Journal of Agriculture and Environmental Sciences
June 2018, Vol. 7, No. 1, pp. 32-39
ISSN: 2334-2404 (Print), 2334-2412 (Online)

Published by American Research Institute for Policy Development
DOI: 10.15640/jaes.v7n1a4
URL: https://doi.org/10.15640/jaes.v7n1a4

# Stakeholder Views on Land Reclamation and Marine Environment in Doha, Qatar

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**Abstract**

Due to the ever-increasing necessity of dry land for agricultural, industrial, urban development or port expansions, some countries use land reclamation methods to gain land from sea. Land reclamation activities normally take place along the coastline and primarily affect coastal and marine habitats close to the shore. The aim of the study is to evaluate using literature, remote sensing data and participatory tools that promote a comprehensive examination of the perceptions held by key stakeholder groups, the effects of land reclamation on marine environment in Doha and develop a Doha marine shared conceptual model to mitigate the impacts of land reclamation. Critical analysis of the findings revealed the need for a strategic intervention. Accordingly, an action plan framework developed with the aim of preserving the marine environment. The framework is divided to three timescales- short, medium and long term- to easily map on to Government projects and long-term vision in a realistic and achievable manner. Although the number of participants limits this study, it reports for the first-time valuable information on the effects of land reclamation activities from the viewpoint of stakeholders that are involved in activities along the Doha coastal area.

**Keywords:** Land reclamation, Doha, Marine environment, Sustainable development, Action plan.

## 1. Introduction

Gaining land from water bodies, sea, coastal shores or wetlands is referred to as Land reclamation (Wang *et al.* 2014). Although land reclamation boosts rapid economic development, it has caused serious cumulative effects on the ecological environment in the Netherlands, North America (OSPAR Commission, 2008), Bahrain (Zainal *et al.* 2012), Singapore (Thiagaraiah *et al.* 2015), Malaysia (Yin and Kwang 2016) and Hong Kong (Chan *et al.* 2017). Land reclamation reduces species diversity, decline in the quality of inshore seawater quality, coastal morphology and tidal current speeds .Those who argue that land reclamation is a necessary development option are prompted by demand for housing, industrial sites and coastal resorts. This modern trend of land reclamation continues to grow to unimaginable proportions, because it is encouraged by new technologies related to the dredging industry.

The State of Qatar is a country in the Middle East, in West Asia. The Qatari Peninsula is in the North-Easterly coast of the Arabian Peninsula. It has a sole land border with Saudi Arabia to the south, with a coastline that extends about 900 km. The east coast is mostly sand, while the western and northern coasts are mostly rocky (Ministry of Environment, 2014, Richer, 2009).

In Qatar, modern dredging technologies have transformed land reclamation into a more economical and feasible solution to the problem of insufficient dry land. In the mind of the policy-makers, it is in fact a proactive answer to overpopulated and congested urban areas. The justification for this approach is that land reclamation can help conserve the coastline, as well as providing more land in parts of Qatar.

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The Qatar coastal area feature the presence of marine environment evidenced by fish and shrimp scattered in several areas along dozens of islands of coral reefs. This should be managed through a sustainable environmental development manner to safeguard the environment and maintain biodiversity. The aim of the study is to evaluate using literature, remote sensing data and participatory tools that promote a comprehensive examination of the perceptions held by key stakeholder group, the effects of land reclamation on marine environment in Doha and to develop a Doha Marine shared conceptual model to mitigate the impacts of land reclamation. A compelling impetus on the part of the researchers is to evaluate the corrective actions suggested by stakeholders in Qatar about these issues. In this paper, we propose an action policy framework based on views from stakeholders.

To the best of our knowledge, this is the first recent research project to evaluate the effects of land reclamation on Doha's marine environment. Proposed work identify critical knowledge gaps, help in future planning and coordinated management priority and resource allocation and provide recommendations on a shared conceptual model related to land reclamation acceptable to stakeholders.

## 2. Methods

Search engines and grey literature sources used to compile information available on land reclamation and marine environment, developed tools to use in the project and completed ethical application forms. At the early stage of the research, a field observation method planned to evaluate the current situation of the Doha coast. Two boat trips around Doha coastal areas conducted, one trip in winter and another in summer.

It is known that in case of poor or limited data from other sources, direct questioning of key stakeholders represent a useful and cost-effective approach capable of providing sufficient data on a subject. There was very limited information related to the project in Qatar. Researchers decided to use an approach to engage stakeholders quite early on at the start of the project. The use of open consultative approach with stakeholders from the start of the project was to ensure sustainability of product developed in the project.

Stakeholder mapping completed using a questionnaire sent to ministry of environment and municipality, ministry of defence, fishermen organizations and coast guards. A participatory workshop held in Doha where all stakeholders were invited and scoping exercises completed that helped identify six key primary and secondary stakeholder groups. Because of the need of having people who observed development changes during the period from the 1980 to present day, these groups selected using the following criteria:

(i) Having experience of more than 20 years in the marine environment.
(ii) Interested in marine environment issues.
(iii) Willing to participate in the project.

The six stakeholder groups are, table 1 below,

1- Navy Officers.
2- Active fishermen.
3- Non- Active fishermen.
4- Coast guards
5- Senior government officials from the ministry of municipality and environment and Public works authority.
6- Recreational staff.

Meetings held with representatives of the six stakeholder groups to help mobilize and identify subjects for the study. Piloting of tools used during key informal interviews and focus groups were shared with stakeholder representatives.

**Table 1. Distribution of the participants**

| | Stakeholder Groups | Number of Participants | % |
|---|---|---|---|
| 1 | Recreational staff | 18 | 8.6 |
| 2 | Government officers | 18 | 8.6 |
| 3 | Non-active fishermen | 84 | 40 |
| 4 | Active fishermen | 24 | 11.4 |
| 5 | Coast Guards | 30 | 14.3 |
| 6 | Navy Officers | 36 | 17.1 |
| | Total | 210 | 100.0 |

Table 1, above, shows that most of the participants are from the non-active fishermen group (40%) reflecting the popularity of fishing as a hobby among Qatari citizens. Recreational staff and Government officer were the smallest participant group (8.6%). Active fishermen, Coast Guards and Navy Officers consisted of 11.4%, 14.3% and 17.1%, respectively.

### 2.1. Focus Groups

Focus groups are widely used in health services and social science researches to obtain the opinions, beliefs or perspectives of people (Gill *et al.* 2008). Group discussions considered one of the most important data collecting methods in qualitative research. The main advantage of this method is the ability to collect a larger quantity of data in a short period from wide range of participants (Gill *et al.* 2008; Batarfi, 2012). Furthermore, it allows the researcher the ability to obtain the thoughts of a range of stakeholders in a thematic and effective manner (Dwyer *et al.* 2012).

Focus groups held where all stakeholder groups attended. Sixty participants from all stakeholder groups attended. Bringing together all stakeholder groups together was an opportunity for sharing experiences on the subject. The focus group was audio-recorded and transcribed. Five key questions addressed:

1- How human activity has changed the coastline of Doha.
2- The effects of land reclamation on the marine environment in Doha.
3- What should be done to reduce the effects of land reclamation on the marine environment in Doha.
4- The role of media and education to increase community awareness on the effects.
5. What individuals can do to help reduce the effects of land reclamation on the marine environment in Doha.

After reviewing all the focus group discussion transcripts, a comparison analysis method used to analyse data. This method enables the comparing of focus group data within a study and allows the correlation of data across these groups to find common themes, (Doody *et al.* 2013).

## 3. Results and Discussion

Since 1947 until the present time, aerial photos of Doha's metropolitan area illustrate how it has extended in all directions. In the early 1970's, projects to reclaim land from the sea were initiated to meet the need for urban expansion.

There has been a rapid evolution witnessed in Doha, Qatar's capital city, especially in terms of urban development. These aerial images, Figure 1 below, from the mid 40's until present day show how far Doha has developed. Evidently, the aerial images from the Centre of geographic information system (CGIS) in Qatar illustrate how there has been a massive land reclamation along Doha's coastline.

The following are some of Doha's mega-land reclamation projects, Figure 2, below:

(i) The Pearl Project: The Pearl Project is located on the northern side of Doha. It is described as a "unique and innovative mixed-use urban development", extending over 43 million square feet of land that has been developed and reclaimed from the sea (Udcqatar, 2016).
(ii) Lusail City: With the capacity to accommodate around 200,000 residents and consisting of four islands, this city covers 3800 ha of land reclaimed from the sea (Lusail City, 2016).
(iii) Hamad International Airport: Over 6.2 million cubic metres of waste material removed, purified and used as landfill for this massive project consisting of two runways measuring 4850 metres. The western runway is the eighth longest in the world (Doha airport, 2016).

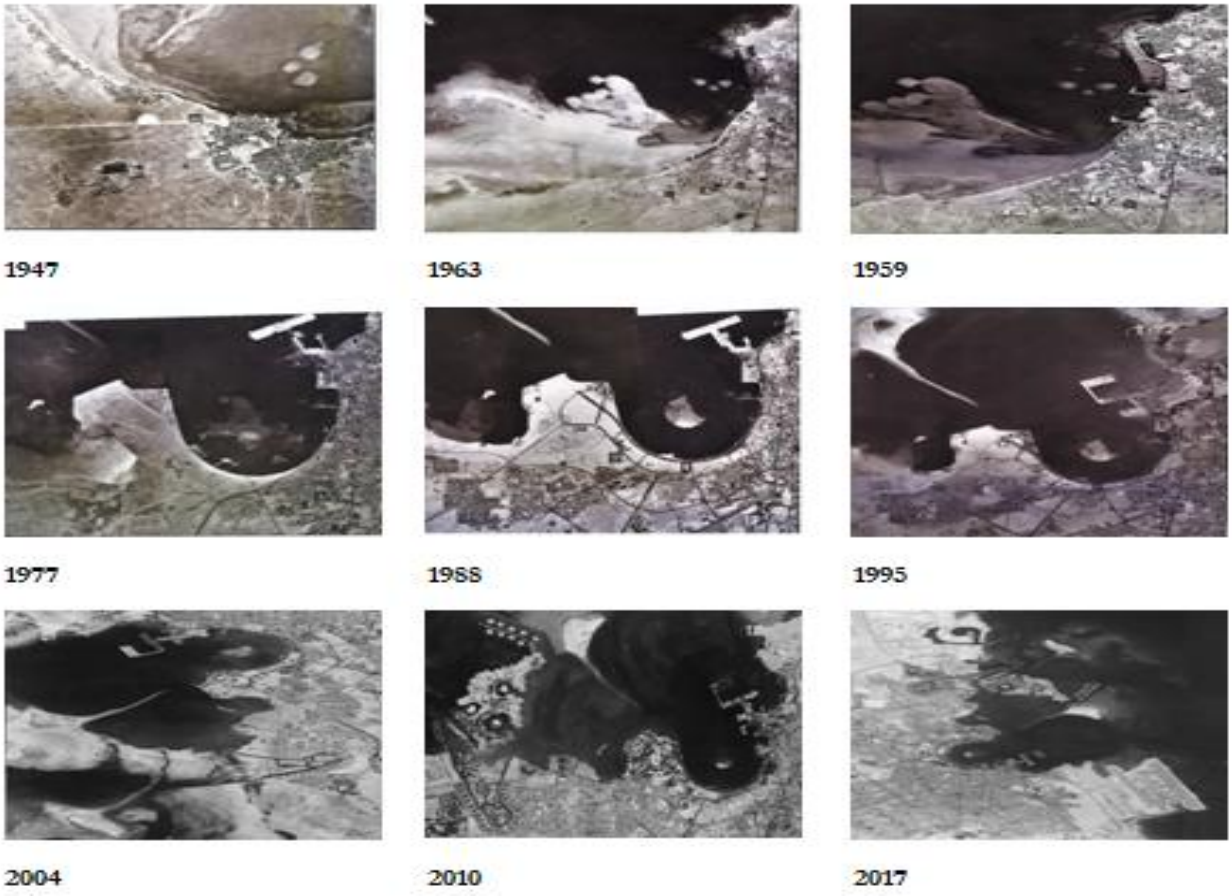


**Figure 1. Aerial images of Doha from 1947-2017 (Source: CGIS, 2016).**


**Figure 2. Map of Doha city (Geoportal.gisqatar.org.qa, 2016).**

Despite the conservational initiatives of the Qatar's Government through timely legislation, strict enforcement and widespread education programs, Qatar's reef remains vulnerable to human activity. However, if this potentially destructive human activity continues unabated, environmental disasters are likely to ensue with unimaginable consequences (Supreme Council for the Environment and Natural Reserves [SCENR] of Qatar, 2012).

### 3.2 How human activity has changed the coastline of Doha and the effects of land reclamation on the marine environment in Doha.

Discussions regarding these issues among stakeholders identified both positive and negative impacts. The positive aspects discussed were that human activities and land reclamation projects had contributed to an extraordinary evolution in the urbanization of Doha. It was suggested that there have been significant achievements as a result in urban and tourist developments along Doha coast. Some of the stakeholders felt that there is a noticeable concern from all governmental organizations regarding environmental sustainability, because of the intensive activities around the coastal areas. Participants appreciated the environmental protection laws that the government enacted although some stakeholders highlighted that there ought to be a more stricter application of these laws.

On the other hand, many stakeholders noted that there are many negative effects that have impacted on the coast of Doha. These effects include:

1. Land reclamation projects which started since early 1970's that have had a massive impact on altering the geographical outline of the city, which some stakeholder refer to as a 'complete transformation of the historical appearance and character of the city.
2. The effects on obstructing the natural flow of the sea currents. This obstruction causes the increase in silt, sediment and turbidity levels in the shores and coastline in, and adjacent to, reclaimed areas.
3. Closely linked to the above point, according to the stakeholders, was the effect of sedimentation on the coral reefs and fish grazing. Many of the stakeholders proposed that this process not only prevents the natural circulation of seawater but it also prevents oxygen and micronutrients, which are all essential and vital elements in marine life.
4. Both professional and non-professional fishermen indicated that they had observed a decrease in fish species. They highlighted, in particular, three fish species-stingrays, parrot fish and the greasy grouper. According to this group of stakeholders, this decline of fish is directly caused by human activities and projects along the coastal area. Furthermore, they pointed to the dramatic increase in the numbers of jelly fish along the eastern coastal area of Qatar, which they stated was due to a decrease in turtle numbers.
5. The potential dramatic increase in marine pollution.
6. An imbalance in the eco-system, which was referred to as a result of land reclamation activities. The issue of imbalance in the ecosystem was described as not only causing a decrease of water depth due to the increase of sediment, but also causing unpleasant odour in certain shores adjacent to land reclaimed areas
7. Human activities, combined with land reclamation projects, affected areas near the coast that were preferred breeding areas for some fish species and fertile pastures for other species. The stakeholders believed that this effect has led to the migration of fish from these areas.

### 3.3 What should be done to reduce the effects of land reclamation on the marine environment in Doha

Participants discussed this topic in depth, and their views and contributions identified proposals and recommendations for appropriate, practical and realistic solutions based on their own experiences.

Their ideas revolved around the following :

1. Thorough prior planning for coastal projects needed.
2. Environmental impact assessment completed for all coastal projects.
3. Form an advisory committee to investigate and provide solutions to existing effected areas.
4. Aim to have sustainable development as a main goal in all future projects.
5. Find a solution to return natural sea streams and currents in affected areas.
6. Conduct a feasibility study for the replantation of coral reefs in the affected areas.
7. Strictly enforce marine environment protection laws.
8. Increase the community awareness on marine environment pollution.

**3.4 The role of media and education to increase community awareness on the effects of land reclamation on marine environment.**

There was a consensus on the important roles the media and education play to raise societal awareness regarding the impact of land reclamation on marine environment.

With regards media or public information, there was almost unanimous agreement that this powerful means of influencing communities was not currently effectively. The stakeholders identified a number of reasons why this was so.

1. Lack of expertise around environmental issues resulted in sub-standards programs, a deficient or limited awareness-raising impact in most campaigns.

2. Most environment campaigns focus on the consequences of environmental pollution and not on its causes. This has led to the continuation of the main problem and over time it has become difficult to find radical solutions to address the problems.

3. Limited duration of public information campaigns, resulting in the rapid demise of its impact on the target groups in society.

4. Previous media campaigns focused only on certain media outlets, such as television and newspapers. The omission of other media outlets, including the powerful tool of social media, symposiums, festivals, etc., was highlighted by stakeholders

As for the topic on the role education plays in increasing the community's awareness, the stakeholders pointed to several strategies and methods that educational institutions can use.

However, the focus group discussion addressed environmental issue as a cohesive unit instead of just concentrating only on land reclamation problems. They considered the impacts of land reclamation on marine environment as just a part of the huge environmental problems faced by the country.

Stakeholders suggested the following various strategies for education to increase the environmental awareness and to assist in preserving and protecting the environment:

1. To include basic environment programs at community programs. This should address issues related to clean environment. The program to include community programs that address environment, hygiene and on how to care for the environment.

2. To introduce environment related courses as a compulsory subject in the curriculum at all levels in the education system, from primary to high school. Many stakeholders also suggested that the courses to be included as a module on all undergraduate university courses.

3. Intensification of awareness campaigns in schools and universities. These campaigns can be in the form of lectures, festivals and educational camps. These activities to focus on the importance of preserving and protecting the environment

4. Introduce environmental events in schools extra-curricular activities, thus enhancing pupils knowledge on the subject.

Education has the means to assist to change in general, and the role of environmental education as a scheme of reflection and influence in society, through which principles and new behaviours can be re-established. Environmental education can educate and raise awareness about environmental problems, so individuals will be a key of the solution not part of the problem (Da Silva et al., 2015).

**3.4 What individuals could do to help reduce the effects of land reclamation on marine environment in Doha.**

In the focus group discussions, stakeholders addressed the responsibility of everyone to contribute in reducing the potential impacts of land reclamation on marine environment. The participants mostly agreed that, every stakeholder group must do its level best regarding protecting marine environment and to mitigate the marine pollution level. This could be achieved through coordination, cooperation and periodic meetings of members of the same group to discuss marine environment problems. The meetings can identify potential risks and identify the best appropriate solutions that can help to address the problem and thus provide solutions or mechanisms to decision makers. Furthermore, these events /meetings will not only increase the environmental hazards awareness within each stakeholder group but will encourage all individuals in society to play their part in preserving the marine environment.
To form a consultative committee under the supervision of the council of Ministers, comprising representatives from all stakeholder's groups to assist in developing and finding a practical solution for the existing marine pollution problem and any future coastal projects.

The findings revealed the need for the development of an action plan framework regarding preserving marine environment. Accordingly, the findings from this study have informed the development of a proposed framework that incorporates the specific environmental needs of Doha and the state of Qatar. Focus group discussions data evaluated, with the help of published literature, to suggest an action plan framework regarding preserving marine environment. Meetings held with stakeholder groups to review the framework. Discussions and input from the stakeholder used to amend the framework. The framework, Figure 3, below is divided into three timescales- short, medium and long term-so it will be more realistic and achievable.

Furthermore, each timescale phase shall lead to an overall aim. In the short-term measures, increasing the community awareness is the desired aim. Environmental resources management is the main aim for the medium-term measures, while long term measures in parallel with all the previous phases, should lead to the environmental sustainability as a goal.

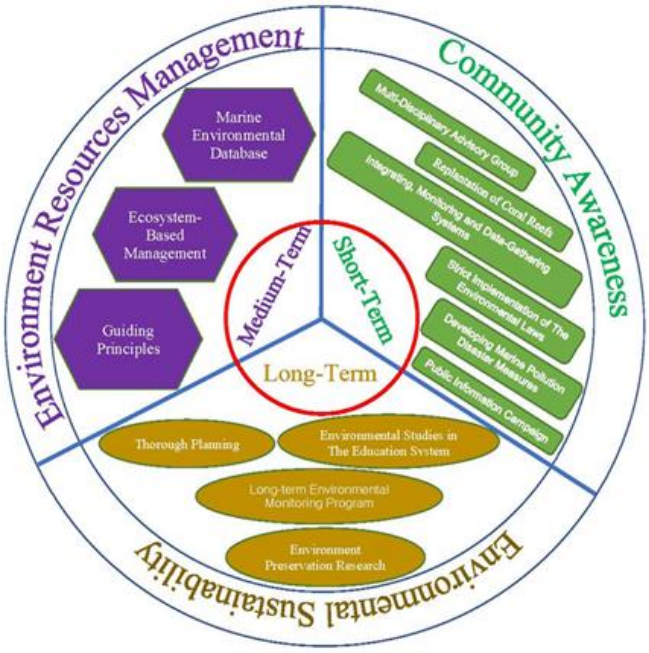


**Figure 3. Proposed Action Framework**

## 4. Conclusion

The impact of land reclamation on the coastal areas of Doha and state of Qatar have been evaluated. This study demonstrated that most stakeholders, who are directly linked to the activities of the coastal areas in Doha, believe that land reclamation has adverse effects on the local marine ecological environment. Furthermore, this study presents a comprehensive action plan framework for an environmentally sustainable development of the coastal areas in Doha.

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