

**Linking Property Rights with Environmental Changes:
The case of Nurerri and Jubho Lagoons, Pakistan**

**by
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Author's Declaration

“I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners. I understand that my thesis may be made electronically available to the public.”

Abstract

Coastal lagoons play a vital role in supporting human well-being and the conservation of unique biological resources. They are crucial for the protection of the coastline from extreme events like floods, and for providing diverse livelihood opportunities to people. However, coastal lagoons face a range of threats from multiple drivers at local, regional and global scales, and those drivers are both anthropogenic and climatic in nature.

In this thesis, I use a commons approach to examine changes in property rights regime in the Nurerri and Jubho lagoons of Pakistan to better understand their linkages with processes of environmental change. Both Nurerri and Jubho Lagoons are designated Ramsar sites in the Indus delta of Pakistan, which is the world's fifth largest delta system. The entire region, which includes a number of other important wetlands, has undergone serious degradation over the past three decades. This research considers the history of changes in the property rights regime in relation to the processes of environmental change. My main focus is to understand the extent to which environmental changes (i.e. reduced fresh water flow, recurrent floods, industrial pollution, and sea inundation) and changes in property rights (i.e. state property, communal property, partially open access, individual / private control) influence each other in times of uncertainty and how these changes affect the local communities. I also focus on the key drivers that influence these changes. I use a qualitative approach that offers a direction to my research and participatory methods for data collection. Findings indicate that there is a two-way feedback between environmental changes in the two lagoons and the system of property rights that shifted from a commons arrangement (mid 1970s) to being privately owned and then to a contractor system (1980s onward) before coming back to a commons arrangement in 2008. However, loss in the key physical and environmental features of the lagoons raises fundamental questions about sustaining

/ re-establishing commons even though policies are in place. I conclude with suggestions on sustaining lagoon commons for the future through crafting innovative governance arrangements that combine dynamic processes of change both in the physical and social spheres.

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Dedication

I dedicate this thesis to my parents. I hope that this achievement will complete the dream that they had for me all those years ago when they chose to give me the best education

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CHAPTER 1: INTRODUCTION

1.1 Problem Context

A coastal lagoon is a shallow water body which is separated from the ocean through a barrier, connected irregularly to the ocean by one or more restricted inlets (Kjerfve 1994). Coastal lagoons support many natural services having high societal value, like fisheries productivity, storm protection, and tourism (Anthony et al. 2009). Coastal lagoons are considered highly productive ecosystems as they provide supporting habitats for aquatic life, like salt marshes, sea grasses and mangroves (Anthony et al. 2009). There are many societal values also associated with the lagoons. For example, some lagoons are a source of livelihoods, and people use lagoons to fulfil their basic needs. For some people, lagoons are not just a source of water, fish and livelihood but also a source of cultural and inspirational values that help create a sense of place (Anthony et al. 2009; Nayak 2011).

“Environmental change is defined as a change or disturbance of the environment caused by human influences or natural ecological processes. Environmental change can include any number of things, including natural disasters, human interference, or animal interaction” (Johnson et al. 1997). These changes may be categorised as external or internal changes, affect both human and ecological system. In ecological system of lagoons changes happen sometimes because of human factors and sometimes because of natural factors. Environmental change also depends upon the level and nature of interaction between human beings and ecological systems, and the level of intensity of interaction may vary from region to region and in different ecosystems. Many authors have explained this interaction in number of ways. Some have explained it as an interaction between human being and biophysical system, where both affect each other (Nayak and Berkes 2011). Addressing the effect of changes on human being without understanding the

dynamics of ecosystem is not enough (Nayak and Brekes 2011). Understanding the social aspect (i.e. cultural values and traditions) is also equally important before looking into the effect of social aspects on natural ecosystem.

The ecological system of lagoons (i.e. lagoon ecosystems and human well-being) are directly or indirectly related to each other (MEA 2005). Figure 1.1 shows how direct and indirect drivers of change are linked with human well-being and ecosystem services, where drivers are defined as any natural or anthropogenic factor that directly or indirectly causes a change in the environment (MEA 2005). The Millennium ecosystem Assessment (2005) conceptual framework (Figure 1.1) highlights that any change in the indirect drivers like population, culture, or socio-political structure, can lead to changes in the direct drivers like catching fish and food production, and both can affect an ecosystem (MEA 2005). Property rights systems can be taken as one of these direct drivers of change, which influence the management of lagoon systems and can potentially cause several environmental changes. For example, the availability of fresh water flow and commercial fishing activities are some of the direct drivers of environmental change that cause change in the ecosystem of lagoons. These drivers of environmental change also are influenced by the property rights system in the lagoon. Property rights systems influence the extent to which natural resources can be exploited by determining the access of people to those resources.

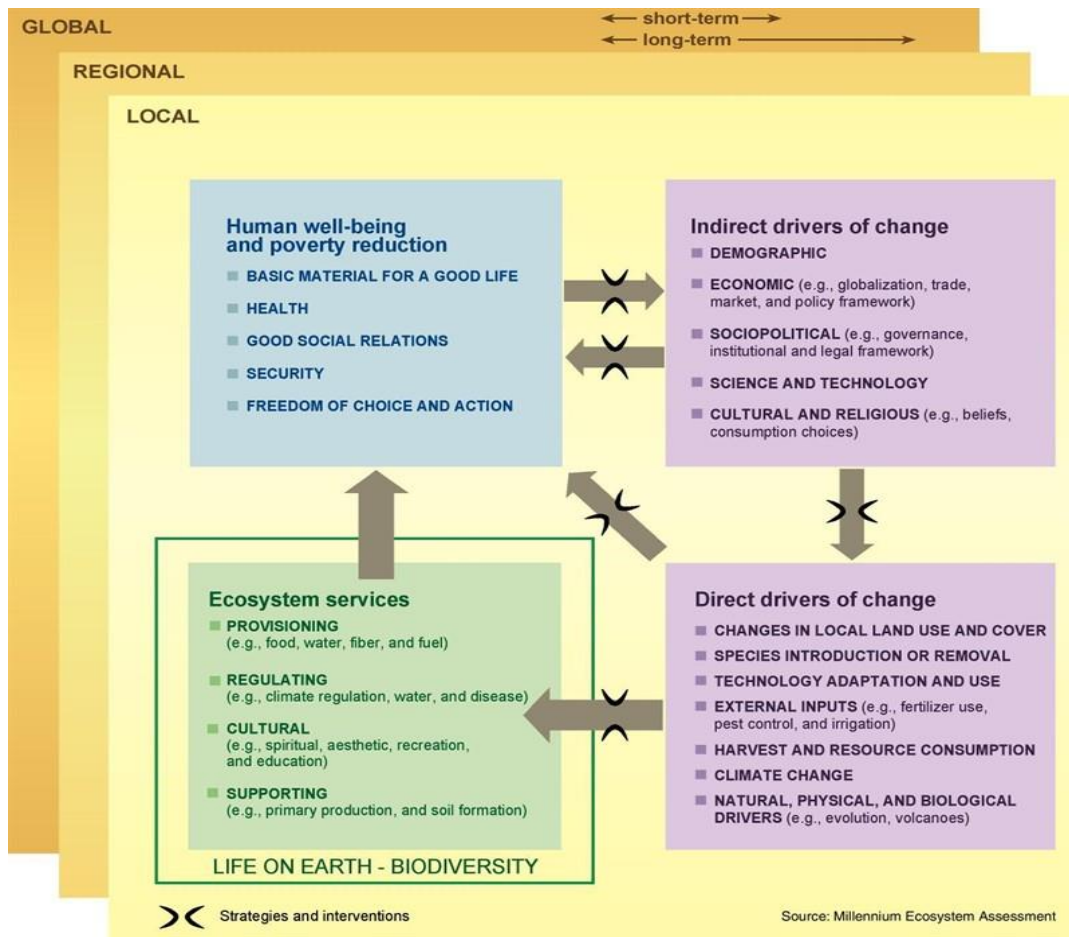


Figure 1.1: Millennium Ecosystem Assessment Conceptual Framework (Source: MEA 2005)

Both direct and indirect drivers of change needs to be studied from an historical perspective to see how, with the passage of time, new drivers emerge and impact the environment and human well-being. However, in this thesis, I will only be dealing with the direct drivers of change in relation to property rights systems and environmental changes. I analyse the history of change in the property rights systems and its linkages with changes in the environment. An historical perspective is important for two reasons: i) change is not constant, which means change may happen or may not happen in a certain period of time and ii) change is not consistent, which means the nature of change may vary from time to time and through space. Another reason to study the

history of change is that: i) local rules of interaction change between different factors influencing each other, as the system evolves and develops; ii) historical information is important to understand the current environmental changes in ecological systems like lagoons; and iii) there are some key disturbances (for example, natural disasters) which are important elements of current ecosystems but they might not occur for many years (Szabo 2010).

Within the property rights systems, commons are described as resources which share two characteristics a) exclusion problem where control of potential user is difficult and b) subtraction problem where each user is subtracting from the welfare of other users. (Berkes 1989), (Feeny et al. 1990). Environmental changes in the commons take place due to multiple factors (i.e. human, natural and combination of both). Nayak & Berkes (2011) use commonisation and decommonisation to explain how different environmental changes and other factors affect lagoons commons.

Nurerri and Jubho lagoons can be seen as commons, where factors like environmental changes, human interaction and property rights system are interconnected in a complex way. In the case of Nurerri and Jubho lagoon, dynamic property rights systems and other human interventions, as well as natural disasters, have led to the significant environmental changes in commons system. This research examines the history of environmental change and property right system as consequences of two different set of drivers of change in Nurerri and Jubho lagoon over the last three to four decades (see section 1.2). My research also examines the linkages between these two different set of drivers and why is it important to consider both set of drivers while making policies and planning to protect commons. In case of Nurerri and Jubho lagoons a historical perspective is needed to understand how different components like property rights system and environmental changes are linked, and are shaping the future of the lagoon.

1.1.1 Environmental changes in Nurerri and Jubho lagoons

Environmental changes have played a key role in degrading the commons in the Indus Delta of Pakistan. Nurerri and Jubho lagoons are the classic examples of degradation caused by environmental changes. Nurerri and Jubho lagoons, a primary threat is reduced fresh water flow. During the 20th century, a complex and unchecked irrigation and canal infrastructure was built which has caused gradual reduction in fresh water flow in to the Indus Delta, affecting the ecosystems of the two lagoons and many other lakes in the coastal area of Sindh (Nasir and Akbar 2012). Natural disasters like floods and cyclones have worsened the situation over time (Nasir and Akbar 2012) and have exacerbated the threat of ecosystem degradation in two lagoons.

Cyclones also have a long history in Pakistan. Cyclones of 1999 and 2007 destroyed a major portion of the Indus Delta in Sindh. Unfortunately, the effect of both cyclone and resulting floods was exacerbated by poorly planned infrastructure like the Left Bank Outfall Drain (LBOD) (Memon 2011). The LBOD has acted as a barrier to the natural flow of rain water to the Rann of Kuch (Memon 2011). Floods and cyclones have caused many breaches in the LBOD, and have caused flooding in many districts of Sindh. Another major factor responsible for the degradation of lagoons is oil exploration activity and sugar mills. Environmental impact from these activities include pollution in the canals and drains which are main source of water for both the lagoons.

1.1.2 Property rights systems in case of Nurerri and Jubho lagoons

Ostrom and Schlager (1996) have explained property rights system as a bundle of rights with five different levels, which includes: (i) access, i.e., who can enter an area, (ii) withdrawal, i.e., who can use the resources, (iii) management, i.e., who can manage or regulate the resource, (iv) exclusion, i.e., who have rights of access and transfer and alienation (v) alienation, i.e., who has rights to sell or lease the resources or rights of exclusion (See section 2.2.1). Some authors

have used property rights theory to analyze conflicts in managing the resources among different user groups (e.g. owners, users etc) (Yandle 2007). Conflicts are mostly related to the distribution of property rights / bundle of rights between different users (Yandle 2007). In any property rights regime conflict often arises where there is a gap in the property rights distribution or bundle of rights distribution under any property rights regime (Wilson 2006; Young 2002; Yandle 2007).

For my research I have used Ostrom and Schalger's (1996) property rights framework which outlines both bundle of rights (explained above) and the holder of rights, which might be the state or the individual. Nurerrri and Jubho lagoon have gone through different stages of property rights systems where they were privately owned, but at the same time they were managed under the arrangement of a license system, contract system and back to a license system again. Under each property rights system both the lagoons and their communities have faced different type of challenges that are the focus of the research.

1.2 Purpose and objectives of the research

The purpose of my research is to examine the linkages between key environmental changes (e.g., reduced fresh water flow, natural disasters) and property rights system changes (e.g., license system, contract system in the Indus Delta of Pakistan) with particular attention to the Nurerrri and Jubhoo lagoons. In particular, I examine here the impact of changes on fisher and non-fisher lagoon communities. Several research objectives guide my research. My first objective is to examine the history of change, including change both in the environment and property rights system shifting from informal system of managing the lagoons towards more formal arrangement of managing the lagoons. The focus of my second objective is to access the different drivers causing change in environment including natural factors (i.e. floods, cyclones) and human factors (i.e. pollution). The second objective will also focus on drivers of change that have altered property rights systems

in lagoons such as the license system that was established to manage different wetlands in Sindh during late 70s. My third objective is to examine the linkages between these two different sets of drivers (i.e. environmental change and property rights changes) and highlight why is it important to consider both different sets of driver simultaneously.

All three objectives consider the effect of change on lagoon communities and how individuals in those communities have coped and adapted with the changing environment or changing property rights system.

1.3 Study area

1.3.1 Indus Delta

The Indus Delta is the world's fifth largest delta system, covers an area of 41,440km², and meets the sea after approximately 210 kilometers (WWF 2015). The fan-shaped Indus delta consists of creeks, estuaries, mud, sand, salt flats, mangrove habitat, marshes, sea bays, and straits and rocky shores (Government of Pakistan et al. 2000). It has 129,000 hectares of mangrove, mostly *Avicenna marina*, comprising 97% of the total mangrove area in the country. The Indus Delta also supports the 7th largest mangrove forest in the world (WWF 2015). Accordingly, the Indus delta was declared as a priority ecoregion by WWF in its global "200 initiative" (World Bank 2005).

Within the Indus Delta, there are hundreds of lakes and lagoons in Thatts and Badin districts. These lakes are major sources of livelihood for many fishermen. In addition to fishing, local communities depend on lakes and lagoons for livestock rearing and agriculture. A large number of communities also earn their livelihood by making grass (Pann) mats and other grass products. Deh Akro, Nurerri, Jubho, Rann of Kuch and Indus Dolphin Reserve are located on the

left bank of Indus (SIDA 2012). All of them have unique biodiversity and home for many migratory birds (SIDA 2012).

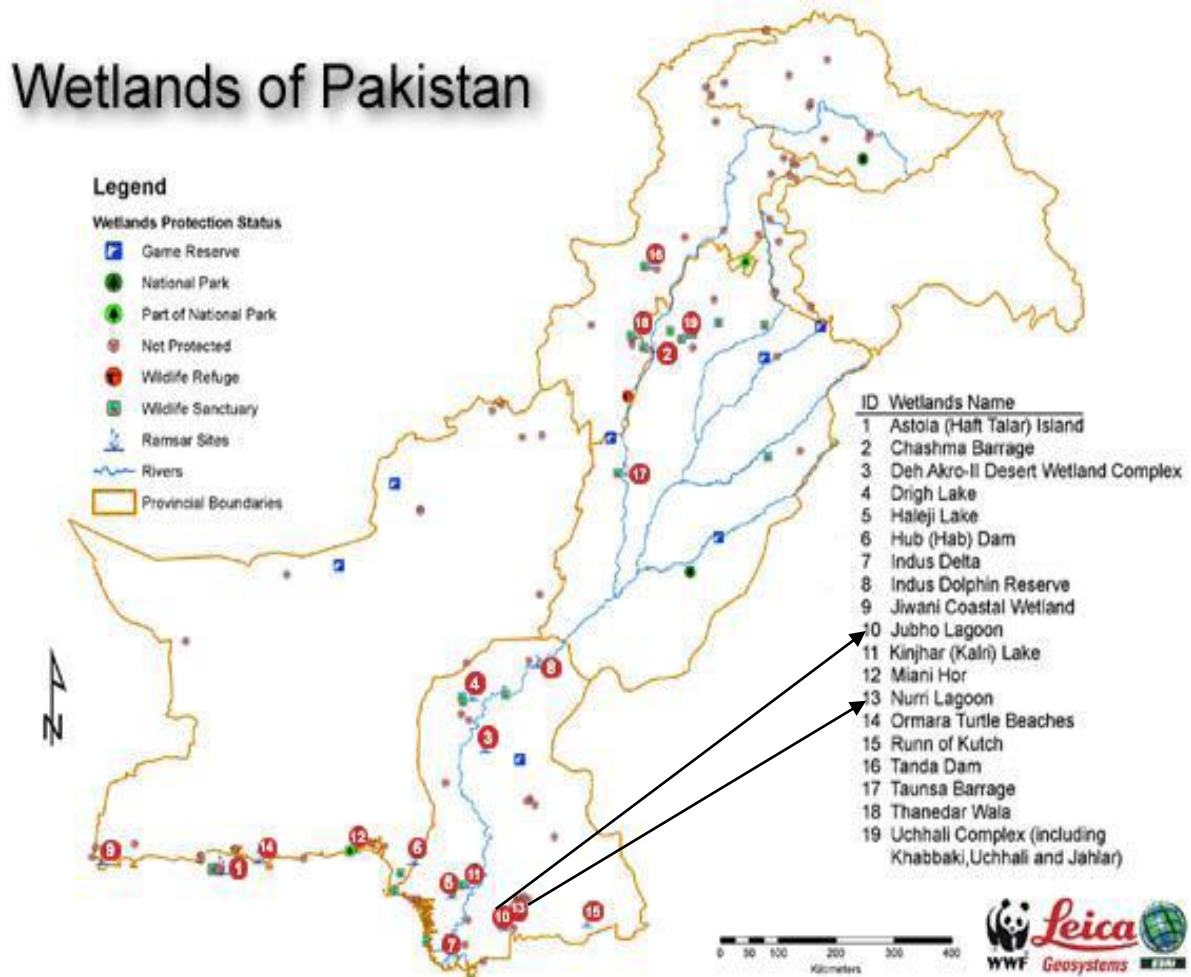
Indus delta, in general, and Nurerri and Jubho lagoons, in particular, came under serious threat of degradation because of different drivers of environmental change (eg, reduction of water flow to downstream Kotri barrage). These drivers are explained in detail in chapter 3 (See section 3.2.2).

1.3.2 Lagoon Complex

In my research, I selected two lagoons in the District of Badin, which includes Jubho and Nurerri lagoon. Both Nurerri and Jubho lagoons are a part of a lagoon complex which has two more lagoons, Pateji and Cholri. Both Nurerri and Jubho lagoons are shallow, brackish with barren mudflats, and located at coordinates 24°26'39.14"N, 68°40'3.91"E and 24° 20 N, 068°40'E (United Energy Pakistan Ltd 2012). Nurerri lagoon covers an area of approximately 4,100 hectares and Jubhoo lagoon has a total area of 700 hectares. The lagoon complex is home to several migratory birds.

According to the Ramsar Pakistan website, Nurerri lagoon is the major source of livelihood for 3000 to 4000 people in 50 to 60 surrounding villages. Fishermen have earned their livelihood using sustainable fishing methods since centuries. Over the last few years due to reduced flow of fresh water, changes in weather patterns, and illegal activities like over fishing, many communities have either migrated or changed their source of livelihood (see section 5.2). Bird species found in Nurerri lagoon are storks, snipes, ducks and gulls. Jubho lagoon is a unique example of natural lagoon. Local communities of Jubhoo lagoon mainly use Jubho for fishing and livestock grazing. Jubho lagoon is also famous for wintering birds like Greater and Lesser Flamingo and Dalamatian Pelican (further detail can be seen in the chapter 4: Environmental Changes). A World Bank (2005)

report also confirms that both the lagoons are threatened by hunting, over population, reduced fresh water flow, industrial pollution, construction of tidal link (Left Bank Outfall Drain) and natural disasters like floods.



Map 1.1 Ramsar Sites in Pakistan (Source: UNDP Forests & Biodiversity Information/Data Report)

Figure 1.2 shows the location of all Ramsar sites in Pakistan, including Jubho and Nurerri (Nurri) lagoon (Number 10 and 13 respectively).

1.3.3 Ramsar Convention

The Ramsar Convention is a global environment treaty adopted in Iran in the city of Ramsar in 1971 (Matthews 1993). It is an intergovernmental treaty which provides a framework for national actions and international cooperation for the use and conservation of wetlands (Matthews 1993). In total, 19 sites in Pakistan have been declared as Ramsar sites because of their unique profile and biodiversity. In 2003, the Indus delta, along with Rann of Kutch and Deh Akro, were designated as Ramsar wetlands of international importance. All of these are situated in the province of Sindh, Pakistan. Nurerri and Jubho lagoon were also declared as Ramsar sites in 2001. As a signatory to “The Convention on Wetlands of International Importance, Ramsar 1971”, the main obligations of contracting parties regarding wetlands to the convention are (Dugan 1990):

- To designate appropriate wetlands to the List of Wetlands of International Importance.
- To formulate and implement planning so as to promote wise use of wetlands, to produce an EIA before transformations of wetlands, and to run national wetland inventories.
- To establish nature reserves on wetlands and provide adequately for their wardening and through management to increase waterfowl populations on appropriate wetlands.
- To train personnel competent in wetland research, management and wardening.
- To promote conservation of wetlands by combining far-sighted national policies with coordinated international action, to consult with other contracting parties about implementing obligations arising from the Convention, especially about shared wetlands and water system.
- To promote wetland conservation concerns with development aid agencies.
- To encourage research and exchange of data on wetlands.

Detail of these 19 Ramsar sites in Pakistan is outlined in table 1.1:

Table 1.1: List of Ramsar Wetland sites in Pakistan

S. #	Site Code	Site name	District	Province
1	2PK009	Astola (Haft Talar) Island	Makran	Balochistan
2	2PK002	Chashma Barrage	Mianwali District	Punjab
3	2PK017	Deh Akro-II Desert Wetland Complex	Nawabshah	Sindh
4	2PK007	Drigh Lake	Larkana	Sindh
5	2PK008	Haleji Lake	Thatta	Sindh
6	2PK010	Hub Dam	Karachi & Lasbella	Sindh, Balochistan
7	2PK018	Indus Delta	Thatta	Sindh
8	2PK011	Indus Dolphin Reserve	Sukkar & Kashmore	Sindh
9	2PK012	Jiwani Coastal Wetland	Makran	Balochistan
10	2PK013	Jubho Lagoon	Badin District	Sindh
11	2PK006	Kinjhar (Kalri) Lake	Thatta District	Sindh
12	2PK014	Miani Hor	Lasbella	Balochistan
13	2PK015	Nurerri Lagoon	Badin District	Sindh
14	2PK016	Ormara Turtle Beaches	Makran	Balochistan
15	2PK019	Runn of Kutch	Tharparkar	Sindh
16	2PK004	Tanda Dam	Kohat District	Khyber Pukhtonkhaw
17	2PK003	Taunsa Barrage	Muzaffargarh District	Punjab
18	2PK001	Thanedar Wala	Bannu District	Khyber Pukhtonkhaw
19	2PK005	Uchhali Complex	Khushab District	Punjab

Sources: Wikipedia

Some of the ecosystems of Pakistan that are critically threatened by different anthropogenic and natural disasters are shown in the table 1.2. Indus Delta is one of them and some of these threats include reduction in fresh water flow, cutting of mangroves, heavy rains causing floods and industrial pollutions.

Table 1.2: Critically Threatened Ecosystems in Pakistan

Sr . #	Ecosystem	Characteristics	Significance	Threats
1	Indus delta and coastal wetlands	Extensive mangroves and mudflats, inadequate protected area coverage	Rich avian and marine fauna diverse mangrove habitat; marine turtle habitat	Reduced freshwater flow from diversions upstream; cutting mangroves for fuelwood; drainage of coastal wetlands
2	Indus river and wetlands	Extensive wetlands	Migratory flyway of global importance; habitat for Indus river dolphin	Water diversion/drainage; agricultural intensification; toxic pollutants
3	Chagai desert	A desert of great antiquity	Many endemic and unique species	Proposed mining; hunting parties from the Gulf
4	Balochistan juniper forest	Huge and ancient junipers	Largest remaining juniper forest in the world; unique flora and fauna	Fuelwood cutting & overgrazing habitat fragmentation
5	Chilghoza forest (Suleiman Range)	Rock outcrops with shallow mountain soils	Important wildlife habitat for several species at risk	Fuelwood cutting & overgrazing; illegal hunting
6	Balochistan subtropical forests	Mid-altitude forests with sparse canopy but rich associated flora	Very few areas now remain Important wildlife habitat	Fuelwood cutting & overgrazing
7	Balochistan rivers	Not connected with the Indus River System	Unique aquatic fauna and flora with high levels of endemism	Water diversion/drainage; overfishing
8	Tropical deciduous forests	Extend from the Margalla Hills NP east to Azad Kashmir	Perhaps the most floristically rich ecosystems of Pakistan	Fuelwood cutting & overgrazing
9	Moist and dry temperate Himalayan forests	Important forest tracts now becoming increasingly fragmented	Global hotspot for avian diversity; important wildlife habitat	Commercial logging; fuelwood cutting & overgrazing
10	Trans-Himalayan alps and plateaux	Spectacular mountain scenery	Unique flora and fauna; center of endemism	Fuelwood cutting & overgrazing; illegal hunting; unregulated tourism; habitat fragmentation

Source: *Biodiversity Action Plan for Pakistan (GOP et al. 2000)*

1.4 Research Design

I have used a qualitative case study approach for my research (See Yin 2009). Qualitative approach covers wide range of fields like public health, education, industry, public policy, community studies, business, social studies, etc. (Yin 2009). According to Yin (2013), the use of qualitative case study approach is ideal in three situations: 1) whenever there are questions like “why” and “how” in the research; 2) situation where the researcher has limited control over behavioural events; and 3) when the focus of study is related to the present situation or in the real-world context.

In the case of Nurerri and Jubho lagoon, all of these conditions exist and justify my use of case study approach. The focus of my research is to examine how property rights systems and environmental changes have degraded both lagoons, examine the current situation of the lagoons and their communities, and consider how poor governance and management have aggravated the situation in both lagoons.

However, it is important to be aware of some of the limitations of a case study approach. For example, some suggest that a case study approach is a preliminary research method which is only appropriate for the exploratory phase of research. Similarly, some believe that case study approach provides little basis for scientific generalization, it takes too long, and that results are massive (Yin 2009; Daughtery 2009). However, if the case study research is conducted carefully, the approach can be used as a basis for exploratory, descriptive and explanatory research (Yin 2013).

There are five main concerns highlighted by Yin (2013), which should be properly addressed while conducting case study research:

- 1) Conducting the research thoroughly: This implies that a systematic and comprehensive research is very important to gather data on all aspects of the issue. I addressed this concern by using multiple data collection techniques (e.g., semi-structured interviews, observations) in addition to a case study method.
- 2) Avoiding confusions with teaching cases: For example, for teaching one does not have to be accurate in terms of results as case study is used only for the discussion purpose in the class. But for research information collection has to be accurate, complete and detailed. In my research context, both the lagoons have not been researched separately in detail. So while collecting information about Nurerri and Jubhoo lagoons it has to be accurate, detailed and explanatory as its not being used for teaching purpose but for research.
- 3) How to arrive at general conclusion where desired: Another challenge associated with case study research is that results cannot be generalized. However, in my research, I am not attempting to generalize because findings about the two lagoons have specific relevance to the case study context and can contribute to better their management. While I recognise that results from this study may not be generalised, it is important to note that the same results are useful in drawing comparisons with other lagoons that are undergoing similar changes.
- 4) Managing the level of effort: Case studies are time demanding and require attention to details. It is important to properly manage time in the field to get results using case study method. I was able to address this challenge by spending four months in the field which allowed me to dedicate enough time not only to complete the case studies but also to implement other data collection methods. Spending time in the field was also

important to observe changes, understanding people's behaviour, cultures and traditions in relation to the two lagoons.

- 5) Understanding the comparative advantage of case study research: For example, my research has historical component in it. Case study research is helpful to collect historical explanation of the changes happened in the two lagoons and link that information to the current processes of change.

Qualitative research aims to undertake the collection of data in the field where the problem of interest exists, by directly talking to the people most connected to the problem or situation of interest and by observing their behaviour or interviewing the participants with the overall scope of the research (Creswell 2012). My research uses a qualitative approach as I seek to examine human behaviour (i.e. property rights) and the historic changes they have experienced (i.e., environmental changes). Qualitative research is also helpful in order to focus on the opinions of local people, their lived, experience, and the ways in which participants in the study address the problem (Creswell 2012). According to Creswell (2012), sometimes it is important to study people within the area they are living in, as they cannot be separated from each other. In many cases qualitative research is used because quantitative data and statistical knowledge cannot explain some issues associated with gender, individual differences, caste, economic and social values (Creswell 2012).

Quantitative data analysis is helpful where the focus is on collecting knowledge about ecological outcomes from single or multiple changes such as destruction of habitat or loss of population (Wilson 2007). Nurerri and Jubho lagoons, there are many such issues involved where quantitative research might have some limitations, including for example, historical and spiritual values of people associated with these lagoons, and opinions or knowledge of elder people who have spent their lives in these lagoons.

1.4.1 Data Collection Methods

Within my overall qualitative research approach, I have used the following data collection methods i) focus group discussions; ii) semi structured interviews; iii) review of literature and documentation; and iv) informal discussions and observations. I outline each of these methods below.

i) Focus group discussions

Focus groups are a form of interview, where a small group of people are interviewed to collect information through shared discussion about relevant features of interest and processes (Berg 2004). I have used focus group discussions to identify key metaphors or concept and the relation of communities with their environment, local needs, community resources, adaptation strategies and their consequences. I held three focus groups with five to six number of people in each group. The groups were segregated by gender and livelihood source i.e., fisher and non-fisher communities, and where possible by age, to explore the impact of changes in property right system in the light of available resources, policies and understanding of climate change. Focus group interviews were conducted in the villages of both the lagoons. The duration of each focus group was approximately one hour. I overcame several challenges in conducting the focus groups. One challenge was the language barrier I faced. A translator accompanied me in conducting interviews with some groups where there was a language barrier as the local and provincial language is “Sindhi” Another challenge was that participants of the focus group discussions were daily wage earners, and it was difficult to make all of them sit together at the same time. Another challenging issue was in the month of May and June, when I was undertaking research heavy sand storms made it almost impossible to conduct interviews. We had to put hanky on our face while conducting interviews.

ii) Semi-structured interviews

Semi-structured interviews were used as a primary source of data collection. Data was collected using semi structured interviews, and was recorded using a digital hand held recorder, with consent of the participants, to enable transcription and coding. A total of 15 semi-structured interviews were conducted with government officials, NGO, INGOs and UNDP personnel. The locations where interviews were completed included Bhugra Memon, Deenar Talpur, Sheikh Kirhio, Badin, Hyderabad and Karachi city. Interviews of the directly impacted communities were conducted in Momin Mallah, Ali Muhammad Mallah, Jummu Mandro, Ghoongro. Some of the interviews were conducted during the month of Ramadan (holy month of fasting). During this month arranging interviews was difficult. It also took several hours daily to visit the impacted communities because of the remote location and dirt tracks.

Focus group discussions and interviews helped me to identify the existing property right system of these lagoons, history property right system, and policies that have an impact on their livelihoods, social and physical environment.

iii) Review of literature and documentation

In addition to above mentioned methods, I also collected information through historic documents and previous studies done on the Indus delta and the Nurerri and Jubho lagoons. My research has included an important element of history to describe the changes in the last three to four decades. Historical documents and literature review gave me very useful information to understand the several major changes that have occurred in my research area. The literature review included previous studies done on the Indus delta, and documentation was collected mostly through the University of Sindh library. Historic documents mostly were collected from government offices such as the revenue department, Sindh wildlife and forest department, the

zoological survey of Pakistan, Pakistan Secretariat Karachi, Fisheries department Sindh, IUCN library, and the UNDP GEF Small Grants Program.

I found it very difficult to gather information about the status of Ramsar sites in Pakistan, and especially in regards to the Nurerri and Jubho Lagoons. There is no mechanism through which all the necessary information about these Ramsar sites can be collected for research purpose. There is a lot of information available on the Indus Delta of Pakistan, but no historic detailed facts about the two lagoons.

iv) Informal discussion and observation

In addition to the above mentioned interview techniques, I undertook informal discussion with UNDP GEF Small Grants Program staff, as well as Minister of Environment, Government of Sindh, and Minister of Fisheries and Livestock personnel. These informal discussion helped me to understand the holistic situation of the area and the challenges arising from perpetual poverty, poor governance and severe environmental degradation. Other means of data collection were manual through field notes, mapping with groups, flips charts used during focus group discussions.

I also attended two multi-stakeholder consultative workshops facilitated by the UNDP GEF Small grants program on: i) rehabilitation of Choarhadi lake; and ii) trash fishing and the need to revise the 1971 Fisheries Act. Both the events were chaired by the Minister of Environment and involved communities of Choardhi lake, line departments and civil society organisations. The deliberations in both the events enlightened me to understand the limited vision of the communities, the inability of the line departments to enforce the law, and the manipulative role of media at the behest of vested interests.

1.5 Data analysis

I gathered all the information collected through interviews, focus groups and literature in a separate folder according to the theme of each chapter (i.e. introduction, environmental changes, property rights system) and at the end linked environmental changes with change in property rights system. After downloading all the recorded interviews from the field, I revisited all the recorded interviews and extracted the information from transcripts.

During data collection I realized that I was receiving information that was very interesting, but slightly different than my original intended objectives. Hence I adjusted my research objectives to reflect the direction to reflect the direction and insights my research was revealing. In the case of Jubho Lagoon, which is now completely dried and since the lagoon communities have migrated, it was hard to collect all the required information. I used the changes occurring in the surrounding lagoon (i.e. Nurerri lagoon) as a proxy for the changes in Jubho lagoon.

To verify the information I collected through focused group discussions and semi structured interviews, I relied on other methods like informal discussions. Further, information received through interviews was verified through analysis of existing research / study reports, government documents and UN reports. For technical knowledge (i.e., to understand the technical fault in LBOD and oil extraction) I relied more on the information received from technical people or experts from IUCN, UN and the Government, where as to analyse the impact of different changes I used information received from the community as well as experts. For resolving any conflicts between information received from different sources, I used my own interpretation skills to present analysed information that represents views of all sources.

1.6 Research ethics

An invitation statement (translated) was used to introduce the project and invite participants with the understanding that agreement to continue implies informed consent. All the semi structured interviews, small focus groups / meeting and participatory data collection and analysis techniques were done at the place where participants were working and living (lagoon communities). Verbal consent was taken from all the interviewees to use their names in the thesis especially for the female participants of semi-structured interviews and focus group discussions. All the interviews were recorded after taking the consent from the participants. For further detail a copy of research ethics is attached (Annexure 1.1).

1.7 Organisation of thesis

Chapter one has provided a brief introduction of main concepts used in the research (i.e. environmental changes, property rights system, and commons), a brief history of the Indus Delta and study area, an overview of my research methodology and methods and data analysis and a summary of my research ethics approval.

Chapter two provides a literature review to understand the different concepts and framework used to analyse the environmental change and property rights system. This chapter helps to understand why management of commons is important. The chapter also explains the “property rights framework” which is the basis of my analysis to explain the property rights system associated with commons in the Nurerri and Jubho Lagoons.

Chapter three provides the information on the different drivers of environmental change in Nurerri and Jubho lagoons, and how these changes impacted the two lagoons and their communities. In this chapter each driver is explained in detail to illustrate many changes, along with their impact.

Chapter four provides the information on drivers of change in property rights system and how these changes impacted the lagoons and their communities. Again, each driver is explained in detail to understand the history of change in the property rights system of both the lagoons.

Chapter five analyse both drivers simultaneously to understand the linkages between environmental change and property rights system. This chapter also examines how changes in both are affecting each other as a two way process, and why it is important to address both changes simultaneously.

Chapter six provides the conclusions of the thesis and outlines some policy recommendations.

CHAPTER 2: LITERATURE REVIEW

This chapter focuses on the main ideas, concepts and frameworks which serves as the basis of my research. The first section of the chapter explains the concept of environmental change and the different drivers of environmental change. The second section explains the concept of property rights, different types of property rights systems and a property rights framework by Ostrom and Schlager (1992) that forms the basis for my analysis. This framework highlights different bundles of rights and holder of rights within a given the property rights system. The third section explains the concept of commons. This section also highlights governance and management of commons and how the concept of governing and managing the commons is related to my case study of Nurerri and Jubho Lagoon.

2.1 Environmental change and its drivers

Drivers are defined as any natural or anthropogenic factor that directly or indirectly causes change (MEA 2005). In any lagoon system, there are many social, political, economic and cultural factors that affect ecological, biophysical, hydrological and geological conditions and vice versa, which ultimately changes the social-ecological system of lagoons (Nayak 2014). There are many drivers of change causing two-way affect between humans and biological system. These divers can cause change in the complex lagoon systems at any level and any scale irrespective of their source, and sometimes one single driver can cause multiple changes like social, economic, institutional, biophysical and environmental (Nayak 2014). For example, natural disasters like floods not just cause the degradation of lagoons but also cause displacement of lagoon communities. Considering the two way effect between nature and humans in social-ecological systems, it is important to assess how much communities of Nurerri and Jubho lagoon as a capacity

to adapt to the different environmental changes and how much biophysical environments of lagoons has the capacity to absorb that change.

Table 2.1: Environmental changes in ecosystems

Drivers of change	Impact on lagoon ecosystem
<p>Direct Drivers:</p> <p>Natural disasters Land use Property rights system Exploitation of natural resources Introduction of new species or removal</p>	<p>Direct Impact:</p> <p>Destruction of natural resources Scarcity of water, food, fuel, fiber Health problems</p>
<p>Indirect drivers:</p> <p>Economy Demography Customs and traditions Migration Power dynamics</p>	<p>Indirect Impact:</p> <p>Less freedom of choice Displacement of communities Human security concerns Loss of sense of belonging, tradition Increased job stress</p>

Source: Adapted from Millennium Ecosystem Assessment (2005)

2.2 Property rights systems

Property rights systems are also direct drivers of change (e.g. the right of access and use of lagoons), which in turn affect other factors such as food security and livelihood. For example, property rights systems determine ownership and access to natural resources like forests, wetlands, fish farms and food. Bromley (1991: 15) defines property rights as “The capacity to call upon the collective to stand behind one’s claim to a benefit stream”. Thus, property rights determine the relationship between the right holder and nature of rights to back up the claim. Bromley and Feeny (1992) also defines property as a benefit stream and property rights as a claim to the benefit steam that some higher authority (e.g., government) agrees to protect through assigning duties to those who are associated with the benefit stream. These rights give liberty to the holders to use and enjoy

the natural resources on which they depend. Hanna et al. (1996:1) describe property rights related to natural resources as *“The structure of rights to resources and the rules under which those rights are exercised the mechanisms people use to control their use of environment and their behaviour towards each other.....property rights systems are part of society’s institutions: the norms and rules of the game, the humanly devised constraints that shape human interaction”*. Property rights may be given to an individual, group or multiple groups under some particular law, regulation, cultural norm, social relationship or property practices (Marschke et al. 2012).

Property rights are considered important in a natural resource setting because they provide formal or informal control to the use of resources (Dick and Suseela 1999). Clear property rights are presumed to allow better management of resources, and encourage collective action to ensure the sustainable use of resources (Dick and Suseela 1999; Berkes 2004; Berkes 2005). Property rights creates awareness among all stakeholders that any misuse of natural resources will ultimately deplete them and holders will not be able to obtain the benefits they used to obtain before depletion. According to some commons theorists, if there is no well-defined property rights system, commons like lakes, forests and fisheries will be over-exploited (Gordon 1954; Scott 1955; Yandel 2007). Thus, property rights systems identify different types of rights that individuals or groups can have over natural resources, to determine what those individuals or groups are entitled to, and to determine what they can do and what they cannot do.

In the literature, different authors have provided different typologies for the types of property rights system. Dick and Suseela (1999) describe three different categories of property rights: i) public rights, where property rights are held by the state, ii) commons, where property rights are held by the community or group of users; and iii) private, where rights are held by an individual or company. According to Feeny et al. (1990), there are four property rights regimes:

- 1) **Open access**, which means access is free to all and that resources are not regulated by any rule. Anyone can use the resources, as is the case for example, with the global atmosphere.
- 2) **Private property**, which means a person or corporation has a right to exclude others and regulate the use of property. These kinds of rights are usually enforced by the state and are transferable (e.g., forests and rangelands).
- 3) **State property** relates to the situation where government controls the access and use property. States have all the rights to make decisions regarding access and use of the resources. State property refers to those kind of properties which can be equally accessed by the general public such as parks and highways.
- 4) **Communal-property** means that property / resources are held by the identifiable community of users who can regulate use and exclude others.

These four different property rights regimes are recognized by many scholars including Berkes et al. (1989, p. 91), Bromley 1986; Gibbs and Bromley 1989 pp. 24-27; Ostrom, 1986).

2.2.1 Property Rights framework by Ostrom and Schlager

Ostrom and Schlager (1992) provide an overview of five attributes of property rights, (i.e., access, withdrawal, management, exclusion and alienation), that is useful to determine the position of community members within a given commons management system (i.e., owner, proprietor, claimant, authorized user and authorized entrant). According to Ostrom and Schlager (1992), property rights are not a single unit but rather should be considered as a bundle of rights and how they are distributed. At the same time, they emphasize that for people to use and manage natural resources sustainably, it is important to provide them incentives and this bundle of rights creates interest for the users to management and use resources sustainably (Yandle 2007; Johnson 2004). Each is outlined below:

Access: Determines who can enter in an area of resources (e.g. the right to enter onto land).

Withdrawal: Determines who can use or extract the resources, like water, fish, etc.

Management: Determines who can regulate, manage the use of resources

Exclusion: Determines who has the access to use the resource and who has authority to exclude others from accessing a resource.

Alienation: Determines the right to transfer, sell or lease resource, and / or possess right of management or exclusion rights.

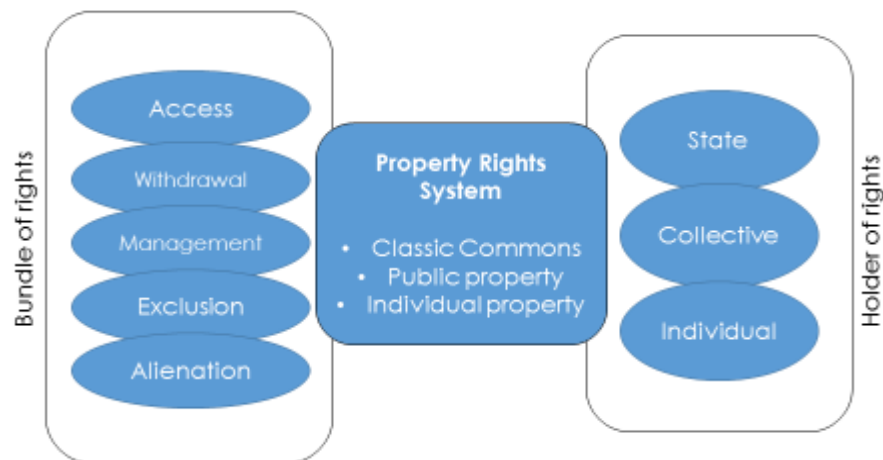


Figure 2.1: Property Rights Framework (Source: Adapted from Schlager & Ostrom 1992 (in Marschke et al. 2012))

The first two types i.e., access and withdrawal are related to the use of resources and are called operational level property rights. The remaining three (i.e., management, exclusion and alienation), are related to control or management and are called collective choice rights. To summarize property rights framework looks at the three different aspects altogether: 1) rights relating to access, withdrawal and exploitation of these lagoons, 2) control or decision-making rights relating to management and exclusion, and 3) rights of alienation such as those related to

the right to rent or sell (Marschke et al. 2012). Figure 2.1 shows five categories of property rights can be taken as a bundle of rights, whereas nature of property is determined by holders of these right. Holder of rights can be individual, collective and state.

As explained by Ostrom and Schleger (1992), holders of rights state, an individual or a collective. The state has complete control over the resources and hence they have all the rights held with them, which means they have complete access to use resources and they have all the rights to manage resources. Collective rights holders can be both state and / or a group of people who use a particular resource. Individual right holders or a company can also possess a right or bundle of rights to use and manage the resources. According to the framework, it is possible for holder of rights to have one set of rights and not the others or holder of rights may not hold full set of rights. For example, lagoons, individuals or collectives may hold rights of access like tourists but they do not hold the right of use or management. Only individuals or collectives with a license can use lagoon resources. However, to hold some of the rights implies possession of others (e.g. without the right of access, right of withdrawal is meaningless). Similarly, alienation rights depend upon the possession of exclusion rights.

Ostrom and Schleger (1992), also categorise rights depending upon the formal and informal arrangement of those rights. In some cases, government can enforce the rights where there are supporting laws and regulations. Rights with supporting laws and regulations are called *de jure* rights. In contrast if rights are determined by the resource users themselves and are enforced among themselves, they may not be recognised by the government and are referred to as *de facto* rights. De facto of rights are not legally binding and as a result they are less secure. Through this framework my research analyses how the bundle of property rights has changed over the last three

decades, and how the local communities of both the lagoons have responded to these changes in the property rights system (See chapter 5).

2.2.2 Bundle of rights vs bundle of power

There are many frameworks to determine the **bundle of rights** suggested by commons scholars (e.g., Demsetz 1967; Scott 1988; Feder and Feeny 1991; Sharp 2004). Ostrom and Schlager's (1992) framework is appropriate to help determine the complexity of property rights when managing natural resources. The framework helps to determine the position of owner, proprietor, claimant, authorized user and entrant from within the community of resource users (Nayak 2006).

Access of natural resources means all of the possible ways through which people can benefit from natural resources, or that they have an ability to access natural resources (Ribot and Peluso 2003). However, a definition of "access" is more effectively considered as a "**bundle of power**" than solely through the notion of "bundle of rights" (Ribot and Peluso 2003). According to Ribot and Peluso (2003), a focus on an "ability" to obtain benefits covers a wider range of social relationships which enables or limits people to benefit from resources. For example, different people and institutions have different powers or "bundle of powers" to access, control and maintain natural resources, depending upon social status, culture, traditions and economic conditions. Similarly, some people can only use their right of access through those who have power or control of natural resources. This perspective is relevant in the case of Nurerri and Jubho lagoon as not everybody has equal access to the lagoon resources controlled by powerful landlords, influential people and agencies (i.e. army control on several lakes in the bordering area).

2.2.3 Common property rights

To understand the concept of common property rights it is important to first understand what commons are and how property rights systems determine the access to these resources. There are many theories and definitions to explain common property resources or commons. Different authors of commons have developed different terminologies to explain commons according to their own experience and understanding. In the case of Nurerri and Jubho, I used the term “commons”, where commons is defined by two characteristics: i) excludability, which means control to access the resources is difficult or in other words exclusion of beneficiaries is difficult or not possible; and ii) subtractability, which means the use of resource by one person will subtract from the welfare of other users (Ostrom 1990; Nayak 2011). The reason why I selected the term “commons” is because it is more inclusive and holistic than others. It covers not only natural resources but people, norms, traditions, relationships, and all of these are covered in my research in the context of Nurerri and Jubho lagoon.

Table 2.2: Various terms used to express Commons

Definition	Reference
<i>A class of resources for which exclusion is difficult and joint use involves subtractability</i>	Berkes, F., Feeny, D., McCay, B., and Acheson, J. M. (1989). The benefits of the commons.
<i>"Common property" or "common-property regime" refer to a particular Property rights arrangement in which a group of resource users share rights and duties toward a resource.</i>	McKean, M.A., (2000). Common property: what is it, what is it good for, and what makes it work? In: Gibson, C., McKean, M.A., Ostrom, E. (Eds).
<i>Common property is where the management group (the owner) have a right to exclude non-members, and non-members have a duty to abide by this exclusion. Individual members of the management group (the co-owners) have both rights and duties with respect to usage rates and maintenance of the thing owned.</i>	Bromley, D. W., & Feeny, D. (1992). Making the commons work: Theory, practice, and policy.

<p><i>Common property resources share two important characteristics. The first is excludability (or control of access). That is, the physical nature of the resource is such that controlling access by potential users may be costly and, in the extreme, virtually impossible. The second basic characteristic of common-property resources is subtractability, that is, each user is capable of subtracting from the welfare of other users.</i></p>	<p>Feeny, D, F. Berkes, B. J. McCay and M. Acheson (1990). The tragedy of the commons: Twenty two years later.</p>
<p><i>Common pool resources are the resources which 1) produce a steady flow of resource units (benefits accruing from the resource), and 2) resources that are so large (an ocean for example) that excluding the individuals that use them unsustainably becomes almost impossible</i></p>	<p>Ostrom, E. (1990). Reflection on the commons. Governing the commons: The evolution of institutions for collective action.</p>

The ‘tragedy of commons’ thesis by Hardin (1968) is usually taken as a starting point for a discussion about the issues of excludability and subtractability in the commons. Hardin (1968) argued that the use of commons was open for all, and he suggested that it is impossible to restrict the use of commons. Hardin (1968) also suggested that common property is only justifiable where there is low-density population, and that with an increasing population it is hard to restrict populations from over-exploiting natural resources. He suggested that the only way to avoid this tragedy of commons is through two possible solutions: i) to privatize resources, or ii) to keep resources as public property. Many scholars disagree with Hardin’s (1968) theory (Feeny et al.1990; Berkes 1987; Fiet 1987). There are many cases where common property has been effectively managed by communities (Feeny et al. 1990). According to Feeny et al. (1990), commons can be managed by local communities or a group of communities through informal arrangements, instead of any defined law or rules set by the government (Feeny et al. 1990).

2.3. Commons Governance

Issues of excludability and subtractability pose a significant challenge for the management of different commons (Nayak 2012). As a result, many scholars such as Ostrom (2007) started to consider the institutional arrangements and management of commons with a focus on the needs of users and their responsibility towards sustaining commons. Collective action is an action taken by a group directly or through an organization with shared interests (Scott and Marshall 2009). In the case of natural resources, collective action includes rules for the use of those resources, monitoring, managing and dispute resolution (Ostrom 1992). In commons, property rights plays an important role in collective action (i.e. holding shared rights reinforces the collective actions among members in commons). Collective action is also important to maintain property rights (Dick and Gregorio 2004). Collective action also depends upon the size of the group, dependence on the resource and capacity of the group to manage commons (Ostrom 1999; Agrawal and Goyod 2007; Agrawal 2001).

Various scholars have identified a host of components that can contribute to effective management and governance of the commons. Some of them include institutional arrangements (Johnson 2004), principle of institutional design (Ostrom 1999), participatory management (Berkes 2003), local rules and regulations and their enforcements (Agrawal 2005; Gibson et al. 2005) and importance of social norms (Peluso 1999).

2.3.1 Challenges of governing commons

There are several key challenges to manage and govern commons. Some of these challenges are outlined below.

- a) Sometimes access and use of commons by dependent communities is restricted by groups of people who are socially, politically and economically strong and influential, and who control decision making processes to define rules of use and access (Agrawal 2007);
- b) There are many external factors (i.e. social, economic and political factors) that affect the management of common (Agrawal and Gibson 1999).
- c) The element of environmental uncertainty is also very difficult to estimate and depends upon the size and scale of the resource pool, which also makes it difficult to sustain commons (Ostrom et al. 2001). For example, unpredictable pattern of floods and cyclones makes it difficult to manage the commons.
- d) Governance of single use commons is less complex than multiple use commons. Similarly, one group governing the commons is less complex than different groups managing the same commons (Ostrom 2007, Wilson 2007). Different authorities with overlapping responsibilities can make it difficult to manage commons. For example, in the case of Nurerri and Jubho lagoons too many stakeholders and departmental authorities are responsible for managing the lagoons.
- e) In the case of commons nothing is permanent because various factors such as population, community dynamics, ecosystem structure and functions, government policies can change over a period of time (Wilson 2007). Therefore, while analyzing commons, it is important to consider their dynamic nature.
- f) Conventional and centralized command and control approach to managing commons has limited success (Berkes 2003) because it does not consider local circumstances and

environment. Context specific needs are better managed through decentralized and localized solutions.

To handle complex systems, mixed management arrangement may be more effective, as is the case for example, where state actors can work with local communities or groups and facilitate their management of resources. For example, co-management, is one approach that encourages multilevel linkage and management through the involvement of different actors associated with the commons (i.e. local resource users, national government agencies, NGOs, etc.) (Berkes et al. 1991; Armitage 2008)

Some users within the group have more influence on commons than others. In case of Nurerri and Jubho lagoon, local feudal lords are considered to be one of those influential groups who own some part of the lagoons as private property. Many commons are managed by groups divided on the basis of ethnicity, gender, religion, wealth and caste (Agrawal and Gibson 1999). Hence social, political and economic dimensions of society are very important to consider when it comes to the management and use of commons (Agrawal 2007) because they influence the “bundle of rights” discussed earlier (see section 2.2.2). To make collective action work in the managing the commons understanding local conditions of the resources and social relationships in the area is critical (Meinzen Dick and Gregorio 2004).

In a complex system, commons cannot be studied in isolation or separately from environmental factors. It is important to see how environmental factors influence the governance of commons. Demographic factors, culture, technology, market forces, nature of state agency, NGOs, and aid agencies, also effect the management of these resources and influence the decision making at local level (Agrawal 2001). For example, in lagoon system, people in the surrounding

villages are mostly depending on fishing as their source of livelihood and are mostly poor. Hence pattern of increasing population is important to consider while managing commons.

Ostrom (2001) noted that power and status of actors within the community of commons can affect how individual actions are perceived, and highlighted how commons are used and manage more effectively through local rules and regulation instead of broad rules and regulations set by the government or by some outside entity (Agrawal 2007). Agrawal (2007) further explains why local rules are more appropriate in certain circumstances: 1) local user understand their resources, capacity, environment more than outsiders; and 2) local users are in better position to use their knowledge for management and institutional arrangements of commons which suits them (Agrawal 2007). Research has actually shown that groups within a community are actually capable of managing resources under certain conditions (Marschke et al. 2012). However, according to Dietz et al. (2003) effective commons is only possible to achieve when the resources and use of these resources can be monitored.

Berkes and Folke (1998) used term social-ecological system to accentuate that the social system and ecological system are linked and cannot be separated from each other. This means that in any complex system where humans interact with the environment, there is a need of governance that encourages learning and adaptive management instead conventional top-down decision making (Armitage 2008).

To improve the management of commons, external factors should be considered. Many other scholars of commons, suggest that local communities can handle both their commons and factors affecting these commons as they are in a better position to suggest solutions to sustain commons (Marschke et al. 2012). But sometimes with the little incentive to the groups within the community, can help to sustain their economic condition and at the same time will protect their

resources from degradation through collective action (Marschke 2012; Johnson 2004) i.e. Microfinance programs which not only provides credit facility but also creates social bonding and encourage people for a collective action to protect their commons.

My thesis focuses on the environmental factors affecting the property rights system of Nurerri and Jubho lagoons. Therefore, in my case study it is important to understand the *linkage* between the drivers of environmental changes in any complex system like lagoons and drivers of property rights system. My study focuses on the importance of studying both set of drivers of change and considering the linkage between drivers of change as an important factor in decision making and planning to protect the lagoon. Management and effective governance of commons is crucial if environmental changes and changes in property rights systems are to be addressed. Currently, only a few studies have been undertaken to explore the linkage between property rights system and environmental change in these lagoon systems.

CHAPTER 3: DRIVERS OF ENVIRONMENTAL CHANGE IN NURERRI AND JUBHO LAGOON

3.1 Introduction

Chapter Three examines the history of environmental changes in the Indus Delta, Pakistan, and explains how those changes have affected the overall ecology of the coastal environments with particular focus on the Nurerri and Jubhoo lagoons. Badin and Thatta districts of Sindh have remained one of the worst affected coastal areas due to frequent occurrence of natural disasters coupled with many anthropogenic alterations to the natural environment. Interestingly, the same area is home to several important wetlands of Pakistan including Nurerri and Jubho lagoons. The complex nature of the drivers of environmental changes require a careful examination to ascertain the process through which the two Ramsar declared lagoons become badly degraded. This chapter will later contribute to examine the linkage of environmental change in Nurerri and Jubho lagoons with the change in property right systems.

Environmental changes in social-ecological systems have been examined by Nayak and Berkes (2011), where, environmental changes can occur due to natural or anthropogenic factors. For example, Hardin (1968) has explained the impact of increasing population on natural resources. According to Hardin, increasing population, which increases demand for natural resources, ultimately becomes a stressor by overexploiting the resources. However, there are other factors like uncertainty, complexity and conflicting human values and interest which make it difficult to manage natural resources (Dietz et al. 2003). Similarly, climate induced environmental changes leave their impact on lagoons (i.e. Storms, rainfalls, temperature, runoff etc. (Kennish and Paerl 2010).

According to Millennium Ecosystem Assessment (2005), in the last 50 years, humans have changed ecosystems more extensively and rapidly than ever before, because of increasing demand for food, fresh water, fuel, fiber, causing serious degradation of natural resources. Coastal lagoons are very complex, diverse and dynamic ecosystems and are very sensitive to internal / external drivers and stressors including both natural and anthropogenic (Kennish & Paerl 2010). While looking at the impact of external and internal drivers on the ecosystem of lagoons, it is important to consider both the intensity and variability of those drivers. Lagoons are social-ecological systems (Berkes and Folke 1998) in which human activity has a central role in ecosystem function (Berkes and Seixas 2005).

Initially, I started my work by looking at the property rights system of Nurerri and Jubho lagoons but soon after realized the changes in property rights systems are closely linked with the environmental changes. This led me to first look at the environmental changes and their drivers in Nurerri and Jubho Lagoons. To do this I collected data through primary and secondary methods, as outlined in the methodology chapter (See section 1.4). In the next section, I present some of these drivers of environmental changes in detail and examine their role in influencing lagoon property rights system.

3.2 Drivers of changes in Nurerri and Jubho lagoons

As discussed earlier in the introduction and literature review, biodiversity of lagoons directly influences the state of the ecosystem of lagoons. If biodiversity is reduced it means ecosystem will be adversely affected. Many anthropogenic and natural factors cause environmental change and adversely affect the biodiversity which in turn damage ecosystems of lagoons. Nurerri and Jubho lagoon, have also gone through many environmental changes over the

period of three to four decades. These changes one way or the other have changed the ecology of whole Indus delta, in general, and Nurerri and Jubho lagoons, in particular. Some of the important drivers include reduced fresh water flow, LBOD, natural disasters and industrial pollution.

3.2.1 Fresh water flow

Lagoons provide essential ecosystem services for the survival of humans, animals and plants. At the same time lagoons also depend upon many factors which maintain biodiversity structure and function, for example, fresh water flow (Campman 1996; Benson 2011). Freshwater inflow is considered an essential factor influencing the ecosystem health of lagoons by dilution of seawater to brackish water, dilution of contaminants, maintaining salinity levels, and helping in transporting the important sediments and nutrients (Longley 1994). Lagoons depend on different sources of water including surface water, sea water, rain and inflow from nearby canals. Which may change over the period of time (Stumpp et al. 2014). Lagoon systems are very heterogeneous and dynamic in nature (Nayak and Berkes 2010; Stumpps et al. 2014), and the quality of water depends upon water flow, its source and nutrient levels (Stumpp et al. 2014; Gattacceca et al. 2009). Several studies have also shown that water flow in the lagoons also depends on its interaction with ground water, changes in the seasonal flow and rate of evaporation, and other hydrological processes (Stumpp et al. 2014; Lecuyer et al. 2012).

The main source of freshwater supply to the Indus Delta and its wetlands including Nurerri and Jubho Lagoons is the Indus River, which has a total length of 3000 km and 950,000 km² of drainage area. In turn, the Indus River receives its main source of water from the glaciers located in the Himalayas and Karakoram mountain ranges bordering China, Pakistan and India, and Hindu Kush which borders Afghanistan (Inam 2007). The Indus River travels southwards across Punjab

and Sindh Provinces in Pakistan through the Indus Delta before entering the Arabian Sea (Inam 2007). A detailed profile of the Indus delta appears in section 1.3



Living conditions in the dry bed of Jubho Lagoon (Photo: Sajida Awan)

To water more than 15 million hectares of farmland, Pakistan has an irrigation network comprised of three major reservoirs, 19 barrages or head works, 43 main canals that are 57,000 km long, and 89,000 watercourses with the total running length of 1.65 million km (IRIN 2001; IUCN 2007). This makes it one of the most extensive irrigation systems in Asia (IRIN 2001; IUCN 2007). However, to meet the need of this irrigation system in the upstream, the required water flow to downstream to Kotri Barrage has been compromised (IUCN 2007). Additionally, construction of barrages and canals in recent years have led to systemic removal of water from Indus Delta, further reducing the annual freshwater flow from >150 billion m³ to <45 billion m³ (Inam 2007). Consequently, sea intrusions have occurred in the coastal belt of Indus Delta causing irreparable environmental damages (DDMA 2008), such as increased salinity levels in the lagoons and depletion of fish from the lagoons. Other reasons for reduced inflow of water in the Indus Delta

are poor management of water allocation by the government, commercial use of water for economic benefits, and hydropower schemes (IUCN 2007). Measures to offset the environmental degradation in the Indus Delta area will not be possible without first addressing the issue of reduced inflow of water downstream to Kotri Barrage (PDI 2006). Table 3.1 shows the rapid reduction of fresh water flow from 1993 to 2003.

Table 3.1: Rapidly declining water and sediment discharges downstream of Kotri Barrage

Period	Average annual water discharge (10⁹ m³)	Average annual sediment discharge (10⁹ t)
1931 – 1954	107	193
1955-1962	126	149
1963-1967	72	85
1968-1976	47	82
1977-1997	45	51
1993-2003	10	13

Source: Inam, 2007, The Large Rivers

Reduction in the fresh water inflow has noticeable effects on the ecology of wetlands like Nurerri and Jubho lagoons in the Indus Delta, including depletion of fish and destruction of mangroves where fish and crustaceans spend most of their life for food (Inam 2007). Furthermore, reduction in freshwater flow has also impacted the sediment discharge downstream of Kotri Barrage. Kotri Barrage was constructed in 1955 which also contributed to the loss of several hundred kilometers of fertile land, and people were forced to change their age old profession of farming to fishing (Inam 2007). Major declines in the flow of water and sediment discharge occurred after the commissioning of Mangla Dam in 1967 and Tarbela Dam in 1976 (Inam 2007). Table 3.2 shows the decrease in the fresh water flow and level of sediments after the construction of Kotri barrage, and Tarbela and Mangla dams. Unfortunately, this extensive construction of dams along with poor management of water flow from upstream to downstream have led to shrinking of

the active delta which is according to a local estimate now only 19 percent of the original area. This hardly contributes to any significant sedimentation in the Arabian Sea. This trend of reduced freshwater flow downstream of Kotri Barrage is likely to increase in future causing serious water shortage, which necessitates an integrated water management plan for the coastal districts to promote healthy ecosystem of wetlands in the Indus Delta (IUCN 2006).

Table 3.2: Post-dam construction variations in sediment and water discharge downstream of Kotri Barrage

Period	Average annual water discharge (109 m3)	Average annual sediment discharge (109 t)
Pre-Kotri Barrage	110	184
Post Kotri Barrage	68	85
Post Mangla	47	82
Post Terbela	37	43

Source: Inam, 2007, The Large Rivers

Effects on lagoons and Wetlands:

Healthy wetland ecosystems in coastal areas of Sindh depend upon sufficient Indus water flow downstream from Kotri Barrage (IUCN 2006). Reduced fresh water has not only affected the fertile lands in the area but has also affected the lagoon complex including Nurerri and Jubho lagoons (see table 3.3). Further details about these lakes and their complete profile is explained in chapter 1.3.3. With the receding water level, local communities of Nurerri and Jubho lagoons started using the dry land and lakebeds for cultivation and many were forced to change their source of livelihoods from fishing to farming. Several people migrated to places where there was enough water and fish. Some of the wetlands that have been badly damaged or threatened are outlined in table 3.3.

Table 3.3: Lagoon complex badly damaged due to reduction in fresh water flow

Area	Lakes and Lagoons	Damage
Badin / Golarchi Wetlands	Jubho, Nurerri, Dahee, Shaikh Keerio Peer	More than fifty percent of Nurerri and Jubho remain without water and thus without flora and fauna The salinity in the lake water increases and thus reduces the fish and shrimp hatching Sea intrusion

Reduced water flow is one of the main reasons behind the degradation of lakes and lagoons in the Indus delta area. The minimum required flow of water for Indus Delta to maintain integrity of its ecosystem is 35 MAF, whereas the government has decided to maintain the flow at 10 MAF, and even that flow is not regular. Regular flow of water is maintained only during monsoon, and the rest of the time water flow remains below 10 MAF. Only a part of the surrounding land area of Nurerri and Jubho Lagoon is good for cultivation as most land has been impacted by regular sea intrusion. (Mr. Abu Bakar Shaikh, Chief Executive Officer, Delta Development Program, interview, 15 June 2014)

According to a local fisherman, Nurerri lagoon used to have high concentrations of fresh water and people used to catch large fish of 15 kilograms. However, due to sea intrusion the lagoon is now full of saline water. Fishes come only in the rainy season. (Mr. Makan, fishermen Nurerri lagoon, interview, 10 June 2014)

Lived his whole life in Jubho lagoon, (Mr. Momin Mallah, fishermen, interview, 13 June) said, they used to catch different types of fishes, like Labeo Rohita (Kuriro), Cirihinus Mirgala (Morakho), Calta Calta (Theree), Wallago Attu (Jerko) and Aorichthys Aor (Shingari). He said with the reduction in fresh water most of these fish types are now disappeared.

15 to 20 years ago this lagoon was flourished and was full of fresh water, but that now they don't get even a drinking water in this lagoon (Mr. Gul Hassan Lakho, Fishermen of Nurri lagoon, interview, 13 June). Figure 3.2 shows that in some years, flow of water towards Indus Delta was zero.

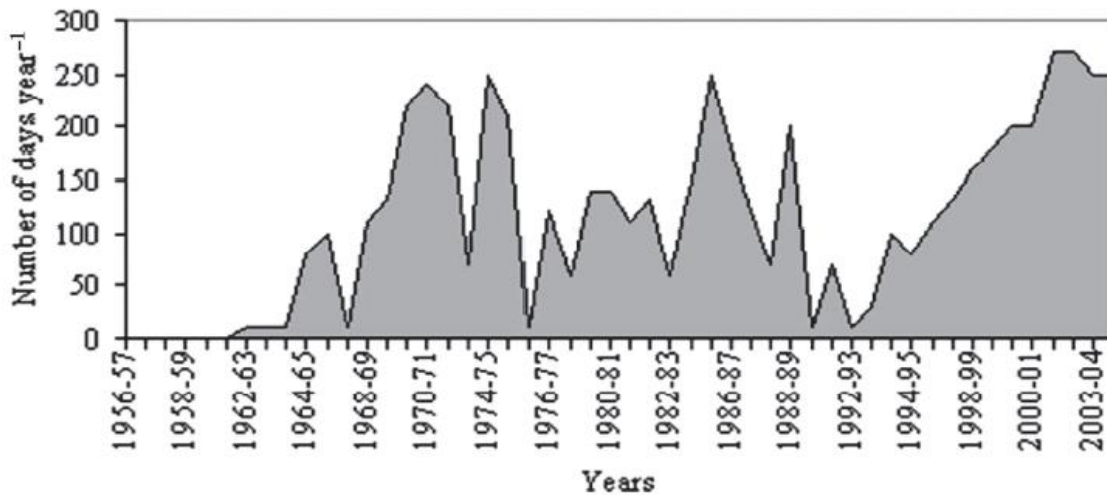


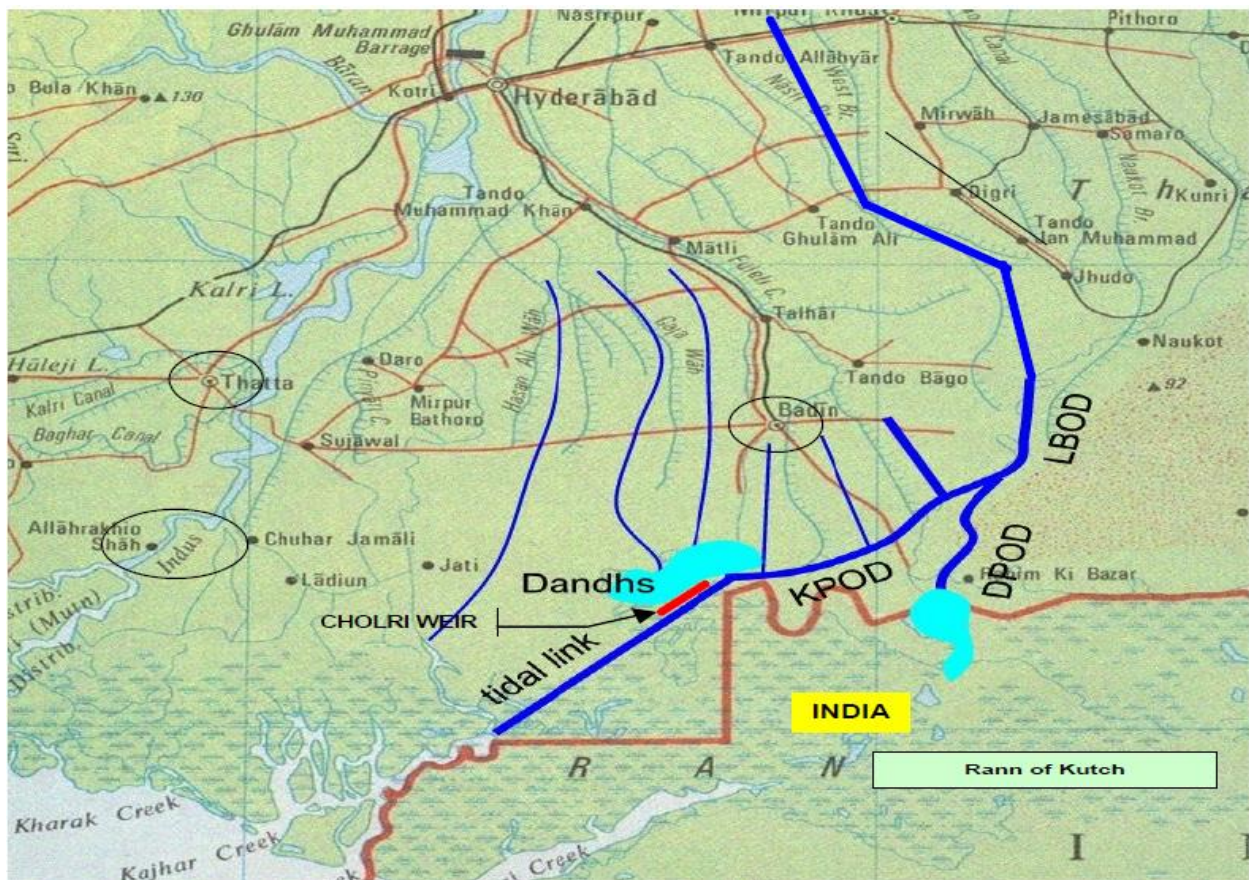
Figure 3.2: Number of days per season with zero flow downstream of Kotri Barrage
(Source: Inam 2007, The Large Rivers)

3.2.2 Mega project failure - Left Bank Outfall Drain (LBOD)

To overcome the issue of waterlogging and salinity from the left bank of the Indus River, the government of Pakistan launched a mega drainage project, the Left Bank Outfall Drain (LBOD), in 1980s. The project completed in 1995 at a total cost of 363 million US Dollars (Qureshi et al. 2007). 60% of this project was funded by international donors and remaining 40% by the government of Pakistan. The purpose of this project was to provide a long term solution to the drainage issues by discharging saline water into the sea. The first stage of this project was to address the three worst affected districts, Nawabshah (now renamed as Benazirabad) with 222 577 hectares of irrigated area, Sanghar with 146 496 hectares and Mirpur khas with 144 877 hectares of irrigated area (IUCN 2006). The LBOD project also included the construction of 1931 km of

drains, 200 drainage sumps, 2000 wells, 2414 km of small channels for disposal of industrial waste, roads and power lines over the area of 526000 hectares (IUCN 2006; Qureshi et al. 2007). Another important part of this project was to construct a 42 km long tidal link in Badin district of Sindh to facilitate drainage of water into the sea.

After the construction of the tidal link, local people and irrigation experts from District Badin and Thatta complained about its faulty design which resulted in further damaging the lands and causing other hazardous environmental impacts. According to the irrigation experts, the tidal link created a hindrance in the natural flow of water into the sea. The drains from Kotri used to flow into the sea through natural creeks but the tidal link diverted the natural water flow, and as a result in 1999, the major portion of Kadhan Pateji Outfall Drain (KPOD) tidal link was washed



Map 3.1: LBOD system runs from the north or middle Sindh along the eastern edge of Badin District (Source: WB 2007)

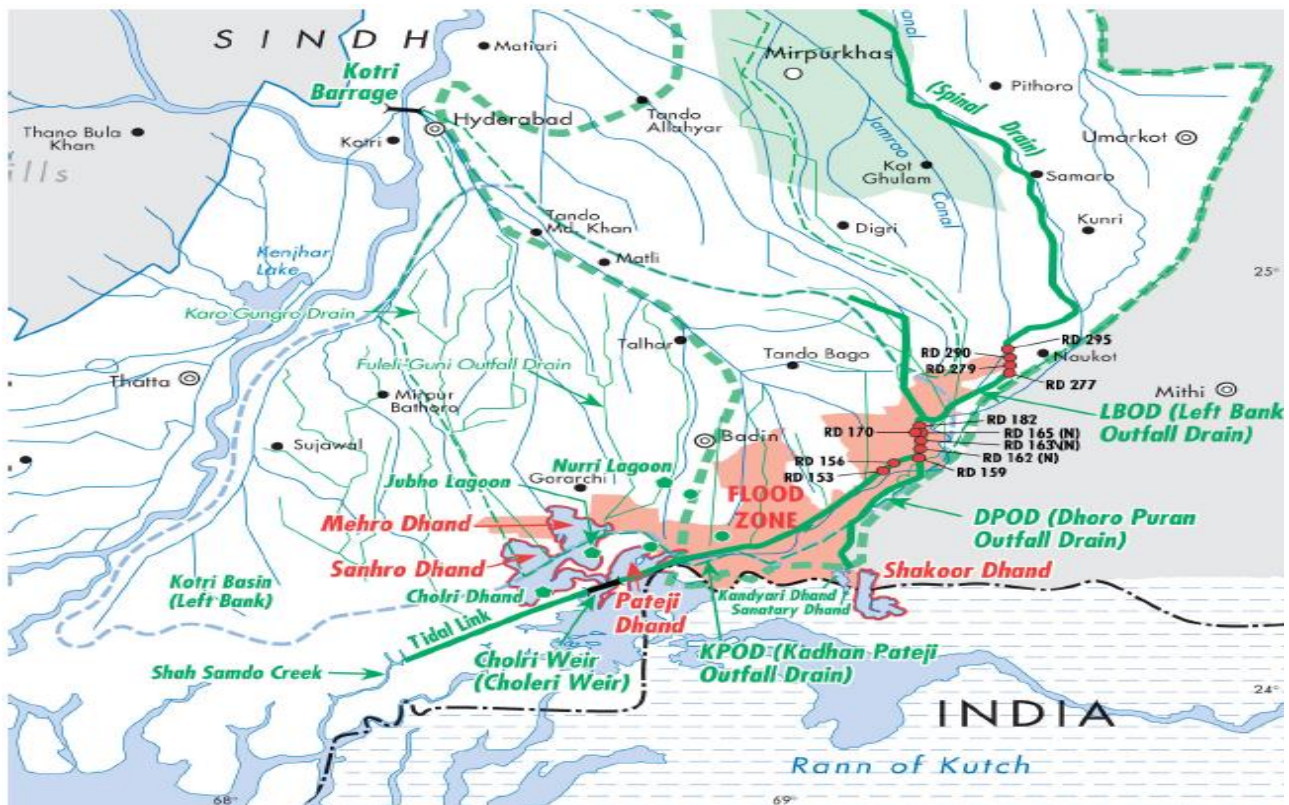
away by the sea tide. According to the District Disaster Management Authority of Badin (2008), the LBOD and its various components have proved to be a huge technical failure which badly affected the coastal population of Badin. Another major design fault was the construction of 18 foot high weir to block the water of Dhoru Puran Outfall Drain from flowing into the Indian part of Shakoor Lake. This weir couldn't sustain the pressure of drainable effluents from KPOD and LBOD channels, and in 2003, floods resulted in several breaches in the LBOD spinal drain and tidal link (GoS and IUCN 2006). The drainage effluent consequently resulted in a backward flow which has increased the level of salinity and pollution in the surrounding area (Schilling et al. 2013; IUCN 2006).

LBOD project has caused major flooding in Badin and serious environmental degradation in the surrounding areas including the damage of aquatic life and fertile lands (Schilling et al. 2013). During the focus group discussions (Nurerri lagoon, June 30), I was told that LBOD structure couldn't sustain the heavy rain falls and were heavily damaged in 2010 and 2011 floods. 2010 and 2011 floods caused severe damage to the acres of land, houses, livestock, and Human lives (See section 3.2.3). Local people also mentioned that they were already aware of the consequences of LBOD. Local communities had also informed local authorities and implementing engineers about the faulty design of LBOD and Cholri weir and warned them that it could cause serious damage.

In addition to the increased flood risks and damage to the fertile lands, this project has also destroyed many coastal wetlands and interconnected lakes including Nurerri and Jubho, known as "*Dhands*" in the local language. The main focus of the project was to ensure the removal of LBOD effluents into the sea, but it paid little attention to the impact on *Dhands* and their ecosystem, especially Jubho Lagoon (World Bank 2007), which is completely degraded now. Both Nurerri

and Jubho lagoons were considered as key sources of coastal fishing livelihood of local communities before the construction of the LBOD project, but breaches in Cholri Weir have caused the degradation of the ecosystem and loss of biodiversity of these two lagoons. Breaches in tidal link at 56 locations, have increased the sea intrusion significantly (Agha et al. 2011). These breaches have also caused a wide opening to the lagoons allowing water to freely enter these lagoons during high tide (World Bank 2007). A network of channels have been formed in the Lagoons due to the frequent in and outflow of sea water, causing waterlogging and salinity issues in the lagoons. The Inspection Panel of World Bank (2007) clearly indicated that the “*Bank did not adequately consider the risk of further degradation of the Jubho Lagoon, a critical natural habitat*” (Page xxvii). (Naseer Memon, CEO Strengthening Participatory Organization Islamabad, interview, 5 July), believes by just confessing the design faults, the World Bank could not solve this blunder. “*It was time by now the faulty components of the LBOD were rectified and those physical changes occurred to the ecology of the two lagoons should have been restored to its original status.*” While faulty designs of the LBOD contributed to the degradation of both lagoons, factors such as water shortage, sugar-mills waste disposal leading to water pollution and unsustainable fishing practices accelerated the degradation process. “*These two lagoons are RAMSAR sites and a great livelihood source to millions of local poor and a cradle of biodiversity.*” (Naseer Memon, CEO Strengthening Participatory Organization Islamabad, interview, 5 July). He added “*Ideally an action plan should have been formulated to rehabilitate both the lakes*”. One of the respondents, (Mr. Saeed Baloch, Chief Conservator Wildlife department Sindh, interview, 2 June), explained that destruction of Cholari weir (One of the main component of LBOD project) caused a serious damage to the whole Indus delta especially the lagoons near to Cholari weir including Nurerrri and Jubho. He also added that series of events starting from cyclone to the

breaches in LBOD) were equally responsible for the degradation of the two lagoons. LBOD was a wrong decision and it caused an irreversible damage to both the lagoons.” Abu Bakar Sheikh’s organization, the DDP, rehabilitated a large portion (2000 hectares) of Nurerri lagoon in 2009 with the funding and technical support from the UNDP-GEF Small Grants Program Pakistan. “In the first year after the rehabilitation the fish catch went up and the flora and fauna in the lagoon and the catchment showed marked improvement.’ Sheikh points out, “The lagoon got degraded again when the authorities made random breaches in the tributary drains to let off the 2010 – 2011 floods. The post-flood lagoon was again without the protective dykes and the sugar-mills affluent started pouring in and polluting.” (Mr. Abu Bakar Sheikh CEO of Delta Development Program, interview, 15 June).



Map 3.2: Nurerri (Nurri) & Jubho (Jubho) in the Left Bank of Indus River In Southern Sindh (Source: NDPP 2007)

LBOD, instead of directing the effluent from sugar mills to the sea, actually started polluting Nurerri lagoon after it was breached. It was not designed properly and fisher communities warned them of the consequences (Ali Muhammad Mallah, Fisherman, interview, 14 July), (See map 3.2).

Degradation in the ecosystem of Nurerri and Jubho lagoons impacted their flora and fauna including a dramatic reduction in the number and pattern of migratory birds (Mr. Masood Lohar, National Program Coordinator UNDP GEF Small Grants Program Pakistan, interview, 27 July), (See table 3.4). Both lagoons are situated on the international migration route of many birds and waterfowl (World Bank 2007). However, there has been substantial decline in the number of migratory birds on this route, almost 46% from 1999 to 2002, in all the interconnected lagoons (World Bank 2007).

Table 3.4: Estimated number of migratory birds in the lagoons

Year	Jubho Lagoon	Nurerri Lagoon
1990	68,548	71,335
2001	24,448	43,115
2002	13,712	50,997

Source: (World Bank 2007)

3.2.3 Natural disasters

Other main drivers of environmental change in the Indus Delta, in general, and the Nurerri and Jubho lagoons, in particular, were natural disasters. According to the Intergovernmental Panel on Climate Change (2001), the global temperature will rise further by 1.4 to 5.8 °C before the end of this century. Due to the rise in temperature, glaciers and icecaps are melting very fast causing a rise in sea level and coastal areas are usually more vulnerable to these changes. The coastal area of Sindh province is spread over 350 kms which is vulnerable to such effects of climate change. This area is also exposed to frequent cyclones and floods. Within the Indus Delta, two main coastal

districts of Thatta and Badin (which house the Nurerri and Jubho lagoons) are the worst affected. Intensity of cyclone events and frequency of flood events are increasing every year, e.g., during 1971-2001 a total of 14 cyclones were recorded (WCDR 2005). Badin is situated in zone II with respect to cyclone activities which means this district is vulnerable to tropical cyclones (UEPL 2012). Table 3.5 shows long history of natural disasters in Badin.



Temporary houses in Nurerri lagoon (Photo: Sajida Awan)

In addition to heavy annual rain fall of 350 to 450 mm, breaches in LBOD further aggravated the problem as artificial floods damaged a huge area in Badin district (IUCN 2006; UEPL 2012). A 70 years old woman (fisher community Nurerri lagoon, interview, 12 June) said that *“During cyclone in 1999, all I remember is that all trees were vanished, animals were dead, plants were squished and two to three feet water was everywhere”*. She also explained that cyclone was followed by an earthquake. LBOD aggravated the situation after 1999 cyclone and 2010 floods (Mr. Abu Bakar Sheikh, CEO Delta Development Program, Interview, 15 June). He explained how both disasters causes serious damage to the LBOD tidal link structure In Badin district,

360,000 people were affected because of recent floods in 2010 and 2011, 22,567 houses were damaged, 160 villages were inundated, more than 200,000 became homeless, and 80,937 hectares of standing crops were destroyed (IUCN 2006). The flood of 2010 was declared the worst in the history of Pakistan and was called a bigger event than the tsunami of 2004 by the UN Secretary General (UEPL 2012).

Table 3.5: History of Natural disasters in Badin

Nature of Disasters	Years
Cyclone A-1 & A-2	1964 and 1999
Floods	1970, 1975, 1979, 1994, 2003, 2006, 2010 & 2011
Earthquake	1958, 1960, 1963, and 2001

Source: Disaster Risk Management Plan, Government of Sindh, 2008

Sea level rise coupled with disasters increased the devastation in two lagoons (Mr. Naseer Memon, CEO of Strengthening Participatory Organization Islamabad, interview, 5 July). Memon noted that reduced fresh water from Indus to the Arabian Sea and has increased the salinity level and as a result Nurerrri and Jubho lagoons have become less habitable for aquatic life such as fish and mangroves. “We used to rely heavily on agriculture farming and livestock for our livelihood, but the 1999 cyclone destroyed everything” (Mr. Gul Hassan Lakho, non-fisher, interview, 6 June). He said floods of 2010 and 2011 changed the land all around the lagoon area. He said “air has lot of moisture which is affecting land, wheat, rice, cotton, tomatoes” and it is because of the sea intrusion, he explained. Salinity level in the Arabian Sea is 3.6% whereas salinity level in the creeks has reached to 3.8% to 4.2% (Memon 2013).

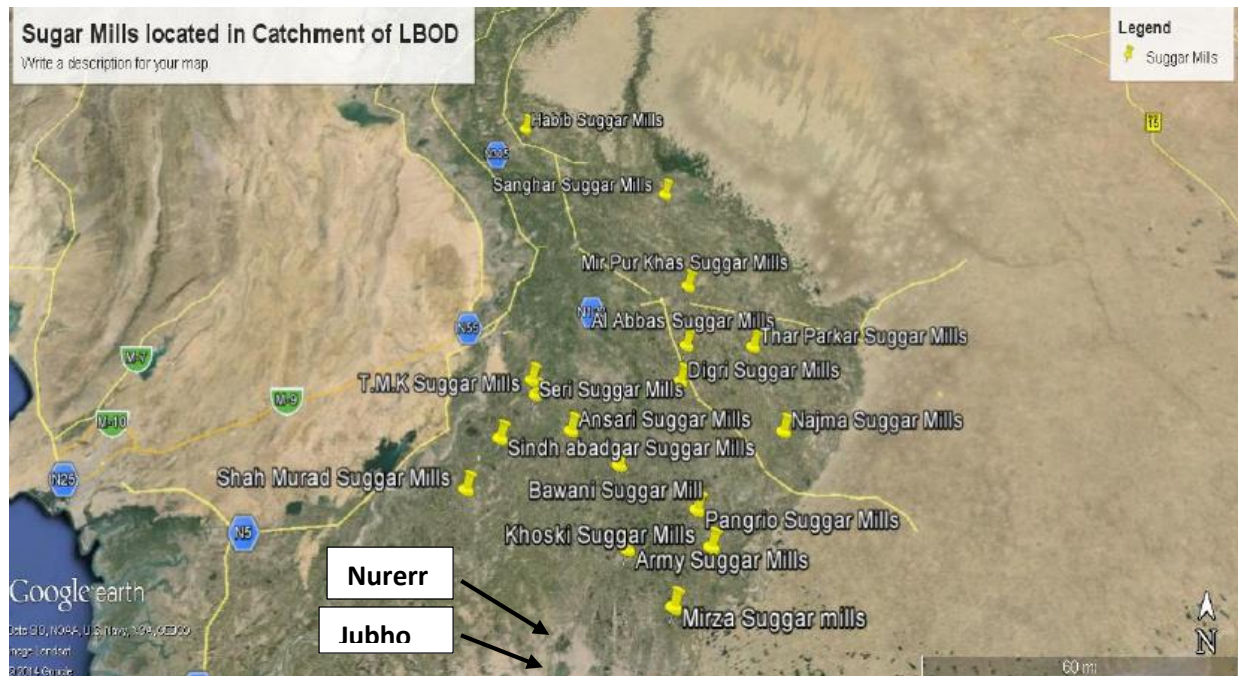
In addition to the huge damage to infrastructure and human lives, natural resources are also affected by these natural disasters. A number of important wetlands in this district have become degraded over last 20 decades and this effect is likely to increase causing salinization of aquifer

and soils, loss of habitat for fish, birds and flora and fauna. (Khan 2012). According to the local villagers many traditional breeds of fish like Notopterus Notopterus (Gundan), Wallago Attu (Jarko), Labeo Calbasu (Dhahi) are now rarely available in the coastal area and some of them have completely disappeared. During informal discussions some villagers indicated that prawns and crabs have almost disappeared after the cyclone of 1999. “Everything was fine before cyclone but after cyclone everything was completely changed” (Mr. Ali Muhammad Mallah, fisherman Nurerrri lagoon, interview, 14 July). He said “*We noticed changes that we never noticed before in our lives*”. These changes were sea water intrusion, polluted water, and dried lagoons and dead fish.

3.2.4 Industrial pollution

There are total nine wetlands that have been declared Ramsar sites in Sindh. Nurerrri and Jubho lagoons are among the six located on the left bank of Indus (Qureshi et al. 2015) which is also the catchment area of Left Bank Outfall Drain (LBOD). However, the coastal belt of Sindh has a total of 6000 industrial facilities (IUCN 2007), including 33 sugar mills, out of which 30 sugar mills are located on the left bank of Indus and six sugar mills are located in the district of Badin (See map 3.3).

Badin district relies heavily on the agriculture sector and many industries are agro-based. Two main agro-based industries that support the economy of Sindh are sugar and rice. Badin is recognized as a sugar estate as it produces almost 4,000,000 kg of sugarcane daily during the three months season (IUCN 2007), and provides employment to 6000 people (World Bank 2005). In addition to sugar mills, there are a total 70 rice husking and milling units in Badin district (World Bank 2005).



Map 3.3: Sugar mills located in the catchment of LBOD Sindh (Source: Page 382, Qureshi et al. 2015)

With the exception of a few, almost all the sugar mills are discharging their untreated effluents into the wetlands directly or indirectly through different canals, water courses and surface drains (Qureshi et al. 2015; IUCN 2006). These effluents contain heavy metal, detergents, lubricating oils, chlorine, various organic and inorganic toxic compounds and high levels of total dissolved salts (TDS), as found in sample tests collected from canals and pumps (IUCN 2007). Sugar mills are not only contaminating the wetlands but are also hazardous for health as indicated by many villagers during informal discussions. Sample tests collected from these sugar mills also indicate that none of them have an in-house effluent treatment plant (Qureshi et al. 2015).

In the context of Nurerrri and Jubho lagoon, the main sources of industrial effluents are through the Kotri drainage system, Amir Shah drain and Left Bank Outfall Drain, lagoons are still receiving highly toxic industrial effluents and poisonous chemicals (UEPL 2012). These effluents

are also harmful for the aquatic life and migratory fish catching birds in both the lagoons as they depend on the drainage system. Many birds have been found dead in the drains due to these effluents. During research interviews one villager, (Ali Muhammad Mallah, Fisherman, interview, 14 July), explained that before construction of LBOD, they were told that it would help to divert all the effluent from sugar mills to the sea. However, the water in the drains is still polluted and is not drinkable, and a cause of skin diseases, eye infections and many stomach problems among to the people in the surrounding communities of Nurerri and Jubho lagoon. (Ameer Mandro, President Mandhar Development Society, interview, 14 July), described how prior to the 1980s both Nurerri and Jubho lagoons were full of biodiversity where there was lot of fish, livelihood opportunities were more abandoned. However, Gungro and Amir Shah drain carried industrial pollution in both lagoons which were already degraded by cyclone in 1999. Another fisherman in Nurerri lagoon, (Mr. Momin Mallah, fishermen, interview, 13 June) noted that *“colour of water in the nearby drains is same like our skin colour”*. He added that sugar mills polluted the water of major drains that were the main source of water for these lagoons. (Mr. Sajjan, Social Organiser, Pakistan Fisher Folk Forum, interview, 10 June), highlighted that people from both the lagoons migrated to other places because water is full of effluent from local sugar mills. People have no clean water for drinking and women have to travel up to four to five km to fetch drinking water.

Table 3.6 Six sugar mills of Badin District, disposal points and contaminants

Sugar Mills	Disposing point	pH value (6.2 to 8.5)	Electrical conductivity 680 uS/m	Total Dissolved Solids (TDS) mg/l	Dissolved Oxygen 8mg/l
Mirza Sugar Mill Kadhan	KPOD	5.8	1530	979	1.72
Army Sugar Mill Badin	Sirani branch drain	7.18	1137	728	1.43
Diwan Sugar Mill Khoski	Khos Ki link	6.59	1098	703	1.19
Panrio Sugar Mill Pangrio	Tando Bhago sub drain	4.62	2200	1408	1.05
Diwan Sugar Mill Talhar	Not identified	5.66	10950	7008	0.82
Ansari Sugar Mill Matli	Jagsi sub drain	4.73	2200	11232	2.41

Source: Page 382, Qureshi et al. 2015

Table 3.6 shows details on untreated effluents from the sugar mills which contains electrical conductivity, total dissolved salts and low limit of dissolved oxygen contributing to the serious degradation of water bodies in Badin including Nurerri and Jubho lagoon. Another focus group (Jubho lagoon, 30 June), comprising five women and three men explained that due to polluted water in the canals, people are facing many health issues including skin diseases and stomach infections, fish numbers are depleted.

The government of Pakistan already has developed a Cleaner Production Program for industries, as recommended by the Federation of Pakistan Chamber of Commerce and Industry (FPCCI). However, there is a need to enforce this program so that it can be adopted by all sugar mills in Badin (IUCN 2006). There is also an Environmental Protection Act (1997) in Sindh. However, this law does not have any clear provision to restrain offenders from draining effluents into local wetlands because the implementation of law is ineffective (UEPL 2012). There are rules and regulations in place to monitor factory effluents, but these are not being effectively

implemented (Mr. Saeed Baloch, Chief Conservator Wildlife department Sindh, interview, 2 June). During one of the focused group discussions (Jubho Lagoon, 30 June) participants mentioned that if there is a clean water in the canals it is not difficult to rehabilitate both the lagoons. IUCN and Sindh Environmental Protection Agency (SEPA) have identified a serious need to enforce the rules and laws listed in Sindh Fisheries Ordinance (1980), Factories Act (1934) including provincial factory rules, Sindh Irrigation Act (1879), Sindh Water Management Ordinance (2002) and Sindh Wildlife Protection Ordinance (1972) to protect the water resources in Sindh province (Qureshi et al. 2015).



Clean water joining the large drain with polluted water (Sajida Awan)

3.2.5 Oil extraction

Badin is considered one of the richest districts in terms of natural resources. Oil and gas production started in 1981-82 and 1988-89 respectively and the total recoverable reserve of oil is around 61% of the total reservoirs (UEPL 2012). Badin oil reserves constitutes 45% of the total oil production in Pakistan (World Bank 2005). Table 3.7 indicates the total crude oil production of four oil fields of Badin as per district disaster management authority.

Table 3.7 Average crude oil production / day in Badin district

Years	Oil (Barrels / day)
1995	20,043
1996	20,970
1997	26,335
2001	30,000

Source: (DDMA 2008)

These oil and gas reserves are considered to be very important factor in the economic growth of not only Badin district, but also Sindh province. However, at the same time these reserves also pose a serious threat to the local environment. Recent environmental impact assessment reports have stated that any oil extraction activity can have negative impact on the environment and it possibly could include crop damage, disturbance to local communities, disturbance and destruction of wildlife, soil erosion, and water pollution (UEPL 2012). Though United Energy Pakistan Limited (UEPL), is taking different technical measures to avoid and reduce such negative impacts through identification and mitigation measures, however, there is no information on what kind of measures they have taken. Both Nurerrri and Jubho lagoon are saturated within the Badin oil concession boundary. Map 3.4 shows the Badin concession boundary which covers the area of Nurerrri and Jubho lagoon.

UEPL (2012) conducted an environmental impact assessment in Sindh province in 2012 and its first report came out with the recommendation for a separate EIA to be conducted for the Nurerrri and Jubho lagoons. The purpose of second EIA was to respond to the provisions of Environmental Protection Act (1997), to analyse the possible impact of oil drilling and extraction activities on the two sensitive wetlands, and to suggest appropriate mitigation measures to reduce the impacts (UEPL 2012). UEPL, with the collaboration of the government of Pakistan, conducted consultative meetings with the different primary and secondary stakeholders including NGOs, experts from different sectors and local community members. Local engineers were also consulted

to screen the environmental impact at the different stage of exploration, namely siting, construction, operation of machinery, and drilling activities at the wasteland of Nurerri and Jubho lagoon in the south block of Sindh (UEPL 2012). According to the recommendations of the EIA study (2012) local people had agreed to allow oil drilling and extraction as long as they are provided with:

- 1) Safe drinking water;
- 2) Employment opportunity;
- 3) Healthcare centers;
- 4) Primary and secondary schools;
- 5) Skill development centers;

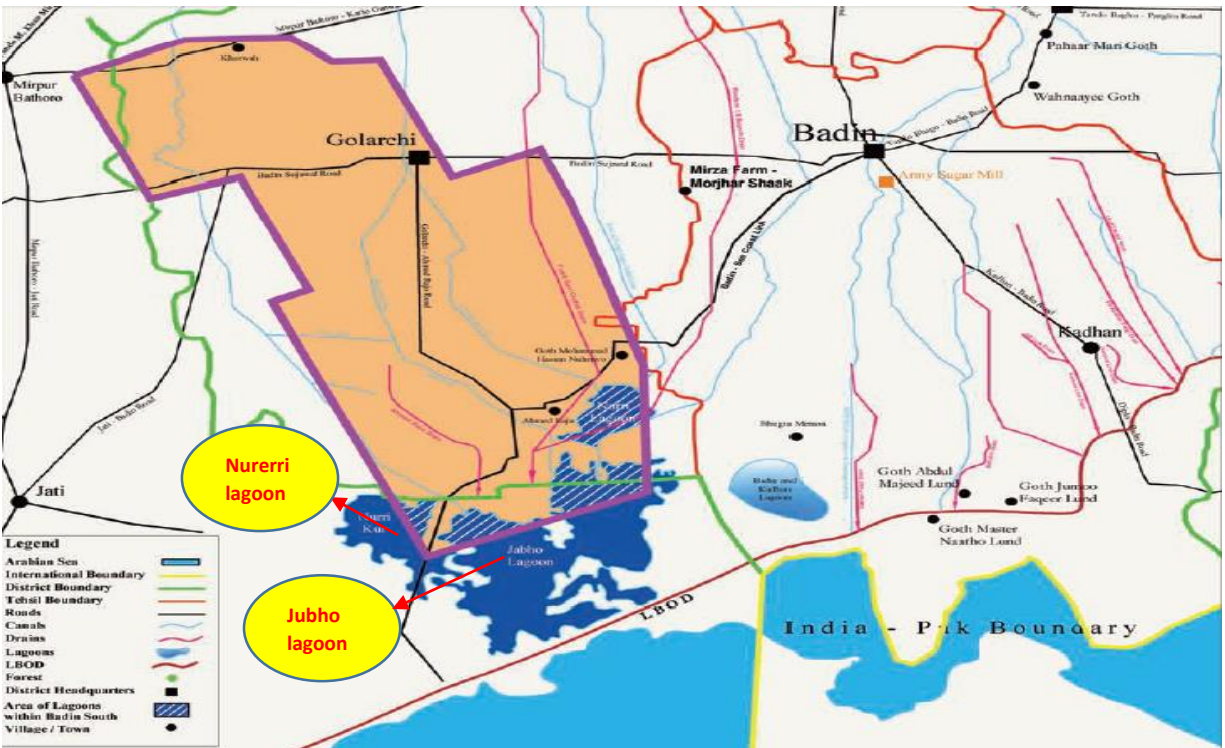
The final EIA study of UEPL (2012) suggested that the severity of impacts on the macro-environment and micro-environment through different oil extraction activities is very small and they justified the oil extraction with the view that it will help to improve the economic condition of poor people by generating employment opportunities in Badin. Oil development will bring social equity by improving the quality of life of people living in Badin without altering the ecosystem of the region. The EIA study also suggested some mitigation measures to offset the loss of vegetation are required and conclude replantation of mangroves in Nurerri lagoon (UEPL 2012). Another justification to start oil extraction was that both Nurerri and Jubho lagoons are already destroyed. As a result the wastelands of both the lagoons can be used for the oil extraction (See figure 3.3).



Figure 3.3: Wells located in the area of Jubho lagoon (Photo: Sajida Sultana)

Unfortunately, according to local people, drinking water, health care and employment is still a major problem in the district (World Bank 2005). With the exception of a small number (5%) permanent employment opportunities are given to external people (World Bank 2005). Many oil companies have also been issued with licence for off-shore drilling in the Indus delta (PDI 2006).

There are many laws to protect the wetlands from any such activity i.e. Sindh Wildlife Protection Ordinance, 1972 (SWPO), which specifies that “*Activities such as hunting and breaking of land for mining are prohibited in national parks, as are removing vegetation or polluting water flowing through the park*”. But considering the economic interest of oil extraction, two major amendments were made in the law in January and June 2001 respectively (UEPL 2012). First, the government is allowed to authorize the laying of an underground pipeline through the protected areas like lagoons. Second, Oil and gas exploration is allowed within the national parks and wildlife sanctuaries with the condition of EIA study approved by the regulatory department.



Map 3.4 Badin Concession boundary for oil extraction (Source: UEPL, 2012, final report)

3.3 Conclusion

This section provides a summary of this chapter. This chapter identified five main drivers of change that have impacted Nurerri and Jubho lagoons. The chapter also discussed some of the impacts of drivers of environmental change (See table 3.8). In the next chapters I will further explore how these environmental changes are linked to the changes in property rights system. The main drivers of change and their impacts are summarized in Table 3.8 below.

Table 3.8: Drivers of environmental change and their impact

	Key drivers of environmental change	Main impact / changes on Nurerri and Jubho Lagoons
1	Reduced fresh water flow	<p>Jubbo completely and the Nurerri partially are dried up and polluted. The lagoons which used to be hatchery for the several marine fishes and shrimp are no more of the same status because of the increased salinity as the fresh water inflow is marked low. Existing source of water is polluted and not enough to rehabilitate the lagoons. During monsoon season the rain water comes but because of damaged dykes and shallowness does not stay longer.</p> <p>The displaced fishing community has migrated to other areas and those who have stayed back have resorted to trash-fishing as an easy source of income – something greatly damaging the ecology of the lakes.</p>
2	Left Bank Outfall Drain	<p>Destroyed the natural boundary of lagoons because of breaches in the LBOD Tidal Link structure. The LBOD has virtually become a source to bring high TDS sea water deep in land destroying the ecology of the lakes among others.</p> <p>The tributary drains of the LBOD are carrying downstream industrial pollution and pesticide contaminated agriculture run-off.</p>
3	Natural Disasters	<p>1999 Cyclone and floods destroyed the LBOD Tidal Link's Choalri wear and thus destroyed the natural boundary of lagoons. Thus increased salinity damaged the ecology and habitat of lagoons.</p>
4	Industrial pollution	<p>Most of the pollution is coming from the Sugar Industry and brought to the lagoons through various drains. Sugar Mills are supposed to have polluted water treatment plants at the source. However, because of the powerful Sugar Industry owners are defying the law without any accountability</p>
5	Oil extraction	<p>Dried lagoons are not being rehabilitated hence oil companies are exploring oil reserves in lagoon area. There are more than seven oil and gas wells inside the lagoon areas.</p> <p>The seismic survey, drilling and other such activities are greatly affecting the flora and fauna of lagoons</p>

CHAPTER 4: DRIVERS OF PROPERTY RIGHTS SYSTEM IN NURERRI AND JUBHO LAGOONS

4.1 Introduction

This chapter explains the history of the property rights system in coastal wetlands in Sindh province of Pakistan, and especially Nurerri and Jubho lagoons. The main objective of this chapter is to explain the different drivers of change in the property rights system and how these drivers contributed towards degradation of both the lagoons. In order to understand property rights, it is important to understand the legal framework under which the management and protection of all the wetlands of Pakistan are covered. This chapter will also clarify how property rights in both the lagoons have passed through different periods and the challenges this has created for managing the lagoons.

4.1.1 History of legal frameworks for wetlands in Pakistan

All the wetlands in Pakistan were listed under the jurisdiction of West Pakistan Wildlife Protection Ordinance (1959) and were protected under the West Pakistan Wildlife Protection Rules, (1960). Two main provisions were made under this legislation. 1) declaration of wildlife sanctuaries and 2) game reserves.

The West Pakistan Wildlife Protection Ordinance and the Pakistan Forest Act (1959) were only applicable to the settled areas of Pakistan which included flood plains of Kabul, Indus River and all the eastern land (East Pakistan and now Bangladesh), whereas the tribal areas and west of Indus were not covered under its legislations. In 1971, The Pakistan Wildlife Ordinance replaced West Pakistan Wildlife Protection Ordinance (1959) which was applicable to the whole country. Under this ordinance, most of the responsibilities were given to the provincial level through

different acts and provisions. In Sindh province the provincial authority for wildlife protection was “Sindh Wildlife Protection Ordinance 1972” (Awais 2014), which was later amended in 2001. Sindh Wildlife Protection (SWP) Ordinance is not only responsible for the preservation and conservation of wildlife but also for the declaration of protected areas and prohibition of any illegal activity in the protected areas like Nurerri and Jubho lagoons. This Ordinance has three main categories in which all the protected areas are classified (in Table 4.1).

Table 4.1: Categories for protected areas under Sindh Wildlife Protection Ordinance 1972

Sr. #	Categories	Detail
1	National Parks	Hunting and breaking of land for mining are prohibited in national parks, as are removing vegetation or polluting water flowing through the park.
2	Wildlife Sanctuaries	Wildlife Sanctuaries are areas that are left as undisturbed breeding grounds for wildlife. Cultivation, grazing and residing is prohibited in the demarcated areas. Special permission is required for entrance of general public. However, in exceptional circumstances, these restrictions are flexible for scientific purpose or betterment of the respective area at the discretion of the authority.
3	Game Reserve	Game reserves are designated as areas where hunting or shooting is not allowed except under special permits

Source: Adapted from Sindh Wildlife Protection Ordinance 1972

Both Nurerri and Jubho Lagoon were protected under the Wildlife Sanctuaries or Game Reserve categories (Scott et. al, 1990) which is defined in the table above. Further detail on Nurerri and Jubho Lagoon as Ramsar site declaration can be found in the section 1.3.

Table 4.2: Nurerri and Jubho Lagoon as Wildlife sanctuaries

Name	Area (Ha)	Date of declaration	Location	Remarks
Nurerri Dhand	4,100	2001	Badin District	Located in or around the Project Area. Wildlife Sanctuary – Ramsar Site
Jubho Dhand	9,000	2001	Badin District	Located in or around the Project Area. Wildlife Sanctuary – Ramsar Site

Source: Adapted from directory of Asian Wetlands

Under the Game Reserve category, wildlife is protected from hunting and is controlled through a license system, but it does not protect the area from settlements, cultivation, grazing and other forms of exploitation (Awais 2014). This situation has applied to both Nurerri and Jubho Lagoons.

Here it is very important to understand what a protected area is, and why greater efforts are required to protect the designated area. Protected areas, as defined by IUCN (2012) are any geographically defined space which is recognized, dedicated and managed through legal and other effective means, for the purpose of long term conservation of nature and its associated ecosystem and cultural values. The IUCN has a set of criteria to determine what can be declared as a protected area, IUCN (2012):

1. The primary objective for establishment is the protection of biodiversity and associated natural and cultural resources.
2. The area of the PA is usually very large, except strict nature conservation areas, and habitats of key species.

3. It has legally defined boundaries.
4. Managed under an active conservation regime.
5. It has a defined tenure.
6. At least two thirds of the area is a natural ecosystem

Table 4.3 shows that government departments like the Provincial Forest Department, National Wetlands Management Committee, National Council for Conservation of Wildlife, Zoological Survey of Pakistan, and Provincial Environmental Protection Agencies are indirectly involved in the management of the wetlands. However, there has been no government department or law to address the specific issues related to the rehabilitation, restoration, sustainable use and management of wetlands. Hence, both the lagoons remained neglected before they were designated as Ramsar sites. After acquiring the status of Ramsar sites it became obligatory under the Ramsar Convention to establish a national wetlands policy. A National Wetland Action Program was approved in 2000 but implementation of National Wetland Policy is still under question. During interviews, (Mr. Tahir Qureshi, IUCN, interview, 28 June) also confirmed that even after the declaration of Nurerri and Jubho lagoon as Ramsar sites, there was no separate budget to maintain and manage these lagoons. He said that both the lagoons were managed poorly because of ignorance at a grass roots level (i.e. local communities) and at policy level (i.e. national and provincial level). (Mr. Cheema, Country representative of IUCN, interview, 28 June) said that there is a strong need to manage water bodies (i.e. lagoons and lakes) at national and local level besides signing numbers on international conventions and treaties.

Table 4.3: Government departments, acts and laws directly or indirectly managing wetlands

Acts, Laws, Rules and Policies	Relevant ministry	Responsibilities
West Pakistan Wildlife Protection Ordinance 1959	Ministry of Forest & Wildlife	<ul style="list-style-type: none"> • Protect, preserve and promote forests, and wildlife (both animals and birds) The Department has been regularly undertaking various development activities and implementing local and donor assisted projects in the fields of Forestry & Rangeland management, promotion of social Forestry, Amenity/Urban Planting, Landscaping & Beautification, Avenue Plantation, Promotion of Sericulture and Apiculture, Forestry Education , protections of wetlands, Research and improvement of important Ecosystems • To promote environmental stability, preserve biodiversity and natural heritage. • To disseminate technology of nursery raising, field planting, marketing etc. to public particularly farmers through trainings, workshops, seminars and field visits. • To promote afforestation on farmlands through farmers participation and use of wetlands
West Pakistan Wildlife Protection Rules, 1960	Ministry of Forest & Wildlife	Protect, preserve and promote forests and wildlife (both animals and birds)
Sindh Wildlife Protection Ordinance 1972	Ministry of Forest & Wildlife	Protect, preserve and promote forests and wildlife (both animals and birds)
Government departments and agencies	Relevant ministry	Responsibilities
National Council for Conservation of Wildlife (NCCW) 1974	Ministry of Forest & Wildlife	Protect, preserve and promote forests and wildlife (both animals and birds)
Provincial Forest Department	Ministry of Forest & Wildlife	Protect, preserve and promote forests and wildlife (both animals and birds)

National Wetlands Management Committee (1995) & now *Sindh Wetlands and Management Authority (SWMA)	Ministry of Environment & Alternative Energy	Protect & Conserve the environment, ensure the treatment of waste, promote alternative sources of energy (clean energy). *SWMA is to be established soon
Zoological Survey of Pakistan	Ministry of Fisheries & Livestock	The main function of Livestock and Fisheries Department is to improve availability of Animal protein in human diet Providing extension and technical services up to village level regarding disease control of Livestock, Poultry and Fish Development. Conservation of Fisheries Resources. Training of Fisheries and Fish farmers and in-service training.
Provincial (Sindh) Environmental Protection Agencies. SEPA	Ministry of Environment & Alternative Energy	Protect & Conserve the environment, ensure the treatment of waste, promote alternative sources of energy (clean energy)

Source: Sajida Sultana

4.2 License system

Property rights have been discussed in section 2.2 which offers explanation on how bundle of rights is a useful way to understand different groups of rights holders. License system can also be seen as a property rights arrangement which was used to regulate access rights to the commons in Nurerrri and Jubhoo lagoons. Before the license system, there was free hold in these lagoons. Free hold means that everyone was allowed to access these lagoons and engage infishing. There was no formal system for management of these lagoons as commons but communities were managing these lagoons through informal local arrangements. The license system was a kind of commons arrangement which was introduced to benefit local fisher communities as well as to protect wetlands in Sindh including Nurerrri and Jubho lagoons. Under this system the local communities would take annual lease of fishing areas within the two lagoons by paying a lease fee to the government and regulate access and use through institutional means (e.g., rules, norms,

practices). Government was only involved in the overall protection of wetlands, making related policies and resolving broader issues at the provincial level.

Table 4.4: Overview of license system applicable in all wetlands of Sindh

Key features	Details
License system	Introduced in 1977, before 1977 the fishing activities were under the under the agriculture and livestock policies
Legal status of License system	Legally status obtained in 1980 after the formulation of Sindh Fisheries Ordinance 1980
What is license system	Giving a legal status to all the fisher communities, the right of access and fishing in the wetlands by issuing individual license
License renewal	Annual renewal
License fee	Rs.100 per annum
Applicability	All the water bodies of Sindh, including lakes, lagoons, Exclusive Economic Zone, Zero point (Sindh waters).
Functions and responsibility of the License system	To regulate the fishing and aquaculture activities To discourage any illegal fishing catch and commercial activity

There was no specific policy at national or provincial levels for fisheries and aquaculture in Pakistan until 1970. Issues related to fisheries were mostly covered under agriculture and livestock policies (GoP 2006). In almost all the lakes in Sindh, anyone was allowed to catch fish and fishing waters were free from any governmental control (Memon 2005). People used to protect their commons through their own informal arrangements under the supervision of their community leaders and institutions. For example, within the fisher community, there were leaders who used to make sure that fishers are not using any harmful techniques to catch fish (thin nets). Conventional methods of catching fish by the fishing communities were sustainable because fishers were allowed to catch fish using normal nets of large mesh size and only during the prescribed season. However, with the increasing population and establishment of non-fishing communities in

the coastal area of Sindh, some powerful groups and private firms were encouraged to exploit lakes for fish catch and other illegal activities (i.e. using thin net to catch fish) (Memon 2005).

For the first time in 1970's the Agriculture Enquiry Committee and National Agriculture Commission in 1987 paid some attention to the fisheries sector, but many issues like trash fishing (where thin net is used to catch small fish) still remained unaddressed. In 1977, a "License System" was introduced by the Government of Pakistan to regulate fishing activities and it gave legal right on fishing to indigenous fisher communities (see Table 4.4). Sindh government introduced Sindh Fisheries Ordinance in 1980, which gave legal status to the license system. Section 3[1] of The Sindh Fisheries Ordinance 1980 reads, "*Government may, by general or special order, grant license or lease for fishing in any public waters on such terms and conditions and on payment of such fees as may be prescribed.*"

The license was a legal permit to catch fish, where fishermen registered themselves and paid a minimal amount for an annual license fee. The government at one point exempted the license fee (i.e. 1992-1994), but later on it was again made obligatory for all the fishermen to pay this fee. The license system helped to control the misuse of natural resources as it allowed fish catch according to the capacity of fish stock in any lake or pond. The license system became very popular among fisher communities as they realized that there is some mechanism to ensure the sustainable use of lagoons. (Mr. Sajjan, Social Organiser / Local community leader, Pakistan Fisher Folk Forum, interview, 10 June), said that the license system was introduced at the right time when population was increasing and people were exploiting both the lagoons. He said the license system helped to protect the rights of indigenous poor fisher communities who rely on these lagoons for their food and income.

The license system, at one point however, was also exploited by the local authorities. There were instances where local fisheries department officials issued fake license fee receipts to the fishermen after taking the license fee from them and reported to the government that fishermen are not paying the fee (Wasim 2007). As well as, influential groups (mostly landlords), have also exploited fishing grounds for their own benefits and threaten poor fishermen who independently catch fish (PFF 2014).

After realizing the increasing problems of fishing communities and misuse of water bodies the government developed, some specific policies to address the fisheries issues, and specially the promotion of licensing system (GoP 2006). While interviewing local fisher communities, most of the participants emphasized that having a license system has helped to protect the rights of fisher communities and ensure the sustainable use of lagoons, but that there is a strong need of implementing the system fairly by the local authorities.

4.3 Contractor system

While these wetlands were going through the stresses of environmental changes (See section 3.2), a group of people wanted to change and manipulate the property rights system, to generate profit from fish business in almost all the coastal area of Indus Delta, including Nurerri and Jubho lagoon. With increasing demand for fish and economic value the provincial government introduced the provision of contract system. The purpose of replacing the license system with contract system was to bring increased benefits to large organizations and allow them to earn more profits through monopoly control of the fish market. Under this system fishing rights went to the highest bidder.

Table 4.5: Overview of contract system applicable in all wetlands of Sindh

Key features	Detail
Contract system	Introduced in 1980
Legal status of Contract / Lease system	Sindh Fisheries Ordinance 1980 Section 3(1)
What is Contract / Lease system	Giving the legal status to the people who participate in the bidding / auction process. A contract is issued to a person / company who wins the highest bid. Only a contract holder can allow or restrict access to wetlands for fish catch and for commercial fishing
Contract duration	One year, sometimes renewable.
Annual fee	Non
Applicability	All the water bodies of Sindh, including lakes, lagoons, Exclusive Economic Zone, Zero point
Ended on	2007

Through Sindh Fisheries Ordinance 1980, fishing grounds were auctioned and contracted to catch fish and sell the fish in the market. This contract was given to the people / companies through bidding process. Contract was issued to a person / company with highest bid. The local Sindh Fisheries department was the main body responsible to carry out the auction process and to issue the contract (See Table 4.5).

Using Section 3(1) of Sindh Fisheries Ordinance 1980, which says “*Government may, by general or special order, grant **license** or **lease** for fishing in any public waters on such terms and conditions and on payment of such fees as may be prescribed*” both lease and license system were adopted. However, later on the contract / lease systems was completely replaced by the license system. Contract system was clearly not for local fisher communities but was only focused to earn more and more profit. This practice created insatiability amongst the local people, large organizations and government departments. Many influential people started misusing contractor system, and encouraged outsiders to enter into fish business, depriving the local fisher communities of their livelihood and depleting the fish stocks (Memon 2005). Local poor fisherman

were not allowed to enter the fishing water without permission of contractors. Local communities were not happy with the contractor system because fishers were not allowed to access the lagoons without the permission of contractors (Mr. Sajjan, Social Organiser / Local community leader, Pakistan Fisher Folk Forum, interview, 10 June). He also explained us that because of increasing demand for fish, it was a flourishing business for many people. According to local people, the contract amount started at Rs. 200,000 and went up to Rs. 2,000,000. Contractors also played the role of middlemen man between fishers and the fish market. Fisher were forced to take loans from contractors because there was no formal credit system available (Wasim 2007). Contractors, through the highest bids, were also authorized to harvest the fish from these water bodies and poor fishermen were hired for harvesting process (GoP 2006).



Trash fishing technique being used in nearby drain (Photo Sajida Awan)

In many coastal and non-coastal districts of Sindh, many fishing grounds and lakes are owned or occupied by the landlords of those areas. Under this system a total of 1209 water bodies' including lakes and lagoons were auctioned to the landlords by Sindh fisheries department (PFF 2005). With the help of local fisheries department, the landlords used received the contract through

a higher bid and sell the fish in the market as and when they wanted to. A bidding process was a formality fulfilled by showing the bids and participation of bidders but it did not actually invite bids from genuine contractors. Fishers were punished for raising their voice against misuse of contract system and fake bidding process and in some cases they were even killed (Wasim 2007). Mr. Mohammad Saddique Mandro from Jammu Mandro village of Jubho lagoon explained that these lagoons were important for them for their livelihood but when contractors took control of these lagoons they started demanding a certain percentage on every fish catch. Mr. Ali Mallah confirmed that contractors used to exploit the system. He explained they used to buy fish from them on cheaper rates and sell it in the market at more than double the rate (Mr. Ali Muhammad Mallah, fisherman Nurerri lagoon, interview, 14 July). When local fisher communities were struggling and coping with the contract system, Pakistan Rangers (Border forces) took over the control of boarder areas of Sindh including major wetlands, and made local fisher community's life more challenging.

4.4 Rangers control

Beside implementation of contract system by the government, Thar Rangers in 1977, wrote a letter to government to give them control of wetlands in Badin to protect the area and also to fulfill their nutrition needs. Established in 1942, Pakistan Rangers are paramilitary forces to protect the borders governed by Ministry of Interior under the Rangers ordinance (1959). Initially, the government gave them formal permission to use four lakes including two study lagoons. A demand to lease more lakes was later refused by the government (PFF 2005). According to the agreement between the government and Thar Rangers, were allowed to take 65% of the total fish catch, and the government was allowed to take 30 percent and the remaining 5 percent for the fishers (PFF 2005). Besides fulfilling their nutritive needs, the Rangers started using lakes for fish and shrimp

business as they had a very good market value. Using their power as a paramilitary force of the country they occupied 20 other lakes in Badin and surrounding districts. According to local people the Rangers took over 29 lakes and the Zero Point (sea fishing ground) of Badin.

The agreement between the government and the Rangers was the first step which allowed rangers to enter into the fishing grounds, and slowly they started taking part in the auction process of the Fisheries department, influence, the process to give contracts to their own people. One of the community leader in Badin also confirmed that Rangers became a part of contract / auction system because of the local government authorities. He also added that local authorities and rangers influenced the contract system for their own benefit without considering the poor fisher communities. Masood Lohar says that during the Zia regime (1977 – 1988), the Rangers were openly allowed to catch fish from these lakes. He also added that rangers not only controlled and prevented the entry of fishermen in these waters, but also exploited poor fishermen to sell the fish in the open market according to their terms (Mr. Masood Lohar, National Program Coordinator, UNDP GEF Small Grants Program, interview, 28 July). They used to purchase cheaper fish from the fishermen and sell it in the market at much more than the price they were paying to the fishermen (Memon 2005). For every 1 kg of fish, fishermen were paid Rs. 10, but in the market value of same quantity of fish was Rs. 100 (Memon 2005). Nobody was allowed to complain against these contractors or the Rangers because they received threats from the fisheries departments and the Rangers themselves.

In 1980, the Rangers formally requested government of Sindh to exclusively grant fishing rights for the safety of coastal areas of Sindh (Mr. Masood Lohar, National Program Coordinator UNDP GEF Small Grants Program Pakistan, interview, 27 July). They received full control of the coastal area in the same year. The Government of Sindh passed a bill to hand over lakes and

lagoons in the coastal area of Indus delta including Nurerri and Jubho Lagoon. As a result, the Thar Rangers not only badly exploited the fishing grounds but also raided, tortured and threatened poor fishermen living near lakes, and in some cases they registered false first investigation reports against the fishermen. In 1990, many fishermen launched a formal complaint against the Rangers' high handedness and their illegal fish catching activities, but no action was taken by the high command of the forces. Their justification was that Badin district and surrounding coastal belt is an Indian border area and the Rangers are only protecting their borders (PFF 2005). This situation was also confirmed by (Mr. Tahir Qureshi, IUCN, interview, 18 June). Rangers also justified their act by saying that they are stopping all illegal activities like smuggling, and illegal immigration (PFF 2005). In many cases the Rangers justified being a part of auction system by saying that they always act as a middle man and try to resolve the disputes between fishermen and contractors. During research interview near Jubho village, (Mr. Noor Mohammad, Fisherman Jubho lagoon, 13 July) explained how the Rangers and contractors were supporting each other to earn money from fish business. He added that only 20% of the fish catch was allowed to the fishermen and rest was distributed between contractor and the Rangers. The contractors were forcing fishermen to handover all the fish catch to them for distribution. Rangers started getting involved initially by requesting that they need fish for their nutrition purposes but later on gradually took over many lakes and got involved in fish selling business with the contractors (Mr. Abu Bakar Shaikh, CEO Delta Development Program, interview, 15 June). Mr. Abu Bakar said that they were controlling the fish catch and sell through contractors and by establishing many check-posts to protect and support contractors. Mr. Abu Bakar Shaikh also said that contractors (mostly the local powerful elites and rangers) earned lot of money from fish and shrimp selling. Last contract went up to Rs.

32, million as it was a huge commercial activity in the Nurerri and Jubho lagoons and adjoining coastal area.



Rangers Choki near Jubho lagoon (Photo Sajida Awan)

Over the period of time dispute between the Rangers and local fishing communities increased, and finally, many civil society organizations raised their voices against the interference of Rangers in the auction system and fish business. Many groups requested the government to stop Rangers from interfering and exploiting the poor fisher communities. Up till 2003, the government and Rangers were signing an agreement to continue their presence in the coastal belt of Sindh. As a result of increasing tension between Rangers and fishermen, in 2004, a conference was organized by civil society organizations and media to illustrate how Rangers activities in the coastal belt of Sindh particularly in Badin district were problematic. The conference participants demanded to free the coastal belt of Sindh, its lakes and to rehabilitate degraded lakes. Conference also demanded to treat the rights of fishers be returned and to allow them to freely sell their fish catch in the open market on the agreed rates (PFF 2014). Following this conference, fisher communities started protests and women and children also participated in hunger strikes.

Finally, in December 2004, the government decided to take notice of this increasing tension and cancelled all the contracts of Rangers on the waters of Badin, and rights were given back to the fisheries department. This was the first step towards giving back to fisher communities' access to the commons of Nurerri and Jubho lagoon.

4.5 Back to license system

It was a big relief for the coastal fishing communities when the government cancelled all the contracts of Rangers and their control of the 29 lakes in Badin district and surrounding coastal areas. However, fishing communities are still struggling to get their rights back from contractors. The contractor system played a devastating role in the exploitation of fish resources, degrading the natural ecosystem of lakes and taking the only livelihood source of poor fish communities.

Although license system had its own weak points, according to local communities they were still in favor of the license system as it was less exploitative in comparison to the contract system. In the contract system, fisher communities had no authority to even access their water bodies without the consent of a contractor. Since the replacement of license system with contract system, many civil society organizations were helping fishing communities to raise their voice in front of government, but actual campaign started in 2004, when Sindh fisheries department announced to auction water bodies. People started demonstrating against the announcement with many political parties and civil society organization participating in demonstrations. Many fishermen in different parts of Sindh started demanding that the license system to be restored and to abolish contracts. Beside demonstrations, thousands of fishermen also gathered in peoples' tribunal where after four hours of hearing they gave the decision in the favor of fisher communities. 4500 fishermen from all the coastal areas of Sindh gathered and filed their petition against the

contract system and requested a stop to auctioning of their lakes (PFF 2005). Many fishermen were arrested by the police and many of them were injured during these demonstrations. These demonstrations and hunger strikes against the contract system continued for two years and finally in August 2007, the Chief Minister Sindh declared abolition of contract system and to restore license system (PFF 2005). Formal notification was issued by Livestock and Fisheries Department. (Mr. Sawan, social organiser Pakistan Fisherfolk Forum, interview, 17 June), explained that Mohammad Ali Shah, Chairman Pakistan Fisher Folk established units at local level to start the campaign against contractor system and control of rangers. He said that local fishermen with the help of PFF, put a lot of effort to make this campaign successful.

Even after the announcement and formal notification the contractor system was active in some water bodies, whereas license system was being used in other part of the coastal area. With the passage of time and continuous struggle of civil society organizations, government not only removed contractor system but also took action to improve license system for the betterment of fishing communities. Many revisions and amendments were suggested in the Sindh Fisheries Ordinance to ensure that it is not being manipulated and misused by the any local government authority or influential people such as given the license to the deserving fishers. Actual amendments to convert contract system back to license system the Ordinance were made in 2011. It was moment of great joy and relief for fishers after government's decision (Mr. Abu Bakar Shaikh, Chief Executive Officer Delta Development Program, interview, 15 June). In addition to amendment, government also took some steps to improve condition of fishing communities by providing them several incentives and formed committee's at district level to register formal complaints of local fishermen and solve their disputes (Dawn 2011). Amendment was also made in the Civil Court Ordinance 1962, to ensure timely and speedy disposal of dispute cases. Sindh

fisheries bill was passed in 2011 to ensure that fishermen get their rights and access to public waters. In addition to that this bill also aims to protect 1209 fresh water bodies from corruption of any sort (Dawn 2011).

4.6 Conclusion

This section provides summary of this chapter. This chapters explains different changes in the property rights system of both the lagoons. How open access commons i.e. Nurerri and Jubho were regulated and managed through license system, contract system, during rangers control and again back to license system. Chapter also identifies challenges faced during each arrangement and their impact on both the lagoons (see Table 4.6).

Table 4.6: Change of property rights and their implications

Change in the policy	Year	Implications
Free Hold	Before 1970	<p>Everyone was allowed to access the lagoons.</p> <p>Less exploitation because of less population</p> <p>Lagoon communities were managing lagoons on their own. Which means that there was an informal system of management to manage lagoons. There was no formal arrangement to manage these commons</p>
License system	Introduced in 1977	<p>Increasing population increased the stress on lagoons. Many non-fisher communities also migrated and started fishing into the lagoon area.</p> <p>System was introduced to regulate / manage the use of lagoons and to protect rights of fisher communities.</p> <p>License were issued by the local government authorities to fisher communities only for fish catch and sale.</p>
Contract system	Introduced in 1980	<p>Introduced because of increasing demand of fish and increasing economic benefit.</p> <p>Contracts were issued to non-fishers, private companies and local influential people.</p> <p>Poor fisher communities were not allowed to access lagoons without the permission of contractors. They were also not allowed to sell fish directly in the market.</p> <p>Lagoons started degrading because of over exploitation and poor management.</p>
Rangers control	Started in 1977	<p>Rangers took control of lagoons for security reasons and to meet their dietary needs.</p> <p>Rangers started participating in the bidding process and used the contracting system in their favor.</p> <p>Local fisher communities were further restricted by rangers from accessing the lagoons. Increased degradation of lagoons because of over exploitation by rangers.</p>
License system	2004	<p>License system reinstated but both the lagoons are badly degraded during the transition period from one system to another. Though in 2004, license system was reinstated but actual implementation of law is still under question. Jubho lagoon is completely dried and is being used for oil exploration activities.</p>

CHAPTER 5: LINKING PROPERTY RIGHTS WITH ENVIRONMENTAL CHANGES

Chapter 3 outlined the environmental changes in the Nurerri and Jubho Lagoons area. In that chapter I discuss various drivers of change (e.g., natural disasters, industrial pollution, reduced fresh water flow etc..) and how those drivers changed the ecology of the two lagoons in particular, and the Indus Delta in general over the period of last three to four decades.

Chapter 4 examined the history of changes in the property rights system in the Nurerri and Jubho lagoons over the last three to four decades, and how this change has affected the communities of these lagoons. Change in the property rights system shows how commons in Nurerri and Jubho lagoons were managed in the context of changing government policies (e.g., from license system to contract system). This chapter outlines how after a long struggle of local fishing communities in maintaining their property rights, the government brought back the license system. The license system was a trusted mechanism which provided more equal rights to all the fisher communities and offered protection from over-exploitation of lagoons by non-fisher communities.

In this chapter, I will examine the impact of environmental drivers of change on lagoon communities and how drivers of change in to property rights system and environment are connected to each other. This chapter thus examines the linkages between property rights system and environmental changes as a two way process. Linking both the changes and addressing their associated issues is important for long term planning and policy making for the protection of lagoons. Ignoring or treating environmental changes and property rights system separately can lead to further degradation of commons.

5.1 How environmental change impacted the lagoons and lagoon communities

In this section my aim is to explain the impacts of each driver on the local communities. Later in the chapter this will contribute to the analysis of the environmental changes and their impact on the property rights system. Table 5.1 shows the history of natural disasters and anthropogenic problems in Badin district which has two important Ramsar sites, Nurerri and Jubho lagoons. In chapter 3, these disasters have been explained in detail and how each of these disasters have changed the ecology of different lakes and lagoons in Badin district.

Table 5.1: History of natural and human caused disasters in Badin District and their impacts on the Nurerri and Jubho lagoons

Nature of change	Year	Impact
Reduced fresh water flow	1940 onwards	More than 0.500 million ha of farmland in the coastal areas of Thatta and Badin damaged. Reduced the required water flow which caused degradation of wetlands including Nurerri and Jubho lagoons. Lagoons remained mostly dry during the year except rainy reason.
Cyclone A-1 & A-2	1964 and 1999	Severely damaged mud flats which acted as a buffer area in Indus Delta area. Damaged the natural boundary of both the lagoons and exposed both the lagoons to the sea water
Floods	1970, 1975, 1979, 1994, 2003, 2006, 2010 & 2011	Severely damaged mud flats no buffer in Indus Delta area. Damaged the natural boundary of both the lagoons and exposed both the lagoons to the sea water
Earthquake	1958, 1960, 1963, and 2001	No major impact on two lagoons. No study done on major destruction
Left Bank Out fall Drain	1989 (On going)	Changed the natural flow of water to downstream Kotri barrage. Polluted Nurerri and Jubho Lagoons with industrial effluent. Sea water intrusion in the Indus Delta including Nurerri and Jubho Lagoons
Industrial Pollution	On going	Polluted the major drains i.e., major source of water for Nurerri and Jubho Lagoons

5.1.1 Long history of disasters and their impact on lagoon communities

The Indus delta has a long history of different disasters including the cyclone of 1999 and floods of 2010-2011 which changed the whole landscape of Indus Delta, including in the Nurri and Jubho lagoons. These disasters played a major role in damaging the ecology of Sindh's Inland and Coastal lakes and lagoons. In this section I will explain how these disasters affected the local communities and caused major changes in Nurri and Jubho lagoons over three to four decades. Pakistan has a very old and one of the largest drainage systems in the Asia. However, but with the establishment of one of the Asia's largest drainage system, Indus Delta faced drastic water shortages. Changing water policies due to increased water demand among different provinces of Pakistan in upstream areas, left the Indus delta with the minimum flow from 150 MAF to 10 MAF in the last five decades. This reduced flow also reduced fresh water flow into the Nurri and Jubho lagoons contributing to the degradation of lagoons, loss of aquatic life and biodiversity. As a result, local fisher communities of both the lagoons were forced to find alternate means of livelihood instead of fishing. As per locally estimated numbers about two million fishermen were affected due to water shortages throughout Sindh province. The communities of over two dozen villages in and around Jubho lagoon migrated to major towns including Badin, Jatti and even Karachi city. This migration was of a permanent nature as the lagoon was badly degraded. The majority of the migrant households abandoned their ancestral fishing occupation and became agro-labourers or other daily wage earners. Those who worked as peasants or daily-wage agro labourers worked on paddy and wheat crops in the neighbouring areas, but the economic displacement has been permanent.

Thus, in the due course of time these fishing communities changed their way of life and culture. The shortage of fresh water discharge and salinity in the Nurri and Jubho also damaged

mangroves that are considered an important source of fish breeding. In addition to the depletion of fish species including Rohu (*Labeo Rohita*), Thela (*Catla Catla*), Dhangri (*Lactarius Lactarius*) and Khagga (Dusky Catfish, Marine Catfish), loss of habitat also caused depletion of shrimps. Now both the lagoons only get water during monsoon rains but only for five to six months. There are at least three agro-runoff drains that still provide water to these lagoons but unfortunately these drains are heavily polluted by Deewan, Ansari, Shah Murad sugar mills. The detail can be seen in chapter 3 “Drivers of environmental changes”.

The cyclone 2-A of 1999 was considered as a “category 3” equivalent storm and according to local estimates killed 6200 people and damaged huge land and water resources in Sindh. This cyclone broke the natural as well as artificial (LBOD’s tidal link) barriers of both the lagoons, including many other lakes which allowed sea water intrusion. With no barriers, there was no fresh water retention capacity in both the lagoons. Condition worsened with the 2010 and 2011 floods which again exposed both the lagoons to the sea water by destroying natural boundary of the lagoons. Table 5.1 summarises the drivers of environmental changes and their impact on the two lagoons. These changes also impacted the livelihoods of people surrounding these lagoons in many ways as explained in table 5.1. As explained by (Mr. Momin Mallah, fishermen, interview, 13 June), explained that when there used to be a lot of water they never saw sand storms in this area but now because the lagoon is dry, sand storm are a permanent feature in this area. I also witnessed this during my visit to Jubho Lagoon area. It is important to note here that most of the poor coastal population in Sindh depend upon fishing as their main source of livelihood. Table 5.2 shows the distribution of livelihoods in coastal areas of Sindh.

Table 5.2: Distribution of livelihood in the coastal areas of Sindh

Primary source of livelihood	% of household	Comments
Fishing	65%	Mostly poor population
Agriculture and livestock	20%	Mostly non-poor population, Around 81% of households earn no income from agriculture and only 11% earn more than 80% of income from this source
Regular employment	6%	Poor to middle
Wage labour	5%	Poor
Other (Wood cutting or external source)	4%	Poor to middle

Source: World Bank (2005)

5.1.2 Diverse livelihood and cultural deprivation

In the past, major sources of livelihood in Nurerri and Jubho lagoon were fishing, with only a few people were engaged with agriculture. Livestock ownership was an additional component to support livelihoods. With the changing environment, fishermen were forced to adapt to different sources of livelihoods including agriculture, employment, wage labour etc. However, some of the fishers were not even allowed to catch fish during the period of the contract system (See section 4.3). On the other hand, fisher communities who were still engaged with fish activities were again controlled by the contractors (See section 4.3). However, it was not easy for indigenous poor fishermen to shift from fishing to another mean of livelihood. To adapt to agriculture, poor fishermen had no resources to buy lands and thus the only option for them was to work on the lands of large landlords. Working on the lands of large landlords in Sindh means living on their terms and conditions. At the same time a changing environment also affected millions of acres of agriculture land in Sindh, hence agriculture lands were not good for cultivation (Memon 2005).

Another possible source of income was for fishers to move to the large bigger cities for employment. However, poor fishermen were not educated enough to compete in the job market in

the nearby cities with very few employment opportunities. A very few family were able to send their family members abroad to work as wage labourers. It was hard for lagoon fishing communities to leave their ancestor's profession. These lagoons are not only a source of livelihood for them but many cultural and social aspects of people's life are associated with them. For example, in the past the *Sindhis* were known as *Dayra Panthis* or the river worshipers. Many folklores written by the famous poets like Shahbaz Qalandar, Zinda Pir, Udeolal and Sadho Bello belong to and were associated with the Indus Delta. Sindhi folklore is also associated with water. Soni Mehar, Noori Jam Tamachi, Hurs of Mukhi, Shah Abdul Latif Bhattai, Mangho Pir and many other writers were famous for their folk stories associated with water. This shows how close these communities were with their wetlands. Being deprived of water or moving away from their lakes and lagoons disconnected fisher communities from their core beliefs and cultural values. After the destruction of lagoons, many communities decided to move near to the sea or other lakes. Some decided not to leave these lagoons and stayed back for the seasonal fish catch or fish catch in the nearby fresh water canals.

Population played an important role in determining the sustainability of ecosystem of Nurerri and Jubho lagoons. 30 to 40 years ago, there was less stress on lagoons because of low population in that area. However, population has increased dramatically in Badin district within the last three decades. High population growth increased demand for food and business, on one hand, and increased stress on the lagoons for multiple uses (i.e. recreation, hunting, transportation etc.), on the other hand. These stresses also contributed towards degradation of the lagoons. Overall, when the status of commons deteriorated, the growth of population kept on increasing.

5.1.3 Ineffective management of lagoons and fish resources

Unfortunately, wetlands and lagoons in Sindh never had a separate law or department to support their management. Even Ramsar sites like Nurerri and Jubho only received attention in 2008. Government's weak policy in response to climate change is another reason for the degradation of commons like Nurerri and Jubho lagoon. An inadequate forecast system and technically poor infrastructure like the LBOD and tidal link (See chapter 3 for details) even worsened the situation during the 2010 and 2011 floods. They exposed both the lagoons to flood water which damaged them very badly. Local people were never consulted during the construction of the LBOD and other canals. A lack of trust between government and local communities are an indicator of inefficient management system.

There has not been any separate fisheries policy until recently to address problems of coastal communities of Sindh. For example, fishermen were never involved in any policy level interventions such as the development of a Fisheries Act. Local communities had no knowledge and awareness about any policy and there was no representation of fishermen in lagoon related decision-making. With the increasing pressure on lagoons for fish, catch there was no regulatory policy for fish catch and fishermen were using different types of illegal thin nets for fish catch. Fishermen were catching juvenile fish which destroyed many fish breeds and the seasonal cycle of breeding. Only after the declaration of Ramsar sites did the government of Sindh decide to form a national wetland policy to protect wetlands, and specifically Ramsar sites. Even after the establishment of the National Wetland Policy and it was not possible to save these lagoons because of poor implementation of policy and laws.

5.2 How change in property rights system impacted the lagoons and lagoon communities

To examine the impact of property rights system on Nurerri and Jubho lagoons, it is important to consider different social indicators, such as power dynamics, cultural values and economic factors. These indicators help to explain the priorities of local communities and government with regards to change required in the policies to manage commons. Property rights system to manage commons are dynamic in nature (Nayak 2011), and changes in property rights systems depend upon many external economic, political and social factors. I refer to these factors as *drivers* of change as defined in the Millennium ecosystem assessment (2005).

5.2.1 Formal commons arrangement for the use of lagoons

Before 1970, there was no rule or policy for the use of wetlands in Sindh province. This means that wetlands in Sindh were free hold and they were under an open access regime. Nurerri and Jubho lagoons supported the livelihoods of about 10,000 people. This number is based on an estimate as these two lagoons are a part of lagoon complex, where they are connected with three other lagoons and as a result, it is difficult to separate the number of users for each lagoons. The majority of the population surrounding Nurerri and Jubho lagoons were fisher communities. Fisher communities were mostly indigenous fisher communities and they were living in that area from three to four decades. Non-fisher communities were very few in number and were engaged in agricultural activities. They were also using these lagoons to extract water for their lands.

Gradually, with the increase in population, the number of users also increased. To meet the increasing demand for fish, fisherman started to sell the fish in the market in addition to meeting their own needs. This increasing economic activity increased the pressure on these lagoons. With this in mind the government at the time decided to introduce a license system in 1977 to protect

the biodiversity and rich ecosystems of these lagoons, and to ensure the sustainable use of these lagoons. The government gave exclusive rights to the fisher communities under which only fisher communities had access to these lagoons. This system was mutually agreed to by the local communities and state, thus establishing the formal rules for the use of commons of Nurerri and Jubho lagoons. This system helped to control the access rights, management rights in both the lagoons. It took three years to shape the license system into a policy, and in 1980 the Sindh Fisheries Act was introduced which gave legal status to the license system.

5.2.2 Use of resources by the indigenous fisher communities

With the implementation of this system, only indigenous fisher communities were allowed to catch fish from the lagoons. These indigenous fisher communities were involved in only sustainable fishing techniques in the particular season following the natural cycle. These sustainable fishing techniques are usually safe and support healthy ecosystems, flora and fauna of the lagoons. Fisher communities had also an informal agreement on the fish catch and selling. Sustainable fishing practices were mutually agreed among the fisher communities. For example, only normal nets with bigger mesh size were used to allow small fish to escape the net. Similarly, seasonality was considered to make sure that fish breeding cycle is unharmed. They knew how much fish catch is safe, when, how and where. For indigenous fisher communities, these lagoons were not just source of livelihood but also a source of inspiration. Their lives, beliefs religion, and customs were interweaved with water. Some of these fishermen spent their whole life on the boats. Depriving them water means depriving them of their beliefs, norms and values. For this reason, they took care of their lagoons as their homeland.

“This is very unjust with the local communities to impose government rules and policies without involving them in the policy making process” (Naseer Memon, CEO Strengthening

Participatory Organization Islamabad, interview, 5 July). *“Local communities are the actual owners of these lagoons because they are protecting these lagoons and have been associated with them from centuries”* (Naseer Memon, CEO Strengthening Participatory Organization Islamabad, interview, 5 July). The license system was a hope for these fisher communities through which they could protect their lagoons from over use and ensure the sustainable ways of fishing. However, during my research I did notice that even the in license system, there was some exploitation and misuse of the system (i.e. giving the license system to non-fishers), although it was still controllable.

5.2.3 Dysfunctional formal commons management arrangement

The contract system established after the establishment of Sindh Fisheries Act (1980). Local fishing communities were against the new system but the local government imposed this system in all the lakes and waters of Sindh. For four to five years both contract and license systems were in place, but after sometime the license system was completely abolished and it was replaced by the contract system. The purpose of converting the license system into the contract system was to manage different companies involved in fish business in and other profit centred organizations which entered into the fish business and wanted to access lagoon for fish catch. Thus contracts were given to fisher and non-fisher communities. With the growing fish market and increasing desire of more profit, many companies and non-fishers started using fishing nets (Boolo and Gujo) which started damaging the fish resources. These nets were used to catch small fishes for chicken feed. Local fishing communities were exploited by the powerful people from within the fishing community and also by the people from outside the fishing community and who recently got involve in fish business. Contractors use to exploit poor fishermen by lending boats, and nets on loans which were hard for fishermen to pay back. With the growing fish market and increasing

desire of more profit many companies and non-fishers started using fishing nets (Boolo and Gujo) which started damaging the fish resources because these thin nets were also catching very small. The contract system thus became one of the factors contributing to the degradation of lagoons.

Both the lagoons remained under the control of contract system for more than 10 years. The problems were aggravated when rangers took over the control of 29 lakes in Sindh including Nurerri and Jubho lagoons. Rangers were allowed by the government to take 65% of the total fish catch, the contractors was allowed to take 30%, and the remaining 5 % for the fishers (PFF 2005). Later rangers also become involved in the auction and bidding process of contracts. None of the NGOs, CSOs and responsible government departments ever approached these local communities to ask them if they were satisfies with the contract system or not. Only after six years did a local organisation, the Fisher Folk Forum, finally decided to bring all the indigenous fishing communities together and motivate them to fight for their rights. Their collective struggle took another five to six years to convince the government to re- implement the license system, also confirmed by (Naseer Memon, CEO Strengthening Participatory Organization Islamabad, interview, 5 July), and terminate the contract system but unfortunately it was too late to protect lagoons.

Exploitation, discrimination and poor governance was present in the license system too. Implementation of the license system in its true form never happened because of poor governance and accountability. Another important aspect to consider here is that the license system was only there for a very short period of time after which it was completely taken over by the contract system. This means that both Nurerri and Jubho lagoons were not managed properly even under a commons arrangement. Even now when license system is back in place there is limited interest in the protection and management of lagoons. One of the reason is that local fisher communities have

migrated from these two lagoons. They hope that if government rehabilitate these two lagoons, they will come back and start living around these lagoons.

This explains that having a commons arrangement is not enough but implementation through strong management and governance is important (see section 2.3). There is always a need of monitoring to ensure rules are being followed properly, dispute resolution within and outside the local communities, as explained by Ostrom (1992) are in place. Otherwise there is a clear chance of failure of commons arrangement as in Nurerri and Jubho lagoon.

Experience in the Nurerri and Jubho lagoon are a clear example, of where commons management has become dysfunctional over time. Both of the lagoons came under a commons resource management arrangement but the improper implementation of rules to manage the resources led to resource decline. A number of factors were involved in the dysfunction of the formal resource management arrangement, including unequal social power among local communities and the overall economic situation. These challenges are already highlighted by many scholars who explain how even under commons arrangement, resources can continue to degrade (see section 2.3.1).

5.2.4 Application of Property rights framework in Nurerri and Jubho Lagoon

In this section, I have analysed the changes in the property rights systems of Nurerri and Jubho lagoons through property rights framework provided by Ostrom and Schlager (1992). To do this I have explained how under different property rights systems, bundle of rights were distributed among different right holders (see table 5.3).

Table 5.3 Property rights framework analysis

Lagoons	Free hold / Open access	License system	Contractor system / Rangers control
Access	Both Fishing and non-fishing communities	Fishing community	Contract holders only (may include both fishing and non-fishing community)
Withdrawal	Both Fishing and non-fishing communities	Fishing community	Contract holders only (may include both fishing and non-fishing community)
Management	Both Fishing and non-fishing communities	Fishing community / Fisheries department	Contractors and Rangers
Exclusion	Fisher communities	Fishing community / Fisheries department	Contractors and Rangers
Alienation	No one has rights of alienation	State	State
Implications	Over-exploitation with increase in population and economic activity, equal use of resources, less control over the resources.	Sustainable use with very minimal exploitation, Equal distribution of resources. Complete control over the resources for effective management	Over-exploitation due to external pressure (boarder security) economic activity, unequal distribution of resources, complete control over the resources but poor management

Source: Framework adapted from Schlager & Ostrom 1992 (in Marschke et al. 2012)

Considering the changes in Nurerri and Jubho lagoon property rights framework provides a good understanding of how bundles of rights have shifted with the change in policies to manage commons. In free hold system, when there was no rule or policy from the state or even at local level, these lagoons were open for everyone. At the same time people were managing their water resources (i.e. lagoons) by themselves. There used to be an informal understanding of how much to fish to catch, when to catch and which parts of the lagoons to use for fish catch and water. It is evident that because of the small population and limited number of users (including both fisher and non-fisher communities), it was easy to access, use and manage lagoons by the local communities. Informal arrangement to manage the lagoons and other commons is not a new

concept. Ostrom and Schleger (1992), also explained about the affective informal arrangement to manage commons (see section 2.2). Apparently with the small group of people, there wasn't any need of rights of exclusion and alienation. As we understand and take commons as a continuous and changing process, this couldn't survive or was not very successful when the population started to increase. People started migrating to this area to earn income from fishing. Floods and sea erosion caused massive and serious destruction in the agriculture lands, and as a result the majority of the population belonging to agriculture profession moved to fishing business to earn their livelihood. The majority of the poor population in Sindh work on the lands of landlords and *Wadayras*, to earn their livelihood as they do not have their own lands. Changing weather patterns and declining productivity of agriculture lands forced them to change their source of livelihoods from agriculture to fishing.

Under the *license system* all those five bundle of rights were exercised formally. Access and withdrawal rights were only given to local fishing communities through the issuing of licenses. People without licenses were not allowed to access or use lagoons to ensure sustainable use and keeping over-exploitation under control. Management rights were held by the local fishing community leaders, and later on with the local fisheries department. Similarly, rights of exclusion and alienation were held by the local government and state. History shows that some of the landlords were also involved in management and exclusion rights because they owned (or still own) some parts of the lagoon. On the contrary the *contract system* gave the rights of access, withdrawal and management to the contract holders only. These contract holders might or might not be from the fisher community. This meant bundle of rights were also exercised in case of the contract system but they were not benefiting the local fisher communities but was there to help the contractors gain economic benefit.

The contract system was a kind of control to protect lakes and lagoons in the coastal area, but later on local people exploited the system and in some cases, contracts were issued to only powerful people including landlords and large companies (Mr. Saeed Baloch, Chief Conservator Wildlife department Sindh, interview, 2 June). In many coastal and non-coastal districts of Sindh, many fishing grounds and lakes are owned or occupied by the landlord of those areas. Under this system a total of 1209 water bodies' including lakes and lagoons were auctioned to the landlords by the Sindh fisheries department (PFF 2005). With the help of local fisheries department, they received the contract through a fake bidding process to sell the fish in the market as and when they wanted to. Fishermen were not allowed to access fishing grounds and lakes without the permission of contractor and they were punished for raising their voice or in some cases they were even killed (see section 4.3).

In the contract system rights of exclusion and alienation were held by the state. Contract system apparently was also a formal arrangement to manage the lagoons as commons but with pure intention of profit making fish business and to allow non-fishing communities to access and use lagoons. Contract system became most problematic when government allowed rangers to take over the control of coastal areas and most of the lagoons, including Nurerri and Jubho. Rangers were not only allowed to access the lagoons for protection but they were also allowed to use the lagoons to catch fish for food.

In the literature section I have explained the relationship between “bundle of rights” vs “bundle of power” (See section 2.2.2). In Nurerri and Jubho lagoon, access can be explained through “bundle of power” in addition to “bundle of rights”. Lagoons are accessible through different property rights arrangement. However, the bundle of rights is heavily influenced by power dynamics in the area. At one point army had a strong control over the two lagoons, where

access for poor fishers was completely controlled by rangers. Other than rangers, strong political influence and presence of landlord control are dominant factors to determine the different aspects of managing the lagoons (i.e. lagoons are misused for hunting, fishing and recreational activities).

5.3 Integrative analysis of property rights system and environmental changes

There is no direct cause and effect relationship between changes in the property rights systems and environmental changes in Nurerri and Jubho lagoons. It is hard to determine how changes in property rights system brought direct environmental change and vice versa but it is evident in case of both the lagoons that disturbance or change in property rights systems aggravated environmental changes and created circumstances in which it became difficult to manage Nurerri and Jubho as commons. Similarly, environmental changes also impacted lagoons, which made it difficult for local communities to manage their lagoons as commons. To manage commons it is important to have favourable and controllable circumstances. In the Nurerri and Jubho lagoon, anthropogenic activities (i.e. LBOD and sugar mills pollution etc.), coupled with natural unpredictable changes, made it challenging for people to protect lagoons.

The case of Nurerri and Jubho lagoon can be seen ideal as a commons 40 years ago when license system was introduced. It was less complicated and challenging to manage both the lagoons because of less environmental change and external pressures to be handled. The most dominant environmental factor 40 years ago causing disturbance in the lagoons was reduction in fresh water flow. Figure 5.1 clearly depicts how both the drivers of change contributed towards the degradation of lagoons in the last 40 years. This change could have been handled easily through proper water management policy. Poor governance and lack of attention at the right time caused water insufficiency in both the lagoons. This was the first step towards degradation of lagoons. After this subsequent stressors caused severe damage in the lagoons. But with the passing time, contract

system was introduced to explore the fish resources because of external market pressure. Simultaneously LBOD project was introduced in 1980s without giving attention to its long term effects on the lagoons. On the one hand the local communities were struggling with the contract system to bring back license system and on the other hand the communities were opposing the mega project LBOD as they could foresee the catastrophic consequences. The government paid no attention towards the two side effect on the lagoons. Instead of resolving the problem of reduced fresh water flow and correcting the mistakes of mega projects, the government resorted in exploring the oil and gas in the degraded beds of the lagoons and establishing the new sugar industries which ultimately became a constant source of pollution.

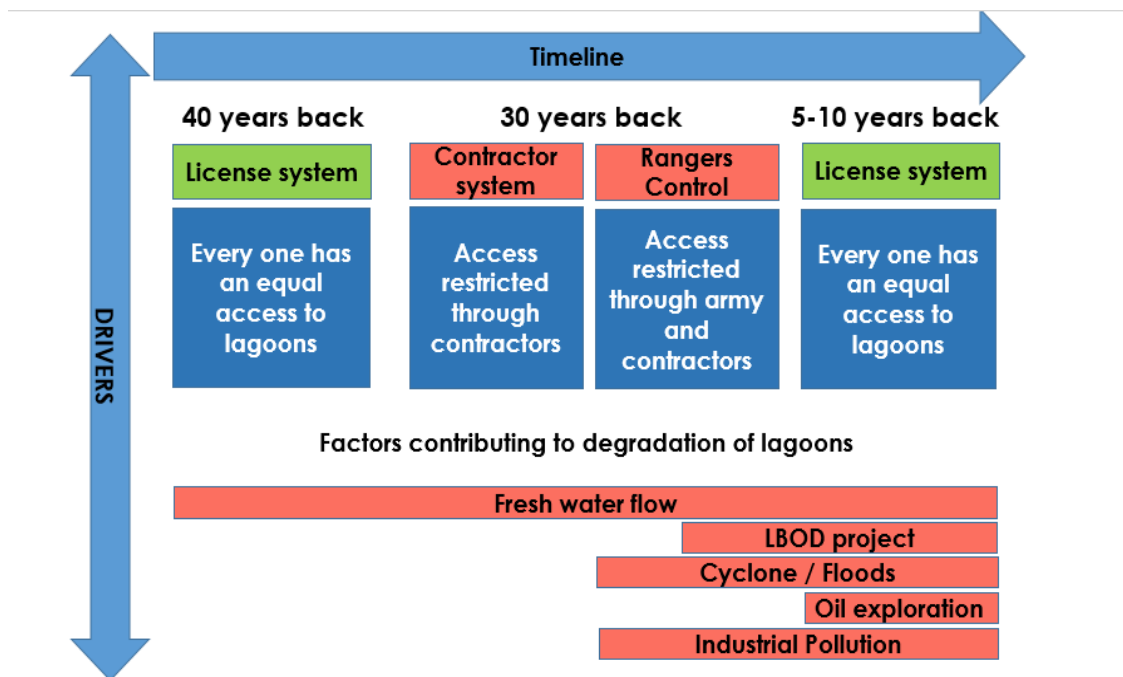


Figure 5.1: History of drivers of change in Nurerri and Jubho lagoon

Most of the environmental changes occurred in the last 15 to 20 years intricate the whole situation and contributed to the degradation of many lakes in Sindh including Nurerri and Jubho lagoon (See figure 5.1). There is a clear example of stressing the lagoons with so many changes without thinking about the long term impact. Poor governance, ineffective policies, lack of coordination and untimely decision making can be seen as key issues in the case of Nurerri and Jubho lagoons. Another important point to consider while finding the linkage between property rights system and environmental changes, is the time factor. Implementation of rights policy at the right time is very important. Bringing the license system back as a commons arrangement when both the lagoons are completely damaged, is of no use. Other measures should have been taken to protect and rehabilitate lagoons back to their original form. This shows why it is important to consider environmental changes and property rights system changes simultaneously. According to the literature of commons and commons governance (see section 2.2 and 2.3) and following the true definition of commons and effective commons management system, it is hard to claim that the license system is a perfect commons management arrangement. Another important challenge highlighted in the literature chapter (see section 2.3.1) is to consider that there are diverse types of change. Conditions are constantly changing in the lagoon systems and it is important to have commons arrangements which are flexible enough to absorb these changes. Similarly, changes in the property rights system are also not constant, as observed in the case of Nurerri and Jubho lagoon. Different external and internal forces influence commons arrangements, hence commons arrangement shift from one system to another (i.e. license system → contract system → rangers control → and back to license system).

5.4 Conclusion

In the literature section, many challenges are highlighted (see section 2.3.1) by different commons scholars. Almost all the challenges highlighted in the section can be found in Nurerri and Jubho lagoon. For example, both the lagoons have faced changing economic factors which affected the demand for fish, which ultimately caused over exploitation of commons (i.e. Nurerri and Jubho lagoon). The bundle of rights explain the distribution of rights among different right holders, but in the case of Nurerri and Jubho lagoon, distribution of rights was uneven and benefited only certain groups of people for more than a decade (during 1980s). This shows that even though there was distribution of rights that could not protect the lagoons because of the dispute between different rights holders.

CHAPTER 6: CONCLUSION

6.1 Introduction

This chapter summarises the key findings of my research, highlights my main conclusions, and proposes some recommendations. These recommendations are based on the findings of my individual interviews and focus group discussions in the villages near Nurerri and Jubho lagoon. Moreover, my findings are based on the changes in the last 30 to 40 years and might not be true for the longer period, while the nature of the drivers of environmental changes and property rights system might not be the same in the future. Considering the limitations of my research, my effort is to propose recommendations that are applicable over the longer period of time.

It is also important to mention here that I strongly believe detailed research for the longer period of time will help to find some concrete solutions to the problems I have identified, and this research can help in formulating national or provincial level policies to protect commons in Pakistan.

Three objectives guided my research, each of which I have met. My first objective was to explore and examine the history of environmental change and the change in property rights systems of Nurerri and Jubho lagoons. To meet this objective I collected information from reports and government documents, and most importantly, by interviewing people who have witnessed the history of change. Information from multiple sources provided me with a clear and authentic detail of the history of change in environment and property rights systems.

My second objective was to analyze the drivers of change in the environment and in the property rights system, and consider the impact on the lagoon communities. To achieve this objective I carefully identified different drivers of environmental change and property rights

system change. Subsequently, I focused only on a few dominating drivers of change to understand how they impacted both the lagoons and their human communities.

My third objective was to analyze the linkage between environmental change and change in the property rights system of the lagoons. To meet this objective I highlighted those factors which construct the linkage between property rights systems and environmental changes. I tried to merge both the changes and analysed the importance of both drivers of change while managing commons. This objective also highlights that failure to consider both the drivers simultaneously for managing commons can cause serious degradation / disturbance to these resources.

6.2 Findings

Emerging from this research are a number of key findings which I outline in the section below.

First, to have a system in place for commons is not enough unless there are proper mechanisms to ensure the right implementation of rules under such arrangements. Similarly, there is a need of strong governance through continuous monitoring mechanisms to ensure that rules are implemented and commons are maintained, which includes ensuring there is no discrimination and everyone has equal right to use the commons. This can be done through awareness raising among community members and making them aware of their rights and importance of protecting their commons

Second, keeping in view different environmental changes, it is important to consider in policy making how each environmental change will impact commons and how any change in the property rights system will in turn influence environmental changes. Addressing one change while neglecting the other will not ensure a sustainable solution to protect lagoons from degradation.

Third, while implementing policies for commons arrangement, it is important to consider local communities that are depending on their commons. As discussed in the introduction section, humans are an important factor under any social-ecological system. Local fisher communities are part of lagoon commons and they have first and foremost right to use lagoons, where use can be controlled through property rights systems.

Some of the secondary findings of my research are described below and include Silt deposit deficit, threats to the Ramsar site, lack of institutional capacity, weak cross scale linkages, and power dynamics.

6.2.1 Silt deposit deficit

Nurerri and Jubho lagoons are not stand alone examples of degradation in the Indus Delta region. A recent letter of Pakistan Senate's Standing Committee on Science and Technology to the Prime Minister highlighted that Thatta and Badin districts would be submerged by the sea in thirty years, and Karachi would be submerged in six decades. One of the predominant sources of the degradation of the delta is low fresh water discharge from downstream Kotri barrage. As discussed earlier, before 1930 the downstream Kotri Barrage discharge was 150 MAF, which came down in 50s to 80 MAF after the new barrages and dams. This discharge was further reduced to a record low of 1.5 MAF in 2001-2. Although now the new consensus is that at least 10 MAF should be discharged downstream Kotri Barrage, this does not actually happen all the time. This marked low inflow to the delta area for over a century has decreased silt deposits and resulted in the decaying mudflats. The silt deposit in the delta at the flow of 150 MAF was over 400 million tons. The delta was under crisis already since the reduction of water flow was reduced to half in 1950s, however, it was further degraded when the silt deposits dropped to 26 -30 million tons per year. A shortfall from 150 MAF to 10 MAF is very significant and the silt-deposit deficit that has

developed over a period of one century is almost irreparable. The ecology of the delta is changed forever. This issue, despite being a political imbroglio, needs immediate attention and strategic treatment as without that most of the solutions will only be cosmetic.

6.2.2 Threats to Ramsar site

In Pakistan, 19 sites have been declared as Ramsar sites, out of which 12 are in Sindh province. Unfortunately, most of these Ramsar sites are under serious threat, due to different natural and anthropogenic changes over the last three to four decades. Ramsar sites in Pakistan, including in Sindh, are largely affected by the rise in sea level, cyclones, floods, poor governance and lack of proper implementation of existing policies. During my research, the Chief Conservator of Wildlife Department mentioned that initially there was no separate policy to a case for Ramsar sites in Pakistan. The lakes were under the jurisdiction of the Wild Life Department, and despite various rules and regulations related to wildlife protection, Ramsar sites were not as protected as they should have been. As a result, unsustainable and illegal fishing practices (popularly known as trash-fishing) were being practiced in the lagoons in broad day light. If nothing else, the line departments could have prevented trash-fishing to protect remaining biodiversity. After the formulation of the National Wetlands Policy (2000), there was hope that these Ramsar sites would be protected but again the implementation of that Policy remained questionable. A major issue that remains is how to go about restoring those wetlands which have already been degraded, and especially ones with Ramsar status.

6.2.3 Diverse of environmental changes and lack of institutional capacity

Another main finding of my research is that over the period of three to four decades many unexpected changes have happened in the lagoons ranging from natural disasters to anthropogenic changes. However, due to a lack of capacity and ignorance, the government at national and

provincial levels have been unable to cope with these changes. There is still no mechanism to change the disaster management policies to handle the rapid environmental degradation. My research also revealed that the government paid less attention towards saving natural resources (like wetlands) and paid more attention towards generating unsustainable revenue from these lakes. The government too often ignored the damage done due to over-exploitation of commons, as well as realizing a lack of capacity to forecast the extreme weather conditions in the Indus Delta area. Had there been a strong metrological department to forecast changes in weather patterns, policies could have been designed or changed in a way to protect wetlands from extreme weather conditions. Similarly, despite the known fact of the LBOD project's degrading impact on both lagoons, no firm action has been taken yet. It has been almost a decade since the World Bank actually admitted to the faults in the LBOD. Unfortunately, there is not much concrete that can be done to rectify the project and mitigate the impact created as a result.

6.2.4 Weak cross-scale linkages

During my research, it was evident that there is a lack of coordination between different levels of authorities from the national to village level (both informal and formal authorities). Multiple institutions are managing different aspects of wetlands in Pakistan. For example, in the Nurerrri and Jubho lagoon area, the Wildlife Department, the Revenue Department, and the Department of Fisheries at the provincial level, and few at the national level, are managing different aspects of wetlands and forests. Lack of coordination between these institutions and delays in implementation of policy are seen as a common problem when it comes to the management of wetlands, and especially Ramsar sites in Sindh. Delays in policy implementation happen usually because of a lack of consensus between different institutions. There is always a

dispute over the policies between the institutions involved in the management of wetlands and their rehabilitation.

The management of all the wetlands including Ramsar site like Nurerri and Jubho lagoon were divided among several authorities such as the Forest department, Wildlife department, Revenue department, Department of fisheries and coastal area management authorities. Among these authorities there is no coordination and linkages to discuss the different levels of responsibilities and sharing of information. This disconnect between vertical linkages are seen at different levels. At the same time there is weak connection at horizontal level too. The decisions made at national level are not translated at local level through effective policies and coordination. There is also a weak linkage between local communities of the Ramsar sites and national and international Ramsar convention rules and regulations. The broader rules and regulations to manage the Ramsar sites are same everywhere and hence lack relevance in specific Ramsar site cases. However, it is important to note here that local communities have strong role in changing the policy at provincial level, which means through proper policy and awareness it is not hard to protect commons and their status of commons. All it needs is to guide local communities under strong rules and regulations, on how to protect their commons from a changing environment.

6.2.5 Power dynamics:

Different people and institutions have different powers or “bundle of powers” to access, control and manage natural resources based on their social status, culture, traditions and economic conditions. Similarly, some people can only use their right of access through those who have power or control of natural resources. This perspective is relevant in the case of Nurerri and Jubho lagoon as not everybody has equal access to the lagoon resources controlled by powerful landlords, influential people and agencies (i.e. army control on several lakes in the bordering area).

In general, Sindh has a very old and strong “Jagirdar” (landlord) system. Large landholding “jagirdars” have control in areas where they have lands and political influence. Poor communities in such areas remain completely under the control of landlords for their major decisions in life, ranging from voting, livelihood, to their family problems. Other key factors that determine the power dynamics in Sindh include different factors like caste, gender, economic status, political influence and education to some extent. Power dynamics in coastal areas of Sindh are also very important factor to determine the changes in the social-ecological system of lakes and lagoons in the area. Many landlords who are also affiliated or directly involved in politics, possess legal or illegal ownership rights over lakes and the surrounding lands. Mostly it’s because many lakes were dry lands of the local landlords. With the passage of time some depressions converted into lakes and lagoons and still remained under the ownership of local landlords. When these lakes finally came under the ownership of government, local landlords and powerful people started influencing decision making by the government. For example, during the license system which was introduced in 1977, the license issuing process was influenced by local landlords and political parties. Licenses were issued to the influential people instead of local poor fishermen, to exploit the lakes and lagoons for fish catch business. When the government decided to change the license system into contractor system, this too was relatively easy to manipulate. The contracts were given to influential people and thus the fishermen perpetually remained under their control. These poor fishermen were not allowed to access lakes and lagoons without the permission of influential people and landlords, and they were also not allowed to access the bigger market for sale of fish.

During my research, I found that local fisher communities of Nurri and Jubho lagoons are usually very poor and uneducated. They do not understand the legalities and processes of contractor or license system and that they have to rely on the educated and influential people. This

is one of the reason why poor fisher communities remained unaware for a long period of time about their rights. Only those fishermen affiliated with the political parties and local landlords were able to obtain some rights. Management of Nurerri and Jubho lagoon were thus very much affected by the power dynamics in the area. Fish and other resources in both the lagoons have been exploited for economic benefit and government has only facilitated influential people in exploiting the resources. The government has paid no attention to the management of lagoons, and this ultimately led to their degradation. These external factors are similar to those that are highlighted as challenges in the literature review (see section 2.3.1).

6.3 Recommendation

On the basis of my findings, I have identified several recommendations:

- 1) The government should immediately form a Wetlands Rehabilitation Task Force in order to rehabilitate degraded lakes, including Ramsar sites like Nurerri and Jubho lagoons. Pakistan is the 7th most water deficient country in the world. Protection of freshwater bodies and conserving the water resources should be the top most strategic decision of the country. Both Nurerri and Jubho are a part of a complex with two other lagoons. Each Ramsar site may be treated and protected separately since the source of water is different for each lagoon in this complex (through different canals). Since a portion of the Nurerri lagoon was rehabilitated by the UNDP-GEF SGP in 2009, but was unfortunately degraded again in the 2010 floods, it will be important to study the scope and success of the effort and also analyze the drivers of degradation.
- 2) In order to rehabilitate the delta in general, and these Ramsar sites and fresh water bodies in particular, the downstream discharge has to be increased to 50 MAF for at least some

period of time so that the increased silt deposits regenerate the mudflats. An awareness campaign is needed to create a national consensus for the distribution of water between different provinces. Without such measures the country will further plunge into the absolute degradation of Pakistan's ecology and water resources.

- 3) Most of the experts, officials and the communities interviewed during this research were of the consensus that the World Bank and the concerned government departments can redirect the faulty tidal link to its natural flow towards the desert of Kutch – something which was even proposed by the local communities at the very beginning of the project.
- 4) The government should revise the Fisheries Ordinance of 1980 in order to legally address the issue of trash-fishing – a menace which has accelerated the process of ecological degradation. The government should also take strict measures to implement the Sindh Environment Protection Agency's rules regarding industrial waste management – in this case the sugar industry's effluent that is degrading both lagoons. The sugar mills effluent is a clear violation of the law and reflects the inability of the government to enforce its own regulations.
- 5) It is also important to mention here that I strongly believe detailed research for the longer period of time will help to find some concrete solutions of the problems I have identified, can help in formulating national or provincial level policies to protect commons in Pakistan.

6.4 Final thoughts

After analysing the case of Nurerri and Jubho lagoons using a property rights lens I emphasize on the need to integrate issues of environmental change while making policies for the governance of commons. I also consider time as an important factor in decision-making and

planning especially in case of Nurerri and Jubho Lagoon which means priority should be given to those issues that needs immediate attention. In other words, there is a need to make both short-term and long-term plans to deal with existing commons issues in both the lagoons. The current situation, i.e., the complex mix of critical environmental problems and messy property rights arrangements, requires immediate attention and dedicated efforts to rehabilitate and protect the commons. Having a policy that supports the management of these lagoons as commons is not enough in the absence of physical resources (e.g., most of the Nurerri and Jubho lagoons are now dry). We need more inclusive governance approaches that consider both the institutional-policy and the biophysical health of the commons for future sustainability. Here, the role of drivers of change in property rights system as well as in environment are crucial.

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ANNEXURE I

Questionnaire for semi structured and focus group interviews

- 1- How many people live in the surrounding area of Nurerri and Jubho lagoon?
- 2- Why this lagoon system is so important for the lives of people living in the surroundings?
- 3- What is the main source of livelihood associated with the lagoon complex?
- 4- What do you understand about the property right system of lagoons?
- 5- What rights do you have on these lagoons and up to what extend you can use these natural resources?
- 6- What changes have occurred in the property right system of these lagoon system in the last 30 years or less?
- 7- As these lagoon systems are partially owned by the local landlords, does it affect you? If yes then how?
- 8- What difficulties you have faced due to changes in the right of use of these natural resources?
- 9- Do you think change in the property right system has contributed in the degradation of these lagoons?
- 10- Being a part of disadvantaged group, what additional effort you have to make to survive in the community and getting access to these lagoons for water and other resources?
- 11- How the natural disaster affected your interaction with this lagoon complex?
- 12- How did you managed to survive after these disasters and did you get any support from the government or the landlords?
- 13- How you like would to manage or protect these degraded lagoon systems?

ANNEXURE II

Political parties, civil society organisations support fishermen –

Action committee to be formed for struggle against contract system

THE NEWS, July 2005 (<http://www.jang.com.pk/thenews/index.html>)

By our correspondent

KARACHI: A large number of political parties and civil society organisations on Wednesday declared the contract system in fisheries sector illegal and decided to form an Action Committee for joint struggle against it.

The All-Parties Conference (APC) convened by Pakistan Fisherfolk's Forum (PFF) at a local hotel decided to hold the next meeting of the Action Committee on June 19, in which more parties would also be invited. The meeting decided that all political parties would take part in demonstrations and sit-ins by fishermen in front of fisheries department on the day of holding auctions for fishing rights.

Speaking on the occasion, the PFF Chairman, Mohammad Ali Shah, said that millions of fishermen in Sindh were suffering hardships due to the exploitative contract system. He pointed out that before 1980, the government had allowed fishermen to fish through license system. However, in 1980, the Sindh Fisheries' Ordinance was promulgated by the Martial Law authorities that gave the fishing industry totally into the hands of the contractors.

He pointed out that in the contract documents, the agreement was signed between contractors and government and there was no mention of fishermen, who were actually involved in fishing. "PFF's opinion is that it is the natural right of fishermen to catch fish and they are the historic custodians of all the waters," he remarked.

The political parties should come forward to take part in the struggle, he said, adding that a protest demonstration would be held in Hyderabad on Thursday against auctions.

Control of Sindh lakes, ponds to be withdrawn from Rangers' Fishing licences will be issued to locals

THE NEWS, November 2004 (<http://www.jang.com.pk/thenews/index.html>)

By our correspondent

KARACHI: The Muttahida Qaumi Movement has announced that after the intervention of President Pervez Musharraf, the administrative control of Pakistan Rangers (Sindh) over the lakes of the province particularly Badin district, has been terminated and from January next year the Sindh government would issue fishing licences to the locals. Addressing a press conference at the Karachi Press Club (KPC) on Monday, the deputy-convenor of the Muttahida's Coordination Committee, Dr Farooq Sattar, said that the fishermen of the interior of Sindh, particularly Badin, had been deprived of their due rights, as a federal organisation i.e. Pakistan Rangers Sindh, had the administrative control of the lakes and ponds of the area.

He said that the administrative control of the Rangers started in 1972 when the then government gave them the administration of lakes and ponds of coastal areas for fishing. At that time it was decided that only 10 per cent of the total income would be spent on the development of the area while the remaining 90 per cent would be spent on the Rangers, on the upgrading of their infrastructure and network to combat smuggling and foil the filtering in of anti-state elements from across the border with India, he added. Later, he said, in 1977, it was decided that 35 per cent of the total income from fishing would be spent on the area.

He said that it was a serious public issue and for the last three months all the ruling coalition parties of the Sindh government, including the Muttahida were trying to get this issue resolved. He said that the Governor and Chief Minister, Sindh, and the Muttahida also raised this issue before President Musharraf and Prime Minister Shaukat Aziz at various meetings.

Finally, he said, on November 19, the matter came up for discussion during a meeting with President Musharraf at Rawalpindi where he (the President) gave clear directives to the Director-General, Rangers (Sindh), Maj-Gen Javed Zia that it was not the task for the Rangers. Dr Sattar said that the present contract ends on December 31, 2004, and from January 1, 2005, the Fisheries Department of the Sindh government would take over the administrative control of lakes of coastal areas of Sindh.

He thanked the President, the Prime Minister, and the Chief Minister of Sindh for solving this long-standing issue. On the occasion, Muttahida's deputy-parliamentary leader in Sindh Assembly, Kanwar Naveed said that instead of adopting the years-old practice of annual auction of fishing contract, the Sindh government would issue licenses to local fishermen to facilitate the local inhabitants.

Enforcing new fisheries law

DAWN - Published Jan 24, 2011 01 :23AM (<http://www.dawn.com/news/601140/enforcing-new-fisheries-law-2>)

From In paper magazine

WHILE fishermen across Sindh have welcomed the abolition of contract/lease system for water bodies, they have urged the provincial government to enforce effectively the licensing system for their rehabilitation. They fear resistance from the legally but not physically displaced influential ex-stakeholders.

On January 14, the Sindh Assembly unanimously passed the Sindh Fisheries Amended Bill 2011, tabled by Sindh Fisheries Minister Zahid Ali Bhurgari to replace the contract/lease system with the licence system.

The licence system, first introduced in 1977, to regulate fisheries was replaced with the contract/lease system under the Sindh Fisheries Ordinance 1980. The section 3[1] of the ordinance 1980 reads as: “Government may, by general or special order, grant licence or lease for fishing in any public waters on such terms and conditions and on payment of such fees as may be prescribed.” While section 3 [2] reads as: “Where a lease has been granted under sub-section [1], the leaseholders may issue permits for fishing in the leased waters, in such form and subject to such conditions and on payment of such fees, as may be prescribed.”

But, this provision was widely abused by government officials and water bodies were auctioned to only influential people while local fishermen were deprived of their right to fish.

“In the beginning, this exploitative (contract) system was introduced on few fishing lakes, but gradually more and more lakes were brought under this system,” said Sami Shah, spokesman for the Pakistan Fisherfolk Forum (PFF).

In its district-level survey, conducted after the recent floods, the PFF found that around 300 out of 1,209 water bodies were under illegal control of influential people while several others had been contracted to politicians, landlords and others.

The licensing system, fishermen believe, will help revive sustainable use of fisheries resources of the province’s 1209 public water bodies and improve their livelihood. Before the contract system, these water bodies provided livelihood to some 0.5 million fishermen.

Tabling the amended bill in the provincial assembly on January 14, provincial fisheries minister Zahid Bhurgari said the contract system had worsened the socio-economic condition of fishermen. He hoped that the licensing system would help restore the livelihood of fishermen and check unsustainable fishing practices in sweet water bodies.

Meanwhile, Pakistan Fisherfolk Forum’s chairman Mohammad Ali Shah has said: “We would now push the government for effective implementation of the amended act.”

Shah added that it was the birth right of fishermen to catch fish from the waters where they live and the government's role was to protect their rights at any cost.

Officials in the provincial fisheries department, who are not sure if the amended act shall be enforced effectively, also term retrieving possession of the contracted water bodies 'no less than any challenging task'.

"Getting back possession of the contracted water bodies from the clutches of influential contractors to whom the leases were awarded – mostly on political grounds – is really a daunting and risky task," said a senior official, who contributed actively in the abolition of the contract system.

But, the fisheries minister appears determined to embark upon the task fraught with perils.

"District level committees, comprising MPAs and MNAs, shall be set up to help the local administration get back control of the contracted water bodies from the contractors," said the Sindh Fisheries Minister Zahid Bhurgari.

To ensure implementation of the Sindh Fisheries (Amendment) Act 2011, the provincial lawmakers have underscored the need for ensuring close coordination between relevant departments.

ANNEXURE III

(Sindh fisheries rule 1983)

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NOTIFICATION

No. 5(3)SO(F)/81 In exercise of the powers conferred by section 27 of the Sindh Fisheries Ordinance, 1960, The Government of Sindh are pleased to make the following rules.

1. (1) These Rules may be called the Sindh Fisheries Rules 1983.

(2) These Rules shall come into force at once.

2. In these rules, unless the context otherwise requires:-

(a) "Appendix" means an appendix to these rules;

(b) "fish processing plant" means a factory or yard set up for fish processing;

(c) "Licensing Authority" means a civil servant of the Fisheries Department not below the rank of Assistant Sarden Fisheries and authorized by Government to act as such;

(d) "mole holder" means a person possessing or holding a place for auctioning shrimps or other fish and is a licensed dealer;

(e) "Ordinance" means the Sindh Fisheries Ordinance, 1960 and

(f) "Section" means a section of the ordinance.

3. (1) The application for a licence, permit or special permit shall specify the devices, contrivance or objects, if any, and the number thereof, to be used by the licensee or, as the case may be, the permit holder and shall be accompanied with the fees therefor as specified in Appendix-II.

(2) The licences, permit or special permit and applications therefor shall respectively be in the form contained in Appendix I.

(3) All the licensees under these rules shall be registered with the licensing authority.

(4) The form of application for licences, permits and special permits shall be made available to the intending applicant on payment of one Rupee for each form.

Continued Page-2-

ANNEXURE IV

Poem

Title: Siberian Birds

By Batool Fatima (From a village Nurreri lagoon)

Birds came from Siberia,
To see Nurreri with exquisite euphoria,
To seek love and hospitality,
When weather in their homeland had no pity,
Teals, Garganeys and beautiful cranes,
Winter's sky was filled with their eternal lanes,
The tragedy is Nurreri was poisoned with industrial waste,
The things were done in money's haste,
People were invited to hunt the guests,
Local birds became selfish and rented them no nest,
This world is hostile,
The climate is changing while,
This is what they realized here,
That life was elsewhere.