LOCAL COMMUNITY KNOWLEDGE AS A TOOL TO EVALUATE LAND RECLAMATION ON THE DOHA COAST

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Abstract - Local community knowledge is characterized by the communities' traditional practices, which are dependent on the successful management of natural resources. Coastal communities have learned through the acquisition of generations of knowledge how to manage the marine environmental resources on which they depend in a sustainable manner. Worldwide there is an ever-increasing demand for land development both commercial and residential along coastal regions. In order to meet this demand, the land reclamation process creates land in sea areas. There has been a rapid evolution witnessed in Doha, Qatar's capital city, especially in terms of urban development. This reclamation has become one of the largest threats to the ecosystem. A holistic approach is necessary in order to ensure sustainable economic and social growth and prioritizes the preservation of the environment for future generations. The main purpose of the paper was to determine the local community knowledge among six stakeholder groups and their views on whether land reclamation has had an effect of increasing the threat of pollution on the marine environment in Doha costal area. The majority of stakeholders highlighted concerns regarding the issue of land reclamation and its impact on the environment along the Doha Costal area. The results from this study will help add important findings to the limited literature regarding the impact of land reclamation along Doha costal area

I. INTRODUCTION

Local community knowledge is defined as the cultural transmission of knowledge, practice and beliefs that govern peoples' interaction with each other and their environment (Iskandar, 2017). Milupi et al 2017 defines local ecological knowledge as being owned by indigenous communities and is intrinsically linked to the culture, traditions and norms of that particular community. It is characterised by the communities' traditional practices, which are dependent on the successful management of natural resources. As a result, a natural sustainable relationship develops between indigenous communities and the local environment.

The traditions and knowledge of local communities naturally incorporates information on species distribution, lifecycles, ecosystems and threats/trends (Telfer and Garde, 2006, Benham, 2017). Coastal communities have learned, through the acquisition of generations of knowledge, how to manage the marine environmental resources on which they depend in a sustainable manner to benefit the community in safeguarding future generations and the environment. This knowledge can be an invaluable resource which can significantly contribute towards research and provide explanations where there are gaps (Hill et al., 2012, Benham, 2017). Local communities increasingly play an essential role in guiding policy and legislation formation.

This involvement ensures the legitimacy and relevance of government initiatives and generates support and engagement within the community. Local and community knowledge can include both experiential (directly or socially learned) and values-based components (Benham, 2017).

Land reclamation

Worldwide there is an ever-increasing demand for land development both commercial and residential along coastal regions and to meet this demand the land reclamation process creates land in sea areas. Unfortunately, land reclamation comes at a great cost to the environment resulting in serious problems that are difficult and costly to reverse

Land reclamation has become one of the largest threats to the ecosystem of tidal marshes, particularly in Europe and Asia (Cui et al., 2016, Yang et al., 2018). Impacts include the immediate and severe damage of coastal ecosystems, geological disasters and the deterioration of marine environment quality. This includes loss and even extermination of mangrove forests (He et al., 2014, Wu et al., 2014), loss of ecosystem-service value (Wang et al., 2014, Liu et al., 2015), landscape fragmentation (Wang et al., 2014; Jiang et al., 2014), geological disaster incidents toxic emissions to the air and/or water, water pollution (Jiang et al., 2015), soil, sediment and groundwater pollution (Duan et al., 2016). These impacts continued further on the reclaimed land areas including the loss of habitat and biodiversity in coastal areas surrounding land reclamation projects (Duan et al., 2016, Yang et al., 2018).

Costal formations that provide a natural habitat and protective shielding barrier to coastal areas are also lost (such as mangroves, saltmarshes, seagrass beds and mudflats). Such habitats are irreplaceable, and whilst considerable global economic development has been achieved the subsequent loss environmentally and subsequent cost of dealing with these environmental issues mitigates any initial financial gain (Chee et al., 2017).

Land reclamation projects can be found in many parts of the world including the Palm resorts of Dubai,

construction of the new Hong Kong airport, artificial islands in the South China Sea and the development of "Baia de Luanda" in the capital city of Angola. Other examples include Flevoland, a province in the centre of the Netherlands, home to 400,000 inhabitants, which was created by draining lakes, and the construction of a contiguous Mumbai from a group of seven islands which has evolved into the second most populous coastal megacity in the world more than 21 million inhabitants (UNEP, 2014, Sengupta et al., 2018).

Moussavi and Aghaei, (2013) concluded that, the construction of reclaimed islands along the coasts of the Arabian (Persian) Gulf leads to an extraordinary pressure upon the marine environment, these impacts including increasing in salinity and temperature level, degradation of marine life and interruption in the natural flow of sea water.

The Gulf Cooperation Council (GCC) is a regional organisation established in 1981, comprising the countries located in the Arabian Gulf. These consist of Qatar, Bahrain, Oman, Saudi Arabia, the United Arab Emirates (UAE) and Kuwait (Meo et. al, 2016). Throughout the past two decades, the Gulf region has witnessed extensive dredging and land reclamation activities in coastal and marine areas. There is currently insufficient data concerning the impact of dredging and reclamation on the Gulf's marine ecosystems. Nevertheless, approximately 40% of the coastline in some Gulf countries is in the course of development, thus jeopardising the wildlife and biodiversity of habitats (Zainal et. al, 2012; Naser, 2014

II. THE STUDY AND METHODOLOGY

The study

The research methods for the study included focus group discussion, questionnaire, key informant interviews and field work. This paper will focus on questionnaire data and its findings.

The problem

The Qatar coastal area features the presence of marine environment and fisheries (fish and shrimp) scattered in several areas next to dozens of coral reefs islands (Ministry of Environment, 2014). This should be managed through appropriate sustainable environmental development in order to safeguard the environment and maintain biodiversity, especially if there are sensitive or fragile environments reefs such as coral or mangrove or fisheries.

Study area

In the preparation phase of the study, several meetings were held with stakeholders to identify the areas most affected, and there was almost unanimous that the coast between North of Hamad International Airport to the south of Pearl Project are the most vulnerable to the effects of land reclamation projects. During the meetings the piloting of study tools were completed, followed by fieldwork, figure 1 below, as well as planning for the panel discussions and the development of the questionnaire.

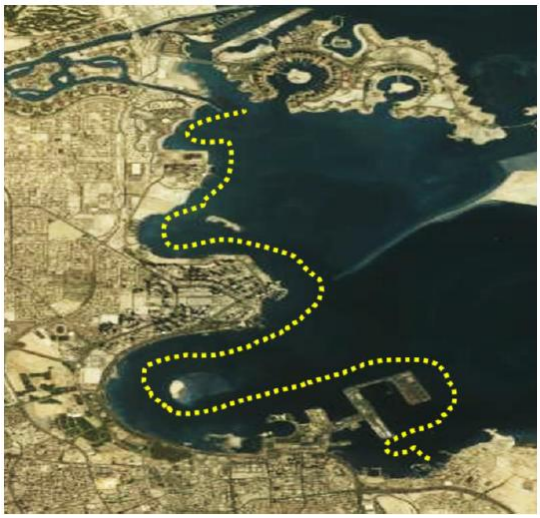


Figure 1 Fieldwork boat trip (CGIS. 2018)

Data collection phase 1

It is known that in case of poor or limited data from other sources, direct questioning of key stakeholders could represent a useful and cost-effective approach capable of providing sufficient data on subject (Creswell. 2013). There was very limited information related to this project in Qatar. The researcher decided to use an approach to engage stakeholders quite early on specify the number of months into the project. Furthermore, during this phase, the research methodology tools were reviewed, developed and piloted. The literature review indicated that gathering information to identify current and future risks related to land reclamation is best achieved by conducting interviews, questionnaire and focus groups with experienced stakeholders.

Research began by using search engines in order to compile existing research, information and grey literature sources on land reclamation and marine environment. Moreover, the changes in the Doha City coast have also been studied through the analysis of aerial imagery over a period of 70 years (1947-2017) (Al-Naimi et al., 2016), using the Geographic Information Systems Centre (CGIS) of the Ministry of the municipality and Environment of the State of Qatar. All this information was used as a basis to evaluate and decide upon the mixed methodology research tools and complete the research ethical application.

Gathering information of local community knowledge from stakeholders is a useful and cost-effective approach, which provides a wealth of indigenous experience and valuable information. This study will enrich the lack of, and limited literature regarding the impact of land reclamation along the Doha coastal area. In order to ensure sustainability of outcomes developed from the project, the researcher decided to

involve stakeholders from the onset. This open consultative approach with stakeholders engages the indigenous population and ensures the use of local community knowledge for continuity and validity of the project.

Ethical approval was obtained from Cardiff Metropolitan University and Qatar Scientific Club (QSC) agreed to host stakeholder meetings in Qatar.

At the early stage of the research a field observation method was planned to evaluate the current situation of the Doha coast. Two boat trips around Doha coastal areas were conducted, one trip in winter and summer, figure 2 below.

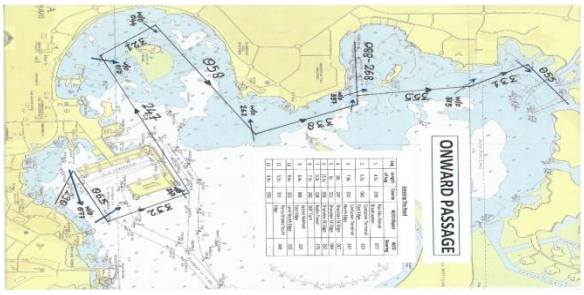


Figure 1 Field work chart, showing outline of Doha costal land and the boat trip course (Amended from personal communication, 2017).

From reviewed literature, the following six groups of stakeholders were involved in the project due to their direct connection to the marine environment:

1. Active fishermen. People who work in the profession of fishing mainly, as well as having a number of fishing boats.
2. Non-active fishermen. People who have a hobby of fishing constantly for 20-years or more.
3. Re-creational staff. People who work in places on the coast or the nature of their work had direct work contact with the related Doha coast.
4. Government officials associated with the marine environment projects with the government.
5. Coast guards.
6. Naval officers.

The stakeholder groups consist of male only participants. This is due to a number of factors, mainly that this study heavily focused on having long experience in maritime activities, and this experience is rarely available for women in Qatar due to several considerations of customs, traditions and cultural values in Qatari society.

Due to the need to reflect the changes along the coastline of Doha during the period from 1980 to the present day, it was necessary to select participants using a specific set of criteria:

1. A minimum of 20 years' experience in the sea environment.
2. An interest in marine environment issues.
3. Qatari citizens in order to gather local community knowledge as stakeholders are fully aware of the impact of land reclamation both environmentally and its possible secondary influence culturally.
4. Willingness to participate in the research study.

According to the requirement of 20 years' experience of working in the sea environment places the minimum age of participant at around 40 years of age, being born around mid-1970s, and a time frame of active working experience spanning from around 1995 to the time of commencing the study in 2015. Due to the nature of Qatari society and its constant influx of workers it is rare to find a non-Qatari citizen who has lived in Qatar for such a long period of time and with such specific experience within the marine environment.

A seminar gathering all stakeholders under one roof was planned. The aim of the seminar was threefold. Firstly, to raise the awareness amongst the relevant stakeholders of the impact of land reclamation on the marine environment. Secondly, to identify appropriate measures for averting the potential hazardous effects of land reclamation on marine environment in Doha's coastal areas and to seek stakeholder views on this. Finally, to gather the insights of relevant stakeholders in order to be able to recommend appropriate tools for mitigating the impact of land reclamation.

Data collection phase 2- Interviews and Focus groups

The interview is a very important tool to collect as much indigenous knowledge from stakeholders as possible. The interviews were divided into two sections: governmental interviews and non-government interviews.

Governmental interviews followed the protocol of the formal semi-structured interview techniques, where key themes were identified beforehand, and a set of questions prepared. This ensured consistency across interviews in order that responses could be prepared, and patterns identified. This technique does however allow a degree of flexibility for the researcher to follow discussion and include new information that is relevant to the research. On the other hand, non-government interviews used a combination of in-depth open-ended interviews and informal open-ended interviews, which took place in a slightly less formal setting, where participants felt more comfortable.

Focus groups are widely used in health services and social science research. Kaplowitz and Hoehn (2001) concluded in an in-depth study on the difference between focus group discussions and individual interviews that focus groups are more useful for reaching positive outcomes when discussing controversial issues. A similar method to that used in arranging the interviews was used to prepare and establish Focus group meetings. The meeting was established firstly by personal calls with the potential participant. After participant agreed to participate in the research the concept and the objectives of the research was clearly explained supported by the university ethical approval and a letter of introduction

from Qatar embassy in UK. Participant consent form was presented and approved by the participant. A list of open-ended questions was prepared in advance to present the discussing issues to the participant and meeting audio recorded. Date, time and duration of the interview was set. Each participant at a focus group signed a confidentiality declaration that responses will remain completely anonymous and that no reference to the names of participants will be kept on any records, and also that any audio recording of the interview will be destroyed once an anonymous transcript has been prepared. The focus group meetings took place at the Qatar scientific club (QSC). The conversation was transcribed in writing during the interview. Each focus group meeting and all interviewee's opinions and thoughts were typed in separate documents for each participant in MS Word format.:

III. RESULTS AND DISCUSSION

The State of Qatar is a small Arabian Peninsula located in the Arabian gulf in southwest Asia, its coastline extends 900 km approximately (Zogaris and Kallimanis, 2016). Since 1947 until the present, aerial photos of Doha's metropolitan area illustrate how it has extended in all directions, especially into the sea. These aerial photos, Figure 3, below from the mid 40's until present day show how far Doha has developed There has been a massive land reclamation along Doha's coastline (Rizzo, 2014, Alnaimi et al., 2016).

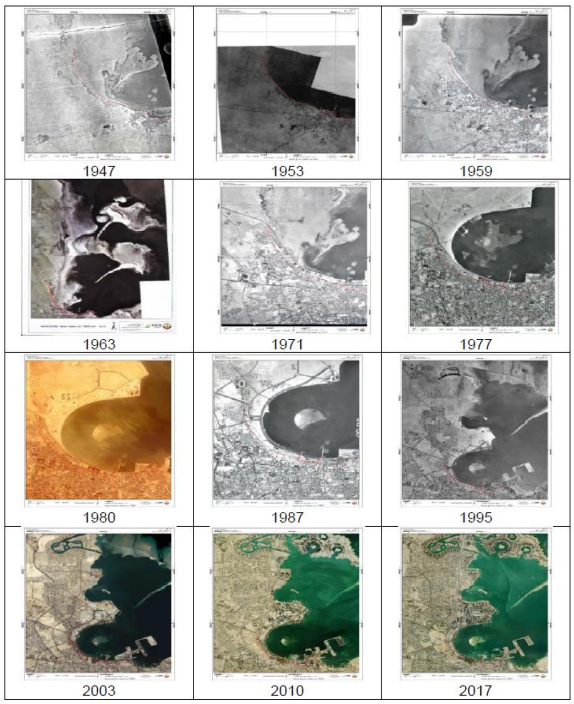


Figure 3: Aerial photos of Doha Coast from 1947-2017(SGIS2017)

A total of 210 participants representing the 6 stakeholders groups completed the questionnaire, table 1 below.

Table 1 Distribution of the participants

Stakeholders groups	Number of Participants	Percent
Recreational staff	18	8.6%
Government officer	18	8.6%
Non-active fishermen	84	40%
Active fishermen	24	11.4%
Coast Guard	30	14.3%
Navy	36	17.1%
Total	210	100.0

The table shows that most of the participants are from the non-active fishermen group (40%) which reflect 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 Guard and Navy consisted of (11.4%, 14.3%, 17.1%) respectively.

All the participants have more than 20 years or more of experience (Figure 4 below).The group of 20 years' experience had a higher percentage than other groups, with slightly more than half of participants (51.9%). The group of (21-25 years) has the lowest proportion of only (1.4%). A significant number of more experienced participants of over 36 years' experience, was represented by 20% of the whole sample. This group enriched the study with their wealth of indigenous knowledge and would have experienced the impact of environmental changes first hand.

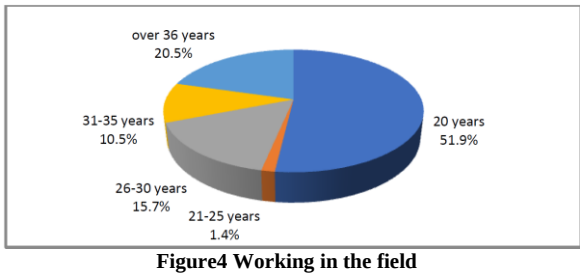


Figure4 Working in the field

Furthermore, almost half of participants in each stakeholder groups have at least 20 years of working experience in his field, which shows a significant accumulated experience (figure 5 below).

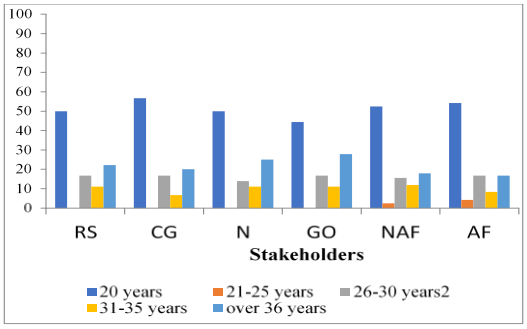


Figure 5 Working in the field for each stakeholder group

The largest proportion of the participant (58%) agree that the most abundant season for fish is winter. However, almost a quarter of the sample (24%) think it's in summer. On the other hand, only (18%) think it

is the same in both seasons. A large proportion (46%) of stakeholders (Figure 6 below) consider that near-shore waters are the most suitable habitat for fish, whereas more than third (34%) of them believe that it is the off-shore waters. Only 20% support the idea of in-shore waters as the most suitable habitat for fish.

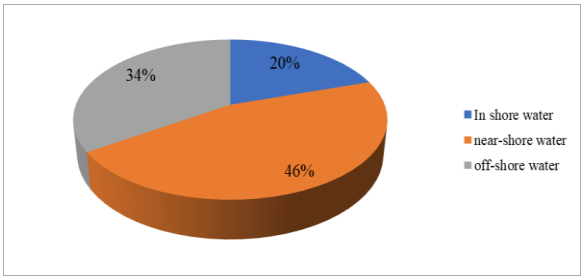


Figure 6 Fish most suitable habitat

With regard to human health in relation with sea water pollution, almost a third (31%) of participants regarded fish disease as the most harmful result of sea water pollution. This was followed by fish death as second most harmful result at 29%. Interestingly human skin reactions and unpleasant smells came joint third in the question results with an equal 20% each (Figure7 below).

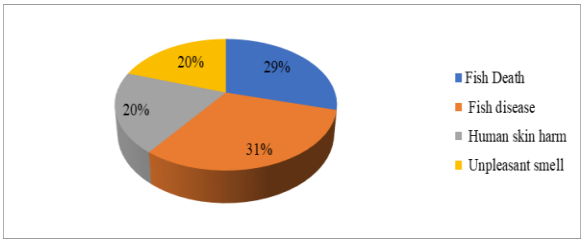


Figure 7 The health harm that can occur from sea water pollution

The topic relating to marine pollution was discussed. Over a third (37%) of participants believe the waters in the Doha costal area to be between 11-30% polluted. Just over a quarter (28%) of participants believed pollution levels to be higher, at between 51-70% polluted. A minority of participants (17%) regarded the waters as being less than 10% polluted. A similar proportion of 18% of participants believed it to be higher at the level of 31-50%.

In relation to the reasons behind the increasing rate of marine pollution, significantly, an overwhelming percentage of participants referred to the raise in marine pollution as being due to human activities (70%). Remaining participants regarded both humans and nature to be equally responsible (30%).

The results demonstrate the breadth of experience of stakeholders within their field. This is evident in their responses to enquiries on patters of fishing seasons and fish habitats. Martins et al. (2018), promotes the benefit of combining scientific and local ecological knowledge. In his study on the co-management of combining local fishers' and scientific ecological knowledge and found that fishermen showed a significant level of knowledge about the marine environment in the research area, They have determined the temporal distribution of the different fish species and also categorized them according to their presence and abundance during the different seasons of the year as well as the importance of each type in economic terms. This ecological knowledge of local fishermen will help not only to enrich scientific knowledge but also to develop future joint management plans. Medeiros adds that administrative cooperation between local knowledge and governments can be in the form of periodic meetings, formation of advisory councils, joint planning and research, joint management of protection and conservation of marine environment or fisheries.

Stakeholders' knowledge identified anthropological activities as the main source of the increase in pollution along the Doha coast. The effects of human activity and their subsequent impact on the marine environment is highlighted as an issue by a number of scientific researches. According to Benejamet al., (2016) the richness of major species and functional diversity dramatically decreases with land use modification. The presence/absence or abundance of these major species is negatively affected by the presence of these anthropological interventions on their environment. It is no secret that there has been a rapid growth in the rate of population around the world, and thus this increase has led to the need to expand industrial, urban and agricultural activities, which in turn generated large amounts of waste, leading to a gradual deterioration of natural resources. Aquatic ecosystems may be more susceptible to potential pollutants from these mentioned human activities, and indeed many studies have confirmed that there have been changes in the ecosystem that have resulted in a reduction in the number of fish (Bukola and Zaid, 2015).

Stakeholders were similarly knowledgeable on the topic of marine pollution, sharing information on a variety of possible sources of pollution, and its harm to human health.Haseenaet al (2017) determined comparable results in their study that found that the damage of plant and animal nutrition by sea pollutants directly effects human health. These water pollutants cause cross species contamination through seawater habitats and through the food chain. Water pollutants also increase in toxicity as they transfer through habitats and species as they become more concentrated, causing further harm to humans (Owa, 2013).

CONCLUSION

The study concludes that the local community knowledge of the stakeholders revealed invaluable indigenous information. The majority of stakeholders highlighted concerns regarding the issue of land reclamation and its impact on the environment along the Doha Costal area.

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