Paper presented in

Seventh Biennial Conference

Indian Society for Ecological Economics (INSEE)

Global Change, Ecosystems, Sustainability

December 4-8, 2013

Host:
Tezpur University

Cohost:
OKD Institute of Social Change and Development

Analyzing the Impact of Mundra Port and Special Economic Zone Limited (MPSEZL) on Coastal Environment of Gujarat, India

Chakraborty,Tamali *; Gundimeda, Haripriya **; and Kathuria, Vinish ***

*Corresponding Author, Research Scholar, IIT Bombay, tamali.chakraborty@gmail.com

** Associate Professor, H&SS, IIT Bombay; *** Associate Professor, SJMSOM, IIT Bombay

Abstract:

The introduction of Special Economic Zones (SEZs) in India has injected hope for augmented economic growth in recent future. The motive of establishment of SEZs was mainly to fuel rapid economic growth, provide world class infrastructure and employment, promote export, increase in foreign exchange reserves and attract more FDI. However, the SEZ policy has been under scanner since its inception and the impact of the SEZs in the surrounding environment raises questions. There has been hardly any study which has looked into the sustainable impact of SEZs on the surrounding environment. The challenge is to know whether developing SEZs maintain ecological sustainability in coastal parts of India. This paper tries to answer the questions of sustainability of economic growth via SEZs in India and aims to check the environmental impacts of the SEZs in the surrounding area. For this purpose, Mundra Port and Special Economic Zone Limited (MPSEZL), Gujarat has been selected. This is the largest private port based SEZ in India and situated in coastal area of Kutch district, which is declared as Critically Vulnerable Coastal Area. This area is ecologically very significant in terms of mangroves, creeks, migratory birds, coral reef and scrub forest. The loss of mangroves, migratory birds, scrub forests and fishing activities are the major concerns of Mundra area. The affected people of Mundra area due to MPSEZL are fisher folks, farmers, salt pan makers and cattle grazers. The preliminary observation has found that the fisher folks are most affected among them. Fisher folks are facing problem due to threat of loss in livelihood in fishing banders as two fishing banders were closed down by the activities of MPSEZL. The farmers are facing difficulty as some of farming land has been taken by the MPSEZL developers. Besides, the increased salination due to loss in mangroves has led to decline in agricultural production of dates, sapota, etc. and significant impact on the quality of the produce. The salt pan makers are not able to produce salt in Mundra area as they are not getting land for lease in Mundra area for salt production. There is an urgent need to check the actual impact of this SEZ on the coastal environment as this SEZ falls under CVCA area. The findings of the study can be helpful in formulating appropriate Government measures for ensuring sustainable development.

Keywords: SEZ, MPSEZL, sustainable, environment, India.

1. Specific theme: Sustainability: Approaches and Implications
2. Specific sub-theme: Ecological Sustainability

Table of Contents: **Page number**

List of Tables:

List of Figures:

I. Introduction

The Special Economic Zones (SEZs) were set up in India to fuel rapid economic growth, provide world class infrastructure, employment, promote exports and attract more FDI. However, since their inception, the SEZs have been under scanner of debate on whether benefits accrue at the behest of the society and environment of India. Several studies (Aggarwal 2004, 2007; Warr 1983, 1989; Spinanger 1984; Chen 1993; Jayanthakumaran 2003, etc.) have tried to examine the economic and social benefits of SEZs but only a few studies addressed the impact of SEZs/EPZs on environment (Lam 1986; Dweiri and Badran 2002; Asher and Kohli 2007; Asher and Oskarsson 2008; Verma and Kumar 2010; Shu et. al. 2012). But these studies have not considered displacement cost, cost of loss of livelihood of the affected people and environmental cost due to the SEZ's activity. As real economic development cannot happen without regard for environment, an attempt is made in this study to explore the impact of SEZs on environment. For this purpose the study considers one of the functional SEZs, Mundra Port and SEZ Ltd. (MPSEZL) for studying the impacts on environment. The findings of the study can be helpful in formulating appropriate Government measures in ensuring sustainable development. This SEZ is selected because there are some instances of harmful effect on environment due to this SEZ. As this SEZ is situated in a Critically Vulnerable Coastal Area (CVCA) of Gujarat, the establishment of the SEZ has become the reason behind loss in mangrove and fishes, loss of creeks and scrub forest, etc.

The paper is structured as follows. Section 2 gives a brief description of the study area of Mundra SEZ in Gujarat. Section 3 gives a review of different studies carried out to see the impact on environment due to SEZs in different countries. In section 4 the data collection process is discussed and Section 5 gives a snapshot of the preliminary observations from the field. The paper concludes in Section 6.

II. Mundra SEZ

Gujarat with two large deserts one in North of Kutch and another between Kutch and mainland Gujarat also has the longest coast-line of about 1600 km which includes marshy lands and estuaries. Gujarat has 23 wildlife sanctuaries and 4 National Parks covering about 8.71% of the total geographical area of the state whereas national average is only 4%. Most of the forests are dry, deciduous to scrub type having very low productivity (Directorate of Economics and Statistics 2012).

There are 60 SEZs in Gujarat covering an area of approximately 31,884.32 hectares (Industries Commissionerate, 2010). IT/ITES and multiproduct SEZs are of 26 out of 60 SEZs in Gujarat (*ibid*). In this study, the selected functional SEZ, Mundra Port and Special Economic Zone Limited (MPSEZL) is

situated in Kutch district which has 14 approved SEZs in Gujarat (see Figure 1). Mundra taluka of Kutch district alone has 5 approved SEZs (see Table 1).

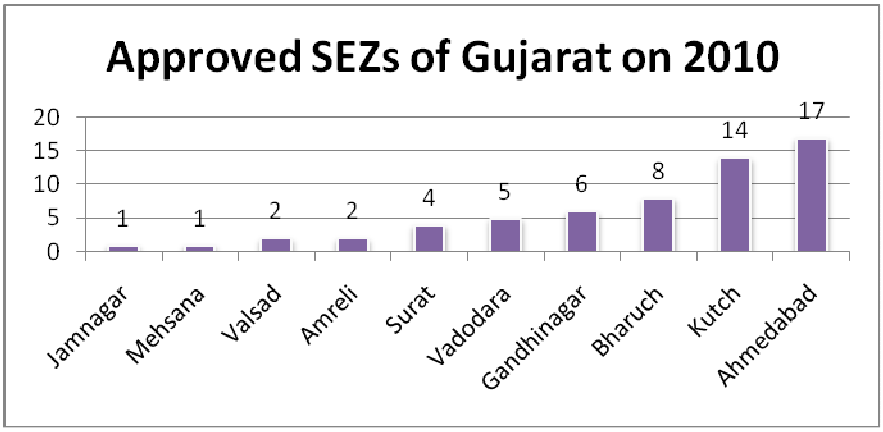

Figure 1: Approved SEZs of Gujarat in 2010

Source: Adapted from Industries in Gujarat Statistical Information- 2010, Industries Commissionerate, 2010.

Table 1: Approved SEZs in Kutch district

SEZ	Location	Type	Area (hectares)	Status of Approval
Kandla Special Economic Zone	Gandhidham	Multiproduct		Operational
Welspun Anjar SEZ Ltd.	Village Anjar	Engineering	109.59	Notified
Euro Multivision Ltd.	Kutch	Non-conventional Energy including solar energy equipments/ cell	11.6	Notified
Mundra Port & Special Economic Zone	Village Mundra, Taluka Mundra	Multi product	6472.8684	Notified
Gujarat Growth Centres Development Corporation Limited (GGDCL)	Moti Chiral GGDCL Estate, Village Moti Chiral	Handicrafts and Artisan	131.59	Formally approved
Asia Pacific Corporation Ltd.	Kutch	Polymer based	101.17	Formally approved
Mundra Port & Special Economic Zone Ltd. (MPSEZL) (Adani Power Pvt. Ltd.)	Mundra Taluka	Multi product	2648.19 (6214.63) (2648.19)	Formally approved
Euro Multivision Ltd.	Village Shikara, Taluka Bhachau	Nonconventional energy including solar energy equipments/cell	11.63.47	Formally approved
M/s. Adani Ports & SEZ (M/s. Mundra Port & Special Economic Zone Ltd.)	Village Dhrub, Taluka Mundra	FTWZ	168.41	Formally approved
M/s. Adani Ports & SEZ (M/s. Mundra Port & Special Economic Zone Ltd.)	Taluka Mundra	Multi Product	1840	Formally approved
M/s. Plastene Infrastructure Limited	Bhandhai, Meghapar Kunjisar, Bhachau	Plastic & Plastic Products	100	In- Principle
M/s. Sealand Ports Private Limited	Villages- Layaja, Ratadiya, Godhra, Bayath & Undoth, Taluka- Mandvi	Multi product	1112	In- Principle
M/s. Avash Logistic Park Private Limited	Villages– Mota Layaja, Godhara & Bayath Taluka – Mandvi	Free Trade Warehousing Zone (FTWZ)	496	In- Principle
M/s. OPG Power Gujarat Private Limited	Bhadreshwar, Mundra	Power	104.72	In- Principle

Source: sezindia, 2009; Note: SEZs in bold letters are situated in Mundra Taluka.

The selected SEZ in this study named Mundra Special Economic Zone Limited was incorporated in November 2003 and later was renamed as Mundra Port and Special Economic Zone Limited (MPSEZL)

after merging with Gujarat Adani Port Limited (GAPL)[1] in 2006. It is India's largest port led SEZ and attracts investors from Africa, Middle East and western countries. The MPSEZL has been developed over an area exceeding 100 sq km as a privately operated multi product SEZ. Mundra Port provides cargo handling and other value-added port services (MPSEZL 2007).

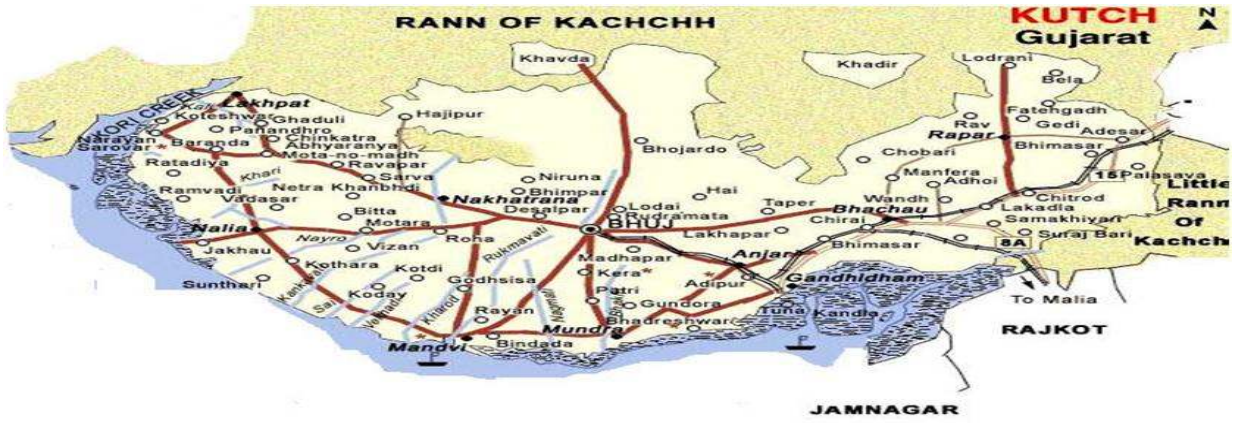

Figure 2: MPSEZL of Kutch
Source: Industries Commissionerate, Government of Gujarat 2012.

MPSEZL by Adani group is under debate since its inception for violating environmental regulations. The petitioners against Adani Group are fishermen who are worst affected due to the SEZ. The SEZ has violated Coastal Regulation Zone Act 1991 and Forest Conservation Act 1980. The environmental costs incurred by this SEZ[2] are: deforestation of mangrove forests and other trees, loss of migratory birds, deterioration in creeks and scrubs. Gujarat Forest Department report claims that around 340 sq. km. of mangroves are in danger. There is also threat of deforestation to 12-13 species of trees (Asher and Oskarsson 2008). Scrub forests are getting reduced and 23 species of migratory birds like herons, egrets and painted storks are in threat (*ibid*).

The selected study area, Mundra is situated in the Gulf of Kutch of Gujarat state. The Gulf of Kutch is situated between Saurashtra and Kutch peninsulas. Kutch is the largest district in India with a total area of 45,652 sq. km. With a population density of nearly 101 persons per sq km, the Kutch mainland

[1] Gujarat Adani Port Limited (GAPL) started its port operation as the largest private port in India in1998.
[2] This SEZ has affected 15 villages of Mundra (Asher 2007).

(excluding Rann[3]) is sparsely populated with population density lower than Gujarat's rural population density of 166 (FKNA 2010). Growth of mangroves[4] of Kutch is faster than other areas.

In Mundra zone, the following biodiversity indicators exist: fishes, mangroves, scrub forest, mudflats, estuaries, seaweeds, commercial fishes, creeks, patches of live corals, etc. The vast intertidal mudflats along the mangroves and corals give breeding zone to many marine livings. The Gulf also has more than 210 species of marine algae (Department of Ocean Development 2002; FKNA 2010). Among coastal places of India, now only in Gulf of Kutch live corals occur[5]. The marine environment of Kutch is in severe trouble due to recent commercial activities of ports, harbours, oil terminals (Department of Ocean Development 2002) and SEZs.

Ecological and Economic Significance of this area

Gulf of Kutch was the first Marine National Park and Sanctuary (MNPS), established in 1982 under the Wildlife Protection Act, 1972. The estimated mangrove coverage in MNPS area is 5,722 hectares. More than 40 islands of Southern part of Gulf of Kutch are fully covered by live corals and require protection. The islands and coast are covered by dense mangrove forests. Gulf of Kutch includes 93% of mangroves of Gujarat. The mangroves found in Kutch are: *Avicennia marina var. acutissima*, *A.officinals*, *A.alba*, *Rhizophora mucronata*, *Ceriops tagal*, *Bruguiera gymnorrhiza* and *Aegicerous corniculata* [6] (Department of Ocean Development 2002). Kutch district is declared as the most important mangrove areas of Gujarat (FKNA 2010). Mundra coast has nearly 2,096 hectares of mangroves. Mangroves are very important for marine coastal soil conservation, breeding and nursery grounds for fish, sheltering prawns, etc. These mangroves contribute to the oxygen budget and soil conservation. Mangroves and corals are nursing ground of many economically important fishes, coral fishes, flora and fauna (Department of Ocean Development 2002).

The economic activities of Mundra region are: multi-crop farming, animal husbandry, horticulture, fishing and salt making. In Kutch, jowar and castrol crops are main products. Dates are very famous in

[3] Rann of Kutch, a marshy and salty area of Kutch of Gujarat state, is located in Thar desert bio-geographic area. It is divided into two main parts: Great Rann of Kutch and Little Rann of Kutch.

[4] Earlier, mangroves were found ranging from 1 to 5 metres and sometimes 10 metres tall in the Gulf of Kutch (Patel 2012).

[5] The coastal ecosystem is basically divided into three categories: estuarine, inter-tidal and coral reef. The estuarine ecosystem comprises of mangroves and other wetlands (Bhatta 2003).

[6] *Avicennia marina var. acutissima* is the dominant species in Kutch area. *A.officinals* and *A.alba* are commonly found. But *Rhizophora mucronata*, *Ceriops tagal* and *Bruguiera gymnorrhiza* are vulnerable. *Aegiceros corniculata* has become endangered now (Department of Ocean Development 2002).

few villages of Mundra like Jarpara and Dhrub. Kutch is a dry region and thus 80% of agricultural farming of Kutch is dry farming. Rainfall is very less and the small rivers get dried in non-monsoon season, thereby.

Salt making is one economic livelihood of the local people. In Kutch, nearly 15,000 persons are engaged in making salt in the salt pans which are spread in the area of 1,720 hectares (FKNA 2010). Gujarat produces more than 70% of the salt produced in India. About 91,400 workers (Agarias) are directly involved in this activity. In the year 2010-11, total production of Salt in State is 145.16 lakh. Mundra region also has cattle grazing land where around 2,000 cattle graze (Directorate of Economics and Statistics 2012).

Fishes from Mundra coast are sent to Assam, Andhra Pradesh and Mumbai. These fishes are exported to Sri Lanka and Bangladesh and Mauritius. Around 1,119 households were engaged in fishing on the Kutch coast in 1980 (Balan et. al. 1987). The fishes from the bandars of Kutch are taken to plants of Veraval for fish freezing. Fishing activity is seen from Lakhpat in Kutch district of North Gujarat to Umargaon in Valsad district in South Gujarat. Commercial fishes like Pomfret, Jew fish, Bombay duck, Shrimp, Lobster, Squid, Cuttle fish, Silver bar, Hilsa, Shark, Catfish, Mullets, etc. are available in large quantities in these areas. Different types of Oysters, Shell fish and Sea-Weed are seen in the Gulf of Kutch (Directorate of Economics and Statistics 2012). The main fish of these banders is bombay duck[7]. It can be seen from the Figure 3 that there has been a decreasing trend in marine fish catching in Kutch district since 2002-03 to 2008-09. However, the scenario seems to have changed in the last two years - 2009-10 and 2010-11.

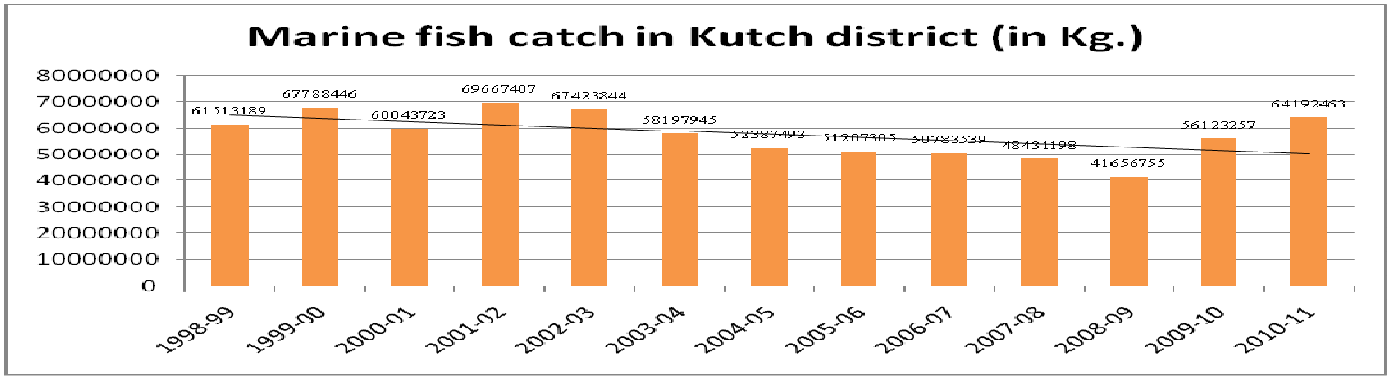

Figure 3: Trend of marine Fish production of Kutch district (in Kg)

Source: SETU Information Centre 2012.

[7] 90% of fishes are kept for drying. Only 10% of fishes are directly consumed.

III. Impact of SEZs on Environment- Experiences from Different Countries:

In China, SEZs have been successful in bringing rapid economic growth. Among all Chinese SEZs, Shenzhen SEZ was the most successful as it transformed a fishing village into an industrial town. According to Chen (1993) who conducted a study on Shenzhen SEZ, this SEZ had been able to serve the purpose behind the establishment of SEZ. The Internal Rate of Return (IRR) and Net Present Value (NPV) have been positive which show that Shenzhen SEZ was really successful in fulfilling Chinese open door policy and it served mostly the purpose behind the establishment of this SEZ (Chen 1993). Though author has proved that Shenzhen has shown path for China's growth with development of SEZs, she hasn't taken into consideration of displacement cost, cost of loss of livelihood of the fisher folk and environmental cost due to the SEZ's activity. Considering the negative externalities of SEZs may not have given a similar conclusion.

Indian Government had become inspired by the success of the Chinese SEZs which came with a huge cost on environment and society. It was found that Shenzhen SEZ of China, situated near the Pearl River estuary, had an adverse effect on the Chinese environment due to its activities. The nuclear power plant of this SEZ has affected the Pearl River estuary. The industries like laundry factory of Shahe, the toy factory of Shekou and the printing and dying factory of Kuichong violated Chinese Environmental Protection Law. The result of air quality monitoring had indicated the increment in the levels of nitrogen oxides and ozone (Lam 1986). The waste materials from the factories and plants operating within this SEZ were dumped openly on the hills of the north side of this zone (*ibid*). The environment of Guangzhou is worse than Heyuan now. There exists an inverse U shaped relationship between the per capita GDP for Guangzhou and waste water emission (Shu et. al. 2012). Thus it has been observed that the success of Chinese SEZs have come with a terrible cost on the environment.

In India, the ecological balance is disrupted by the SEZs as these are built in sensitive coastal ecosystems and the construction of SEZs in coastal area violates the Coastal Regulation Zone (CRZ), 1991 notifications. According to the Coastal Management Zone (CMZ) notification, 2008, SEZs can be established in coastal areas. This Act violates the basic rights of the local community (Centre for Environment and Development 2009). The actual extent of mangrove destruction[8] in the Mundra area is

[8] The Gujarati Samachar news paper report claimed that in 1998, 13 km. areas of mangrove (25,000 plants of mangroves) were cut by Adani and Gujarat Forest Department punished them by imposing penalty of Rs. 2500 only.

still unclear as no proper study has been done so far[9]. The vanishing mangroves of the Mundra SEZ are very important for the balance of coastal eco-systems and soil preservation of this area. Fishing in such coastal areas has been largely affected due to dredging of the port and pollution created by the Mundra SEZ (Asher and Oskarsson 2008). The Mundra SEZ is located on land that houses 5,79,000 trees and more than 23 species of migratory birds like Herons, Eagrets and Painted Storks. Chief Conservator of Forests, in Gujarat Forest Department report of 2007 talked about drastic losses of mangroves in that area. More than 1,000 fishing families, direct and indirect vendors who depend on fishing activities are affected due to this SEZ. Not only the fishing community, farmers and cattle grazers are also affected. The residents who depend on common wastelands for their livelihood are severely affected due to loss of livelihood (*ibid*). Even in the case of Orissa, the POSCO (Pohang Iron and Steel Company) SEZ will affect the coastal environment severely. In addition, the Gahirmatha Marine Sanctuary of Orissa, which is a breeding ground for the endangered Olive Ridley turtle, will also be hugely affected by the POSCO SEZ and port (Asher and Kohli 2007). The POSCO SEZ will destroy the mechanism of natural creeks, waterways and nalas. It will bring negative impact on 'pan' cultivation and livelihood of the 'pan' cultivators will be at stake (Verma and Kumar 2010). Villagers of Polepally and Mudireddypally are affected by water pollution due to Polepally SEZ of Andhra Pradesh (Rawat et. al. 2011).

IV. Data Collection:

This study is based on secondary data and preliminary primary data. The primary data is collected through interviews and group discussions. The secondary source is from the Governmental websites and relevant journals and books and documents provided by local NGO SETU. Data on loss of fishes, reduction in mangrove area and affect on fisher folk and farmers are collected. From the preliminary investigations carried out in the field area (during December 2012), it is evident that the fisher folk, farmers, cattle-grazers and salt-pan makers are affected due to MPSEZL. Among the affected people, fisher folk are mostly affected.

V. Observation from Preliminary Visit of the Study Area:

Affected Area due to MPSEZL:

The affected villages due to Mundra SEZ are: Jarpara, Navinal and Dhrub. Jarpara and Navinal banders are closed now due to Mundra SEZ activity and fisher folk of these banders are displaced to other

[9] The Hindu (dated 19th August 2007) reported that more than 600 hectares of mangroves had been cut since 1998 in the Mundra SEZ.

functional banders. The farmers of Dhrub village lost their agricultural lands due to SEZ operation. There were 12 banders in Mundra region earlier: Veera, Bawdi, Randh, Luni, Gaduria, Juna, Kutadi, Tragdi, Rampadh, Tuna, Navinal and Jarpara. The Figure 4 shows the banders of traditional fishermen of Mundra.

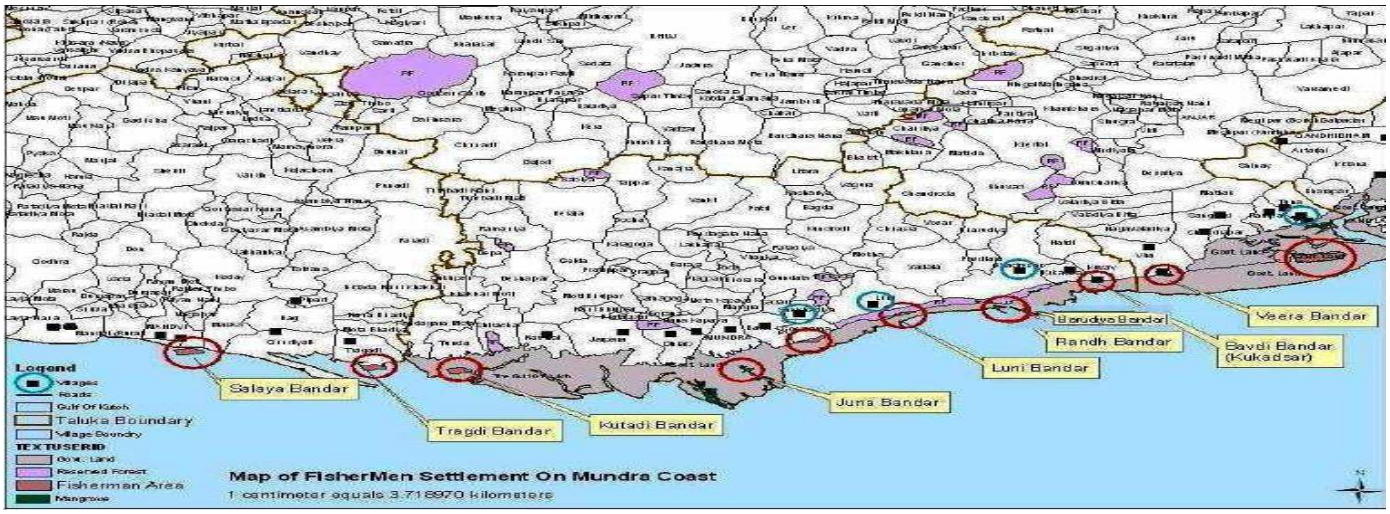

Figure 4: Map of Banders of traditional fishermen in Mundra coast
Source: Machimar Adhikar Sangharsh Sangathan (MASS) website, Kutch, Gujarat

The Table 2 shows the affected banders due to MPSEZL. Few banders are closed now and some banders fall within SEZ premises and the fisher folk can be displaced in near future.

Table 2: Displacement Pattern in Banders

Sr. No.	Harbour	Village	Location	Current Status
1	Tragdi	Tragdi	West Mundra Coast	Going to be displaced in near future due to MPSEZL.
2	Navinal Kutadi	Navinal	West Mundra Coast	Already displaced due to Adani/CGPL power plants.
3	Jarpara	Jarpara	West Mundra Coast	Already displaced due to Adani/CGPL power plants.
4	Juna	Mundra	Central Mundra Coast	Going to be displaced in near future due to MPSEZL.
5	Shekhadia	Shekhadia	East Mundra Coast	Proposed location of East port for MPSEZL.
6	Luni	Luni	East Mundra Coast	Falls within SEZ boundaries & likely to be displaced in near future.
7	Randh	Bhadreshwar	East Mundra Coast	Falls within SEZ boundaries & likely to be displaced in near future.
8	Gaduria	Bhadreshwar	East Mundra Coast	The only remaining banders on the Mundra coast which are still available for nearly 1000 fishing families of the coast.
9	Bawdi	Kukadsar	East Mundra Coast	The only remaining banders on the Mundra coast which are still available for nearly 1000 fishing families of the coast.
10	Veera	Veera	East Mundra Coast	The only remaining banders on the Mundra coast which are still available for nearly 1000 fishing families of the coast.

Source: Aswani 2012.

Affected People due to MPSEZL:

The affected people due to Mundra SEZ are: fisher folk, salt-pan makers, farmers and cattle-grazers. Many farmers were affected by this SEZ by losing their land. Around 15 families of Dhrub village lost

their agricultural land. Nankapaya and Motakapaya villages are also affected due to loss of agricultural land. The interesting fact is that if the Adani group had shifted the location of private highway 5-10 meter away, the agricultural lands could have been saved. One farmer had informed that he had lost 90 meter land due to private road of Adani and got compensation only of Rs. 90,000, whereas his land's price was more than 1 lakh. Compensation was really meagre compared to actual land price and expected date price.

The fisher folk are worst affected due to this SEZ. Due to Mundra SEZ, 1,015 households of fisher folk are affected (FKNA 2010). They are involved in fishing activity for last 200 years. In Kutch, during traditional fishing, people use only passive net. The traditional fishing happens by small boats or by pagadiya (fishing on foot). Active fishing happens in area where fisherman keeps on moving the net from one place to another place. But in passive fishing, the fisherman stays at one place with the net. In pagadiya fishing, intertidal zone area is used. The net is kept at that area before the high tide. With high tide, many fishes come and get stuck in the net and cannot come out during low tide and then the fishermen catch them. This kind of fishing is seen only in Kutch area. The small boats were earlier made of wood (1905) and later fibre boats (1970) came which were actually life boats of the bigger ships. Very few fishermen (around 4-5 of them) bought those boats as it was very costly. In 1970s, 1 small boat cost Rs. 3,50,000 and now the price of those boats have reduced to Rs. 60,000. Due to this low pricing of boats, now many fishermen have bought small boats. In 1998's cyclone many fishermen lost their boats. The money-lenders trapped them by saying that they will give the fishermen money only if they sell their fishes to them at cheap price. Price for 40 kg of dried fish was fixed at only Rs. 850. The fishermen fell into a trap of debt and were unable to come out of this debt. SETU (NGO) workers gave them loan after constructing a production committee with bank loan of Rs. 16 lakhs. The production committee[10] was built with few SETU members and few fishermen. Since then the production committee has given loan to the fishermen to buy small boats and now 90% of them have become debt-free. Only 10% of them are still under debt. Now 40 kg of dried fishes' price is increased to Rs. 3,200. In Gujarat, Wagher fishing community is called low caste as fishing is seen as "Paap nu Dhando" or as "sin" as the fishermen are engaged in a business of fish killing. The higher castes especially Jains are at

[10] A member of Production committee set up by SETU informed that 7th, 8th and 9th of 15 days of month fishing doesn't happen due to low tide. So 6 days in a month, they are unable to do fishing. This producer group was started in 2006-07. Some fishermen and few people of SETU made the group and due to this 90% of fishermen became debt free. In 2006-07, price of 40 kg dry fish was Rs. 650- Rs. 850. In 2012, price of 40 kg dry fish, is Rs. 3500. The price differs for different fishermen depending on their loan. Price of fresh fish was Rs. 20-25 in 2006-07. Recently, price of fresh fish is increased and price depends on grading of fishes (Parmar Jagdish, personal communication, December 12, 2012).

the top most administration of the state and fishing is seen as a sin by them. So they never tried to improve the livelihood of the fishermen. It has been seen that they have been displaced without any compensation as they stay in bandars for fishing for 8-9 months of a year and Government have no records of their stay. They do not have any basic amenities such as drinking water, sanitation, health care, education[11] etc. (SETU Information Centre 2012).

The saltpan-makers are called *Agaria*[12] in Kutchi language. Salt pan makers do partnership with salt-labourers. It is 50-50 without advance and 1/3- 2/3 with advance. After producing salt, these groups divide the production in two parts among themselves. The land owner sell the salt to industry and not to the market directly as the salt is not refined at that time. The salt-workers take land in lease from the government and do partnership with salt labourers for 3 years. After 3 years, lease has to be renewed. Since 2005, the government has not renewed the lease of salt-workers of Mundra. Some of them left the occupation and labourers migrated to another area. Salt pan producers take leased land from the Government, so Government is keeping account of them. Now in Mundra, as they did not get any land, they have started working in CRZ land which is a cause of concern as government can throw them again from that place. Moreover, the industries may bring problem for salt quality as a dust layer can fall on the upper part of salt when salt is kept open for drying under the sunshine and the buyers may refused to but this kind of salt. This kind of situation has happened with salt production in Gandhidham where more industries have come up.

Costs due to MPSEZL:

The evident costs due to SEZs by Adani group can be broadly divided into three categories: environmental costs, economic costs and social costs.

[11] SETU members had surveyed the education level of the male and female fishermen in 2007. To a greater surprise, it was found that only 7 women out of 100 were educated upto 1st-2nd standard. If they took out under 14 years old girls from the total number of women, then only 2 women were educated. Among men, 19% were educated but again above 14 years old men were less educated compared to below 14 years old boys. Below 14 years old children were given education by Yusuf Mahurali Sangathan (Usman Gani, personal communication, December 8, 2012). Yusuf Mahurali Sangathan, a local NGO is actively working for the educational development of the fishing community. This organisation has started moving school in the banders where the community stays (Patel 2012). Government had taken no initiative to improve their living condition. No proper road facility is seen in bandars where fishermen live for 8-9 months. The pregnant women suffer a lot during the delivery time due to lack of health facility and road. Because of this, sometimes, they give birth to handicapped children. The survey by SETU found that in 2005, 250 children of fishermen were not given polio drops. This can be another reason behind disability of few children (Usman Gani, personal communication, December 8, 2012).

[12] Even after death, the legs and hands of salt pan labourers do not burn due to salt deposition. And after age of 50, mostly they lose their eye-sight due to excessive heat of salt-pan. It is very difficult to stand nearby salt-pans for any common person, but they have to do work inside the salt-pan. This affects their health adversely and they lose their eye-sight easily after age of 50.

Environmental costs due to Mundra SEZ:

It was quoted in the report that the Mundra SEZ area had 2,096 hectares of mangroves and most of these had been cut (Department of Ocean Development 2002). The causes of reduction of mangroves in the area are: (a) indiscriminate cutting of mangroves; (b) water from cooling towers mingle in sea and increases temperature which is bad for mangroves and fishes[13]; (c) blocking of creeks by industry; (d) reclamation of land by industry (Aswani 2012). According to SETU (NGO) workers[14], the MPSEZL has encroached the coastal land gradually. They have seen through the satellite maps of 2000 and 2007-08 of the area that some patches of mangroves are already filled with sand deposits and dredging of the port has deteriorated the coastal land of Mundra by destroying the mangroves and creeks (see Figure 5).

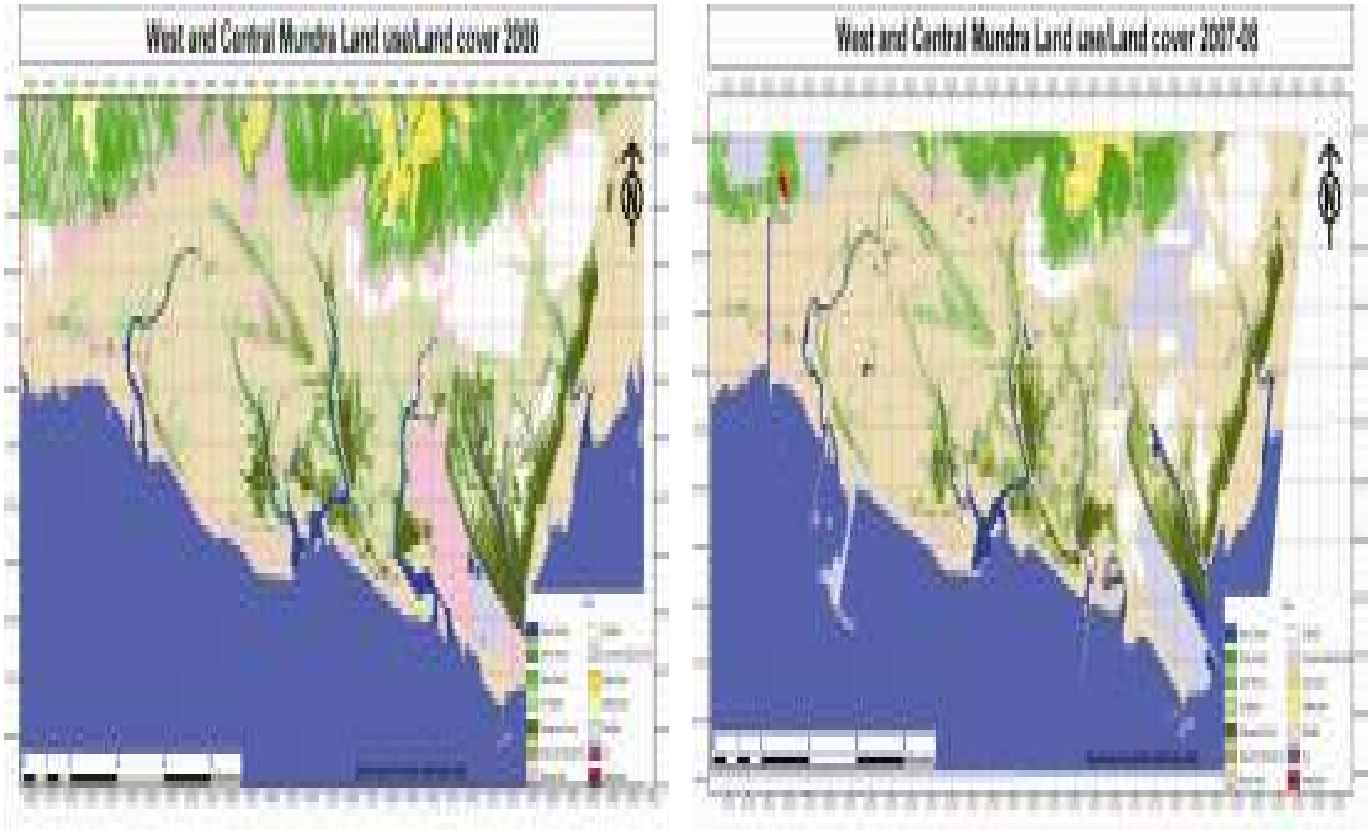

Figure 5: Change in mangrove pattern of Mundra in 2000 to 2007-08

Source: Aswani 2012

[13] Quality of fish has decreased as now the fishes perish in 2 hours after catching them whereas earlier it stayed for 4 hours. Sometimes, fishes turn black after washing and drying (Aswani 2012).

[14] In 2009, by water front development, Mundra SEZ developers encroached some lands and CRZ map was distorted. In 2010, power plant and SEZ of Mundra distorted CRZ map more by encroaching more mangrove lands and thus mangrove areas were filled and destroyed by sand deposition and dredging. The sand was deposited at that place from another place. So the earlier red areas of mangroves were turned into white sandy lands (Figure 6).

Land of marine national sanctuary was denotified by Government and the land was given to Essar and Reliance companies (457.92 sq. km.). These companies produce oil and almost in every 2 months, oil spill happens. Tata power plant and Adani power plants have water cooling system which creates water pollution. Salinity increases by this process. Moreover, eggs of fish and food of fish pass through the broiler and gets destroyed. Another problem with water cooling system is that it creates algae and to treat algae, chlorine is used which is very bad for seawater and marine ecosystem. Tata has 5 plants (each has 800 megawatt) and they use 600 litre of water per hour (SETU Information Centre 2012).

One of the fishermen of Randh bander, noticed few changes in last 4-5 years: (1) loss in migratory birds; (2) earlier, during diwali time, there used to be stomach problem in every household of the fishermen in the village. If they went to seashore ("*dariyakinare*") the problems would have reduced and never re-occurred in that year. But in last few years, the same problem has started happening in the sea-shore also; (3) earlier, there was no mosquito in the seashore. Now there is mosquito in the seashore due to polluted water; (4) earlier, fishes were available in 1-2 km from seashore, but now they need to go to 15 km from seashore to catch fishes. Nearby area of seashore has become polluted and thus fishes do not survive here anymore. Sometimes they also go near South Gujarat (Dwarka, Okha, and Jamnagar); (5) nowadays, after coming out of the sea, itching happens. Earlier nothing of this sort would happen and the water was clear; (6) Prawns were also lost due to OPG plant. Earlier, 1200 trawlers from Veraval used to come to Randh Bandar to catch prawns, but now they stopped coming as prawns are no longer available here; (7) After OPG plant came into being, 5-6 fishermen found 5-6 tonnes of dead fish in nearby sea area of that plant; (8) closing down of some creeks due to Adani's SEZ.

According to a local farmer of Dhrub village, the agricultural production of current year has reduced 60% than last year, maybe due to less rainfall of this year. According to him, the SEZ is the sole reason behind salination of water in last 4-5 years. Due to indiscriminate cutting of mangroves and polluted water, salinity of the land has increased which is harmful for cultivation. Due to salination, there has been reduction in quality and quantity of dates. There has been deterioration in quality of coconut also. Earlier, the farmers used to sell dates to Mumbai traders at Rs. 300- Rs. 700 per kg. And now they sell dates at Rs. 30- Rs. 60 per kg. Sapota production has been worst affected due to air pollution of SEZ. Earlier, 1 kg of sapota's price was Rs. 7 and now it has become Rs. 0.50. Most farmers have stopped producing sapota.

The CRZ area has been changing since 1991 to 2010 (see Figure 6). Port and SEZ activities have changed the CRZ area through dredging. It can be seen in this figure that CRZ area has been increased by reclamation of land by dredging activity in this period.

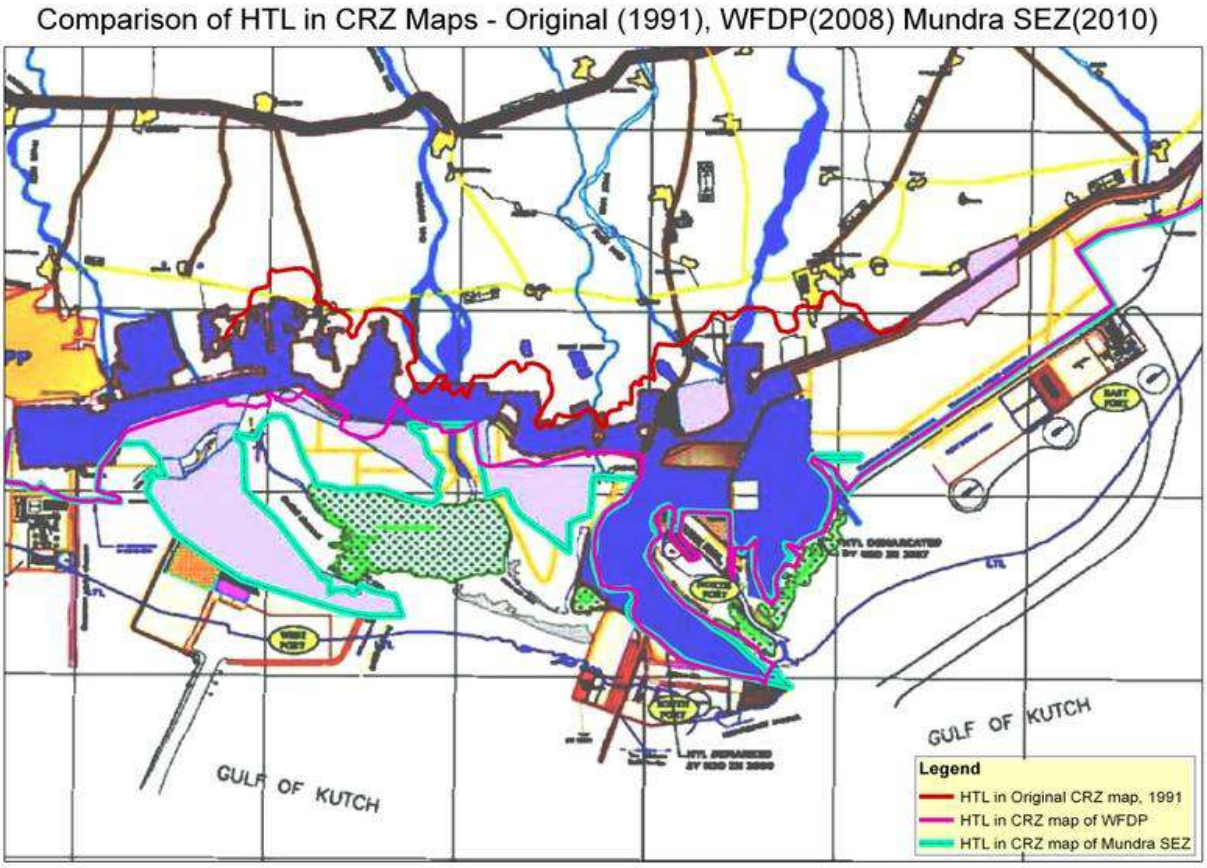

Figure 6: Comparison of High Tide Line (HTL) in CRZ maps of 1991, 2008 and 2010.

Source: SETU Information Centre

Economic Costs:

According to FKNA study (2010), around 1015 Muslim Wagher[15] families, 1000 pagadiya families[16], farmers[17] and cattle-grazers are affected due to Adani SEZ (FKNA 2010). Fishing in such coastal areas

[15] Traditional fishermen are known as "Waghers" in Kutchi. "Wah! Gher!" is an expression to appreciate the marvelous skill of trapping the fish (Aswani ,2012).
[16] Pagadiya families do fishing by walking into the intertidal zone.
[17] According to Gujarati Samachar news paper report, 600 date trees were cut in Dhrub. There were even 50 year old trees which were cut. It is difficult for the farmers if so old trees are cut as one date-palm tree takes 5-6 years to bear fruit.

has been largely affected due to dredging of the port and pollution created by the Mundra SEZ (Asher and Oskarsson 2008).

The fisher folk are also not entitled to compensation as according to Government authorities, Resettlement and Rehabilitation (R and R) policy is not valid here as the Mundra SEZ has not officially displaced anyone. Problem here is that, many fishermen do not own revenue/patta land as they have migrated in this place for 200-300 years ago and are well recognized by local people. Fishing families do fishing for 9-10 months continuously in banders and they do not do fishing during 10th June to 15th August as Government imposes ban on fishing with small boats in bandars. Pagadiya fishing still continues at this time and some fishermen who do fishing with small boats also do pagadiya fishing at this time period. Moreover, Government has most of their records in the villages but not in banders. Thus, when the fisher folk are displaced from the banders, Government does not compensate[18] them.

Aswani (2012), had observed three problems related to employment in SEZs: (a) very few local people get employment in the SEZs as they are not skilled and educated; (b) cheap migrated labour are available and most of the migrated people get jobs in lower wage; (c) industrialists fear that the local people will create trade unions. Due to these main reasons, very few local people are employed in the SEZ (Aswani 2012).

Social Cost:

According to census 2001, the total population of Mundra block is 83,010 persons. Now Adani SEZ developers have planned to bring 64,000 families inside SEZ in future. Already many townships have been built outside SEZ area. Adani group had sold many lands to real estate businessmen for developing townships. Now, the question is if the non-local families outweigh the local families, will not be there any social problem in near future? The peace and harmony among the local people will be shattered. The employment opportunity for those local people is very little. It can be shown with the fact that Adani group has given employment to 28,000 persons and astonishingly, only 15-20 local people have got job in the SEZ (SETU Information Centre 2012). Many temples and dargas fall inside the SEZ area and no common people have any permission to enter inside that area. This can lead to serious problem in future from the cultural and religious aspect.

[18] Surprisingly, during earthquake in Bhuj in 2001, the fishermen were given some relief by Government. If Government did not recognize their presence in coastal area of Kutch, it would not have given relief to the fishermen.

The SEZ developers get water from Narmada river, but villagers of Bhadreshwar do not get Narmada's water for drinking purpose. Narmada's water is given only to 3 villages and these are Chasra, Mokha and Laphra. The condition of the fisher folk in banders is worse as they need to bring water for drinking and cooking purpose from outside bander. The Randh bandar fishermen bring water everyday for their family from outside bander in a donkey-cart. The interesting fact is that the road from this bander to outside bander is through a forest and Gujarat Forest Department does not allow them to construct the existing kaccha road to a pacca road. But they gave permission to Adani builders to take some part of forest land[19] for the SEZ purpose.

The observed problems found in the field area are given in the following table:

Table 3: Observed problems in the study area

	Environmental Problem	Economic Problem	Social Problem
Fisher folk	Earlier, during diwali time, there used to be stomach problem in every household of the fishermen in the village and this was cured in the seashore. But in last few years, the same problem has started happening in the sea-shore also.	Quantity of prawns has deteriorated drastically due to OPG plant.	Displacement even without any kind of compensation.
	Mosquitos are visible in the seashore due to polluted water.	Fishes and their eggs deteriorate due to broiler of water cooling system of power plants.	Insecurity of displacement from the bandar as the bandar is inside the area of SEZ.
	Earlier, fishes were available in 1-2 km from seashore, but now fishermen need to go to 15 km from seashore to catch fishes.	With starting of OPG plant, 5-6 tonnes of dead fishes were found in the sea nearby the plant.	
	Nowadays, after coming out of the sea, itching happens. Earlier nothing of this sort would happen as the water was clear.	By blocking creeks, fisher-folk cannot freely use the creeks for fishing purpose.	
	Loss in mangroves and reduced creeks result in deterioration of fish quantity.		
Salt pan makers	Quality of salt may get deteriorated with the air from the industries of the SEZ and the dust layer can cover the salt (This kind of situation has happened with salt production in Gandhidham where there are industries).	Insecurity of displacement from CRZ land (They started making salt in CRZ land once they were denied to get any land in Mundra area).	
		There may be no buyers for lesser quality salt.	
Farmers	Deterioration of quality of land due to water salination caused by loss of mangroves	Loss of agricultural lands including date trees with meagre compensation	
		Deterioration in quality and quantity of date production in recent years	
		Huge loss in sapota production	
Cattle grazers		Loss in grazing land and loss in livelihood	
Others	Water cooling system of power plants creates algae and to treat algae, chlorine is used which is very bad for seawater and marine ecosystem.		Many dargas and temples fall inside the premises of SEZ and remain deserted without visitors as no-one is allowed to enter SEZ area excluding the fishermen.

[19] 2240 hectare forest land was given to SEZ developers but Gujarat Forest Department did not give permission to make a road or bring water pipeline for fishermen in Randh Bandar. From a World Bank Project (Coastal Zone Management Planning- CZMP), the fishermen got Rs 10 lakh. But it is lying in vain as the Forest Department is not giving permission to make a proper road for them and to bring water pipeline (Manjali Ibrahim Salem Mohammed, personal communication, December 9, 2012).

VI. Concluding Remarks:

It is evident that the fisher folk, farmers, salt pan makers and cattle grazers are affected due to the MPSEZL. But fisher folk are most affected as the SEZ has affected fish catch and they need to go very far to catch fishes. Also they do not get any compensation as Government has no records of their stay in the banders. The loss in mangroves also reduced fish and prawn cultivation and fisher folk are facing severe problems due to the SEZ. The date and sapota cultivation have been also affected. The salt pan makers are not getting land in the Mundra region due to the SEZ.

This study aims to find out whether the SEZs built in the coastal areas can affect the environment. Kutch district of Gujarat is declared as Critically Vulnerable Coastal Area (CVCA). So, the SEZ in this area may bring future vulnerability in nearby areas. The findings of the study can be helpful in formulating appropriate Government measures in ensuring sustainable development.

Reference:

Asher, M., 2007. SEZs: Stirring Up a Storm along the Indian Coast. Info Change Trade and Development, July 2007. Accessed on 13th September 2012. Available on (http://infochangeindia.org/trade-a-development/analysis/sezs-stirring-up-a-storm-along-the-indian-coast.html).

Asher, M., Kohli, K., 2007. Uneasy Quiet on the POSCO Front. India Together: The News in Proportion, 4th October 2007. Accessed on 13th September 2012. Available on (http://www.indiatogether.org/2007/oct/eco-posco.htm).

Asher, M., Oskarsson, P., 2008. Se(i)zing the coast and the countryside. Seminar February 2008. Accessed on 13th September 2012. (Available on http// www.india-seminar.com/2008/582/582_manshi_patrik.htm).

Aswani, Prachi. 2012. Impact on Livelihood due to Industrialisation: Case of Fishery Decline in Mundra, Kutch. (Unpublished M.Tech Dissertation submitted at CEPT University, Gujarat).

Balan, K., Sivaraman, P., George, K. P., Ramchandran, M., 1987. An Appraisal of the Marine Fisheries of Gujarat. CMFRI Special Publication Number 38, Central Marine Fisheries Research Institute, Cochin.

Bhatta, R., 2003. Socio-economic issues in fisheries sector in India. In: Kumar, A., Katiha, P. K., Joshi, P. K. (Eds.), A profile of people, technologies and policies in fisheries sector in India. National Centre for Agricultural Economics and Policy Research, New Delhi.

Centre for Environment and Development, 2009. Integrated Coastal Zone Management Project Environment and Social Assessment. Report submited to Ministry of Environment and forests, Government of India.

Chen, J., 1993. Social Cost- Benefit Analysis of China's Shenzhen Special Economic Zone. Development Policy Review 11, 261-271.

Department of Ocean Development, Government of India (2002). Geographical Information System for Gulf of Kachchh. Integrated Coastal and Marine Area Management, Chennai.

Directorate of Economics and Statistics, Government of Gujarat. 2012. Socio-Economic Review Gujarat State, 2011-12, Budget Publication No. 34, Gandhinagar.

Fishmarc & Kutch Nav Nirman Abhiyan (FKNA). 2010. Kutch Coast –People, Environment & Livelihoods, Study jointly conducted by Fishmarc & Kutch Nav Nirman Abhiyan with support from FES (Foundation for Ecological Security).

Industries Commissionerate, Government of Gujarat 2010. Industries in Gujarat Statistical Information 2010. Gandhinagar.

Industries Commissionerate, Government of Gujarat 2012. Special Economic Zones in Gujarat. Accessed on 28th December 2012. (Available on http://www.vibrantgujarat.com/images/pdf/special-economic-zones.pdf).

Lam, Kin- Che., 1986. Environment and Development in Chinese Special Economic Zones: The Case of Shenzhen. The Science of the Total Environment 55, 147-156.

Machimar Adhikar Sangharsh Sangathan (MASS) Kutch 2012. Map of Banders of traditional fishermen in Mundra Coast. Accessed on 30th December 2012. (Available on http://masskutch.blogspot.in/2009_05_01_archive.html)

Mundra Special Economic Zone Limited (MPSEZL). 2007. 9th Annual Report 2007-08, Adani group.

Patel, Bharat. 2012. Analysis of traditional fishing system and the changes in it over the last few decades in the district of Kutch and Study of changes in the ecological and environmental status, its reasons and its impacts in the coastal areas of Kutch, (unpublished Ph.D. thesis submitted to Centre for Studies in Rural Management, Gujarat Vidyapith).

Rawat, V. B., Bhushan, M. B., Surepally, S., 2011. The Impact of Special Economic Zones in India: A Caste Study of Polepally SEZ. Paper presented at the International Conference on Global Land Grabbing, Land Deals Politics Initiative (LDPI).

SETU Information Centre, Bhadreshwar, Mundra.

Shu, L., Zeng, F., Fang, H., Xu, Z., 2012. An Empirical Test of the Environmental Kuznets Curve in Guangdong Province, China. APCBEE Procedia 1, 204 – 209.

Special Economic Zones in India 2009. Special Economic Zones in India. Accessed on 15th September 2012. (Available on http://www.sezindia.nic.in/index.asp).

Verma, N. M. P., Kumar, V., 2010. Environment of Land Diversion, Displacement and Rehabilitation: A Study of Indian SEZs, Paper Presented at Annual IASSI Conference held at 19-20 March, Madras School of Economics, Chennai. Accessed on 19th January 2013. (Available on http://www.mse.ac.in/Frontier/w23%20Verma.pdf).