



ORIGINAL ARTICLE

Impact of Climate Change on the Socioeconomic Conditions: A Case study of district Thatta , Sindh, Pakistan

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ABSTRACT

Pakistan is a land of variety, both in terms of resources and people. The study focused on the district of Thatta in Sindh (coastal district) to discern the complex problem of socioeconomic effects the district has received due to climatic change. The current article is a report of a postgraduate research project of the author. The methods in the study were qualitative. They were designed to (a) identify the current socioeconomic conditions through focus group and household interviews, and then (b) identify the vulnerability of the communities associated with climate change. The indicators studied in the present study are food deprivation, water deprivation, health deprivation, shelter deprivation, education deprivation, etc. The findings of the study show all indicators are present in the studied district to a high extent. People are living in drastically poor conditions in most villages of the surveyed localities of Thatta. In fact these communities are marginalized and therefore the impacts of climate change are exacerbating.

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INTRODUCTION

District Thatta occupies an area of 17355 sq. km and located in Sindh province of Pakistan. In ancient times; Thatta was an important seat of learning in the region and was the centre of Islamic arts. The rise of Thatta as an important cultural and commercial centre was mainly due to the patronage of the Samma Dynasty (866-1461). This contributed significantly to the evolution of the architectural styles that can be classified as Sindhi Islamic architecture. However, the importance of this ancient city gradually declined as River Indus began to shift away. Nevertheless, Thatta was recognised as a municipality by the British regime in 1854.

The district is surrounded by Dadu district in the north, on the east by Hyderabad and Badin districts, on the south by Rann of Kutch area and the Arabian Sea, and on the west by Karachi.

The total population of Thatta district is over 1.1 million, out of which 11.21% is urban. The average annual growth rate is 2.1%. The district is administratively subdivided into 7 sub districts (*tehsils*). These are: Mirpursakro, Ghora Bari, Ketu Bundar, Shah Bundar, Jati, Khari Chan, and Sujawal. These sub-districts include 55 union councils, 7,200 villages, and over 190,000 households with an average size of 6.5 persons per household.

Although formal area poverty profile has not been prepared for Thatta, the secondary data generated by Project Preparatory Technical Assistance (PPTA) shows that 54% are among the 'poorest' category and 79% may be listed as 'poor'. In a 2004 national survey, Pakistan's poorest district was Thatta. It is being reported that almost 90% of the families live below the poverty line and therefore all members of the family have to contribute to survive.

METHODOLOGY

For the present research, we designed a methodological approach that would first (a) identify the current socioeconomic conditions through focus group and household interviews, and then (b) identify the vulnerability of the communities associated with climate change.

Based on this, Participatory Rural Appraisal (PRA) approach was followed, which encourages the community to share their opinions, ideas and experiences pertaining to the local problems, issues and needs [1]. It was, therefore, imperative to organise group meeting with local communities that would open up a logical way of learning about local conditions and resources [2].

For the present study, three sub-districts of district Thatta were selected. These include Shah Bundar, Keti Bundar, and Kharo Chan. Impact of climate change on the socioeconomic status of Keti Bundar and Shah Bundar area was determined by using dual approach: one was to collect secondary data from official reports, newspaper reports, and other relevant sources, while the other component of the study was a field-based survey, which was mainly based on focus group discussions and direct observations. The villages visited were selected using Google Earth to determine accessibility to the community and their vulnerabilities to climate change. During field surveys one to two local interviewers, with sufficient expertise were recruited to secure better access to the communities as described by [3].

Field work was conducted to collect information about the socioeconomic status, community land usage patterns, social infrastructure, community environmental dependency, and community climate change concerns. In each of the visit, focus group conversations and semi-structured household interviews were undertaken. During the focus group discussions, we encouraged all the participants to speak so as to avoid having one person dominating the discussion. As Mohammad *et al.*, [4] described, this is important for the success of the PRA depends on the active participation of all community members). Key informant interviews were also carried with different governmental and non-governmental organisations working in the study area.

Data analysis

Each of the household and focus group interview was coded with the number of the interview of the area and date. Participatory appraisal involves a series of qualitative multidisciplinary approaches to learn about local-level conditions and local people's perspective. Therefore, descriptive statistical techniques, such as percentages, mean and standard deviation are used for presenting the socioeconomic data.

Indicators of socioeconomic status used in the present study

The following indicators were used as indicators of socioeconomic status in the current study:

- i. Food deprivation
- ii. Water deprivation
- iii. Deprivation of sanitation
- iv. Health deprivation
- v. Shelter deprivation
- vi. Education deprivation
- vii. Potable water deprivation

RESULTS AND DISCUSSION

Variability in climate change has gravely influenced social and natural environments in the entire Sind, and the studied area is no exception. The climate change variability along Sindh has rendered the local communities, especially the coastal communities, to suffer from deprivation of natural resources, agriculture and energy. The continuous abnormalities in the climate of the study area also resulted in alterations in landscapes and the services that ecosystems supply.

It may be pointed out here that in the local population poverty is a consequence of impoverishment of resources, which acts as an accelerant of instability and conflict [5].

When floods swept through the country in late-July 2010 and again in 2011, there was extensive loss of the already diminishing resources. Each time there was displacement of the people and stress on the natural and man-made resources.

During the field surveys the area covered were Shah Bundar, Keti Bundar and Kharochan. The villages surveyed during the field visits are presented in Fig. 01.

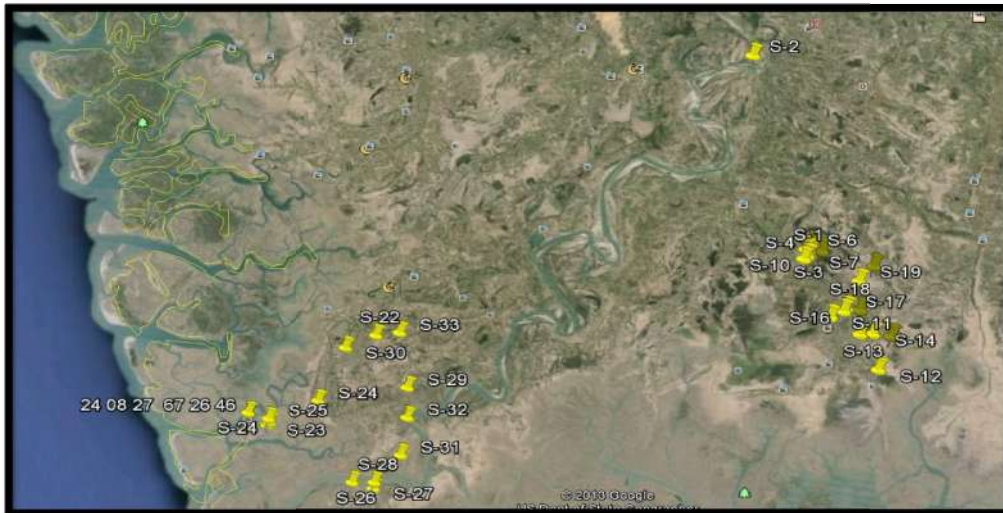


Fig. 1: Villages of Shah Bundar, Keti Bundar and Kharo Chan covered in the field surveys

Lifestyle

The communities are living according to the traditional lifestyle which their ancestors left for them. Specific tribes dominate many professions. The majority of the population have very low standard of living and are least bothered about their lifestyle. Their earnings are usually spent on food and such basic necessities, disabling them to improve their lifestyle. In general, women are usually deprived of their parents’ inheritance. Women have no role in decision making.

Education and Literacy Rate

The education facilities available in district Thatta are reported in table 01 below.

Table 01: Schools available for children in useable conditions in Thatta

S.No.	Primary school up to grade 5= 3162			Middle school up to grade 8=72			High school up to grade 10=62		
	Male	Female	Teachers	Male	Female	Teachers	Male	Female	Teachers
1.	79,366	60,258	4612	1465	1523	147	9329	3989	638

Table-1 presented above clearly indicates educational facilities in the area under consideration are limited. Although the number of schools is adequate and premises are available in most of the villages, the maintenance of the buildings is poor and the rate of enrolment is fairly low. Also, there are no professional colleges or universities in the region.

The literacy rate is even less than 30% whereas female literacy rate does not exceed 5%. General educational level is below average and according to our estimates 60-70% of the population has education upto primary levels, 10-20% are matriculated or intermediate, while only 5-10% are graduates. Individuals with a master degree were rare. Vocational training is inadequate and the proportion of skilled labour in the technical human resource is only 10% of the total labour force. The emergence of mosque schools has been witnessed which show the current influence of religious trends in the local communities.

Healthcare

The total number of health care facilities in district Thatta is reported in Table -2.

Table 02: Healthcare facilities present in Thatta

S.No.	Type of facility	Total number	Total number of beds
1.	Basic health care units/dispensaries	64	96
2.	Rural health care centre	9	129
3.	Hospitals	5	348

If we compare the availability of healthcare facilities in the country, the number of hospital beds available per capita it would be 1 per 1,500. In developed countries this ratio is about 100 per 1,500 people. The situation is even worse in the entire province of Sind, particularly in the rural areas. Table 2 is self-explanatory and shows the unenviable healthcare facilities available in the district of Thatta.

The present study reveals that the health related problems are common in the local communities due to inadequate medical facilities. It can be argued that health related problems are the direct consequences of climate change which become a new challenge to the coastal communities while the poor health services further exacerbate the problem. For instance, countless people were infected variedly after the two major floods mentioned earlier.

The health related ailments with respect to climate change may include cardiopulmonary illness due to extreme temperatures, vector borne diseases, water borne diseases, illness due to malnutrition, and allergic reactions. Heat-related mortality would be further enhanced due to prolonged heat spells in the project area during summer.

The spread of infectious diseases would also be enhanced in the face of current warming trends in the study area. Human health would be compromised also with the increases in the levels of malnutrition due to disruptions in food production and supply. Malnutrition problems could also be attributed to crop failure [6].

Climate variability also has direct influence on the epidemiology of vector-borne diseases. An estimated rise of global temperature by 1.0–3.5 °C in 2100 will increase the likelihood of many vector-borne diseases of which malaria and dengue fever are among the most important diseases in the tropic and sub-tropic regions [7]. In fact dengue fever is emerging threat to the local communities which has never been reported in the area before. This could also related to the changes in climatological regime because the temperature is favourable for the growth of dengue fever vector.

Child and Maternal Health

The status of child health is often reported in terms of child weight. If children are undernourished or malnourished they often do not gain weight appropriate to their age. This situation is highly prevalent in the study area as most of the children are undernourished. According to the official statistics, approximately 49% of the children of age five years in district Thatta are malnourished.

As far as maternal health is concerned, the situation is even worse. Maternal health is often calculated as maternal deaths out of every one hundred thousand births. In Sind, this ratio is 350:100,000. In Thatta, child birth is normally facilitated at home by untrained female midwives, locally called *Daees*. Our estimate suggested that almost 50% of the pregnant mothers give birth normally at home. Moreover, having more children also confers social standing in the society. Therefore, in most of the cases the reasonable period among two births is very limited.

Housing

The survey of the study area reveals an average household comprises five individuals. In the entire area almost 95% families own their houses. Only 3-4% of the houses are occupied by tenants. In the entire district of Thatta 64% of the houses are provided with electricity. In the area of Shah Bundar, most of the villages are without electricity. A similar situation also exists in the area of Kharo Chan. However, in the town of Keti Bundar electricity is available. In the entire district only 62 of the households have latrines. Natural gas is available in for only 14% of the houses while the rest of the population uses other means of fuels (mainly wood, charcoal or cow dung cakes). On standard of living Thatta is placed at 74 among all the districts in the country.

Sources of Income and Livelihoods

Livestock

The common livestock found in the area include cows, sheep, goat, camel, and ass. Relatively upper class people also keep buffaloes and horses. In the entire district of Thatta the average number of cattle is 3.1 per household whereas the average number of ruminants is 2.2. People also keep mule as a mean of transportation. The livestock numbers have been particularly affected as a result of the decrease in the flow of freshwater in the Indus. The rainfall pattern is also changed which is affecting the vegetation cover of the area. Limited grass land or pasture is available where the nutritive quality of the fodder is particularly low. It has been noticed that instead of keeping bigger animals people mostly prefers goat and sheep which can easily acclimatized with climate change shift. During the period of severe drought which is not uncommon the people use to sell out their livestock for cash earnings. In these communities the number of livestock which the individual has confers the social standing in the society. However, in fishing communities living in the coastal areas often do not have adequate number of livestock. In such communities the people usually herd camels.

Agriculture

Agriculture is the most important source of earning since historical times. The common cash crops in the area are wheat, rice, sugarcane and vegetables. Among vegetables chilies and tomatoes are mostly preferred. During 2008-2009 wheat was cultivated on 33000 acres of land in district Thatta through which about 1000 metric tons of wheat was harvested. During the same period rice was cultivated on approximately 0.2 million acres through which about 5077 tons of rice was harvested. Share of rice production of Thatta in the Sindh province is about 155 tons. Similarly, during the same years sugar cane was cultivated on about 82000 acres which gave 40700 tons production. Among fruits banana is most commonly grown in Thatta. Sindh produced 80% of banana of entire country. In Sindh the share of Thatta in banana production is about 16%. Banana orchards occupies an area of 10,000 acres.

In many areas the cultivation of land is highly seasonal dependent where the local farmers rely on rainy season. The cultivable land mostly owned by villagers which is mostly inherited or being shared by families. Nearly 70% of the population own land of different sizes. Two-thirds of the village households own land of varying sizes. The land is mostly cultivated by the land owners however, they usually hire daily wagers during growing seasons. Sometimes the bigger land owner share the land with the agriculture workers on half and half basis. In that system the workers performs all the agriculture activities from sowing till harvesting and the total income is being shared by the two parties. It has been noticed that the cropping pattern is also change due to climatological conditions. Rice for example is high water demanding crop. Because of limited availability of fresh water the rice cultivation area is gradually declining. Similarly the quality of sugarcane is also affected. In fact the farmers now prefer water resistant crops like sunflower and pearl millet. During the field survey value added crops also have been seen like betel leaves and melon.

Fishing

This profession is common in the villages closed to the coast. In Keti Bundar area almost 90% of the population is involved in fishing business. These are the area where agriculture land is hardly present and if available is too saline and water logged. It has been reported that fish catch is sharply decline but still 90% people continue with fishing. This could be mainly attributed to mismanagement which is the root cause of crises in fisheries sector. Fishing begins in September and between November-February is the peak fishing season. From March to April strong winds blow and fishermen do not take their boats in an open sea. The catch however is very nominal during off season, not even enough to cover costs of two meals. From May – July is the rainy season and also the breeding season for fishes, wherefore in these months no fishing activities are carried out. In the entire study area there are only 25% of local families which owned their boats. The boats can be divided into three categories. The small boats which carries 1-5 tons of fish, medium sized boats can collect fish catch upto 6-15 tons while bigger boats can even collect upto 25 tons of catch.

The crew at each boat comprises of 5-10 people depending upon the size of the boats. There is one captain for the boat who is mostly the owner of the boat while rest of the people working as labour where they hardly get an amount of Rs. 200-300 per day. During bad weather from May-August the situation becomes miserable for these daily wagers. It was found that the fishing sector in the area is over-saturated as a sizeable population left their traditional profession of agriculture due to unavailability of water. The overharvesting of fish has resulted in gross decline of catches as well.

Occupation

Owing to the limited livelihood opportunities the sources of occupations are only limited. The people are mostly employed as cheap unskilled labour force in their by towns. Cultivation of the land is restricted due to shortage of water therefore livestock herding is the only feasible income generating option. There is chronic shortage of skilled labour and only limited skilled labours are available as drivers, welders, plumbers and electricians. Government jobs are also limited. People are mostly primary school teachers. The focus group discussion revealed that there is massive unemployment in the area.

We have estimated that the economically active population in the project area is only 30-35% while 45% percent is aged 10 and above. We have estimated that the high unemployment rate in the project area which is around 30-35%. Of the total employed persons, about 75% are engaged in basic occupations like agriculture, wood cutting and fishing. The main occupations are listed below.

- i. Government jobs mostly school teachers
- ii. Agriculture income from owner's cultivable land
- iii. Sale of Livestock as and when need arises
- iv. Contractual jobs as daily wagers
- v. Wood cutting, and Charcoal Kiln
- vi. Fishing

The people mostly migrated in search of better livelihood opportunities. The current status of net migration rate is not available but focus group discussions revealed that net migration rate is 10%. It was interesting to notice that even with limited livelihood opportunities a sizeable population is reluctant to migrate. They are happy with the present standard of living.

Physical Infrastructure

Water Supply

In the areas of Keti Bundar and Shah Bundar piped water supply is not common. The only reliable sources of water are hand pumps, wells and ponds. The area is at the tail end of River Indus only receives a limited water supply. In the coastal sub districts only 10 percent of the people had access to water supply from within the village. In Keti Bundar area the people have to buy tanker water as there is no permanent source of fresh water.

The quality of water is a major issue in the area. In many of the union councils the water supply schemes have been approved but no work has been seen on the ground. In the coastal villages the quality of ground water is mostly brackish.

Sanitation

There is no sewerage network is available in the rural areas. Most of the houses are devoid of latrine facilities. They mostly used the surrounding areas for defecation. In some areas there are separate enclosures are available for male and females. Solid waste is also usually dumped in and around close to the settlements.

Solid Waste

The quantity of solid waste generated in the villages is fairly low. Solid waste mostly comprises of polythene bags, biological waste from kitchen, card board boxes and paper. It is usually being dumped indiscriminately to the nearby land. Animal waste is mostly collected separately and used as organic manure. Solid waste normally thrown indiscriminately in open places.

Electricity and Natural Gas

Electricity is available in only 20 villages of Keti Bundar and Shah Bundar. Kerosene oil is commonly used for lanterns. Moreover, there is no supply of natural gas in the areas of Keti Bundar and Shah Bundar.

The villagers use kerosene oil lamps for lighting. Car batteries are also used in some villages. Fuel for energy mostly comes from fire wood. The source of fuel wood is the bushes and woodlands around the village from where household members cut bundles of wood as per requirement.

Transport

Most of the villages at Keti Bundar are connected with metalled roads. However, in Keti Bundar area the metaled road is available which requires lots of repairing and maintenance. Cost of travelling to and from the villages is quite high as the people used different means of transport.

Means of transportation include

- i. Motorbikes
- ii. Tractor trolleys
- iii. Suzuki
- iv. Private buses

Irrigation and Drainage Systems

The people use the canal waters originated from river Indus for irrigation. In many villages privately owned tube wells are also used. However, the pattern of irrigation has transformed due to lack of water availability, which is hampering the irrigation of plantations.

Socioeconomic Impact of Climate Change

Food Deprivation

Climate change is predicted to have severe consequences on agriculture and the rural population in South Asia. Long-term changes in temperature and precipitation have direct impacts on crop yield. Moreover, resilience is typically low in rural areas, as the existing asset base is limited, and services are often insufficient.

Agriculture is largely dependent on the monsoon system which accounts for more than 70 per cent of the region's annual precipitation that is now totally disturbed due to changes in climate of the region. Given that approximately three-fifths of the cultivated area in South Asia is rain-fed, the onset, duration, spatial extent, and total precipitation of the monsoon are critical factors in determining the livelihoods of vast majority of people in rural areas [8]. The region would continue to face extreme climatological events in future [9,10]. According to Lobell *et al.*, (2008)[11] South Asia and South Africa are the two regions that may suffer from negative impacts of climate change on several crops that may lead to food insecurity in the region.

The study area has semi-arid climate where the staple crops are already giving lesser yields mainly because of water scarcity. It is anticipated that further increase in temperature may severely hamper the growing stages of cereal crops. Sultana and Ali (2006) pointed out that wheat yields would decline by 6-9% in sub-humid, semi-arid and arid areas with 1°C increase in temperature[12].

The worst sufferers of climate change are small farmers who make the majority in the study area, with low socioeconomic profile and limited technical capability to adapt to climate variability. This poor segment of the society either suffers from economic losses or facing food security problems owing to climate changes.

Floods, droughts, bad governance, and environmental changes have been held responsible for escalation of price because most of agriculture zones are hit by floods and droughts.

Another problem which exacerbates food security in the region is the emergence of infectious diseases of plants. The farmers are planting more drought resistant crops like sunflower and maize which are

generally considered crops with lesser profits. This is not only because of water shortages but also emergence of new diseases which decreases crop yield. Anderson *et al.* [13] argued that Emerging Infectious Diseases (EIDs) of plants are directly associated with severe weather events.

Water Deprivation

The entire economy of the South Asia is agriculture based, which is largely dependent on the availability of water. Climate change has the direct impact on already dwindling water resources of the region that is already water stressed. HDR (2006) has already reported that 2.5 billion people of this region will be directly suffered from water scarcity by the year 2050[8]. Since 1950, per capita water availability has already reduced by 70% [14].The variability in rainfall intensity and frequency compounding the problems of both floods and droughts.

Pakistan is already a water stressed country. The impact of climate change on the economy, particularly agricultural activity, will nevertheless be highly disturbing since per capita water availability will be reduced to below 900m³ and Pakistan will remain a water stressed country. Availability from tube wells will go down each year since the groundwater sources will not be adequately charged. In Sind, 5 million people are hepatitis positive which is mainly due to the consumption of contaminated water[15].

Deprivation of Sanitation

Only up to 25% population of the study area have sanitation facility. However, such facility hardly seen in the remote villages of the coastal areas of Keti Bundar, Shah Bundar and Kharo Chan. Households are devoid of latrine facility and most people use bushes to answer the call of nature. Although, women's enclosure is separate, it is not properly concealed.

Solid waste is thrown indiscriminately outside the houses. Heaps of solid waste can be seen sometimes outside the villages. These heaps often attract stray animals. Animal waste is not collected separately and is thrown in the common garbage den and allowed to dry. When the quantity of animal waste is substantial, it is lifted and taken to the agricultural field and dumped in a pit to form manure, or else sold to contractors from other villages which may have it lifted by tractor trolley and take it to their own lands.

Shelter Deprivation

It is anticipated that about 75% of the population of the rural areas are living below poverty line. The size of the house hold varies depending upon the number of individuals. Most of the houses are made up of mud and mud bricks. In the coastal areas people live in huts made up of bamboos and wild bushes. The general architecture of the house comprises one or two rooms mostly used for sleeping. The front yard is commonly used for routine daily activities. The houses do not have concrete boundary walls, rather wild bushes and hedges are commonly used to demarcate the boundary of the house. Electricity is not available in the villages. People used kerosene oil mostly for lightning. In most of the cases these types of shelter are over-crowded. Also, there is no concept of personal privacy.

Impact on Infrastructure

The road is used for providing the only means for transportation of fishes and agriculture commodities to the cities including Thatta and Karachi. The fish is mostly transported to Karachi for better income. The vegetables grown in the area mostly sell in the local markets or transported mainly to Thatta, Sajawal and Karachi. Women mortalities during pregnancies are also common. One important feature that was noticed during the survey was that although the life of the people is miserable, the use of cellular phone is very common. Electricity is not available in the area. Diesel operated pumps are common and in use where there is agricultural activity.

Climate Change Refugees

Mobility and migration are key responses to environmental and non-environmental transformations and pressures, thus the impacts of climate change are likely to affect population distribution and mobility [16].

Climatic change also induced involuntary migration of the people that is responsible for creating socioeconomic problems in the region. Within a given climatic change scenario people can adapt to these problems by staying in place and doing nothing, staying in place and mitigating the problems, or leaving the affected areas. The choice between these options will depend on the extent of problems and mitigation capabilities [17]. This involuntary migration is also responsible for breeding conflicts, especially in less developed countries. Depletion of resources particularly in developing countries have compelled mass migration of people in search of availability of resources that has created anti-immigrant sentiments as well as unauthorized international migration is considered as security threats in many parts of the world [18].

It has been reported that by 2050, the number of people forced to move primarily because of climate change will range between 200 million and 1 billion[19,20]. Experiences have shown that extreme weather events only become disasters when they affect populations with high levels of vulnerability. The frequency of extreme events with limited access to government and non-government support systems are

important factors in increasing vulnerability. This has been seen in 2010 flood in Pakistan and 2004 tornado in Bangladesh.

CONCLUSIONS

The reduction of fresh water resources in the area has changed both the natural resource base and the livelihood patterns of the people, particularly the poor. The people are now rely on multiple system of earnings. Agriculture land has shrunk and those engaged in agriculture are now rely on fishing or other manual labour. The villages are poor in infrastructure, while there is limited availability of electricity, road access, educational and health facilities. Drinking water is available through hand pumps and tube well but the quality is extremely poor from public health point of view.

Health related problems are the direct consequences of climate change which become a new challenge to the coastal communities while poor health services further exacerbate the problem. Health related ailments with respect to climate change may include cardiopulmonary illness due to extreme temperatures, vector borne diseases, water borne diseases and illness due to mal nutrition and allergic reactions. Heat-related mortality would be further enhanced due to prolonged heat spell in the project area.

Incomes in general are irregular and seasonal from multiple sources and occupations. Women's role is significant in the total household income through various means. Coping mechanisms for dealing with vulnerabilities is through loans, selling animals, selling milk and women's craft production. The above discussion clearly depicted that the communities are highly vulnerable to the problems of climate change and having social unrest that needs to be addressed immediately by increasing alternative livelihood opportunities.

RECOMMENDATIONS

Thatta is among the least resourceful districts of Pakistan, and the conditions discussed above leave no room for imagination about the distressful circumstances of the people living in the region. Lack of education keeps them from understanding the long-term losses they are bound to endure, but the educated population of the country and their political representatives in the democracy can present no excuse for their ignorance of these problems in the district and many others like it.

This study has provided us a clear perspective as to what kind of exercises is required to reduce the exceedingly deteriorating conditions of the studied region. Not only does a strategic plan required to resolve the lasting problems of Thatta in the wake of climatic changes, infrastructure and administrative problems can be resolved far sooner, which are only adding to the misery and effect of the natural disasters.

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