquatic entertainment
#	Environmental protection NGOs (local)
!	Fishermen
!!	Fishing cooperatives (local)
*	Local poor people (non fishermen)
//	Maritime cooperatives (local)
mr	Employees at maritime activities
M	Market traders and retailers
=	Public service vehicle owners
@	Tourists


(Primary Stakeholders' legend)

Table 1a: Interaction-stakeholders matrix

			Components																						
Changes	Industry	Ports and harbours	Coastal environment				Land use				Ports & harbours				Industry				Housing & Infrastructure						
			Dry plain	Shoreline	Coral reefs & coastal habitats	Agriculture	Aquaculture	Landfill	Wells	Natural landscapes	Fishery ports	Coastal (trading) terminals	Jetties & Piers	Desalination plants close to the ports	Tourism	Offshore industries	Other	Transportation	Fishing	Residential building	Hotels & Restaurant	Shopping mall	Governmental offices		
			✓	# @ =	÷ # @		* !!				✓									\$, !! *					
			* @ =	# @ =	÷ # @											* @ =									
			✓	✓	✓							✓				✓							\$, M, *	em	
					# @							✓	✓	✓				✓	mr // * \$!, !!					//
	Tourism development and aquatic recreational activities	# @ =	÷ # @ =	÷ # @				@ =						✓						* \$		\$ M *			
	Oil/Gas exploitation			# @														mr * // \$!, !!						

(Contd.)

Table 1a: (Contd.)

Components																							
			Coastal environment			Land use					Ports & harbours				Industry					Housing & Infrastructure			
			Dry plain	Shoreline	Coral reefs & coastal habitats	Agriculture	Aquaculture	Landfill	Wells	Natural landscapes	Fishery ports	Coastal (trading) terminals	Jetties & Piers	Desalination plants close to the ports	Tourism	Offshore industries	Other	Transportation	Fishing	Residential building	Hotels & Restaurant	Shopping mall	Governmental offices
			\$@=					✓	✓	✓						\$ *			✓				
Housing and infrastructure	More buildings	\$@=						✓	✓	✓						\$ *				✓			
	More Hotels, Restaurant & Shopping mall	\$@= *						✓	✓	✓						\$ *				✓			

protect the coastal zones environment and sustainable use of resources. Secondly, development-based approach, which addresses socio-economic growth of coastal zones as an integral part of plan implementation, and last not least Integrated-based approach in plans and policy implementation, which emphasizes on continuous collaboration of beneficial and monitoring sectors (i.e. different groups of stakeholders).

Normally in developing the option matrix, four categories of management options have been considered: legislation, coastal land-use, environment and tourism development. Therefore possible measures should refer to the problems. As expressed in the matrix (Table 2), most of interactions are associated with “environmental legislation and mandatory EIA for coastal projects and any discharge in coastal environment”. In fact these management options engage more sectors and groups in long term and short term. The management options can have positive influence on coastal components and modify the responses from environmental NGOs, tourists, investors, etc.

Possible measures to mitigate Coastal-land use problems were suggested mainly in B and E labeled rows in Table 2 (some rows are sharing in more than one category). Changes in coastal land-use have different effects on stakeholders. For some groups the changes have positive effects and for some groups negative and also some groups are neutral to the changes. For example setback line is negative issues for investors, landowners and dealers. Because they have to miss some opportunities of constructions in coastal regions and sometimes they have to evacuate or repair constructed buildings. The other example is controlling any direct and indirect discharge (i.e. standard marine outfalls) through legislation and EIA studies whose consequences have positive influence on increasing coastal water quality and biodiversity in long term (suppose the situation of discharging wastewater or saline water without EIA study, preliminary purification and marine outfall diffusers). This management option helps the economy of fishermen and fishing cooperatives in long term. By increasing water quality, protecting coral reefs and natural habitats more tourists are willing to visit coastal regions of Kish Island.

Possible measures to mitigate environmental problems and legislations were suggested principally in C and A labeled rows in Table 2. Decreasing environmental problems is not only difficult but also very expensive. It should be noted environmental management needs legislation as a strong tool in authorities' hands. For instance allocation of a region in the south-east of the

island for a new “National Park” due to its unique and invaluable natural resources can have positive effects on attracting more tourists and create a basis for more job opportunities for employees related to aquatic entertainment. Implementation of the management option in collaboration with environmental protection NGOs and some groups of secondary stakeholders will lead to desirable results. The other example is “fishing restrictions in some regions” that in long term may protect marine resources and protect coral reefs, biodiversity and natural habitats but have slight negative influences on fishermen and fishing cooperatives in short term and long term. D and E labeled rows in Table 2 are management options to mitigate tourism dependent problems. For example “Creating green areas and landscapes along the coastline” can have effective influence on attracting more tourists and the consequence of more visitors in Kish Island is enhancing the livelihood of indigenous poor people.

In addition to the matrices some key issues and recommendations for improvement and obstacles were studied. The obstacles could jeopardize the success of the plan. The most important obstacles encountered in Kish's ICZM plan are: lack of vigorous legislation to support environmental standards, lack of strict EIA laws for any project and any discharge, lack of strong monitoring system, poor discretion of authorities to take environmental education in serious consideration, sanctions and limited international relations and lack of enough incentive among primary and secondary stakeholders to comprehend sustainable development.

Conclusion

This study encompassed a practical method for a small island where coastal problems are acute and there is no time in long-term research programme in order to obtain the perfect management solutions. The method developed for Kish's ICZM plan can permit the source of conflicts to be identified by decision makers. The matrices provided clear tools for understanding the components of Kish's coastal regions and management interventions. According to the results, most of the interactions belong to “coastal environment” and “tourism” and also many groups of primary stakeholders are involved by any change. The results of Option Matrix imply that “environmental legislation and mandatory EIA for any project and any discharge” and also “allocation of some regions to national park” interact with various components of the matrix and many primary stakeholders engage.

The most important obstacles to preserve environment in the island are legislation, lack of strict local environmental laws and immature vision of decision makers and stakeholders.

Acknowledgements

The authors are especially thankful to Dr. Phill Watson, principal coastal specialist in the NSW government's Office of Environment and Heritage, Canberra, Australia for his valuable comments to this study.

References

- Burbridge, P.R. (2004). A critical review of progress towards Integrated Coastal Management in Baltic sea region, coastline Reports 2. *In*: Scheme Ski, G., Loser, N. (Eds), Managing the Baltic Sea.
- Commission of the European Communities (COM 547 final) (2000). Communication from the commission to the council and the European parliament on Integrated Coastal Zone Management: A strategy for Europe.
- Drees, Sommer (2005). Final Report. Kish Island Destination Master Plan (Persian Garden in Persian Gulf), vol. 1.
- Dibajnia, M., Soltanpour, M., Vafai, F., Shoushtari, M. and A. Kebriaee (2012). A shoreline management plan for Iranian coastlines. *Ocean & Coastal Management*, **63**: 1-15.
- Le Tissier, M.D.A., Ireland, M., Hills, J.M., McGregor, J.A., Ramesh, R. and S. Hazra (Eds) (2003). A Trainers' Manual for Integrated Coastal Management Capacity Development. The University of Newcastle upon Tyne, Newcastle upon Tyne, UK.
- Naghsh Click Data Processing International Company (2006). Land use plan for islands of Hormozgan province. (Reported in Persian)
- Pak, A. and M. Farajzadeh (2007). Iran's integrated coastal management plan: Persian Gulf, Oman sea, and southern Caspian sea coastlines. *Ocean & Coastal Management*, **50**: 754-773.
- United Nations (1994). Barbados Programmer of Action, First Global Conference on the Sustainable Development of SIDS, Barbados.
- Woolcock, M. (1998). Social capital and economic development: Towards a theoretical synthesis and policy framework. *Theory and Society*, **27**: 151-208.