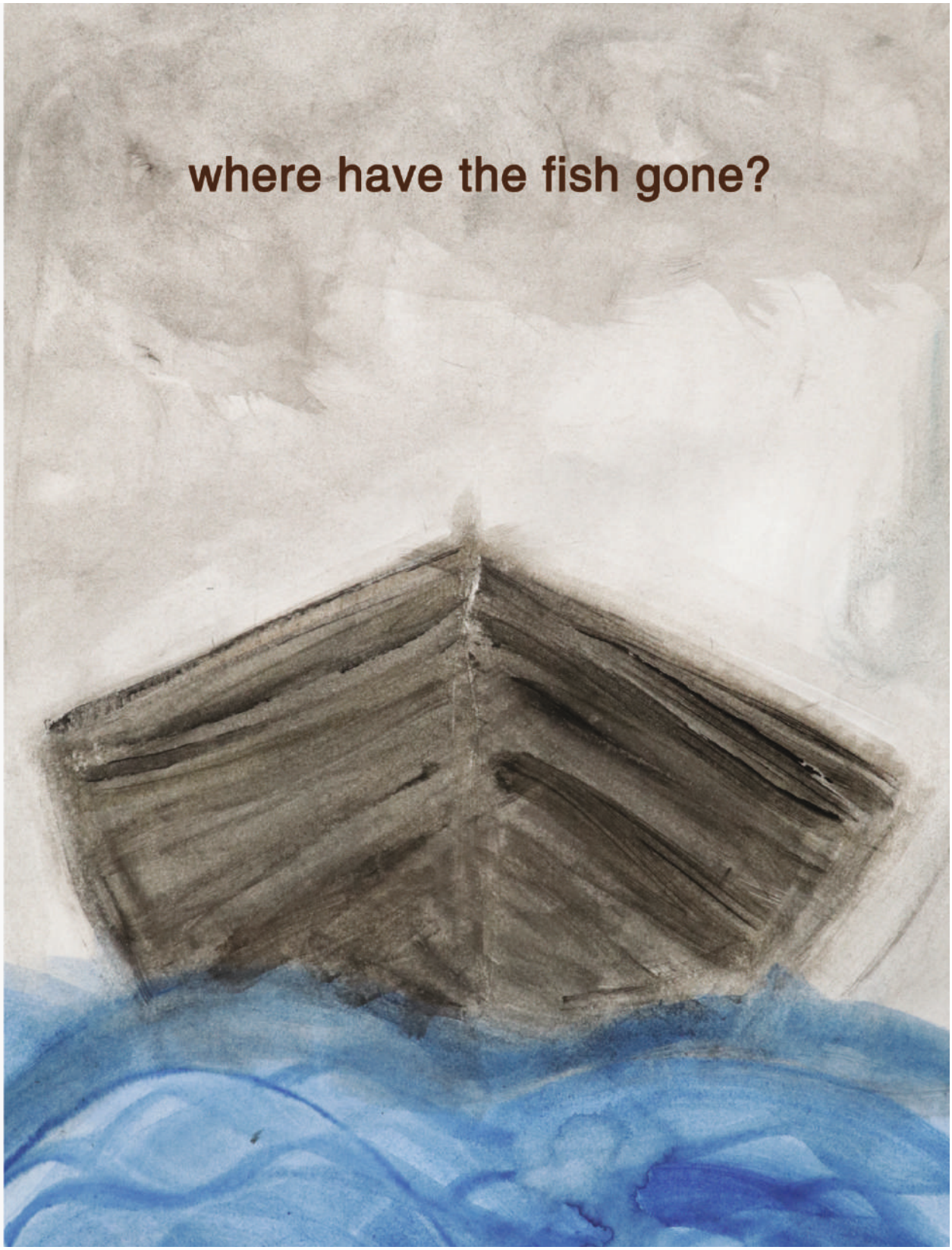

where have the fish gone?

# Where have the fish gone?

The impact of industrial development on fishworkers in Gujarat

The Research Collective

November 2017

Cover & Design: The Media Collective
Layout: AUS Enterprises
Printer: JSA Enterprises, 9873294668

Programme for Social Action (PSA)
1st Floor, G-46, Green Park (Main), New Delhi - 110016, India
Contact: + 91-11-26561557 | +91-11-26561556
Email: trc@psa-india.net

# FOREWORD

## Gujarat: Fish Disappeared, Fishworkers arrested, Coast destroyed… Now what?

“Why do our Indian fishermen go to the Pakistani sea to catch fish…?” (implying… and then get arrested") This question was asked by the then Prime Minister Dr. Manmohan Singh. The occasion was a meeting with representatives of National Fishworkers Forum (NFF) in 2013, on the issues surrounding the arrest and custodial death of Indian fishermen in Pakistani jails (and vice versa).
NFF, Pakistan India People's Forum for Peace & Democracy (PIPFPD), Delhi Forum, etc. are among those organisations that have worked on the issue, Dr. Singh raised, for many years. The rationale behind this question about 'greedy fishermen' was evident. After all, we, as organisations trying to secure the release of fishworkers from Indian and Pakistani jails, have been subjected to this rather bureaucratic prejudice for decades now. To avoid an unpleasant encounter with the Prime Minister of the country, the delegation explained to the best of its ability the nature of issues involving international water borders – the depletion of fish in the Indian sea, the very fact that India and Pakistan became independent territories only in the last eight decades—while fishing has been done by traditional fishworkers from both sides for centuries, how it is important for India and Pakistan to sign a Maritime Economic Co-operation Agreement, the 'no-arrest' policy, so on and so forth.

In hindsight, the question by Dr. Singh and many others, who were probably genuinely unaware of why is it that Indian fishworkers were 'greedy' enough to go to Pakistani territorial waters for fishing and risk their lives, led The Research Collective to this study. We realise this is a double trap. If we say that the Indian fishworkers cross the territorial waters while fishing, it is an admission of guilt. On the other hand, if we argue that it is because of the fact that there is no fish in Gujarat's sea, it is again taken as an admission of guilt, since it is the same 'greedy' fishworkers who have already overfished in Indian waters—and are now fishing in Pakistan's waters.

This study, made over a period of close to two years, started with such questions. This effort was a follow-up from our earlier publication '*Fishing in Troubled Waters*' (2013), which was more of a compilation of articles, studies and opinion pieces. The current study is also meant to take us beyond the bureaucratic mindset as well as the ignorance and neglect of the political class about fishworkers.

Initial explorations led us to some of the letters sent by the Shree Porbandar Macchimar Boat Association (to the Central Government and State Fisheries department), demanding immediate and stringent action against pollution in the Gujarat Sea (especially Saurashtra region). The Late Shri. Premjibhai Kokhari, the erstwhile leader of the fishing community of Gujarat, was the champion of the campaign against pollution and coastal industrialisation. He argued, in no uncertain terms, to end the unwanted entry of all sorts of industrial, chemical and electricity generating clusters into the coastal zone of Gujarat—that were causing coastal and marine pollution. He warned that if the situation was allowed to continue, it would lead to uncontrolled depletion of fish in the Gujarat Sea and impoverishment of the fishing community. This was way back in 1987! We wish the government had heeded the warnings from the community!

In the early part of 2000s, the traditional fishers of Kutch (Mundra region) started vehemently opposing some of the mega projects that were coming to their coast, in the form of the Adani SEZ & Port, the Tata Ultra Mega Power Plant, the OPG Power Plant, the Adani Mega Thermal Power plant, among a host of other projects dawning on them. The Machhimar Adhikar Sangharsh Sangathan (MASS, Mundra) continues to fight the disastrous impacts these projects have had on the coastline and marine ecology of Guajrat—despite the fact that these projects are a reality today with the consequent fish depletion in Kutch, the last region left to be exposed to the exploitative development model, is near complete.

The study analyses the kind of 'development' that has taken place in Gujarat, with a focus on coastal and marine ecology and the devastating impacts of pollution on its coast. It helps the reader understand the demography and topography of the region, its historical importance and unearths the different facets underlying the 'Gujarat Asmita' (the Proud Gujarat—a campaign by the state government).

It also raises critical questions to the community, about the current model of industrial expansion having influenced decision-making within the communities involved in fishing, about the need to take forward the mantle of Col. Pratap Salve, of the resistance against the Nargol Port in Valsad, Premjibhai, etc. in fighting for the traditional natural resources, historically bestowed upon the community. It raises the pitch for community planning and management of natural resources, over corporate profit mongering. We hope the study will help in upholding traditional rights over resources and challenge the unchallenged industrial and development model, which has left the coast and the sea devastated.

The original idea was to commission this study to community-based activists in Gujarat and join hands to develop the concept and study together. However, the fact that many of those who could contribute to such a work, while being based in the ground and fighting several community and environment linked battles, are badly caught up in day-to-day basis led to TRC assigning this work to a researcher based outside of Gujarat. It was wonderful to see Ishita putting in so much effort to go beyond the obvious and the visible and bring out several aspects, through many visits, interactions, interviews, secondary research and group discussions. We are grateful to friends like MSH Sheikh, Usmangani Sherasiya, Bharat Patel, Mujahid Nafees, Jeevanbhai Jungi and several others from the community for investingh so much of their time, energy and intellect, to this endeavor.

We thank friends like Jatin Desai, who anchors the initiatives on the release of fishworkers from Indian and Pakistani jails – both in his personal and official capacities. We would also like to thank PSA's partner, the Heinrich Boell Foundation (HBF), who has resource supported much of this study and publication and has been a consistent aid for the past several years. We are also grateful to the many silent friends, who have withstood the test of times and travelled with us in unearthing truth and fighting for justice, human rights, dignity, peace and equality.

TRC aims to follow up on this work, especially on aspects of militarisation, migration, etc. and the impacts of climate change. We hope this study opens our eyes and ears to the other side of 'Vikas' (Development) and that we are humbled enough to accept our mistakes from the past and make amends, before it is too late!

Vijayan MJ
General Secretary, PSA
1 November 2017

Aashima Subberwal
Coordinator, TRC-PSA

# CONTRIBUTORS

This work combines the efforts of many people. Rather than seeing research as geared towards an end product, we hope to bring attention to its collaborative and evolving nature. Each piece of written work builds on multiple other efforts made in the process of unearthing information. Putting together this study was also only possible because of a common belief that information must be freely shared. People who have contributed to building this study are:

All the members of the fishing community who shared their stories

Official documents and documents found under the Right to Information were shared by MHS Sheikh, Usman Gani Sherasiya, Roshni Patel and Bharat Patel from Gujarat, along with insights and guidance. The framework of the study arose in conversation with them.

Lakshmi Premkumar, Siddharth Chakravarty who contributed hugely to the structure and content. Vijayan MJ by ideating and pushing the study forward.

Jatin Desai, Ibrahim, Jeevan Jungi, Mujahid and Azima from Gujarat who offered support, insight and coordinated fieldwork.

Aradhna Wal by editing and refining, Bhamati Sivapalan by designing maps and Annirudh Rajan by providing support in analysing numbers.

Anupam Chakravarty and members of the TRC who pitched in at different times by sharing information and feedback.

We hope to further build on this work in both form and content.

Ishita,
Primary Writer

# CONTENTS PAGE

# INTRODUCTION

This report concerns itself with the fishworker community of Gujarat and their future in a state that prides itself with being on a fast track to progress, imagining an economic growth at par with the East Asian economies. Gujarat's developmental model has, on the one hand been determined by its coastal nature; its ports and import-export industries have meant industrial development aimed at international markets. On the other, it is divorced from the coast, in how traditional livelihoods based on coastal resources and environmental concerns have been neglected and natural resources exploited.

In popular imagination, as well as scientific classifications Gujarat is defined as a predominantly arid and semi arid region, indicating a lack of bio-diversity and 'environment'. However such an overall cataloguing hides the varied nature of the State's ecological diversity, ranging from grasslands, forests, wetlands, saline deserts and coastal systems, supporting a range of flora and fauna. Anthropogenic pressures as a result of coastal industrialisation are being increasingly felt on these ecological systems, in turn impacting economic activities and livelihoods that rely upon them. The transformation of the commons such as land, water, minerals and other natural resources into private property has also led to a complete neglect of both communities dependent on natural resources and ecological systems such as soil, agriculture, livestock, fisheries, hydrology and biodiversity.

Our interaction and solidarity with fish worker unions in Gujarat was the impetus behind this report, which pushed us to investigate the relationship between industrialisation and changes in fishworker lives and livelihoods through the lens of traditional fishing communities in Gujarat. While much of the literature on sustainability of fisheries and marine resources addresses the adverse impact of industrial fishing on marine resources, the question of how coastal industrialisation has impacted fishing communities and fishing patterns have not been addressed adequately. This question becomes pertinent for the entire coastline as increasing coastal resources and infrastructure are being leveraged for industrial and economic growth. With a new phase of 'mega-modernisation' plans such as the Sagarmala in the country, this study attempts to offers some preliminary insights into what the future of the Indian coast could be by drawing upon the impacts in Gujarat as a pre-emptive indicator.

Fishing communities have traditionally been defined by their forms of economics – of traditional / artisanal on one hand and mechanised on the other. During the course of this research it became apparent that fishworkers do not exist in a binary of both constituencies at two ends of the spectrum, but are separated by degrees. Fishing communities are also not homogenous, but they're composed of place-specific practices that have evolved over time and are continuously adapting and responding to changes in the world outside of them and – 'today, fishing practices are in addition shaped by trends of the domestic and international market, politics and policies, technology, climate change and ecological degradation[1]. In Gujarat, fishworkers operating traditional, motorised and mechanised boats have been equally disadvantaged by the current industrial model of the state and have not received adequate support or reinforcement in strengthening their livelihoods.

[1] Savita Vijaykumar, Occupation of the Coast, TRC (2017)

pagadiya, the traditional form of fishing in many parts of Gujarat has almost entirely been wiped out. A small number of pagadiya fishing is still carried out by the local Kutchi populations and Adivasi and Dalit fishers in south Gujarat, mainly for subsistence or for selling to the local markets to supplement incomes.

It became evident during the course of the research work that fishworkers are caught between an increasingly industrialised coastline, rapidly depleting marine resources and artificial national boundaries and demarcations in the seas. All three are deeply interconnected and are squeezing the traditional fishing community - leading to their dispossession and disenfranchisement.

Both fishing communities and activists in Gujarat have been relentlessly fighting a state that does not care for due process or democratic rights. Their grit and determination is responsible for much of the information and for the cases in which redress has been sought or justice achieved.

## Structure of the report

The report is divided into two main sections; Chapter One provides a geographical and industrial overview of the State of Gujarat. Chapter Two investigates the impact of coastal industrialisation on traditional fishing communities through interviews and case studies conducted during the course of the research, substantiated by additional secondary research.

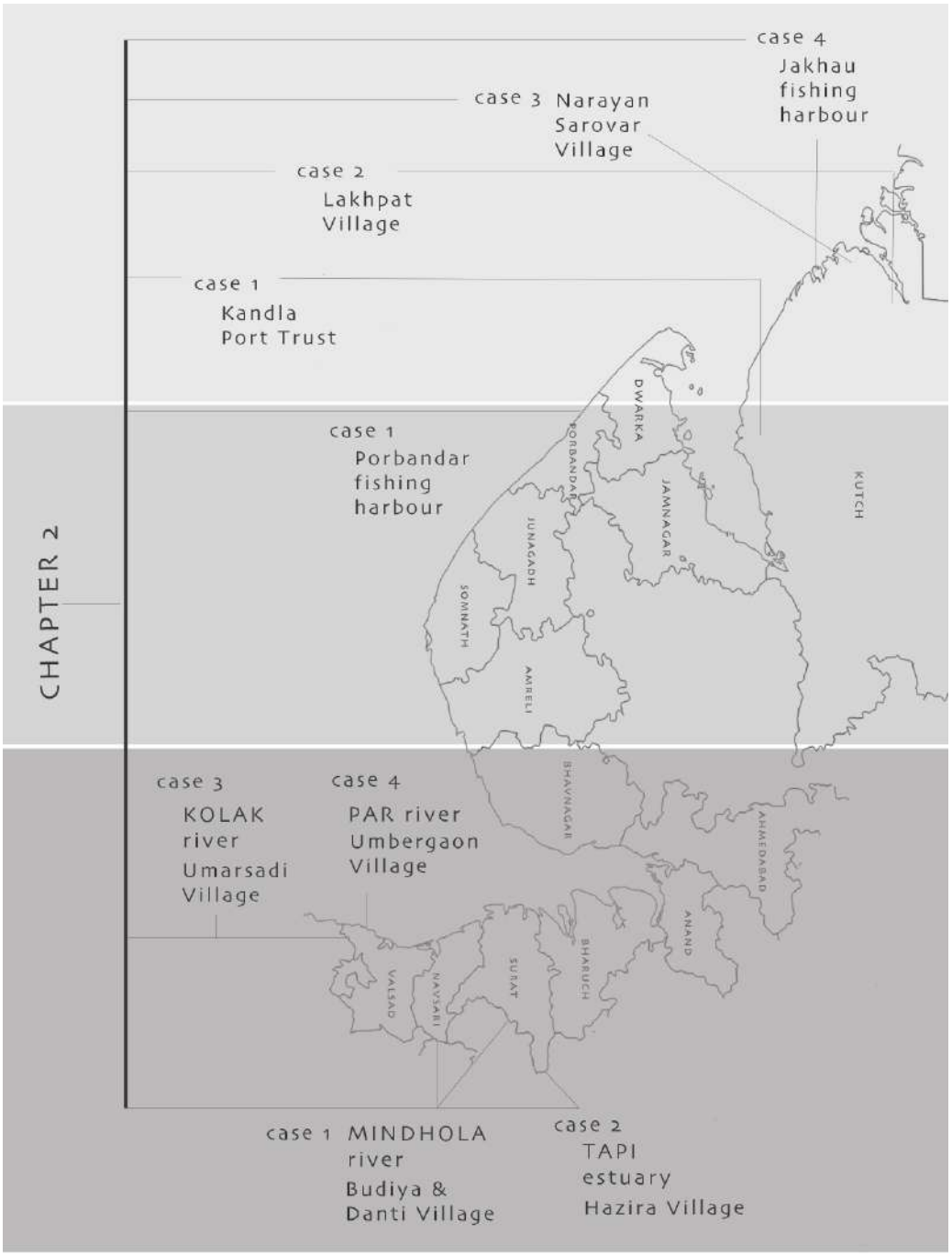
**Chapter 1:**

Describes the physical geography of the Gujarat state, divided into three key coastal zones, from South to North: Gulf of Khambat, the Saurashtra coast and the Gulf of Kutch. It provides an overview of the fishing patterns, fishing community and the fisheries conflict, followed by the legal governance system of the coastal zone in brief.

The next section looks at the industrial profile of the coastal zone through an overview of the different industries built on the coast. It also, briefly, outlines the preliminary environmental impacts to establish the consequences for the fishing communities and coastal ecology.

**Chapter 2:**

This chapter follows the same intra-state coastal zonation – the Gulf of Khambat, the Saurashtra coast and the Gulf of Kutch. Drawing upon secondary research on the industrialisation of Gujarat to substantiate issues recounted by fishworkers, it outlines regional and localised impacts that years of industrialisation have had on the fishing communities. It also broadly spells out some of the key issues that fisher communities are facing and their articulation of the same. These include five case studies from Valsad, Navsari and Surat Districts in the Gulf of Khambat, one case study from Porbandar District in the Saurashtra Coast and four from the Kutch District in the Gulf of Kutch.


CHAPTER 2
case 4
Jakhau
fishing
harbour
case 3 Narayan
Sarovar
Village
case 2
Lakhpat
Village
case 1
Kandla
Port Trust
case 1
Porbandar
fishing
harbour
case 3
KOLAK
river
Umarsadi
Village
case 4
PAR river
Umbergaon
Village
case 1 MINDHOLA
river
Budiya &
Danti Village
case 2
TAPI
estuary
Hazira Village
DWARKA
PORBANDAR
JUNAGADH
JAMNAGAR
KUTCH
SOMNATH
AMRELI
BHAVNAGAR
AHMEDABAD
ANAND
BHARUCH
SURAT
NAVSARI
VALSAD

## Methodology

The study was conducted over a span of one year[2] and utilises fieldwork, primary data and secondary data collection. Much of this material has been unearthed through multiple efforts by activists in Gujarat who have been kind enough to freely share the information.

### Primary Data

Data from the following Government bodies: Gujarat State Socio- Economic Review, Gujarat State Industries Survey, Gujarat State Socio - Economic Review, Gujarat State Industries Survey, Central Pollution Control Board (CPCB) (Regional Office, Vadodara), Gujarat Coastal Zone Management Authority (GCZMA), Gujarat Pollution Control Board (GPCB), Gandhinagar, Gujarat Industrial Development Corporation, Industrial Extension Bureau (INDEXTb), Vibrant Gujarat, Gujarat Infrastructure Development Board, Gujarat Industrial Investment Corporation Ltd., Gujarat State Financial Corporation Ltd.

Information from RTI's filed by activists in Gujarat, 2011 Census Data, the 1986, 2005 and 2010 Marine Census Data, Impact Assessment Reports (IAR), Environmental Clearance Reports (ECR), Industry surveys and documents, Court petitions and appeals filed by community representatives and civil society organizations in Gujarat, legal documentation on current cases.

Academic articles, material produced by the movements- internal documents and communication, news material- magazine and newspaper articles, social media and blogs.

### Field Work

Locations for the interviews were selected based on secondary research and access in consultation with activists and individuals working on environmental and fish workers issues in Gujarat. While most interviews were one-on-one, three group discussions took place, as mentioned below. Interviews with the following fishworkers form the basis of the case studies and information presented.

### Interview Schedule

### Gulf of Khambat

- Chaman Bhai Patel, Budhiya Village, Surat District
- Deepak Patel, Danti Village, Navsari
- Group discussion with representatives of the Sagar Khedut Boat Association, Umbergaon, Nargol Village, Valsad District
- Group Discussion with Jeetu Bhai Tandel, Umarsari Village, Valsad District

[2] Preliminary research and ideation for the study began in 2015 between a group of people associated with various different collectives, unions and organisations in Gujarat and Delhi.

**Saurashtra Coast**

- Jeevan Jungi, President of the Boat Owner's Association, Porbandar
- Discussions at the women's fish market in Porbandar
- Jadhav bhai, Trader, Porbandar
- Group discussion with Bhaskar Panjari (Pilana Boat Association President) and fishworkers - Girish Shanti Lal, Kishore Bhai Kotiya and Dinesh Bhai Kotiya, Porbandar fishing harbour
- Arjun Damu Vadu, Boat overseer from Valsad in Porbandar

**Gulf of Kutch**

- Yusuf Adam Parit, Kandla Port & Gani Daud Parit, Kandla Port, Kandla Port, Kutch District
- (Names withheld for security), Lakhpat Village, Lakhpat Taluka, Kutch District
- Hassan and Juma bhai, Narayan Sarovar, Lakhpat Taluka
- Jakkho Port, Abdasa Taluka, Kutch District
- Narsi Bhai Lalu, President, Tandal Valsad Group Association,
- Kanji Bhai Bhagwan Bhai Barega, Supplier/Agent, Gir Somnath, Kotara Bandar, Kodinar and Dhanji Bhai Barega, Kotara Group Pramukh (Boat associations in Jakhau Port)
- Hingaraj, Boat Labour from Valsad in Jakhau Port
- Kamlesh, Boat Labour, Diu in Jakhau Port
- Jakhau Port Small Boat Owners Association, Jakhau Port
- Small Boat Owner Jakhau Port
- Abdullasha H. Pirjada, Jakhau Port Boat Owner's Association President

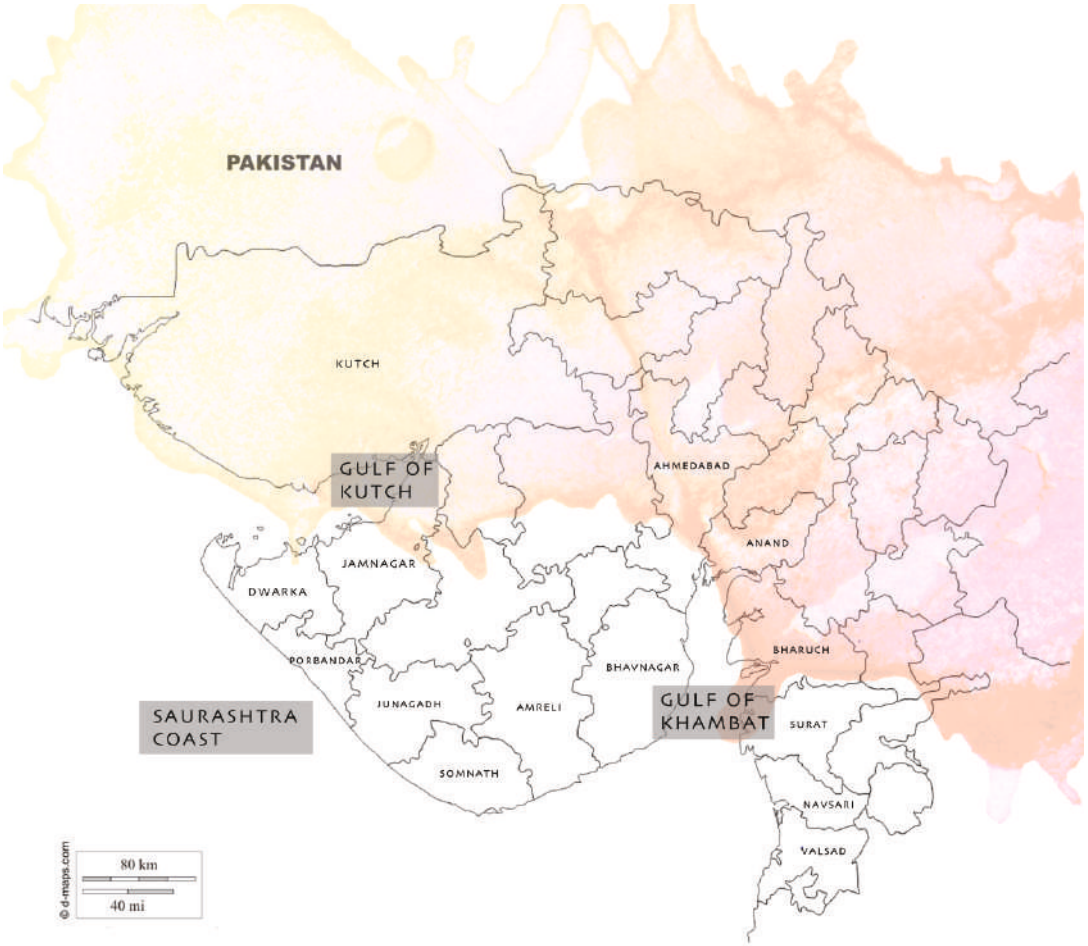
## Limitations

- An overabundance and paucity of have information simultaneously have defined the contours of this report. While accurate information on the history and practices of fishworkers, labour, employment and social welfare indicators is entirely absent, facts, figures and statistics from an industry perspective have flooded all forms of information – from newspaper reports to industry assessments, government documents etc. This manages to obfuscate, rather than clarify the current situation of fishwork and industry in Gujarat. As an activist in Gujarat mentioned, the only way to actually verify any official industry figure is to go and check the status on the ground. This was outside the capacity of the current research and we hope that others can contribute further to this effort.

- Similarly, data on industrial pollution is not publicly available in a standarised format. Gaps in monitoring of water, land and air pollution are apparent. The information here been pieced together from different independent and government sources and is not authoritative.

- Interviews have largely been conducted with fishermen who go out to sea. Conversations with women fish workers could not take place at all locations of interviews because of various constraints and as we ealized during the course of the study, this would required an entirely different approach. Women form an intrinsic, but neglected part of the fishworking community. This is a sizeable gap in the study, one we hope to bridge in different forms in the future.
- In Jakhau port, pagadiya fishworkers who are from Kutch could not be interviewed because of lack of access and translation.
- Interviews, while following the same format, had to be adapted to specific contexts (place-operation) and also to the person – who was being interviewed. Considering that fisheworkers are constantly at work, the situations in which the interviews were conducted differed.
- The scope of the study became expansive as more and more information came our way. While we have done our best to consider different sources of information and maintain accuracy, kindly forgive us our mistakes.

We conceptualise this report as one that is in making and hope to refine and take forward the existing work.




# CHAPTER 1:
# OVERVIEW OF THE COAST

# Geography

Table 1: Overview

| | |
|---|---|
| Number of coastal districts | 14 |
| No of coastal talukas | 37 |
| No of coastal villages | 550 |
| Population of coastal villages | 1 million approximately |
| Marine fisheries production | 7.22 lakh tonnes (2015) |
| Aquaculture production | 9393 metric tonnes |
| Length of coastline | 1600 km |
| Area of mangroves | 938 $km^2$ |
| Area of natural coastal wetlands | 2,7073.5 $km^2$ |
| No of Protected Forest Areas | 11 |
| No of protected areas (relating to marine ecology) | 9 |
| Area of protected areas (relating to marine ecology) | 7,476.8 $km^2$ |

*Source: Compiled from different sources by TRC*

Gujarat can be divided into four geographical regions, the Gulf of Kutch, Gulf of Khambat, the Saurashtra Coast and the South Gujarat Coast. Of the 33 districts in Gujarat, 14 are coastal. There are, in all 37 coastal talukas in the coastal districts of Gujarat. An approximate population of one million, people residing in over 550 villages depends on the coast[3]. The districts of Valsad, Navsari, Surat, Bharuch, Vadodara, Amreli, Anand and Ahmadabad are situated across the Gulf of Khambat, in the South, with Bhavnagar separating the Gulf from the coast of Saurashtra. As we move northwards, the districts of Porbandar, Junagadh and Gir Somnath face the Arabian Sea, with Dwarka Devbhoomi situated at the tip of the funnel that forms the Gulf of Kutch. Westward, towards the mouth of the Gulf, are the districts of Jamnagar and Morvi, adjacent to the Rann of Kutch before the wide expanse of Kutch, the largest district in Gujarat, bordering Pakistan, begins.

Because the study is based on the coast, we have used a geographical classification of districts to best represent this relationship. Here, the Gulf of Khambat, the Gulf of Kutch and the Saurashtra coast, that directly faces the Arabian Sea, become distinct regions. In such a classification, the following districts and talukas have been represented in the respective regions as follows:

[3] State of Environment Report on Coastal Monitoring and Marine Environment, Gujarat State, Gujarat Ecology Commission, Govt. of Gujarat (2012)

Table 2: Districts & Taluka as per study classifications

| S. No. | District | Taluka |
|---|---|---|
| **Gulf of Khambat** | | |
| 1 | Valsad | Valsad, Pardi, Umbergaon |
| 2 | Navsari | Gandevi and Jalalpur |
| 3 | Surat | Olpad, Chorasi |
| 4 | Bharuch | Hansot, Jambusar, Vagra |
| 5 | Anand | Borsad, Khambat |
| 6 | Ahmadabad | Dhandhulka |
| 7 | Bhavnagar | Mahuva, Talaja, Bhavnagar, Gogha |
| 8 | Amreli | Jafrabad, Rajula |
| **Saurashtra Coast** | | |
| 9 | Gir Somnath | Sutrapada, Kodinar, Una, Veraval |
| 10 | Junagadh | Mangrol, Malia, Junagadh |
| 11 | Porbandar | Porbandar |
| 12 | Dwarka-Devbhoomi | Kalyanpur and Okkhamandal |
| **Gulf of Kutch** | | |
| 13 | Jamnagar | Jodiya and Jamnagar |
| 14 | Kutch | Abdasa, Anjar, Bachau, Gandhidham, Lakhpat, Mandvi, Mundra |
| Total | 14 | 37 |

*Source: Compiled from different sources by TRC*

Gujarat contains the longest coastline in the country at 1,600 Kilometres (km) and an extensive continental shelf of 164,000 square kilometres (sq.km)[4]. This forms nearly 20 percent of India's coastline and 32 percent of its continental shelf. The Exclusive Economic Zone (EEZ)[5] for the utilisation of marine resources is 200 Nautical Miles (NM) or 370.4 km from the coast. For Gujarat, this translates into an EEZ of 214,000 sq.km. Gujarat also shares both a landward and seaward border with Pakistan; the Rann of Kutch Kutch district borders Pakistan, while the International Marine Boundary Line (IMBL) demarcates territorial waters. Both these become important determinants in the lives of fishworkers, whose livelihood patterns bring them into contact with national boundaries, their regulation and political contestations.

[4] Square kilometer (sq.km) has been used for geographical formations, whereas industries are in Hectare (ha).

[5] An Exclusive Economic Zone (EEZ) is a concept adopted at the Third United Nations Conference on the Law of the Sea (1982), whereby a coastal State assumes jurisdiction over the exploration and exploitation of marine resources in its adjacent section of the continental shelf, taken to be a band extending 200 miles from the shore.

# Community

## *Fisheries on the Gujarat Coast: A Brief Overview*

Traditional fishworkers can be defined as those who are fishworkers by birth and for whom fishing is their ancestral occupation. The system of fishing is further defined by factors of scale, cost, labour, region of fishing, technologies used and access to markets. Typically, small scale, low cost, labour intensive fishing with the use of indigenous or local technologies that occurs near-shore regions and sells to local markets, is broadly defined as traditional fishing.

Fishing is not just an occupation, but also the fulcrum around which a community's identity, culture, daily life and sustenance revolve. Taking ancestral occupation as a key consideration, the communities of Kharwas, Kolis, Mugaina, Macchi, Mangela, Halpathi in South Gujarat and Saurashtra and Machiyaras in Kutch are, historically fish-workers. Fishing communities are not homogeneous but composed of different castes and classes, with varying access to technologies of fishing. But they are bound together by community history and, in the State of Gujarat, the lack of any legal framework for claiming resources or rights. For the purpose of this study, the fishworkers include those from traditional fishing communities, who might be using different means and technologies of fishing, whether traditional or mechanised boats, but have, historically, been disadvantaged because of official neglect and the discriminatory attitude towards fishing in mainstream Gujarat, reflected in the State bureaucracy.

This section of the report attempts to establish some of the macro-level changes that interviews and case studies in Gujarat pointed to. It seeks too understand how far local trends point to a structural shift in the demography and fisheries pattern of Gujarat.

**Population & demography**

According to the 2010 Marine Fisheries Census[6], conducted by the Central Marine Fisheries Institution (CMFRI), 62,231 fishing families live in 247 villages across the coast of Gujarat. The total population of fishworking people in Gujarat was 3,36,181 persons in 2010 (see Table 1 in Annexure 1). Of these, 1,75,427 were male and 1,60,754 female. Of the fishworkers covered in the Census, 96 percent were traditionally part of the fish working community. Of these, 25 percent of fishworkers lived below the poverty line, while only 44 percent had been able to access any form of education. These numbers are probably underestimated. A majority of the families identified as Hindu, with Junagadh (1,390), Jamnagar (8,306) and Kutch (3,068) having the largest number of Muslim fishworker families. While this Census indicates that there were only 82,901, (24.65 percent) active fishworkers in 2010 (see Table 2 in Annexure 1), a report by the Commissioner of Fisheries[7] stated that, in 2007, there were 2.18 lakh active fishermen in Gujarat. These included full-time, part-time and occasional fishworkers. Women dominated the allied activities industry, particularly marketing (88 percent) and peeling (87 percent).

A comparison between a appraisal of fisheries by CMFRI in 1980[8] and the 2005 and the 2010

[6] Marine Fisheries Census 2010

[7] Census 2007, Commissioner of Fisheries, Gandhinagar, Gujarat

Marine Fisheries Census indicates that South Gujarat has seen a decrease in full-time fishworkers, particularly in Valsad, Surat, Navsari and Junagadh in Saurashtra[9]. (See Table 3 and 4 in Annexure 1).

The Census indicates a decrease in full-time fishworkers and a marginal increase in part-time fishworkers. A significant drop, from 75,082 to 51,794 fishworkers (including both male and female), took place in fishworkers engaged in allied activities from 2005 to 2010, specifically in men going out to sea. However, the number of women increased from 2005 to 2010 (see Table 5 in Annexure 1). Similarly, a comparison between the 2005 and the 2010 census shows that the number of fishing villages reduced from 263 to 247 and the number of fish landing centres decreased from 123 to 121. A larger decrease has taken place from the '80s onwards, when, according to the 1980 census, there were 173 fish landing centres in Gujarat. District wise, the most substantial decrease in fishing villages, between 2005 and 2010, has been in Junagadh (59), followed by Bhavnagar (2) and Amreli (2) all of which fall in Saurashtra (see Table 6 in Annexure 1). While it is premature to conjecture as to why this drop, one reason could be the displacement of fishworkers due to decreasing catch.

Table 3: Fishing villages in Junagadh, Bhavnagar and Amreli

| Fishing village | Junagadh | Bhavnagar | Amreli |
|---|---|---|---|
| 1980 | 22 | 4 | 8 |
| 2005 | 72 | 10 | 8 |
| 2010 | 27 | 8 | 6 |

Along with fish landing centres, there are five existing fish harbours in the State, located at Dholai (Bhavnagar), Porbandar, Veraval, Mangrol (Saurashtra) and Jakhau (Kutch). Five new harbours have been proposed in Umargaon (Valsad), Bhadeli Jhagalala (Valsad), Jafrabad (Amreli), Navabandar (Junagadh District) and Okha (Dwarka-Devbhoomi District).
The table below shows the drop in the number of fishworkers, fishing villages as well as fish landing centres between 2005-2010. The next Census might shed better light on whether this trend is continuing.

Table 4: Population, full-time fishworkers, fishing villages and fish landing centers

| Year | Fishworkers population | Full-time Fish workers | Fishing villages | Fish landing centre |
|---|---|---|---|---|
| 1980 | 1,52,015 | 25,616 | NA | 173 |
| 2005 | 3,23,215 | 68,956 | 263 | 123 |
| 2010 | 3,36,181 | 65,002 | 247 | 121 |

[8] Marine Fisheries Census 2005
[9] Kheda was counted in the marine census in 1980 but was not taken into consideration in the 2005 and the 2010 census.

**Shift in patterns of fishing**

The fishing community operates different kinds of boats with varied equipment in Gujarat, making it a more complicated categorisation than simply traditional and non-traditional fishing or small-scale and mechanised fisheries. The abovementioned apparisal report by CMFRI[10], as well as interviews conducted during the study, indicated a clear decline in pagadiya fishing across the coast. Surprisingly, no official figures are available for pagadiya fishing. CMFRI reported 4120 non-motorised boats in the 1980s. These have seen a large decrease, with the Commissioner of Fisheries reporting only 56 non-motorised wooden boats in 2007-2008.

Two forms of traditional fishing are historically found in Gujarat:

Pagadiya: fishing by foot where nets are strung between two poles planted within the intertidal zone (usually 2-3 km into the sea in Gujarat). These nets are often many kilometres long and catch fish when the high tide recedes.

Traditional boat fishing: Fishing crafts deployed for marine fishing in Gujarat were traditionally flat bottom canoes. Staked bag-net, surface driftgill-net, bottom-set/ anchored gill-net, doll-net, anchored bag-net and stake-net were the most common net combinations used by traditional fishers in Gujarat.

Inhe '80s and '90s, the boundaries between traditional and motorised fishing blurred. Along with pagadiya, most fishers started using wooden or fibre boats of lengths up to 7m, with an outboard or inboard engine powered by petrol. Motorised boats were found across South Gujarat and Kutch, with different net combinations depending on the catch available. But there are degrees of difference across the crafts and the gear used not adequately represented by official categorisation of 'traditional', 'motorised' and 'mechanised' boats.

Motorised and mechanised fishing were the most common techniques observed. The key difference between trawlers and motorised boatswas the use of mechanised or manual nets, along with boat size, quantity of nets used, days spent at sea, etc. As far as technology is concerned, motorised boats use doll-nets and gill-nets of different mesh size, depending on the season and the fish available. In passive fishing - nets are dragged by the current and pulled up by hand.Mechanised fishing takes place through fishing boats 20m in length, with a mechanised trawl nets. Trawl fishing is, in essence, dredging the sea floor.

Mechanised boats and trawlers dominate the fishing scenario in Gujarat currently. In 2015-2016, as per the CMFRI[11], 57.67 percent of the mechanised crafts in the country operate on the west coast, namely in the states of Maharashtra, Gujarat and the Union Territory of Daman and Diu[12]. To the total catch of 7.22 lakh tonnes in 2015 in Gujarat, mechanised boats

[10] Annual Report, CMFRI, 2015-2016
[11] Union Territorry of Daman and Diu which falls within the territory of the State of Gujarat has not been considered as its and data collections systems are separate.
[12] CMFRI Annual Report 2015-2016

contributed 88.6 percent and motorised boats contributed 11.3 percent. Similarly, 90 percent of the catch in Daman and Diu is from the mechanised sector. Showing a similar trend, Maharashtra, adjacent to Gujarat, had a total of 2.65 lakh tonnes of landing, with 98.5 percent caught by the mechanised sector. This gains importance because of trawlers from Maharashtra fishing in Gujarat as well.

Discrepancies are present in the exact number and type of fishing vessels currently operating in Gujarat and the following table presents figures from different sources for different years[13].

Table 5: Distribution of fishing crafts 2014 to 2015

| Traditional Crafts | Motorised crafts | Mechanised crafts | Total | Source |
|---|---|---|---|---|
| 1884 | 8238 | 18278 | 28400 | Ministry of Agriculture, 2014 |
| 102 | 10620 | 14330 | 25052 | CMFRI, 2015 |

Table 6: Type of craft

| Craft Type | | Description |
|---|---|---|
| Motorised Boats | Inboard Motored | The motor of the boat is fixed inside the hull of the boat, with or without shelter. The propeller is positioned to the rear underwater of the hull through a relatively short shaft. Transmission is direct and rudder control is directly using a bar at the aft of the boat. |
| | Outboard Motored | The motor of the boat is removable and is fixed at the hind portion of the hull and propeller is attached to the engine proper with or without a shaft. Transmission is direct and rudder control is by tilting and turning the engine on its pivotal base. |
| Mechanised Boat | | The motor of the boat is fixed inside the hull of the boat, with shelter, and propeller is positioned to the rear underwater of the hull through a relatively longer shaft. Transmission is through gearbox, which allows use of power for winch operation. Rudder control is indirect using a steering wheel in the wheelhouse of the boat. |

[13] Daman and Diu has a total of 1252 fishing crafts with 298 traditional, 161 motorised and 793 mechanised crafts (IOMENVIS).

What these figures do not represent is the pattern of ownership of fishing vessels, which could lead to an accurate assessment of whether the expansion in fisheries has specifically benefited the traditional fishing community. Till the end of the 1960s, traditional fisheries accounted for the bulk of fish catch from Gujarat. By 1963, with increasing state investment in marine fisheries, the potential of modern fisheries as an investment sector opened up for a class of emerging capitalists and entrepreneurs from within and some from outside the fishing community. This led to the displacement of small-scale traditional fishworkers, particularly those from economically weaker sections or Dalit and Adivasi communities. Access to ownership of fishing vessels and new fishing techniques were mediated through state intervention, i.e. subsidies and schemes, that forced through increasing mechanisation, with no thought for equitable distribution of wealth or for future sustainability.

**Fish catch**

The rapid motorisation of traditional boats and the extension of mechanised fishing was synonymous with the extension of fishing grounds, as boats could now travel further offshore. The Saurashtra region, because of its natural access to plentiful catch, was where mechanisation initially took place. Veraval was the first landing centre where mechanised boats were introduced. Till date, Veraval and Mangrol in Gir Somnath district, Porbandar in Porbandar district and Jaffrabad in Amreli district of Saurashtra remain the major fish landing centers for trawlers, followed by Valsad district. While district wise distribution of fish catch over the years was not available, figures from 2011-2012 show that districts in the Gulf of Kutch accounted for 20.23 percent and Saurashtra coast 53.49 percent of fish catch. Out of the 26.28 percent of catch from districts in South Gujarat around the Gulf of Khambat, 12.56 percent was from Valsad[14] (see Table 8 in Annexure 1).

Marine fisheries constitute a majority of fish catch in Gujarat. The expansion of the fisheries sector has led to increasing catch and profit from export of marine resources.

Table 7: Analysis of periodic growth from marine catch and export

| Period | PTC | RoG | PTVC | RoG | PMC | RoG | PMVC | RoG | PEC | RoG | PECV | RoG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1960s** | 79,412 | NA | 1.76 | NA | 79,412 | NA | 1.76 | NA | Data Unavailable | | | |
| **1970 to 1975** | 156,190 | 97% | 7.81 | 344% | 149,107 | 88% | 7.47 | 324% | | | | |
| **1975-1980** | 220,995 | 41% | 37.11 | 375% | 208,300 | 40% | 34.98 | 368% | | | | |
| **1980 to 1985** | 236,203 | 7% | 67.52 % | 82% | 218,872 | 5% | 62.57 | 79% | | | | |
| **1985 to 1990** | 383,431 | 62% | 238,24 | 253% | 359,304 | 64% | 223.30 | 257% | | | | |
| **1990 to 1995** | 635,302 | 66% | 689.80 | 190% | 580,936 | 62% | 629.62 | 182% | 48,813 | NA | 218 | NA |
| **1995 to 2000** | 705,934 | 11% | 1196.96 | 74% | 636,677 | 10% | 1,078.48 | 71% | 95,075 | 95% | 471 | 116% |
| **2000 to 2005** | 686,145 | -3% | 1,547.20 | 29% | 641,806 | 1% | 1,447.47 | 34% | 123,744 | 30% | 664 | 41% |
| **2005 to 2010** | 756,890 | 10% | 2,872.28 | 86% | 678,559 | 6% | 2,573.63 | 78% | 164,794 | 33% | 1,333 | 101% |
| **2010 to 2015** | 791,107 | 5% | 2,658.52 | -7% | 414,422 | -39% | 4,429.83 | 72% | 226,912 | 38% | 2,985 | 124% |

*Legend:Table 7: Legend: P-Periodic Average, TC-Total Catch, MC-Marine Catch, E C-Exported Catch, V-Value, RoG-Periodic Growth;*

*Source: Compiled from CMFRI, Ministry of Agriculture, and Commissioner of Fisheries, Gujarat State*

[14] Study of Saurashtra Coastal Corridor of Gujarat, Price WaterhouseCoopers, Commissioned by the Gujarat Industrial Development Board (2006)

The data shows that post 1995 the rate of growth of both marine and total catch decelerates substantially, from nearly 70 percent growth in the previous decade, to an average of a bit more than 5 percent. Export growth in sheer volume has been averaging around 54 percent in the same period. This indicates that more of the total catch is being diverted to foreign markets as evidenced by the exported portion of total fish catch expanding by nearly 300 percent between 1990 and 2015. Also, rate of growth of sale values from total, marine as well as export catch far exceeds that of the respective volumes, indicating that muted expansion of fishing activity has not impeded the turnover made. This is in line with global trends where fisheries peaked in the '90s and have plateaued since.

The Annual Report by CMFRI indicatesthat “trawlers target Sciaenids (croakers), Ribbonfish, Lobsters, Shrimps, etc., and contribute bulk of the total catch, while Gillnetters target Pomfret, Seerfish, Tuna and Sharks, and Dol-netters, Bombay Duck and large Sciaenids'. Our interviews in Suarashtra contextualised how the beginning of seafood export in the late '80s and '90s changed the composition of fish caught by the fishworkers. Interviews and secondary material both suggest that fish catch has reduced in value in the last decade because of declining fish catch and quality of catch. The composition of catch in Gujarat, as well as other parts of the west coast, has also changed drastically. More than 75 percent of the catch in Gujarat today consists of low value miscellaneous fish, whereas larger high value fish are disappearing[15] except for ocassional windfall catches where high value fish is caught once in a while. As per the CMFRI annual report, 2015 saw a 1.4 percent decline in fish catch, with the maximum contribution (in counted fish catch, excluding by-catch) being of Non- Penaeid (small) prawns (14.7 percent), Ribbonfish (12.3 percent) and Bombay Duck (10.91percent), all of which are low value fish. This indicated that the numbers, be it in fish catch or revenue, have remained consistent only because targeted catch has changed. Increasingly, low value fish are being used to manufacture feed for poultry, aquaculture and other non-human consumption, through local traders.

The above data could be explained by two conjectures; literature suggests that the disappearance of large fish species implies a trophic cascade, or the tendency of fishing down the marine food web, as has been observed the world over. Fishing down is the process whereby, having depleted predatory fish at the top of the food chain or trophic index, fishing progressively targets smaller and previously ignored species, also bypassing the need to address the disappearance of fish species. Along with the gradual fishing down that has occurred over the years, research indicates that the expansion of fisheries during the 1980s and 1990s caused a spatial expansion from fishing near coastal waters to further afield (offshore). This expansion might have reached its natural limits as waters within the continental shelf have been fully exploited[16].

Much of this corresponds with information collected through interviews with fishworkers during this study. The three key issues, or changes in the pattern of fisheries, that all interviews indicated were:

---

[15] Catch consists of low value fish such as non-Penaeid Shrimps, small Croakers, clupeids, carangids, cephalopods, Bombay Duck, Ribbonfish, Searfish, Threadfin Bream, Lizard Fish and Flat Fishes. While groups like Lobsters, White Fish, Seals and large Penaeid Shrimps Pomfrets, Threadfins, Sharks, Clupeids like Hilsa, the large Croakers, large Perches and Mullets are disappearing.

[16] Bathal, Pauly et. al, Reconstruction of India's Marine Fish Catch, from 1950-2010, University of British Columbia, Working Paper (2015)

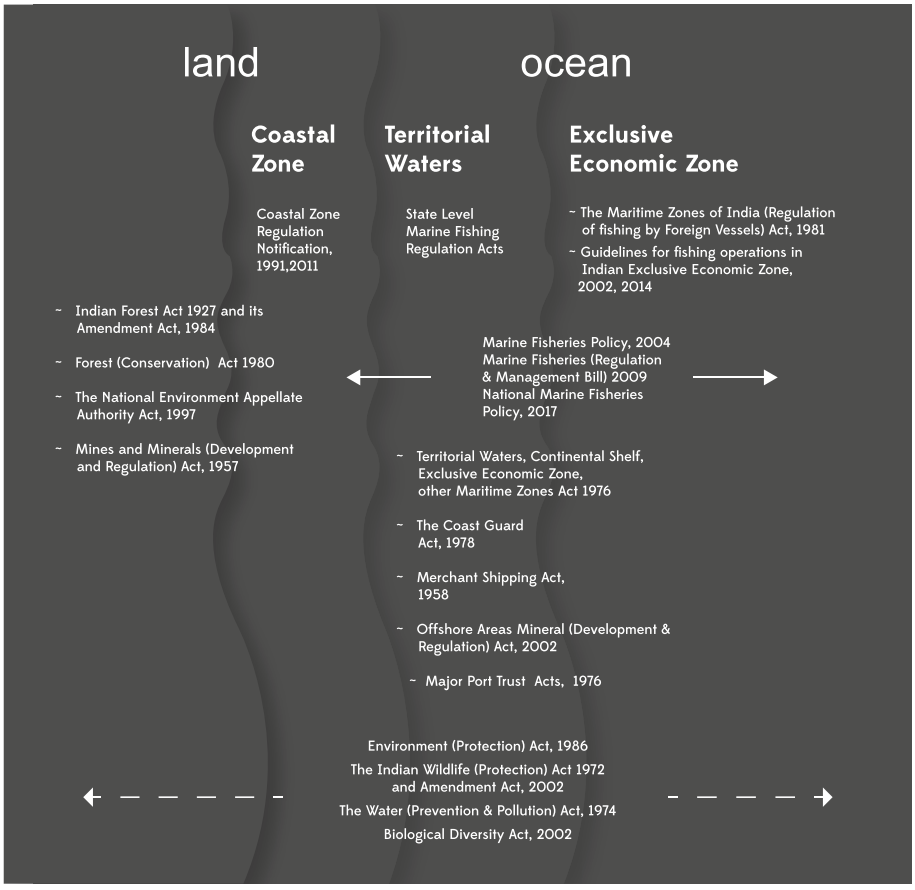
- Large fish species, such as sharks, dolphins, sardines, Hilsa, Ghol (croakers), King Mackeral, Asian Sea Bass, that used to be abundant near the coast and in estuaries during breeding season, have disappeared over the last 10-20 years.
- A spatial expansion of fishing grounds has taken place. Because fish have disappeared within 5 NM of the coast, fishworkers are now travelling from 10 to 60 or 70 NM to find catch. The number of days taken to find catch has increased.
- Marine catch is primarily directed towards export and this has corresponded with the expansion in marine fisheries.

What became apparent during this research was the inadequacy of information regarding the fishing communities, their use of multiple crafts and nets and its relationship to marine catch, in official data collection mechanism. While the above data points to broad trends, it does not represent the entire scope and character of fishing practices. Rather, it narrows the scope of actual fishing practices by only taking into account the type of vessel and the estimated fish landings. But it does indicate a clear change in composition and unsustainability of fish catch, which has not yet reflected in the State's rhetoric of expanding fisheries and plans for the future. It also does not shed light on what this implies for questions of food sovereignty for coastal districts and fishing communities.

# Legality

*The legal framework of fisheries and coastal governance in Gujarat*

The first fisheries related act in India was passed under the British rule in 1897, titled The Indian Fisheries Act No. IV of 1897. The then State of Saurashtra (Saurashtra was a separate kingdom while the rest of the current Gujarat State came under the Bombay Estate), adopted a similar Act in 1897, with The Maharashtra Fisheries Act being adopted only in the 1960s. The Act was a framework for region or statewise laws and specified jurisdiction. It prohibited particular kinds of destructive fishing (like dynamiting) and imposed penalties for offences.




After Independence, in 1947, according to the Constitution of India, Article 246, Entry 57 of List 1 of the Seventh Schedule of the Constitution, legislations regarding coastal regulation and fisheries came under the ambit of both the Central and the State governments.

Much of the legislative framework for governing marine regions after Independence came from international law. The primary legislation that defines the parameters of marine or ocean governance began with the defining of the territorial waters through the Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones, Act 1976. The Act demarcates the territorial waters as extending upto 12 NM, the contiguous zone upto 24 Nautical Miles (nm) from where territorial waters end and the Exclusive Economic Zone (EEZ) of India at 200 nm, in accordance with the United Nations Convention on the Laws of the Sea (Law of the Sea Treaty), 1982. All activities conducted within the EEZ, including fishing, fall under Indian jurisdiction. The 1976 Act specifies that territorial waters fall within the regulatory authority of the respective State Governments, while waters beyond 12 nm are the under the Union Government.

While the mechanisation of boats and purse seiners were introduced in the Indian Oceans by the 1960s, no clear regulations existed in the initial years regarding who could engaged in fishing and what kind of fishing was permissible. By the 1970s, there was a growing demand from the traditional fishworker community to ensure protection of their livelihood. By the 1970s the fishworkers' movement had gained ground in the country. Unions from Maharashtra, Malwan and Kerala initiated the creation of National Fishermen's Union in 1978 (later changed to National Fishworkers Forum [NFF]) that led the political movement for the rights of traditional fishworkers. Along with a fisheries act, a call was raised for a legislation that regulated the coastal and marine zone (demands for coastal regulation later resulted in the Coastal Regulation Zone Notification in 1991). The 1970s also saw a rising conflict in some states between mechanised and traditional fishing boats, resulting in violence on the seas and on the coast. The Government reacted in an attempt to diffuse the increasing political momentum and constituted a working committee in 1976, by the Central Board of Fisheries, to delimit the areas of fishing for different kinds of boats. Consequently, the committee circulated a model Marine Fisheries Regulation Bill to all states in 1979. The Bill empowered state governments to make rules for regulating fishing in coastal or territorial waters. It prohibited particularly destructive methods of fishing and catching of juvenile fish, and specified the regulation of mesh size and gear and, significantly, gave guidelines for the demarcation of zones of fishing for mechanised and traditional crafts.

The State of Gujarat, in its present form, came into being in the 1960s and officially adopted the Indian Fisheries Act only in 2003 titled the Gujarat Fisheries Act, 2003. The Act reserved area up to 9 km, or 5 NM, for fishing by non-mechanised vessels, and beyond that for mechanised vessels. It also restricted the size of trawl-nets and gill-net to 40mm and 150 mm, respectively. Considering the pattern of marine catch and the decline that had already taken place, this measure was, possibly, undertaken too late. In 2011, a seasonal ban on fishing was promulgated to ensure conservation and fisheries management. Across the west coast, including Gujarat, trawl fishing is banned from 15th June to 31st July, every year. Traditional community organisations, like the NFF, have demanded a longer trawl ban period of 90 days. Pagadiya (stake-based shore fishing) continues during the ban season and a number of traditional and small-scale fishworkersengage in the same for self-consumption.

A complex matrix of laws constitutes regulation in coastal regions. Aside from marine and fisheries related legislations, environmental laws and legislations applicable within

the coastal zone, defined as the interface between land and water, are key for the protection of the marine world, its ecosystem and sustainability. These includes the Coastal Regulation Zone, 2011, and its subsequent notifications, as well as other laws and acts focused on environmental, wetland and forest conservation and wildlife protection.

The Coastal Regulation Zone (CRZ) Notification, originally notified in 1991, requires special mention. It was the first regulation that, in principle, aimed at protecting the coastal regions and communities, through affirmative claiming of/ positive discrimination of the right of the fishworker communities over coastal land[17].

The CRZ sets a framework for regulating all development, infrastructure and tourism activity in coastal regions, for the protection of both marine ecology, and, as later added in the preamble of the notification, provides protection to the livelihoods of fishworkers and coastal communities. The notification makes a distinction between onshore and offshore activities, namely those directly related to the waterfront or that need foreshore facilities. But over the years, there has been a constant attempt to dilute provisions of protection, and multiple amendments to the CRZ provide exemptions for industries and tourism related activities on the coast.

The 1991 CRZ meant a strict set of guidelines, without exemptions, except those applicable to community interests and rights. However, the CRZ is, now, the most amended notification in Indian history. The central government, decided to put up the law for a review in 2008, under the MS Swaminathan Committee. The Swaminathan Committee brought out a complete revision of the CRZ mechanism and suggested a Coastal Management Zone approach. It recommended the formation of the Coastal Management Authorities at the district, state and national levels (similar to the position the World Bank has taken on the issue). However, the non-consultative approach of the Committee, clubbed with its unscientific method and acceptance of the World Bank position on the issue, in totality, irked the community. The NFF led protest demonstrations and agitations against the Swaminathan Committee recommendations to kill the CRZ and replace it with CMZ. The UPA Government decided to scrap the recommendations, hold consultations with the NFF, and draft an amended version of CRZ itself, which was notified later in January, 2011. While the CRZ, 2011, is still a diluted version of the 1991 original, it managed to divert the government agenda of 'management' and keep the framework of 'regulation' of the coastal zone. However, the World Bank project for coastal management continued in various ways, including through the Bank funded Society for Integrated Coastal Management (SICOM, an NGO placed inside the Ministry of Environment, Forests and Climate Change). Coastal management authorities were created for the three case study states of Gujarat, West Bengal and Odisha. The coastal management plans hence become another means, to impose a framework that was rejected by the Government, under pressure from the people.

The Act is of particular relevance for states such as Gujarat that have extensive development in coastal districts. A report by the NFF, in 1998, states that the Department of Agriculture, on behalf of the Department of Forest and Environment, prepared the Gujarat Coastal Zone Management Plan (GCZM). The methodology for fixing the High Tide Line (HTL) was not explained and extensive tidal mudflats were omitted from the GCZM. Additionally, the government fixed differing slabs of 500m, 350m and 150m for areas around creeks, though the Notification demands demarcation of at least 500m (100 m width from creek) from the HTL. Ports, irrespective of whether they are in municipal areas or not, have been categorized as CRZ-II. The CZMP does not integrate the state government's port policy with the jetty requirement of different industries within

[17] Read Occupation of the Coast, TRC for a history of the CRZ legislation (2017)

harbour or port premises[18]. Whereas South Gujarat has seen an already high degree of industrialization on the coast, Kutch till 2001 was relatively not industrialised. However, particularly since 2005, a major industrialisation drive has taken place in Kutch and violations of the CRZM have already been recorded and reported. Power plants, particularly, such as Akri Moti Power Plant in Lakhpat taluka in Kutch, the OPG and TATA thermal power plant in Mundra. The entire stretch of 60km that houses the SEZ and the port of the Adani Group, violate the principles of the CRZM. Over 25,000 MW coal-based power plants are further being proposed in Kutch's Mundra coast[19].

The following table outlines existing laws across different sectors. A complex interaction of the same defines the legal regime of the coast, while the CRZ acts as the principal means of regulating the usage of coastal lands.

Table 8: Regulations in the Coastal Zone

| | |
|---|---|
| **Marine governance**<br>Central<br>Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones, Act 1976<br>Marine Fisheries policy 2004/ The Marine Fisheries (Regulation and Management) Bill, 2009, The New Marine Fisheries Policy 2016<br>New Deep Sea Fishing Policy, 1991 and the Murari Committee Report 1995<br>Guidelines for Operation of Indian Deep Sea Fishing Vessels in the Indian EEZ<br>The Coast Guard Act 1978<br>Merchant Shipping Act, 1958 | **Fisheries**<br>Central<br>The Indian Fisheries Act No. IV of 1982/1987<br><br>State<br>Gujarat Fisheries Act 2003<br>Village Pond Fisheries Policy, 2003<br>Reservoir Leasing Policy, 2004<br>Brackish Water Land Lease Policy 2007 |
| **Environmental Protection**<br>The Environment (protection) Act, 1986<br>Biological Diversity Act, 2002<br>Indian Forest Act 1927 and amendment in 1984<br>The Indian Wildlife Protection Act 1972 and amendment in 2002<br>The Forest Conservation Act 1980<br>The National Environmental Appellate Authority Act 1997<br>The Water (Prevention and Control of Pollution) Act, 1974<br>Mines and Minerals (Development and Regulation) Act, 1997, amended in 2014 | **Industry and Land Utilization**<br>Coastal Regulation Zone, 2011<br>The Land Acquisition Rehabilitation and Resettlement Act 2014 (?)<br>Offshore Areas Minerals (Development and Regulation) Act 2002<br>Indian Ports Act, 1908<br>Major Ports Trust Act, 1963 |

*Source: Compiled by the TRC*

[18] Nandakumar and Muralikrishnan, Mapping the Extent of Coastal Regulation Violations of the Indian Coasts, NFF (1998) and CRZ Report Card, Namati

[19] Letter to the Minister of Forests and Environment, dated 15th February 2010 by Bharat Patel of the Machimar Adhikar Sangharsh Sangathan, Mundra taluka, Kutch

# Industry

*The 'Entrepreneurial' State of Gujarat*

**The place of industry**

The antecedents of the current 'Gujarat model of development' can be located in the 1960's when the State of Gujarat was carved out of the Bombay Estate. Its first steps were to replicate the growth pattern existing in Bombay (now Mumbai) that consisted of a number of Gujarati business families[20]. In tune with the planned economy model followed by newly independent India, the State acted as a key player in facilitating business through organised planning.

Gujarat, in comparison to the rest of the country has had a burgeoning manufacturing sector. The manufacturing industry formed the mainstay of the Gujarati economy; textile brass and diamond, all historically strong industries in Gujarat and manufacturing of machine parts formed some of the first industries. Pre-empting the wave of liberalisation that was to hit India after 1991, the state in the 1980's started encouraging private participation in the manufacturing sector with a focus on medium and large-scale industries[21]. State support was extended to manufacturing of non-metallic minerals, chemicals and chemical products. Many of the mechanisms to promote industry listed below, now used by different states, were first implemented in Gujarat. Industries had high export targets, highlighting the importance of proximity to the coast. The manufacturing sector, the mainstay of the Gujarati economy grew at 3.04 percent per annum in sixties, 5.55 percent per annum in the seventies and 8.11 percent in the '80s whereas post 1991, a gradual slow down occurred[22].

Mechanisms for facilitating private industry

- Gas and electricity subsidy
- Water subsidies
- Easing regulation for agricultural land conversion
- Build Own Operate Transfer (BOOT) and Build Operate & Transfer (BOT) Policies
- Tax exemptions for particular industries
- Creation of clusters with Infrastructure by the State Abolition of urban land ceiling

The next shift occurred in the '90s, with the Gujarat Industrial Policy of 1995 that laid out key shifts in policy, with the intention to compete not just domestically, but with newly emerging

[20] Ghanshyam Shah, Politics of Development: A Study of Gujarat, Studies in Indian Politics, Lokniti, CSDS Sage Journals (2013)

[21] Dinesh N. Awasthi, Recent Changes in Gujarat Industries: Issues and Evidence, EPW, Vol 35, (2000)

[22] Mahadevia and Hirway, Impact of Structural Adjustment Programme on Land and Water Resources of Gujarat, Published by the National Institute of Agricultural Economics and Policy Research (N.d)

regions of Southeast and East Asia. The focus also shifted from small and medium enterprises to facilitating large private industries with investments of above 100 Crores (cr), as well as investment in infrastructure to facilitate industry. One could conjecture that the new mega projects of the 2000s are a way of enhancing growth, which stagnated during the last decade.

High industrial growth was accompanied by a consequent decline in agriculture. Ravindra Dholaki, a noted economist from Gujarat argues that the decline in agriculture "indicated significant structural changes in Gujarat's economy over the short period of 18 years"[23]. Parallel to this was a trend towards casualisation of labour, with high growth industries, namely manufacturing, with low wage rates –indicating a higher incidence of poverty[24]. This becomes important to understand the structural shift that has been taking place in the political economy of Gujarat, which indicates reduction in the livelihood opportunities available to the working class in Gujarat. It also indicates opportunities available to fishworkers, as traditional fisheries decline. Fishworkers in south Gujarat have already transitioned to being daily wage labourers in surrounding industries in the last 10-15 years.

**Location of industry I** The main locations of the manufacturing industry in Gujarat have been the coastal belt from Vapi to Ahmadabad in south Gujarat, followed by the Saurashtra region. While in the 1960's, Ahmadabad and its countryside formed the main industrial region, a gradual expansion occurred towards Vadodara and Surat by the 1980s. Awasthi notes that in 2000, 10 talukas of south Gujarat accounted for 58 percent concentration of investment in small scale, 80.42 percent in medium scale and 76.53 percent in large-scale industries[25]. If the 1960's to 1990's saw south Gujarat as the focus of industry and investment, late '80s-90's saw a shift towards Saurashtra. The earthquake of 2001, in Kutch, marked the beginning of industrialisation in the district. With the Kutch reconstruction programe after 2001 – coastal regions around the Gulf of Kutch began receiving the largest share of investments across the State. As has been observed by writers, industrialisation has historically been accompanied by rapid urbanisation, primarily in the coastal belt, resulting in imbalanced regional growth and also the environmental degradation of exploited areas. The following section extrapolates on the current industrial scenario in coastal Gujarat. But due discrepancy between projected figures and implemented projects, any estimation can only be speculative.

**Industrial scenario in Gujarat**

Gujarat stands at the third position in terms of volume of investments into the country, after Odisha and Chhattisgarh, whereas it receives the highest amount of investment in domestic infrastructure. The percentage of projects implemented in the state is 15.43, which, even at less that 1/4th is the highest in the country[26]. An analysis of investment patterns show that since 1983 investments have moved from chemicals and petrochemicals and textiles to infrastructure, with 38 percent of investments currently being in the infrastructure sector. Currently, 56 percent of investment is in Saurashtra and Kutch. Santosh Kumar Das writes that the distribution of investment in 2012 was as follows: Kutch (32.26 percent), Jamnagar (13.94 percent), Bharuch (13.53 percent) and Surat (10.74) and Ahmadabad (9.28 percent).

[23] Ravindra H Dholakia, Liberalisation in Gujarat, Review of Recent Experiences, EPW, 2000
[24] Hein Streekman, Thirty Years of Industry Labour in Gujarat: Trends and Significance, EPW (June 2001)
[25] Awasthi, 2000)
[26] Sood (2012)

Within this Jamnagar, Vadodara and Surat account for a majority of manufacturing activity (64 percent of fixed capital in 2005-2006). The Kutch region is expected to attract Rs. 40, 000 crore worth investment in the next two to three years[27]. Key industries are to be cement, coal and gas. Considering the propensity of the Gujarat government to throw figures, without much of it materialising, whether this will actually happen remains to be seen. But with the new Kutch Industry Promotion Cell and Vibrant Kutch Summit, the push to follow a developmental model similar to south Gujarat has already started. Activists and reports from parts from Kutch (such as the Anjar-Mundra area) note that with industrialisation and the building of highways for transport, land prices have also increased. This seems to point to a shift in the occupational structure of the region, with decline in agriculture, animal husbandry and an increase in industries and real estate.

Industrialisation on the Gujarat coast includes ports, Gujarat Industrial Development Corporation (GIDC) estates, including manufacture of chemical and chemical products, textiles, fertilisers and pharmaceuticals and thermal power, oil & gas exploration and extraction, cement and salt-pan industry and ship-breaking & recycling. Much of this is actualised through cluster-based development such as Special Economic Zones (SEZ), Industrial Parks and Special Investment Regions (SIR). The following table represents the spread of industry across the coast, followed by sector wise details. Key areas of focus for this report because of their impacts on the coast are ports, industrial estates, thermal power generation, Oil & Gas extraction, Mining and Salt Industry.

## Ports

**Environment and Livelihood Impacts**

Whereas port based infrastructure is pitched for expansion, such as under the Government's Sagarmala Policy[28], the environmental and livelihood impacts of ports have not been studied widely. Environment concerns include the destruction of marine ecosystems by construction on the coastline and dredging. This also causes erosion and accretion of the coast. Moreover, even with safeguards in place, pollution caused by cleaning of oil tankers and ships harms near-shore marine life, while shipping channels also disturb the marine ecosystem. Moreover, multiple oil spills have taken place in Gujarat, with no assessment of damage or proper cleanup.

Along with environmental impacts, port projects also displace and disrupt the access to the coast of small-scale fishworkers. Most traditional communities live either in temporary structures (landing center and homes) called bandars on the intertidal zone or in villages near the coastline as was mentioned in the above section. Ports, not only acquire homestead land and community commons, but also disrupt access to the coast where fishing takes place or where boats are moored. Moreover, port projects change the political economy of the region, without providing any kind of protective mechanisms to local communities, also creating an influx of migrant labour to the region. These impacts are expanded upon in the subsequent case studies of the Hazira Industrial Region and the Kandla Port in the latter sections.

[27] Kutch to attract Rs 40,000 crore worth investments in next three years, Business Standard (2015)
[28] Occupation of the Coast, TRC (2017)

As the Gujarat Maritime Board (GMB) website states, the pattern of investment in Gujarat centres on potential port sites. From Hazira, to Pipavav, large business house see investments as a way of importing industrial raw material and gaining access to international market through sea routes.

The tagline of the Vibrant Gujarat Summit 2017 is 'Gujarat- Well Connected State' — indicating the number of ports with 1 Major and 41 Minor ports (other sources show 48 minor ports) in all in Gujarat. In the Constitution of India, ports come under the concurrent list and fall in the jurisdiction of both Centre and State. Ports under the aegis of the central government are known as Major ports and those under the State Government are called Minor ports. There are 12 major ports currently functioning, under the central government across the country. The Kandla Port, in Kutch is the only Major port in Gujarat and accounts for the largest share of Major port traffic in the country. In 2016-2017, Kandla handled 16.3 percent of the total port traffic in the country Minor ports come under the aegis of the Gujarat Maritime Development Board (GMB)[29]. A majority of the 42 or 48 minor ports under the GMB are private jetties and ports. As per the GMB's classification, private ports, private jetties, captive (operated by a specific industry for a specific product) jetties come under Minor ports. All GMB ports have multiple infrastructure, captive power generation plants, LNG terminals, private jetties, transmission lines, dockyards and storage containers within its premise (see Table 1 in Annexure 2).

Ports have always been significant for the growth of the Gujarat economy; as mentioned before, the state always had high export targets for manufacturing. It also imports crude oil, which constitutes a major chunk of Indian imports and is essential for its manufacturing industry.

Ports in Gujarat are connected to the Middle East, Africa and Europe. The 1995 Port Policy not only encouraged private investment in ports and promoted incentives for private players, but also imagined the ports as being gateways for an expanded industrial region, which included manufacturing, roads, highways and connectivity to the northern hinterland (Gujarat supplies cargo from Gujarat, Rajasthan, Haryana, Delhi, Punjab and UP). This focus has expanded, with ports playing a large role in the new industrial regions and policies; nine out of the 13 proposed SIR and 29 out of 60 SEZs are port based[30]. Private conglomerations such as Essar, Adani, Larson & Tubro and foreign-based Israel Port Company, Maersk and other European companies are the main actors in port development. Gujarat currently has four functional private ports, in Pipavaav (1996), Amreli District Mundra (1998) in Kutch District, Dahej (2004) in Bharuch District and Hazira (2005) in Surat district. Four of these ports are operated by companies or Special Purpose Vehicles (SPVs)[31] related to the Adani Group and contribute a majority share of port traffic as shown below. New greenfield[32] ports in Junagadh, Valsad, Navsari and Bharuch district are proposed (see Table 2 in Annexure 2). Some of these port projects have run into opposition. For example fishworkers and farmers groups in Valsad and Navsari have stalled the proposed port in in Valsad[33]. The Mundra SEZ continues to face stiff opposition from fishworkers organisations like MASS and environmental advocates[34].

[29] GMDB was the first maritime board to be set up in India in 1982. It acts as an agency for port development, privitisation and specialised cargo handling in Gujarat. The GBM has authority over the non-major ports

[30] State of Environment, 2012 (not much movement has been made on this so far)

[31] Sub implementation body

[32] New ports built in a previously undeveloped site/ land for commercial development – Greenfield sites usually require new land acquisition

As is evident, the GMB is only a nominal regulatory body that oversees the port-based infrastructure, whereas a large share of actual shipping takes place through private ports from Dahej, Hazira and Mundra. Reliance has a monopoly over production and shipping of petroleum with its refinery in Jamnagar. Smaller private players like United Shippers Ltd. also operate general cargo and coal out of Junagadh District. Traffic details of the ports give a clearer picture where traffic for the April to July 2017 was as follows:

Table 9: Traffic from April to July 2017

| **Type of facility** | **Traffic in Million Metric Tonnes (MMT)** |
|---|---|
| Private Ports | 52.28 |
| Captive Ports | 50.2 |
| Private Jetties | 2.1 |
| GMB operated ports | 7.0 |

*Source: GMB Annual Report*

Of the 52.28 MMT traffic handled by the private ports, 52.2 MMT, which is 99.9 percent was handled by ports with relationship to Adani Enterprises[35], namely the MPSEZ, APPP, Dahej, AHPPL and HPPL.

A report on ports across the coast in India notes that that there is a port every 24.3 km in the State of Gujarat, begging the question of whether existing port infrastructure is being fully utilised before plans for newer port projects are made. While Gujarat has seen an increasing utilisation of existing port capacities, in 2015-2016, only 73.6 percent of total capacity was utilised in non-major ports in Gujarat, leaving scope for better utilisation.

Table 10: Current capacity and utilisation of Non-major ports in Gujarat (MMT)

| **Year** | **Capacity** | **Cargo handled** | **Utilisation** |
|---|---|---|---|
| 2012-13 | 366 | 287.82 | 78.6 |
| 13-14 | 387 | 309.94 | 80.1 |
| 14-15 | 422 | 336.09 | 79.6 |
| 15-16 | 466 | 340 | 73.00 |

*Source: Vibrant Gujarat and GMB*

Top commodities handled for the same period (2nd quarter of 2017) were crude oil (30.10 MMT), Coal (20.60 MMT), Petroleum, Oil and Lubricants (POL) (17.10 MMT) and Container (20.93 MMT). For comparison, the division of cargo in the first half of 2017 was as follows. Petrol, crude oil, lubricants and related products account for more than half the cargo handled across the State. As can be seen from the table below, the share of coal in seems to be lagging behind with only 2.90 percent in first quarter of 2017. Moreover, the Minister of Energy, Piyush Goyal has indicated in 2017 that India plans to eliminate coal dependency in a

[33] See details of Public hearing in Valsad - http://environmentclearance.nic.in/writereaddata/Public%20Hearing/200520175KHJRIJR4NargolPortPHDocument.pdf& for more details on MASS, see http://masskutch.blogspot.in

[34] Rodriguez and Sridhar, Harbouring Trouble, Dakshin Foundation (2010)

[35] Figures as per the Gujarat Maritime Board Quarterly Report for 2017

few years[36]. This is particularly pertinent as coal import is a main commodity on which plans for new ports are being made (for example the new port in Valsad).

Table 10: Composition of commodities 2017 (1st Qtr.)

| | |
|---|---|
| Iron ore | 32.50 |
| POL (petroleum, oil and lubricants) | 20.50 |
| Others | 20.50 |
| Container | 20.50 |

In 2015-2016, Gujarat handled 72 percent of total port traffic from India. The total traffic handled by Gujarat ports was 273 MTPA in 2010-2011 and 340 MTP in 2015-2016, where two-thirds the cargo was handled by private and GMB ports. As per the Big 2020 goals established by the Gujarat government, estimated traffic by 2020 will be 919 MTPA. Considering that traffic for both 2014-2015, 2015-2016 and 2016-17 have been in the region of 300 MTPA, such a three-fold jump in just three years, seems to be an overestimation especially in light of global protectionist trends. It is also interesting to note that the growth in traffic is largely because of the MPSEZ Port. One can speculate that the basis for the estimate is dependent on a growth of traffic with the expansion of private ports and the creation of coastal industrial or economic zones that are meant to manufacture goods for export. But the possibility of the same materialising in the next three years is also suspect. Considering that a large number of industrial projects have not gone forward due to problems in acquiring land and a slowdown in investment, the expansion of port related infrastructure remains uncertain. Moreover, some of the concerns pointed out in the case of Gujarat in making ports economically viable over a long period of time have been low draft, (depth) necessitating the need for constant dredging and growing shoreline erosion, as is expanded upon in the following chapters.

**Industrial Estates**

**Environmental and Livelihood Impacts**

Industrial effluent and waste from GIDC estates, private industries and industrial clusters are released into rivers and creeks. The impacts of the same have been particularly felt in South Gujarat because of the decades of industrialisation based on highly polluting small and medium scale industries. The region fondly referred to as a 'toxic sink' has seen destruction of its rivers and creeks, many of which have turned into polluted drains. Agrarian and fishing communities have faced the brunt of the pollution. Reports of contaminated drinking and underground water as well as health problems have existed since the last two decades. Cases of fish kill or die-offs (mass death of fish due to a external factor in marine environment) and disappearance of riverine and marine life are reported regularly. The decreasing population of fishing villages in districts of south Gujarat were established in the first section of the report and interviews/ case studies in the following section further establish the relation between industrial pollution, its impact on marine life and a steadily disappearing fishing community.

[36] India to end coal imports in “next few years”, Climate Home News, 2017

The coastal districts across Khambat, Kutch and Saurashtra account for nearly 60 percent of the Gujarat Industrial Development Corporation (GIDC) estates. As described above, the industrialisation of Gujarat started with South Gujarat. The impact of industry hence is more visible and apparent here. Parallel to the Gulf of Khambat lies the 'golden corridor' of Gujarat, an approximately 200 km stretch from Vapi in Valsad District to Nandesari in Vadodara District that was created as an industrial belt in the 1980s. The coastal talukas surrounding the Gulf of Khambat include 25 GIDC Estates (see Table 3 in Annexure 2) encompassing a total area of 21407.87 ha approximately. Land area falling under GIDC in the Saurashtra coast is 357.42 ha, whereas the newest entrant to the GIDC structure, the Gulf of Kutch has 431.23 ha of Industrial Estates in coastal districts. (See Table 3 in Annexure 2)

The key sectors comprising industrial estates are chemical and chemical based industries, metal and steel fabrication, textile industry, electronics, pharmaceuticals, synthetics, fibre and paper industries. The geographical spread according to commodities manufactured in coastal districts is as follows[37]:

Table 11: Type of Industry and Polluting Category

| District | Industry | Polluting Category |
|---|---|---|
| Gulf of Khambat | | |
| Valsad and Navsari | Chemicals, petrochemicals, pharmaceuticals, textiles and engineering | All industries come in the Red category indicating high pollution load and necessity of consent management |
| Surat, Bharuch, Ahmadabad | Petroleum, petrochemicals and chemicals | |
| Amreli, Bhavnagar | Soda ash, salt (with captive ports) | |
| | Saurashtra coast | |
| Junagadh | Soda ash, salt, engineering ceramics | All industries come in the Red category indicating high pollution load and necessity of consent management |
| Porbandar, Dwarka-Devbhoomi | Petroleum, cement, brass parts, | All industries come in the Red category indicating high pollution load consent management |
| | Gulf of Kutch | |
| Jamnagar | Petroluem | All industries come in the Red category indicating high pollution load consent management |
| Kutch | Soda ash, salt, cement, steel | All Industries come in the Red category indicating high Pollution load consent management |

*Source: Compiled by TRC*

[37] GIDC at a glance, GIDC website

The Gujarat Industrial Development Corporation (GIDC) was constituted under the Gujarat Industrial Development Act 1962 as a statutory body to oversee and coordinate industrialisation in the State of Gujarat. As mentioned in the introductory section, the GIDC model is based on a cluster based premise that emphasises economies of scale and provides a ready-made infrastructure (land, water, drainage, waste disposal, electricity to facilitate industry. GIDC land is notified as non- agricultural lands and does not need additional permissions or land acquisition, including consent or consultation with affected communities. The GIDC estates across the statehave approximately 63,000 units in its estates.

Whereas under the 1962 Act, the GIDC acted directly as the implementing authourity, the push now seems to be towards creation of Special Industrial Regions and Industrial Parks. In the new Industrial Parks Scheme 2002, a PPP model is used, where a private agency is appointed by a Government agency to develop, finance, maintain and operate industrial parks. The minimum size of the Industrial parks is to be 40 ha. Moreover, provisions also exist to convert Industrial Parks into Special Economic Zones, with a status of foreign territory, implying further tax exemptions and reducing the regulatory role of the government. Approximately 26 Industrial Parks have been developed in Gujarat so far with a concentration in Ahmadabad and Surat (as per calculation). These are primarily Industrial, Textile, IT and Pharmaceutical parks. The status of SEZ and SIR are difficult to verify. Most new SIR and SEZ's do not appear to have moved forward.

**Effluent and waste management I** GIDC Estates in Gujarat have been held primarily responsible for pollution in Gujarat, particularly across the Gulf of Khambat. As the table above shows, a majority of industries in GIDC estates are highly polluting. Key forms of pollution broadly include a) pollution of underground water, b) land pollution due to landfill and land dumps and c) noise/air pollution.

The Central Pollution Control Board in 2009 in collaboration with IIT Delhi and other environmental institutes devised a measure to rank and evaluate polluted areas known as the Comprehensive Environmental Pollution Index (CEPI). In 2009, Ankleshwar topped the list of critically polluted areas with Vapi at the second spot. In 2011, Vapi was in the first place with Ankleshwar at the seventh. Six industrial clusters of Gujarat find themselves on the CEPI list. These are Ankleshwar, Vapi, Ahmadabad, Vatva and the Junagadh GIDC- all in coastal districts with critical or severe water and land pollution.

According to CPCB and Ministry of Environment and Forests (MoEF) reports, the overall capacity of CETPs in Gujarat is 727.06 MLD, with a concentration in South Gujarat[38]. As per a report by the Comptroller & Auditor General (CAG) of India[39], Large-scale industries were meant to have individual Effluent Treatment Plants (ETPs), whereas for Small-Scale Industries (SSI), Common Effluent Treatment Plants (CETP) were to be established jointly, facilitated by GOI and state financing. In the CAG report referenced before, 83 industrial clusters were identified in the state with 9000 large scale and 3.13 lakh small-scale industries. In comparison, according to the Central Pollution Control Board, there are 196 industrial areas in Gujarat. As per the information available, these industrial clusters (including GIDC estates) are serviced by only 33 operational CETPs and 11 Common Integrated Treatment, Storage & Disposal Facilities (TSDF) that are currently functional across the state of Gujarat. Moreover, no CETP's or TSDF plants have been built in the districts surrounding the Gulf of Kutch and Estates discharge their effluent directly in the open sea.

Whereas according to the Polluters Pay Principle in international environmental law, those causing pollution, should be paying for the damage done to the natural environment, in Gujarat the costs of cleaning industrial discharge is shared amongst the State, Center and company where the company or association provides investment for 50% of the costs.

## Power generation

**Environmental and Livelihood Impacts**

71 percent of Thermal Power Projects (TPPs) in Gujarat are in coastal districts, the rationale being easy access and disposal to water, cutting of transport cost for imported coal and availability of land. Some key concerns are as follows:

- The use of thermal power, particularly coal-based power, has come into censure across the world because of increasing Co2 emissions that contribute to climate change. Coal is a carbon-intensive energy source, and India is a party to international commitments to reduce its emissions intensity by 25% in around a decade. For example, the total greenhouse gases emission from the Tata Mundra plant, based on Ernst and Young's estimated baseline CO emissions for the project, would be 30.796 million tonnes per year (baseline value), which would make it India's third largest emitter of greenhouse gases'.

- TPPs on the other hand have also been documented to be a key source of environmental and livelihood damage on the coast of Gujarat, particularly the Gulf of Kutch, which has a fragile and diverse ecology. Investigations and newspaper reports have documented alleged illegal dredging and landfill of the sea in Mundra as well as destruction of mangroves and coral reefs.

- Dredging as well as the high temperature treated water released from outlet channels of TPPs changes the physical composition and turbidity of water and lead to de-oxygenation. Fish are extremely sensitive to such a change is chemical composition and have disappeared from near-shore waters. Fishworkers around TATA UMPP have seen a decline of fish catch amounting to Rs.25-27 Lakhs to Rs. 9 Lakhs annually between 2004-2005 to 2010[40], whereas fishworkers from Nani Cherr Village near the Akrimota Power Plant also report similar complaints.

- TPPs on the coast have not only decimated the livelihoods of fishworkers, but have displaced communities who either live on or utilise the coastline. Along with fishworkers, agricultural and pastoral communities have also been adversely impacted and have lost land and access to common property.

[38] Figures vary across government documents, CPCB website states that 33 CETPs are operational and seven are proposed/ under construction. Comparison between TSDF and CETP statistics across different Government bodies indicated discrepancies in figures

[39] The Report of the Comptroller and Auditor General of India (CAG), performance audit of the on the Forest, Environment, Narmada, Water Resources, Water Supply & Kalpasar and Sports, Youth Services and Cultural Activities Departments (2011)

[40] The Real Cost of Power, Delhi Forum (2012)

- TPP acquire land for the land and ancillary infrastructure and also cut of access to the coast for fishing communities who park their boats on the coast. Lack of access to grazing grounds for pastoralists has also been reported in the Mundra region.
- Asides from marine impacts and displacement, Thermal Power Plants also lead to air pollution though coal dust and fly ash. Impacts of ash on saltpans as well as contamination of fish through coal dust are have been raised as key concerns near TTPs – harming other livelihood generation activities.
- The questions that arise here are of whether the financial benefits of TPPs on the coast outweigh the damage to the marine environment and livelihoods of communities dependent on natural resources?

The Gujarat Electricity Board (GEB) was established in the 1960's and reached 100 percent rural electrification in the '80s. But by 2002-2003, the GEB started running into heavy losses and in 2003, the Gujarat Electricity Industry Act began the process of unbundling the state electricity board into seven entities for generation, transmission trading and distribution. Since then, Gujarat has witnessed an exponential rise in the power sector and since 2009 has been a surplus power producing state. It also accounts for approximately nine percent of the total energy production in the country.

Coastal districts hosted 71 percent of the power projects in the entire state, including thermal power plants and their ancillary infrastructure. As per our calculation there are 33 thermal (coal and lignite) and gas plants with a total capacity of 34285 MW. Of these, 22 are situated in districts across the Gulf of Khambat (with a total capacity of 7,483 MW whereas the Gulf of Kutch is surrounded by 10 plants, with more than double the capacity at 21,350 MW. The TATA Ultra Mega Power Plant, under the UMPP policy of the Central Government and The Mundra Thermal Power Station have a combined capacity of 8,620 MW (See Table 4 in Annexure 2).

Vashisht and Arya note that Gujarat has one of the highest shares of power production from captive power generation amongst all states. The capacity of Captive Power Plants (CPP) increased from less than 1 GW in 1996 to 2.7 GW in 2005[41]. Gujarat produces more than 50 percent of its industrial load from captive power generation and 'captive power was 81 percent of power used by industries with captive plants and approximately 50 percent of all power used in the state by all industrial units'[42].

The total power generation capacity of Gujarat in 2010-2011 was 13110.2 MW, where State contribution was 5931.9 MW and private players produced 7178 MW. Of this 78.85 percent was through thermal power generation and renewable energy provided 15.26 MW (by private players). In January 2017, total installed capacity from coal and gas equaled 23,316.71 MW. Whereas figures from 2017 were not available, 2015-2016 saw private generation of thermal power at 74 percent (see Table 5 in Annexure 2).

Moreover, at an average 71 percent of thermal power plants are concentrated in the coastal

[41] Sood (2012)
[42] Sood (2012)

zone[43]. If on one hand, this trend in coastal concentration is questionable because of environmental and livelihoods impacts, even the economic or viability argument is in question with the three existing mega projects, the Mudra Power plant and TATA UMPP in Kutch and the Essar Salaya Power plant in Vadinar, Jamnangar now running in losses. The plants operate on imported coal from Indonesia and escalation in price of coal has made the plants unviable. Reports suggest that the Gujarat Urja Vikas Nigam Ltd. (GUVNL) has been approached to acquire majority stakes in the plants[44]. Considering that that the same plants account for 8,620 MW of power generation in Gujarat – this might also imply a serious fault in the strategy of private thermal generation in the State.

Table 12: Installed Capacity (MW) of Power Utilities (as on 31.01.2017)

| Ownership Sector | Coal | Gas | Diesel | Total |
|---|---|---|---|---|
| State | 4980.00 | 2321.80 | 0 | 7301 |
| Private | 8642.00 | 4060.00 | 0 | 12702 |
| Central | 2886.62 | 427.27 | 0 | 3312.89 |
| Total | 16,510.62 | 6,806.09 | 0 | 23,316.71 |

*Source: CEA, MoP, GoI,*

Whereas recent consumption figures are not available, as of March 2012, the industrial and commercial sector consumed almost half of the total power generated (see Table 6 in Annexure 2), if captive power were to be included, industrial usage exceeds 60%.

## Oil and Gas extraction

**Environmental and Livelihood Impacts**

Oil and gas production is an emerging sector and literature on its impacts on the marine environment, particularly of offshore drilling in India is limited. Some of the key issues that have been raised are as follows:

Any environmental measurement of impacts needs an assessment of existing environmental parameters and conditions. Whereas baseline data is well established for land based environmental impacts, the deep seas are not as well understood. No long term monitoring of deep-sea environment is taking place either. Some key impacts are mentioned below:

- Oil Operations have a history of disasters, leading to release of hydrocarbons/ oil spills that impact both surface water and the deep sea. This becomes particularly relevant considering that the recent history of oil spills in the Gujarat coast have led to no action against polluters. In 2009, Gujarat saw a 150 km long oil spill across the coast of South Gujarat.
- Crude oil terminals of IOC, reliance and Essar and SBM are located near

[43] State of Environment Report, GEC
[44] Chatterjee, Gujarat Government may take over TATA, Adani, Essar Power Plants, The Wire (2017)

the Kutch Marine Protected Area and National Sanctuary. Changes in geomorphology such as siltation of creeks and decreasing biodiversity has been observed in the region and might be attributed to some of the industrial operations in the area, including particularly movement of ships and oil cargo, also increasing risk of oil spills.

- Marine life and ecology are sensitive to changes in light, sound and temperature changes that are produced by drilling and construction of offshore rigs.
- Ecological changes have been noted 200-300 m to 1-2 km around drilling operations in other places.
- The drilling process includes drill cuttings, excess cement, fluids ad other chemicals that can be harmful to the ecology. The drilling process also includes discharge of wastewater and that adversely impacts marine life.
- Infrastructure associated with oil rigs are a matter of concern in biogenic habitats, such as those formed by corals and sponges, which are fragile and have low resilience to physical forces.
- Corrosion and small leakages of pipelines across time.
- Decommissioning of drilling operations also impacts subsidence on the sea floor and also introduces contaminants to the marine environment.

Gujarat has three major sedimentary basins[45] of Cambay, Kutch and Saurashtra with total reserves of 3090 MMT and Billion Cubic Meters (BCM) reserves of 351 BCM. Gujarat is the second largest gas-producing region in the country and supplies 10 percent of the overall gas production in the country. In 2015, total production of oil was 4.53 MT and gas was 1526 Million Metric Standard Cubic Meter Per Day (MMSCMD), whereas onshore crude oil production was to the tune of 3534 MMT.

A jump in oil and gas production is planned for the coming years; while exploration is ongoing in the Cambay Basin, exploration in the Kutch Basin is to start while Saurashtra is seen as a prospective Basin. Currently, Offshore drilling for petroleum is also a major component of economic activity with nearly 775 wells being drilled over 1.3 lakh meters in the Gulf of Khambat between 2005 to 2010. As per the State of Environment Report in 2012, there were 7 gas-based projects in six coastal estates with an installed capacity of 2,300 MW.

These include two LNG terminals at Dahej in Bharuch district and Hazira in Surat district with a capacity of 20 MMTPA. There are four refineries in the state with a total capacity of 93.7 MMTPA. These are the Gujarat refinery at Koyali, (operated by the Indian Oil Corporation), the Jamnagar Reliance Refinery and Reliance SEZ Refinery, (both operated by Reliance

[45] A depression in the crust of the Earth formed by plate tectonic activity in which sediments accumulate. If rich hydrocarbon source rocks occur in combination with appropriate depth and duration of burial, hydrocarbon generation can occur within the basin.

Industries and the Essar Refinery) and the Essar Refinery, operated by Essar Oil.

The existing supply sources of Natural Gas are as follows:

Table 13: Existing supply of Natural Gas

| Supplier | Source | Volume (MMSCMD) |
|---|---|---|
| ONGC | Onshore fields near Ankleshwar/ Surat region and offshore in the Arabian Sea | 20.00 |
| GSPC/Niko Resources | Hazira Gas fields | 00.60 |
| Cairn Energy | Cambay Basin | 00.80 |
| Petronet LNG Limited (PLL) | LNG from Ras Gas, Qatar | 08.00 |
| Shell, Hazira | LNG Spot Cargo | - |
| Reliance Industries Limited | Krishna Godavari Basin | 26.00 |
| **Total** | | **55.40** |

*Source: Gujarat Industrial Development Board*

The Directorate of Petroleum was created by the Gujarat Government in 1997 and regulates the upstream (exploration and production) and downstream (refining and distribution) of oil and natural gas in the State. The Gujarat State Petroleum Corporation is a state owned oil and gas company. It includes subsidiaries for different upstream and downstream activities, which cover the extraction, generation and distribution process. GSPC also operates and has acquired exploration stakes in other states such as Andhra Pradesh. GSPC has also come under scrutiny by CAG and other watchdog bodies in their operations in other states.

As per the BIG2020 vision document for the State of Gujarat, Oil and Gas will account for nearly 30 percent of overall consumption. The Gujarat State Petroleum Corporation has stakes in a (unspecified number of Exploration and Production blocks in Cambay, Saurashtra and Kutch). Petroleum, Chemicals and Petrochemical Investment Region (PCPIR) have also been planned as part of the Delhi Mumbai Industrial Corridor at Dahej, Bharuch. The PCPIR, which is at the edge of the coast near the Gulf of Khambat will occupy 453 km brownfield area[46]. A Joint Venture Company between ONGC, GAIL and GSPC called ONGC Petro Additions (Opal) Ltd. is promoting the PCPIR.

## Salt Production

**Environmental and Livelihood Impacts**

- Salt production by solar evaporation as practiced in Kutch needs a continuous supply of brine (or saline water) that is draw from the sea. Brine released by saltpans has high salinity and mineral contents and can lead to changes in salinity, alkalinity and temperature of marine water, hence impacting marine life. In areas such as Kandla, fishworkers believe that one

[46] Brownfield areas refer to previously developed land that is currently not in use

of the reasons of the decrease in fish catch has been the large amount of brine released directly into the ocean Bittern[47] has also been found to harm mangroves.

- Interviews suggest that increasingly, larger companies such as Dev and Ahir Salts are taking over the salt production market as opposed to smaller local companies that have since generations produced salt. Data on the salt industry is limited and needs better understanding to be able to draw any conclusions about the nature of salt industries. Companies like Dev Salts have also been responsible for blocking creeks to make pits for salt production, for example, Dev salts in Mundra and have blocked sea water access for 300 smaller Agariya/ traditional[48] manufacturers of salt.

- 21 Salt work units, including TATA Chemicals and Associated Cement Company at Mithapur are creating habitat changes around protected areas of the Marine National Park and Sanctuary in Kutch and have been indicated as sources of pollution in the marine protected areas.

Salt production remains a significant industry that accounts for more than half the total salt produced in India. Salt production comes under the aegis of the Industry and Mines Department and the Commisionerate of Salt. Salt Production forms a major source of income and employment in Kutch. India is the third largest producer of salt in the world, where Gujarat produced 2,27,06,740 tonnes out of the 2,80,32,420 tonnes of total salt production in India in 2015-2016, almost 70 percent. Of this, 80,41,280 tonnes was produced in Kutch. The coastal districts of Porbandar, Bharuch, Bhavnagar, Dwarka Devbhoomi, Amreli, Junagarh, Valsad and Surat also manufacture salt and the total production of coastal districts in 2015-2016 was 1, 84,11,490 tonnes[49].

Marine salt production dominates with 1,8,964.1 MT. The total land utilised for marine salt production in Gujarat is 22,4,365 acres[50]. From a business that traditional communities called Agariyas (which include Chuwaliya Koli, Bharwads, Ahirs, Sipahis, Fakirs communities) undertook, 62 percent of Salt production in Gujarat now is carried out by large public and private limited companies. Gujarat, as per official figures (including Daman and Diu) has 53,880 labourers employed in salt manufacturing. A study commissioned by Care India reports that at least 75,000 to a lakh people are seasonally employed, while Kutch in 2002 officially had 1,1,156 salt workers in the district. The State of the Environment Report 2012 puts the figure at 91,400 salt workers. The condition of salt workers is known to be dismal, even by standards of other unorganised sectors. Saltwork has been widely reported to be inhuman and conducted in insecure conditions.

[47] Bittern is a by-product of salt production/ that is rich in minerals such as magnesium chloride, bromides, iodine etc. It is also defined as the a concentrated solution of various salts remaining after the crystallisation of salt from seawater.
[48] Interviews (Bharat Patel)
[49] Annual report of the Salt Department, Ministry of Commerce and Industry (2015-2016)
[50] Annual Report (2015-2016)

## Mining

**Environmental and Livelihood Impacts**

- Mining in coastal regions has been known to result in a range of adverse impacts, particularly as the scale of mining increases with a greater demand for raw material. In Gujarat, mining in coastal regions has been seen as one of the reasons for shoreline erosion that is taking place in the Saurahstra and Gulf of Khambat region. A State of the Environment Repot by the Gujarat Ecology Commission also came across that coastal sand mining has resulted in the loss of habitat for endangered Olive Ridley turtles in Junagadh District.
- Mining has also found to result in air, noise pollution and increase particulate matter pollution.
- Coral mining also use to take place in Kutch since the 1930s and was only banned in 1983.

Gujarat is different from other investment rich states in how it does not have a high percentage of mining related investments. Mineral resources are concentrated in non-metallic mineral production. In 2012, 77 and 61 percent of mining lease and quarries respectively concentrated in the coasts[51].

Approximately 75 percent of the state mineral production is centred in the Kutch, primarily the Lakhpat and Abdasa talukas and includes 21 major and 8 minor non-metallic minerals[52]. Limestone mining takes place across Kutch, Junagadh and Porbandar, Lignite mining in Surat and Bhavnagar and Bauxite mining in Jamnagar, Junagadh and Valsad Districts. Whereas clear data is not available, sand mining takes place near and from the rivers of South Gujarat.

**New trends in coastal development or 'Next Generation Project'**

The 1995 port policy of Gujarat can be seen as a precursor to the Sagarmala Policy of the current Government of India, which seeks to lower costs of bulk commodities and improve export competitiveness by locating future industrial and manufacturing (for example, petroleum, power, cement, steel etc.) capacities near the coast. It moreover, shifts focus from roads and railways as a form of transport and movement to the waterways and seas. Moving forward from the 1995 policy and in line with the Sagarmala policy, a discussion paper, titled 'Port Policy of Gujarat', commissioned by the Gujarat Maritime Board and written by the consultancy firm of Ernst and Young LLP, in January 2017, similarly provides a blueprint for the growth of coastal Gujarat, centered on the needs of industry. It states that an estimated 50 percent of future investment will be near port locations[53]. Nine out of the 13 proposed SIR and 29 out of 60 SEZ are port based[54]. Key areas of focus in coastal regions are as follows: a)

[51] State of Environemnt (2012)
[52] Ecological Profile of the Gulf of Kutch, Gujarat Ecology Commission (2014)
[53] Port Policy of Gujarat, Discussion Paper, GMB (January 2017)
[54] Sood (2012)

The Delhi Mumbai Industrial Corridor, Petroleum, b) Chemicals & Petrochemical Investment Regions[55], c) Coastal Economic Zones under Sagarmala[56], d) Development of Port Cities at Mundra and Kandla and e) Development of SIR/ SEZ/ Industrial estates along the coast.

With the shift from manufacturing to infrastructure, new projects also reflect a new focus on IT, technology (nano-technology) and finance (for example, the GIFT City), logistics parks, expressways and fast trains. But in some ways, the pitching of such project as 'new' is an exercise in a reimagining and expansion of already existing industrial nodes and infrastructure. For example, Six Special Investment Regions (SIRSs) are proposed across the DMIC. These are:

- Dholera: Ahmadabad Investment Region
- Vadodara: Ankleshwar Industrial Area
- Palanpur: Mehsana Industrial Area
- Bharuch: Dahej Investment Region (PCPIR)
- Surat: Hazira Industrial Area
- Valsad: Umargam Industrial Area

Ahmadabad, Ankleshwar, Mehsana, Dahej and Hazira already form part of the resource-exhausted Golden Corridor's existing industrial belt and have a large number of manufacturing estates under GIDC in the same stretch of area. The key changes that seems to have occurred is that the GIDC is now focusing on the creation of Industrial Parks and Special Investment Regions that repackage older industrial estates with one key difference, that is the greater promotion of private participation and investment.

Another project in planning since 1996 that deserves special mention is that of the Kalpasar Project, or the Gulf of Khambat Development Project. Kalpasar envisages a 30 km long Dam with a 100 m wide, 12 lane road on top over the Gulf of Khambat, connecting Saurashtra to South Gujarat. Pitched as the largest man made fresh water reservoir in the world, the project is to lead to land reclamation of 2 lakh ha, provide water for irrigation and domestic use in Saurashtra, as well as improve connectivity between the two regions, and provide a boost to ports such as Bhavnagar, amongst other things. With an estimated cost of Rs. 53,000 cr, there is no real clarity on whether such a 'mega' plan is even feasible. But the current Prime Minister as part of the larger Kalpasar project inaugurated the Badbhut Barrage Project on 8th August 2017. The barrage is meant to create a fresh water reservoir downstream of the Sardar Sarovar Project. The barrage will displace 20,000 fishworkers from Bharuch district that are already impacted by pollution – leading to decreased fish catch – from the Industrial Estates of Jhagadia, Ankleshwar, Panoli and Dahej in Bharuch district. The project will block the Narmada River at Bhadbhut village, a 40 km breeding ground of Hilsa, an economically important fish as well as other fish species.

What the repercussion of such as plan of development mean for the coastal ecology and fish workers of the Gujarat state remain to be seen. But it is clear that in the growth strategy of Gujarat, the coast is only a commercial entity.

---

[55] Bharuch-Dahej region

[56] Identified areas are Kutch (Kandla, Mundra and Sikka), Saurashtra (Pipavav)Southern Gujarat (Hazira, Magdalla and Dahej).

# CHAPTER 2: ESTUARIES, FISHERIES & BORDERS

## *Introduction*

A State of the Environment Report, published in 2012, by the Gujarat Ecological Commission reads, the "peculiarities of a somewhat heterogeneous coastal system and the impacts of fast-paced development pose environmental challenges that need to be better understood. Given the fact that the state has the longest coastline and the largest continental shelf among all Indian states, global climate change impacts are particularly worrisome for the state."[1] While hinting at the relationship between industrialisation and coastal degeneration and climate change, the report stops short of actually connecting the two.

Different kinds of industrial activities lead to differing impacts on the coastal zone, which includes both land and water as described in the above section. Both, the excessive use of natural resources as well as emissions (of chemical waste, radiation and noise), exert pressures on the environment. Such impacts are varied across the coast of Gujarat, and cumulative studies to assess them have not taken place.

Worldwide, coastal ecosystems are considered to be at serious risk, with increasing development, industrialisation and urbanisation of coastal waters. Not just the coast, the Arabian Sea as a whole is undergoing changes. A study by the Lamont-Doherty Lab, at Columbia University, found increasing signs of dead zones (areas of the ocean where no marine or plant life exists) within the Indian Ocean. One of the factors leading to the creation of dead zones was identified as the release of waste and sewage, from cities such as Mumbai, Gujarat and Karachi, across the Arabian Sea.

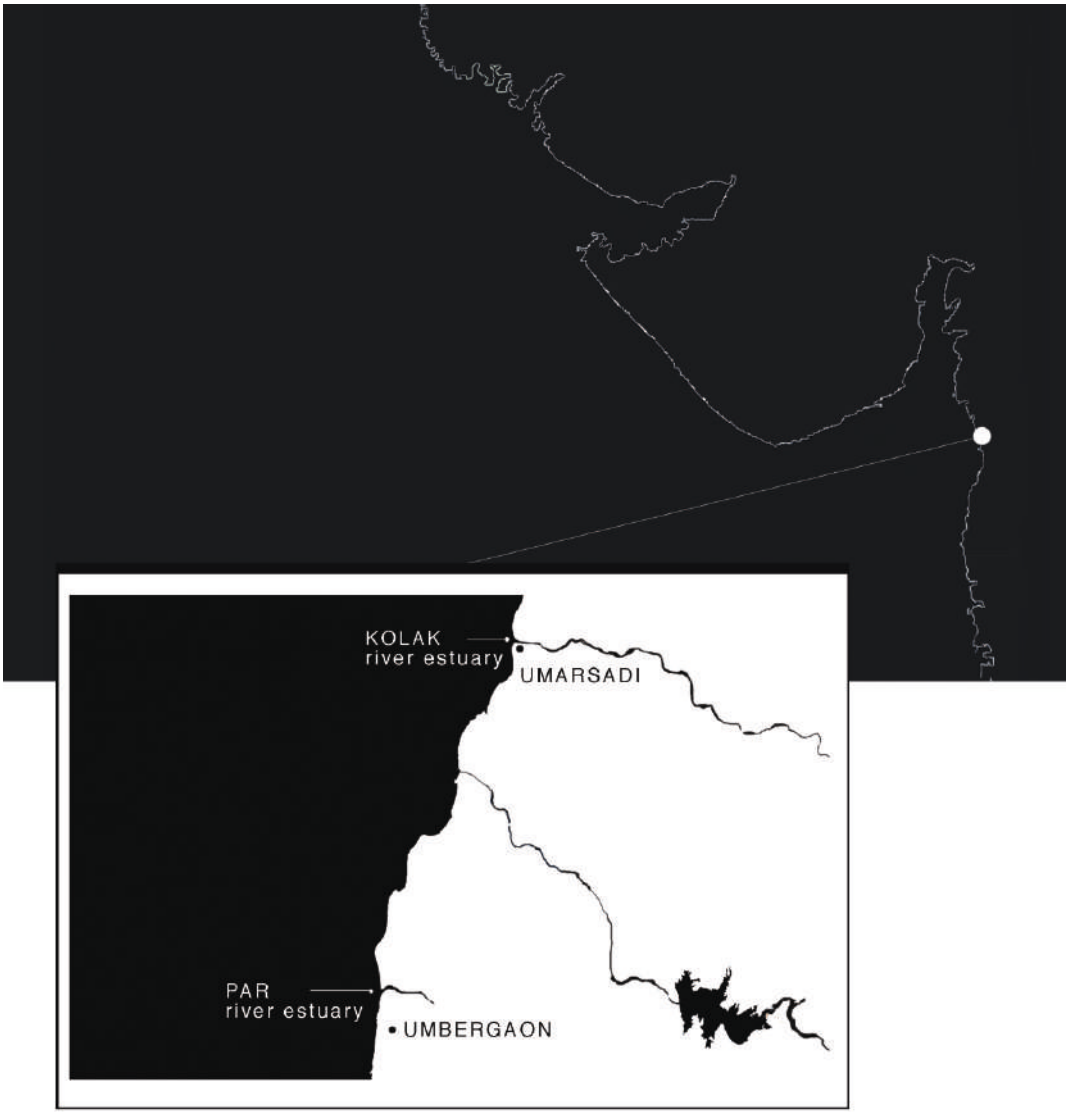
While it is understood that urbansiation and industrialisation of the coast results in a series of detrimental impacts on downstream estuarine and coastal ecosystems, the direct effects of projects and development is difficult to gauge due to the complex character of coastal ecology. *Changes* include those in water quality, loss of habitat and in biodiversity and fisheries. Coastal systems are highly susceptible to climate change *impacts that* result **in coastline erosion, salinity ingress, disappearance of fish species, sea level rise and changing patterns of precipitation and flooding.**These are overarching changes. Current indicators of coastal conditions are not yet linked with specific stressors (or sources), can be spread over time and have not been clearly defined. They are, hence, difficult to measure, particularly over a short period of time. Still, clearly, both human and marine health are linked to the health of costal ecosystems.

**Coastal pollution** has been defined by NIOS as a change in the physical, chemical and biological characteristics of water and sediments, and causes an adverse change in the quality of the coastal environment. **Coastal pollution in India arises primarily form land-based sources, including domestic waste, industrial runoff, agricultural runoff, shipping, offshore exploration and infrastructural development.** Key pollutants are oil, sewage, pesticides, toxic chemicals, heavy metal, radioactive waste, thermal pollution and nutrients.M.D Zingde of the National Institute of Oceanography writes that the coastal belt of India sees a concentration of industries in a 25km width, which are estimated to have generated 1.35 million $m^3$ per day (cubic millimeter/ day)of liquid effluent and 34,500 tonnes per day of solid waste.The west coast has seen the highest degree of industrialisation, particularly Maharashtra and Gujarat. Of the total wastewater generated in the country, 85 percent reaches the coastal waters without treatment[57].

The patterns show that the regions surrounding the Gulf of Khambat, the Saurashtra coast and the Gulf of Kutch have seen varying forms of industrialisation impacting the fishing communities. This section of the report describes case studies from the three different coastal stretches to highlightthe most pressing issues and investigate some key challenges facing fishworkers today. The format of reporting differs as cause, conditions, consequences and patterns of fisheries varied across the state. But connections between all three regions are present.

[57] M D Zingde, Health-Status of the Coastal Marine Environment of India, National Institute of Ocenagraphy


The Gulf of Khambat


KOLAK
river estuary
UMARSADI
PAR
river estuary
UMBERGAON

The Gulf of Khambat covers a coastline of 400 km with the adjoining 19 talukas spreading over an area of 1,9,189 sq.km. As per the 1991 census, the talukas surrounding Khambat have a population of approximately 4.3 million people. The gulf itself covers a land area of over 3,120 sq. km[58]. The width of the continental shelf is greatest in the Umbergaon-Maroli region of Valsad-Navsari, where populous fishing grounds exist. The coastal belt of Khambat has a humid and sub-humid climate.

Table 14: Coastal Talukas in the Gulf of Khambat

| **Districts in Gulf of Khambat** | **Coastal Talukas** |
|---|---|
| Valsad | Umbargaon, Valsad |
| Navsari | Gandevi, Jalalpur |
| Surat | Choryasi, Olpad |
| Bharuch | Hansot, Jambusar, Vagra |
| Anand | Khambat |
| Ahmadabad | Dhandulka |
| Bhavnagar | Bhavnagar, Gogha, Mahuva, Talaja |
| Amreli | Jafrabad, Rajula |

**Rivers** I Originating in the upper reaches of Gujarat and draining into the Gulf, are several major rivers: Sabarmati, Mahi, Narmada, Kim, Tapi, Purna, Ambika, Auranga and Daman Ganga. The rivers of south Gujarat intersect the coast almost parallel to one another, draining water and alluvium to the gulf and surrounding coastal areas. All nine rivers form estuaries, partially enclosed bodies of water that are periodically or permanently open to the sea. Multiple small creeks, tributaries and estuaries and distributaries branch out in different directions, meandering through fields and cities, under bridges, through villages. These not only form the ecology of the water systems in the region but also play an essential part in creating the complex geomorphology of south Gujarat, making the region unique. Such estuarine zones, where salt and freshwater meet, are critical links in the environment. These are dynamic transition zones between coastal, marine and freshwater systems and are essential in bringing nutrients into the marine system. Estuarine zones are diverse and include a range of simple to complex 'frontiers' that can include delta, estuary, lagoon mudflats, coastal marshes, reefs and barrier islands, for example. The ecosystem of the Gulf of Khambat includes mangroves, estuaries, creeks and large intertidal mudflats, with rich biodiversity.

> If a Gulf is where a portion of the ocean intercepts land, that interception is also the moment of interaction between different water systems as they meet at the entry to the marine world.

Bharuch, Bhavnagar and Surat have rich coastal wetlands[59].Coastal areas around the Gulf of Khambat support 12.6 percent of the mangroves in the state[60].

[58] Ecological Profile of Khambat, GEC (2011)
[59] National Wetalands Atlas: Gujarat, Space Application Centre, ISRO, (May 2010)
[60] As per the Gujarat Forest Department, attempts to gain information on actual state of mangroves in Gujarat through RTIs have been unsuccessful (Interviews with environmental activists in Gujarat).

But rivers and estuaries in Gujarat, much like in other parts of the country, are used as easy pathways for the dispersal of industrial waste and urban sewage. A paper titled Status of Industrial Environment, published by GECin 2004, calculated that the estuarine and coastal waters of Gujarat are expected to receive 606 $Mm^3$ domestic sewage, 215 $Mm^3$ of industrial effluents and 14000 tonnes of domestic solid waste[61]. According to the study, coastal industries account for 5 million tonnes of solid waste. Impacts of agricultural runoff, with increasing use of fertilisers that contribute to excessive nutrients in water, further lead to pollution. Much of this is concentrated in south Gujarat where estuarine systems have been destroyed by industrial development. Studies from as far back as 1977 suggest pollution in the rivers of south Gujarat. Polluted rivers in the region include Par, Mindhola, Mahi, Purna, Ambika, Kolak and Daman Ganga, as well as Amalkhadi, Vatha and Bhogava. The following table represents the main industries and regions responsible for river pollution, compiled from various sources including interviews.

| River/estuary | Sources of pollution | Pollutants |
|---|---|---|
| Sabarmati | Ahmadabad city waste and sewage, the Naroda Vatwa Effluent Channel. | High pollution and nitrate levels<br>High Biological Oxygen Demand (BOD)[62]<br>High organic load |
| Narmada<br>Amalkhadi and other tributaries<br>Amravati creek | Birla Copper, GIDC, Torrent, PCPIR, ONGC, Ankleshwar, Panoli and Jhagadia as well as Dahej, Ankleshwar and Bharuch, Jhagadia, Panoli Estates | High Salinity due to dumping of urban sewage<br>High Nitrate concentration<br>High temperature |
| Mahi | GSFC (fertiliser), Reliance Industries Ltd. Gujarat Refinery, GIDC, GACL Common Effluent Channel from Dhanora, Vadodara GIDC and M/S Vadodara Enviro ETP, Nandesar GIDCi, Umaraya GIDC and Umaraya CETP | High temperature<br>Ground water contamination in neighbouring areas (Aresenic, heavy metals) |
| Tapi | Surat Municipal Corporation, Textile MIlls Hazira Industrial Complex (including large industries), Sachin GIDC Pandesara GIDC,Kadodara-Palsana GIDC, Magdalla Industrial Area,<br>Domestic sewage and agricultural run-off. | Categorised as grossly polluted<br>Low DO[63] and BOD, high turbidity<br>Presence of Cadmium, Magnesium, Hard water<br>High alkalinity, Phosphate, Ammonia, Potassium, release of hydrocarbons |

[61] Status of Industrial Environment, GEC (2004).
Figures differ across sources and documents but are broadly in the same range

[62] BOD indicates amount of dissolved oxygen needed to water to break down organic matter and maintain water temperature – above 8 mg/l is considered polluted.

[63] DO indicates Dissolved Oxygen – DO of below 5mg per litre can lead to death of acquatic organisms

| | | |
|---|---|---|
| Mindhola | Sachin, Pandesara, GEPIL, Kala Tax, Hazira Waters, Kadodara, Palsana- dyeing, fertiliser, rayon, chemical, pulp and pharma industries<br>Surat Municipal Corporation<br>Textile Mills | Industrial Effluent and sewage leading to Fluoride, suspended solids, biodegradable organic matter, toxic organic compounds (e.g. phenols), and heavy metals |
| Purna | Relatively less polluted | |
| Ambika | Billmora town | Industrial and domestic wastewater* |
| Auranga | Relatively less polluted | |
| Par | Atul Industries, agriculture and domestic waste from Valsad | Industrial effluents and domestic waste, acidic effluents, low DO, high organic pollution |
| Kolak | Vapi Industrial Area, Sarigam Industries, domestic waste, sand mining | Effluents and wastewater<br>High BOD<br>Low DO<br>Organochlorine compounds (for example di, tri, tetra chlorobenzenes, chlorinated benzamines, diphenyl chlorinated pyridine derivatives, naphthalene and others)<br>Heavy metal contamination (zinc, manganese, mercury, nickel, chromium, copper)<br>Land erosion |
| Daman Ganga | Vapi GIDC, distilleries, Sarigam Industrial Area direct dumping on beach at Tadgam village | High BOD<br>Organochlorine compounds (for example di, tri, tetra chlorobenzenes, chlorinated benzamines, diphenyl chlorinated pyridine derivatives, naphthalene and others)<br>Heavy metal contamination (zinc, manganese, mercury, nickel, chromium and others) |

*Source: compiled from interviews and studies by TRC*

Pollution, as described above, has had direct impacts on the estuarine system of these rivers. Estuarine systems are a form of wetlands particularly important in the context of this study. They are a living ecosystem that sustains water-based life forms as well as livelihoods through maintaining an ecological balance. They act as nurseries and spawning grounds; fish from marine waters and rivers breed in the estuarine zones. As the fish mature, they swim away to their respective living grounds. Across the world, a

majority of marine-coastal catch depends on fish from the estuarine- to-coastal zone. Such is the case in Gujarat. Rich in nutrients, the estuaries enable the growth of fauna, feed fish, shellfish and marine mammals, and provide a resting ground for migratory birds. The living patterns of coastal communities depend on estuarine systems, as do other activities such as inland transport and tourism. The estuarine zone is also considered to be a buffer between land and sea, providing protection from storms and flooding, on the one hand, and protecting the health of the ocean, on the other, through filtering sediments and pollution, and lessening the impacts of anthropogenic activities on marine life.

Considering south Gujarat was one of the first areas to industrialise, impacts of industrial pollution and development are most clear here. In some ways, they point to the future of the Gulf of Kutch, unless stringent measures for the protection, of both the environment and the communities dependent on natural resources, are not taken.

**Case 1: Budiya and Danti Village on the Mindhola Estuary**

Area: South Gujarat
Districts: Surat and Navsari
Village: Case 1: Budiya, Case 2: Danti
River: Mindhola
Industry: Various

**Industrial overview of Surat and Navsari district**

Surat and Navsari are adjacent districts with significant and contiguous estuarine systems. Surat is highly industrialised, while Navsari has been proposed as an upcoming industrial region under the DMIC. Urban and industrial pollution and wastewater disposal from Surat hits Navsari through tangible impacts in the estuarine systems, creeks and rivers. These have dramatic implications for fishwork in the region. The main river-estuarine systems of Surat and Navsari are the Purna river estuary, the Mindhola and the Tapi river, which flow into the Gulf of Khambat. The Purna river is considered relatively cleaner, and the focus in the following case studies is on the Tapi and the Mindhola estuarine regions.

**Industrial overview of Surat and Navsari district**

**Surat[64]:** There are approximately 41,300 small and medium scale industries and 116 medium and large scale industries in Surat district. Most of the small-scale industries are located in Choryasi (western Surat), Mangrol and Olpad (northern Surat), Mandvi (central Surat) and Palsana (southern Surat) tehsils. The key manufacturing sectors are textiles, chemicals, dyeing & printing, diamond processing, zari (silver) making, and engineering works. Textile is the most prominent sector, followed by the repairing and service industries. The district has an airport and GMB-run jetties. Essar Steel Ltd., Reliance Industries Ltd., Larsen & Toubro Ltd, and Gujarat Ambuja Co. Ltd. have constructed captive jetties for the import and export of their products at Magdalla port, also identified for expansion. Key commodities handled in the region are fertilisers, soya bean, groundnut, cement, gas, sponge iron, coal and general cargo.

[64] Figures as per the Brief Industrial Profile of Surat District, MSME Development Institute, GoI

**Navsari[65]:** a smaller district, it is less industrialised and has 8,870 small-scale industrial units and 25 large and medium scale industries. The main sectors are drugs, pharmaceuticals and vegetable oil. Navsari has been proposed as an industrial area under the DMIC, and a greenfield port is also proposed at Vansi Borsi in Gandevi taluka.

**Ports:** Hazira and Magdalla are the two functional ports in the region on the Tapi, and a new greenfield port is proposed at Vansi-Borsi in Navsari. There are plans for the expansion of Magdalla port for the movement of coal and general cargo.

Table 16: Medium and Small industries

| Estate | Area | Units in production |
|---|---|---|
| **Surat District** | | |
| Sachin GIDC | 749.35 | 2075 |
| Pandesara GIDC | 218.27 | 782 |
| Surat Apparel Park | 54.96 | 50 |
| Bardoli | 4.71 | 67 |
| Icchapore-Bhatpore- Kawas | 919.84 | 337 |
| Hazira-Mora | 428.04 | 4 |
| Khatodara | 3.08 | 142 |
| Olpad | 31.59 | 68 |
| Katargam | 38.33 | 887 |
| **Navsari District** | | |
| Navsari | 55 | 264 |
| Billmora | 44 | 234 |

*Source: Compiled by TRC*

Some of the main industrial regions identified as sources of pollution in the rivers and the coastal belt of Surat and Navsari, are the Udhana-Palsana Industrial Corridor and the Surat-Navsari Industrial Area that stretch across both districts. The Udhana-Palsana Industrial Corridor is a region comprising over 1000 industries of metal, textile, pharmaceuticals, plastic and chemicals. The region is a 32 km long belt, one of the busiest industrial zones in Asia. Some of the main GIDC estates in the corridor are the Sachin, Pandesara, Kadodara, Palsana GIDC. The following GIDC estates, industrial areas and the municipal corporation are the main sources of waste and effluent disposal.

[65] Figures as per the Brief Industrial Profile of Navsari District, MSME Development Institute, GoI

Table 17: Some details about the main sources of pollution

| S. no. | Industry/Estate | Description |
|---|---|---|
| 1 | Sachin GIDC | A 692 ha estate in Surat, which is filled to capacity. In 2015, there were approximately 545 industrial units in the estate. Sachin is mainly a textile manufacturing estate with steel, dyeing, chemical, paper and fabrication units, engineering works units. It gets its name from the town it's situated in; the Sachin municipality is 9 km away from Surat. The GIDC will also fall under the DMIC and there are plans of connecting the GIDC to the upcoming Hazira and Magdalla port. |
| 2 | Pandesara GIDC | There are chemicals, dyeing and printing, and engineering units, with a focus on textiles based in Udhna, under the Surat Municipal Corporation. Pandesara Infrastrcture Ltd. operates a CETP plant for the textile, dyeing and printin g units located here. It has a capacity of 150 MLD and, as per GPCB, currently services 127 industrial units. |
| 3 | Kadodara GIDC: | Information not available |
| 4 | Palsana GIDC: | All its members are textile dyeing and printing units located in and around Vareli, Kadodara, Tantithaiya and Jolwa, in Surat district. These industries are located in area of approximately 10000 Ha. |
| 5 | Hazira Industrial Area | The Hazira Industrial Area and Port is located at the intersection of Tapi and the Arabian Sea. The Hazira Port serves as a gateway port for north, west and central India and is a deep-water, all weather, direct berthing port in Surat. The area includes manufacturing of petrochemicals, fertilizers, heavy engineering, steel and energy. Hazira consists mainly of large and medium industries. |
| 6 | Magdalla Industrial Area and Port | Information not available. |
| 7 | Textile Mills of Surat | Approximately 24,000 small and medium textile units operate in the Surat district. Approximately, 5 lakh powerlooms operate in Surat city. W astewater, hazardous and solid waste, and air and thermal pollution is generated during dyeing, printing and solid. Waste yarn is also manufactured from petroleum in Hazir for polyester based textile mills. |
| 8 | Surat Municipal Corporation | Civic body resposible for the administration of Surat city and is responsible for disposal pf domestic waste. |

*Source: Compiled by TRC*

**The Mindhola river estuary**

The Mindhola river originates near Doswada, in Songadh in Tapi district, and meets the Arabian Sea in Surat district. It is 105 km in length, and has a catchment area of approximately 1518 sq.km. Before reaching the Arabian Sea, the river passes through the villages of Surat and Navsari coastal districts. Many smaller creeks join the river at different places, before it empties out into the Arabian Sea. Two dams- Kakrapar and Ukai- located upstream of Surat city, 116 and 87 km away, respectively, control freshwater flow towards the city. The Mindhola river system in Surat city comprises seven natural tributaries, Koyali, Mithi, Kankara, Khajod, Bhedwad, Sonari and Varachha.

There are a range of issues affecting the riverine ecosystem of the Mindhola river; sand mining, pollution from brick kilns, the discharge of treated and untreated effluents from industrial estates and the dumping of domestic sewage. Reports, from as far back as 1978-86[66], noted extensive but polluted sandbanks and mudflats along Mindhola. Wastewaters carrying heavy metals, such as nitrate, copper, zinc and lead, at the rate of 31 and 9 kg per day, were found to be released in the Mindhola. More than 85 percent of the effluent and sewage load was released through the Udhna Creek in the 1980s. Studies from 2016, on groundwater recharge in Surat city also found that ground water quality had been contaminated bythe presence of electrical conductivity (EC), Total Dissolved Solids (TDS)[67] and chloride. Key causes identified by the study were overexploitation of ground water, seawater intrusion and domestic pollution sources such as industrial growth, which leadto hardness, acidity and salinity[68].

Table 18: Polluting industries, pollutants and impacts in River Mindhola

| Sources of pollution | Pollutants | Impacts |
|---|---|---|
| GIDC Estates & CETP-Dyeing, fertiliser, rayon, chemical, pulp and pharma industries | Chloride (cl), nickle (ni),copper (cu),zinc (zn),lead (pb), chromium (cr), pesticide, cyanide, toxic waste | High TDS, TSS and turbidity[69], electrical conductivity(EC)[70] |
| Surat Municipal Corporation | Sewage and domestic waste | |
| Textile Mills | Fluoride(f), suspended solids, biodegradable organic matter, toxic organic compounds (e.g. phenols), and heavy metals | Suspended solids can clog fish gills, either killing them or reducing their growth rate<br>Reduced light penetration.<br>Reduced ability of algae to produce food and oxygen |

[66] Narvekar, National Institute of Oceanography, Dona Paula, Goa (1980)
Impact of Mining Activities and Super Thermal Power Stations on Environment, J.K Garg, Space Applications Centre (Nd)
[67] Total dissolved solids (TDS) comprise inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates) and some small amounts of organic matter that are dissolved in water.
[68] Zaveri and Patel, Analysis of Groundwater Quality with respect to Seawater Intrusion in Surat, American Water Works Association (2016)
[69] Suspended particles in water – high turbidity indicates bad water quality
[70] Indicates quantity of ions in water. Dissolved salts and inorganic matter such as sulphides and carbonate compunds cause hig electrical conductivity

| | | |
|---|---|---|
| Agricultural runoff | Pesticides (including different chemicals used to control pests in agriculture). | |

*Source: Interviews and secondary material compiled by TRC*

**Case Study:** The Gujarat Enviro Protection Infrastructure Ltd. (GEPIL)[71] polluting case is instructive in understanding the scale of pollution and the lack of accountability mechanisms for flouting environmental norms in the state. GEPIL, a CETP, is seen responsible for pollution in the Mindhola estuary for over a decade. The GEPIL CETP is part of the Luthra Group Company and pitches itself as anenvironment- infrastructure company that aides in waste recovery, recycling and environmental sustainability. GEPIL is involved in waste management projects across Gujarat, including hazardous, municipal, solid and liquid waste management. It is also in the process of creating a recycling and management zone in Dahej - a 500-acre park for recycling, rag-picker training and waste management. GEPIL operates a CETP in Udhna, Surat, formed in 2002. The plant receives, approximately, 200 kl of liquid hazardous waste from industrial estates, such as Ankleshwar and Sachin[72].

2005 onwards, multiple petitions and complaints were filed against GEPIL by villagers in neighbouring areas for releasing toxic waste into creeks, such as Unn khadi (creek), that lead to the Mindhola. After six years of complaints and demonstrations that saw the participation of 32 coastal villages, GEPIL was finally issued a closure notice from GPCB, under Section 5 of the Environment Protection Act (EPA), in 2011. In 2012, GPCB filed a court case against the Company. Villagers from Danti and Budiya report that GEPIL was issued a new license in 2012, and remedial measures in the form of newer technology were prescribed. Newspaper reports say the case is still ongoing.

In the six interim years, RTIs and the GPCB investigation reports found that GEPIL was charging the above mentioned GIDC estates for accepting their solid and liquid waste, for which they had inadequate treatment facilities. It was also illegally accepting 600 mt of plastic waste, for which it had no treatment facility. It is estimated that 1000 tonnes of waste, that can be incinerated, has been dumped, over the years, in the Unn Khadi, through three illegal connections and tankers. GEPIL also disposed more than 2000 mt of chromium waste without stabilisation in the treatment storage and disposal facility (TSDF). Pesticide and cyanide traces have been found in the creek and, over time, more than 250 buffaloes have died by consuming grass and water in the neighbouring areas. Worries remain about the impact of leachate from toxic waste stored in the plant premises.

[71] Information on GEPIL has been compiled from letters of complaint to the MoEF and GPCB from the Brackish Water Research Centre (BWRC), in Surat, documents accessed by RTI by BWRC, Letters from Department of Forest and Environment of Gujarat to GPCB as well as newspaper reports.

[72] Waste manager dumps it in the river, Down to Earth (2011)

**Impact on fishworkers in Budiya Village, Surat District**

**Village & History |** Budiya is part of the Surat Municipal Corporation, with an area of 3.6380Sq.km and a population of 2438 people[73]. It is located at the edge of the Koyli Creek, which meets the Mindhola river-estuary. Budiya falls between the Arabian Sea and the Udhna-Palsana Industrial Corridor, and is approximately 3 to 4 km from the Sachin GIDC. Budiya used to be a fishing village till the '80s and its main occupations were fishwork or agriculture. The village has, both, the Patel and Adivasi Halpathi fishing communities. The Koyli Khadi and wetland region beyond the Khadi extends till the Mindhola estuary and provided rich fishing grounds. Both,pagadiya and fishing by non-motorised boats of 15-20 metres took place and catch consisted of crab, lobster, catfish and Bombay Duck amongst others. The fish were present at the edge of the water and were plentiful. Each day's catch could be upto 20 kilos and was consumed and sold locally.

**Pollution/ River flow |** Over the last 10 years, major changes have occurred in the environment. Its resulting impacts can be seen in the village. The Kakrapar Dam and the Ukai Dam were made in the 1950s and 1970s, respectively. Because of the Ukai Dam, the volume of water flowing towards Budiya decreased, impacting marine life adversely. Where water once flowed freely, is now a stretch of sand, sludge, scraggly vegetation and babul scrub. The sea that was accessible through the river, is now a few kilometres long walk away. The riverbed has dried up and one abandoned boat stands rotting. Pollution from cities and industrial regions, as described above, further degraded the estuarine areas. Villagers report that there is a persistent smell of sulphur, and hold GIDCs and CETPs, such as GEPIL, responsible for the state of the Mindhola river. The villagers of Budiya were also part of the movement that led to the case against GEPIL.

**Fisheries & Livelihood |** By 2016, Budiya was no longer a fishing village, and the Patel and the Halpathi fishing communities have transitioned to daily wage labour. There is unemployment and lack of job security among the people. Most men and women work as contract labourers in the neighbouring GIDC estates, while others sell vegetables and fish bought from traders. These are temporary jobs, with earnings of Rs. 5,000-Rs. 6,000 per month,and no guarantee of future employment. The villagers are concerned about the impacts of pollution on their health. Speculation on increasing cases of cancer are present, but difficult to substantiate without better evidence.

**Impact on fishworkers in Danti Village, Navsari District**

**Village & History |** Danti Village falls in the Navsari district where the Mindhola merges into the Arabian Sea. As per the 2011 census, there are 655 families in the village and a population of 2,699. The river flows past the back of the village towards the sea. Danti used to be a fishing village, or machiwada, but now has only two families engaged in fishwork. The Mindhola, with its deep waters, was a preferred fishing ground for fishworkers in the region. Till 20 years ago, pagadiya fishing largely took place in the river, and traditional wooden boats without motors were in use. Big fish, such as cheer, sharks and dolphins, inhabited the estuary.

**Pollution/ River flow |** Over the last 10-20 years, there is a tangible difference in water quality, and the river water is black compared to the blue seawater. During monsoons, dirty

[73] As per the 2011 National Census

water and dead fish rise to the surface, and there is an apparent stink when the seawater comes in. Fishworkers interviewed,described how the few fish that are caught in the river are black in colour and have a layer of oil on them. Dead fish have been found in the estuaries and the baby/small fish born in the river are dying. Villagers have stopped swimming in the water and those who still fish have skin discolorations from when they have to stand in the river to push boats out to water. Oil spills have occurred on the coast. In 2009, a large spill took place and a line of dead fish could be seen for 10-12 km on the coast. No clean up took pace and the fish eventually disappeared back into the ocean with the movement of the tides[74].

**Fisheries & Livelihood I** Two boats are still in operation in Danti village. Lack of fish catch near the river bank and the coastal waters means that these two boats now fish approximately 20-25 km in either the open sea or the Purna river, rather than the Mindhola's estuarine region. Daylong fishing, using nylon nets, takes place with seven or eight people on board. The catchconsists primarily of pomfret and Bombay Duck. Bigger fish are also caught during the monsoons. The catch is sold and consumed locally. Approximately 19 boats from the neighbouring area of Bhimpore and 20-25 boats from Vansi-Borsi also fish in the Purna river and in the sea, 20-25 km out from the coast. The fishing families makes Rs. 2-3 lakhs a year, most of which is invested back into the coming fishing season. Fishworkers interviewed said they have not had to take a loan. This was because family members had migrated to the Gulf to work, as the income from fishing is not enough to sustain a joint family.

Migration to the Gulf is also taking place from the village because of a lack of job opportunity. Most villagers now work in the neighbouring industries, as contract based, daily wage labourers, and earn Rs.5,000-6,000 per month. The contractors are largely from outside the village.

**Conflict I** There have been cases of fishing nets being cut by the big boats that load coal at the neighbouring ports of Hazir and Magdalla. No compensation is given in such cases and this is a source of heavy losses for small fishworkers. Fishworkers say that sometimes the big boats cut through their nets on purpose but there is no way of demanding any compensation or fixing accountability.

**Fisheries Department I** Boats have permit cards that are checked by the customs department, but landings are not calculated. Fishworkers also said that repeated complaints to the fisheries department, about pollution in the estuary, have been ignored.

[74] Affected communities and environmental activists/ organisations in Surat attempted to communicate this information to relevant authorities such as the GPCB and Coast Guard, but no action was taken.

**Case 2: Hazira at the Tapi Estuary and Arabian Sea**

Area: South
Districts: Surat
Village: Hazira
River: Tapi, near-coastal region
Industry: Hazira Port and Industrial Area

> We have to run the household, don't we? Some or the other work must be found. Someone comes and tells us, come, I'll give you Rs. 200 to work in the field for a day.
>
> - Dhansuk, Fishworker, Hazira Village

**Industrial Overview of the Hazira Port and Industrial Area**[75]

Hazira forms one of the industrial areas in Surat district, and includes mainly large and medium industries. The Hazira Port and Industrial Area are located over 63 ha in the Choryasi taluka of Surat. The port is situated at the intersection of river Tapi and the Arabian Sea, and is 20 km from Surat city. The Hazira Industrial Area was established in the early 1980s, to take advantage of the region's proximity to the Bombay High offshore drilling station. The first industry was a gas based fertiliser factory – the Krishak Bharti Cooperative Limited (KRIBHCO). Other gas based production plants, such as NTPC, Reliance Petrochemicals, ONGC, have also come up in the region since 2003-2004. Hazira is known as the "single most sought after destination for investments[76]" in the state, and includes manufacturing of petrochemicals, fertilisers, heavy engineering, steel and energy. The operational and proposed industries in the area are as follows:

Table 19: Industries in the Hazira Port and Industrial Area

| S.No | Industry name | Sector / Type |
|---|---|---|
| 1 | Essar Steel Ltd. | Steel plant with power plants and jetty |
| 2 | Reliance Industries Ltd (Petrochemical complex with SPM) | Petrochemical manufacture |
| 3 | KRIBHCO Ltd. (Fertiliser manufacturing plant) | Fertiliser |
| 4 | L&T (Shipbuilding, Heavy Equipment, Turbines, etc.) | Forgings, etc. |
| 5 | NTPC (Power Plant Gas base) | Power |

[75] Information on the Hazira Industrial Area has been compiled from the judgment of the National Green Tribunal, Appeal No.79 of 2013, as passed on January, 2016. Documents and evidence of environmental violations collected by the appellants from Hazira, Surat, have been used for this study, as well as newspaper reports.
[76] Hazira becomes state's industrial hub, Business Standard, (2013)

| | | |
|---|---|---|
| 6 | ONGC (Petrochemical complex) | Petrochemicals |
| 7 | HAEP (Heavy water plant) | Atomic |
| 8 | Niko Resources Ltd. (Oil gas exploration /production) | Oil/gas |
| 9 | GSPC – Niko (Gas production & processing facility) | Oil/gas |
| 10 | Cairn Energy Pvt. Ltd. (Oil – gas exploration & production) | Oil/gas |
| 11 | Hazira LNG Port by Shell (LNG Terminal) | Port |
| 12 | Magdalla Port (GMB Port) | Port |
| 13 | ABG Shipyards Ltd. (ship building yard) | Ship Building |
| 14 | GSEG Power Plant (Gas base power plant) | Power |

*Source: Compiled by TRC*

Table 20: Proposed Projects in the Region

| **S.No** | **Industry name** | **Sector / Type** |
|---|---|---|
| 1 | Essar Steel Ltd | Steel plant with power plants and jetty |
| 2 | Reliance Industries Ltd (Petrochemical complex with SPM) | Petrochemical manufacture |
| 3 | KRIBHCO Ltd. (Fertiliser manufacturing plant) | Fertiliser |
| 4 | L&T (Shipbuilding, Heavy Equipment, Turbines, etc.) | Forgings, etc. |
| 5 | NTPC (Power Plant Gas base) | Power |
| 6 | ONGC (Petrochemical complex) | Petrochemicals |
| 7 | HAEP (Heavy water plant) | Atomic |
| 8 | Niko Resources Ltd. (Oil gas exploration /production) | Oil/Gas |
| 9 | GSPC – Niko (Gas production & processing facility) | Oil/Gas |

| | | |
|---|---|---|
| 10 | Cairn Energy Pvt. Ltd. (Oil – gas exploration & production) | Oil/Gas |
| 11 | Hazira LNG Port by Shell (LNG Terminal) | Port |
| 12 | Magdalla Port (GMB Port) | Port |
| 13 | ABG Shipyards Ltd. (ship building yard) | Ship building |
| 14 | GSEG Power Plant (Gas based power plant) | Power |

*Source: Compiled by TRC*

The Hazira LNG terminal and Port serves as a gateway port for north, west and central India, and is a deep water, all weather, direct berthing port in Surat. The Hazira Port Private Limited (HPPL) was formed in 2002. HPPL is a special purpose vehicle promoted by the Royal Dutch/ Shell Group and Total Gaz Electricite Holdings France. In 2009, HPPL signed a sub-concession agreement with the Mundra Port and Special Economic Zone Limited and GMB for the development of a non-LNG bulk/ container terminal at Hazira. This led to the formation of the Adani Hazira Port Pvt. Ltd. (AHPPL). West of the AHPPL, approximately 2.4 km away, is an LNG Port and Oil terminal operated by Nikko Resources Ltd. as a joint venture with the Gujarat State Petroleum Corporation. This includes a 50 sq.km (5000 ha) onshore and offshore block and the aforementioned LNG Port and Oil terminal.

**The Tapi River Estuary**

The Tapi, or Tapti, river originates in Betul district of Madhya Pradesh. It is the second largest westward draining river with a total length of about 724 km and a catchment area of 65,145 sq.km. The Tapi flows through the state of Maharashtra before meeting the Arabian Sea in Choryasi taluka of the Surat district in Gujarat. The Tapi is the second largest westward draining river of the peninsula.

A coastal water monitoring report by the Central Pollution Control Board categorises the Tapi as one of the most grossly polluted rivers in the country[77]. A study from 2014, published in the Journal of Environmental Research and Development, found that the Tapi receives an influx of pollutants that have changed the river's water quality. Three of four sites from where samples were collected found Dissolved Oxygen (DO) below prescribed norms, because of industrial and city waste disposal, leading to eutrophication in water and the death of plant and animal life[78]. The level of Total Suspended Solids (TSS) was high with resulting turbidity of water. The study also found presence of heavy metals such as cadminum and magnesium, as well as the hardness and alkalinity of water to be higher than GPCB prescribed norms. A study from 2013 also found indicators of Ph, turbidity, DO, BO and chemical oxygen to be beyond permissible levels. The same study also observed the presence of potassium, phosphate and ammonia in the water.

[77] Status of Water Quality in India- 2012, CPCB, MoEF (2012)

[78] Kamal, Hemangi et. al. Impact of Industrialization and Urbanization on Water Quality of River Tapi, Surat, Gujarat, India, Journal of Environmental Research and Development, Vol 9. No.2 (2014)

Similarly, a report by Comptroller and Auditor General (CAG)[79] released in 2011 that assessed the workings of the Narmada, Water Resources, Water Supply and Kalpsar Department of the State of Gujarat, also found that industrial units of Hazira released untreated waters to the estuary with high levels of hydrocarbons, leading to depletion of fish stocks. A report by the Integrated Coastal and Marine Area Management (ICMAM), released in 2002, says that the Hazira-Surat coastline is a high erosion area[80], making large projects and ports a risk to the stability of the coastline. Coastal erosion also results in a loss of land and increased salinity, which can be exacerbated by activities such as dredging, carried out to increase draft at ports.

Table 21: Sources and impacts of pollution in the Tapi river

| Sources of Pollution | Pollutants | Some impacts |
|---|---|---|
| GIDC estates and CETP | High quantities of silicate, phosphate and chloride | Categorised as grossly polluted<br>Low DO and BOD,<br>High turbidity<br>High Alkalinity, phosphate, ammonia, potassium, release of hydrocarbons |
| Hazira Industrial Estate | Silicate | |
| Surat Municipal Waste | Presence of Cadmium, Magnesium and hard water | |
| Cleaning of oil tankers at port | | High TDS, TSS and turbidity, EC<br>Suspended solids can clog fish gills, either killing them or reducing their growth rate.<br>Reduced light penetration.<br>Reduced ability of algae to produce food and oxygen |
| Dredging and port construction | | |
| Coastal erosion | | |

*Source: Compiled by TRC*

**Other impacts of coastal development**

Approximately 16 villages have been impacted by the development of the industrial area and port region, including the Hazira village. Hazira was an agriculturally rich area with fishing and agriculture as the main occupations. The east and west sides of the village contain reserved forests that host the critically endangered black back and long bill vulture. The coast near Hazira village is also lined with mangroves.

There was resistance to the acquisition of fertile agricultural land by the Hazira Industrial Complex (now termed Hazira Notified Industrial Area), even in the

[79] The Report of the Comptroller and Auditor General of India (CAG), performance audit of the Forest, Environment, Narmada, Water Resources, Water Supply & Kalpsar, and Sports, Youth Services and Cultural Activities Departments.
[80] Ecological Profile of Coastal talukas Around Gulf of Khambat, GEC (2002)

1980s, which led to protests by the villagers. Land was initially acquired from farmers by the GIDC, under the guise of 'national development', for token compensation, but was later sold to the existing industries at premium prices. Much of the farming land, private and common village land of approximately 5267 ha, was converted to industrial use.

Environmental issues are now a major concern but complaints or documented evidence is not available. Oral accounts indicate that not only fishworkers but farming and agricultural communities have also been impacted by the transformation of Hazira into an industrial zone. Air pollution is a significant problem, with uncontrolled emissions and/ or flares by petrochemical complexes visible on the road from Surata to Hazira. Essar's steel furnace and the forging units of L&T also release emissions and the entire road approaching Hazira is covered in dust, exacerbated by the constant movement of trucks and coal stockpiling at the port. The forest reserve that houses endangered vultures is 200 metres from the Essar steel furnace and 1 km from L&T's forging units. The Shell L&G terminal and the Reliance Petrochemical Estate are also within 5 km of the reserve forest, endangering the vultures' resting and feeding grounds.

Farming of cucumber, gourds and other vegetables takes place, but villagers report that the vegetables become black with dust from Essar's steel plant. Contracts for trucks transporting coal and urea have been given to local people in a bid to create local employment. Community members and activists from Surat further claim that the plastics factory inside the RIL compound is also increasing pollution load in the waters, by releasing untreated water into the Tapi estuary from where it flows into the sea.

**Impacts on fishworkers**

**Village & History |** As per the 2011 census, the Hazira village has a total population of 16,724 people and 4,443 families, consisting of fishworkers, traders and farmers. The village has 80 Adivasi fishing families who, historically, fished in the intertidal zone of the Tapi river and the Arabian Sea. The entire region is a rich intertidal zone with active mudflats. The Halpati community traditionally followed pagadiya fishing, and the caste families such as Koli Patels did fishing by boat. The fishing hamlet of Hazira village is only 2 km from the HPPL and AHPPL ports and is bound on the west by the open sea and on the east by the Tapi estuary. The hamlet used to have access to both fresh and marine waters where fishing took place.

**Pollution/ River flow |** The traditional fishworkers of Hazira have been pauperised by the development of the LNG terminals and ports, as the physical infrastructure of the port reclaimed land, blocked access to the sea and released oil sludge from cleaning tankers. According to fishworkers from Hazira village, pollution in the estuarine region, traffic because of port activity, and the cleaning of oil tankers in the sea, are the main reasons for the disappearance of fish.

**Fisheries & livelihood |** Dhansuk Halpathi, a fishworker elder and president of the Hazira Machimar Samiti reports that the most adverse impacts on the lives and livlihoods of Hazira fishworokers occured in the last 10 years due to Adani's project. By 2009-2010, the realisation that industry could destroy fishworker''s' livelihoods was dawning on the community and by 2016, the Hazira fishworkers no longer followed their traditional occupation. The Hazira village has approximately 80 fishworker families who have lost their livelihoods.

These are registered fishworkers who have received no compensation or benefits from the fisheries department or the industries. Pagadiya fishing has stopped completely and only one boat goes out to sea, to a distance of 10 NM, with approximately six or seven people on board. Each person has to pay Rs. 50 for a seat. The route to access the fishing ground has been fenced off and villagers have to travel a few kilometers on foot, or by bike, to reach the coast where their boat is moored. From catching big fish like swordfish, dolphins, jewfish, ghol, hilsa at the coast, the main catch now is low-value levta (mudskippers) that live in mud in nearby islands and are sold for Rs. 80 per kg. From making at least Rs. 10-12 lakhs per year, fishworkers now barely manage Rs. One Lakh.

The Halpati community now leads an insecure existence as daily wage labourers. Dhansuk laughs at being asked how they manage to make ends meet. "We have to run the house no? We have to do some work or the other. Someone will come say, work in my fields, I will pay you Rs.200 for the day". The main source of income for the community, ironically, is the waste product produced by Essar in the process of manufacturing steel. Waste scrap, which has a percentage of iron ore content, is produced as a by-product of steel manufacturing. The scrap is dumped on the beach and the ground leveled. Smaller pieces are picked up by villagers, both men and women, and sold to scrap units in Mumbai. Some 200-300 kg is picked up and loaded onto Honda Activa scooters, modified for this purpose. One kilogram will sell for Rs. 4 and, in a day, people can make up to Rs. 200-500. But fishworkers say that "it is harder work for less, they need space for dumping and we need food to eat, they will keep filling and we will get food to eat. That's how it is". While the dumping of scrap is legal, the lifting is not and is subject to the whims of the company officials and the local sarpanch (village head). During election time, for example, the dumping and lifting is stopped, leaving the entire village with no income opportunity. A forest area has also been demarcated for dumping and, villagers report, while a forest clearance has not been obtained, a compound has already been constructed demarcating the area.

Dhansuk narrates that educated people from the village, who have been employed by the factories, earn approximately Rs. 8,000 to Rs. 10,000 a month. But the fishworkers' community is not literate and cannot access such jobs. Moreover, the AHPPL, specifically, employs only migrant labour. The nature of work creates a barrier and those without educational qualifications have limited opportunities. For example, helpers for cranes in companies such as Essar Steel and L&T are in high demand but local people are not used to climbing and working at a height. Villagers also recount unreported deaths of migrant labourers over the years. A by-product of the changing economy is the transformation of women's labour in the fishing community. Women traditionally cleaned and sold fish caught by their male family members. Now, most have either stopped working or they lift scrap and work as domestic servants for upper caste communities in other villages in Hazira.

In 2013, a case was filed with the NGT by the Hazira Machimar Samiti and the residents of Hazira, on the grounds of invalid environmental clearance, destruction of mangroves, the restriction of mouth of the creek and illegal reclamation of land and dredging that harmed the marine ecology and fishworkers' livelihoods. In 2016, the court ruled in favour of the appellants, stating what seems to be the norm with industries in Gujarat, that “obviously, AHPPL laboured under impression that it can manage with the authorities to alleviate the problems”. The NGT found that the disputed Environmental Clearance (EC) was illegal and that environmental degradation and damage was clearly observed.  AHPPL was ordered to pay a penalty of Rs. 25 cr towards the restoration of mangroves and the judgment has now been challenged in the Supreme Court. Dhansuk, also one of the petitioners, say "with the case, we finally got some hope".

**Case 3: Umarsai at the Par Estuary & Case 4: Umbergaon at the Kolak Estuary**

Area: South
Districts: Valsad
Village: Case 3: Umarsari, Case 4: Umbergaon
River: Par and Kolak
Industry: Various

The district of Valsad, south of Navsari, borders the state of Maharashtra. The union territory of Daman and Diu is situated within the district and is administered independently. Valsad has three coastal districts (Pardi, Umbergaon and Valsad), out of a total of five districts, with a population of 1,705,678 persons. Within Valsad, the Umbergaon to Umarsadi coastal stretch of 50 km is the most prosperous fishing and fish breeding ground in south Gujarat[81]. In 2011-2012, the district of Valsad had 87,594 thousand tonnes of fish production, which was 12.65 percent of total fish production in Gujarat.

Valsad is also known as the chemical hub of Gujarat and its estuarine systems and coastal belt reflect this status. The river systems in Valsad and Daman and Diu are Daman Ganga, the Kolak river and the Par river that were found to be channels through which pollution, both industrial and domestic, reaches the Gulf of Khambat. If on the one hand, pollution forms a key source of conflict for fishers, on the other, the region, being a rich fishing ground, also attracts trawlers and purse seining boats from Saurashtra, Daman and Diu, as well as Maharashtra. Squeezed between pollution on the estuarine and coastal zone and trawlers beyond 5 NM, the fish workers are resorting to migration, both occupational and regional, in search of better fishing grounds. Unlike Danti and Budiya, where fishing has been wiped out, Umbergaon and Umarsari Villages in Valsad still have a significant traditional fishing community.

- Case 3 is based on interviews from the Umarsadi village, situated where the Par river meets the Arabian Sea. The village has traditionally accessed rich fishing grounds near their coast and the Umarsadi fishing association has a strong presence. The village consists mainly of traditional fishworkers.

- Case 4 is based on interviews in Umbergaon, situated at the edge of the coast, where the Kolak river meets the sea. Umbergaon has a prosperous fishing community, some of whom are also trawler owners operating boats from Saurashtra or Maharashtra. The coast is significantly impacted by pollution in the Kolak river and nearby creeks, because of the Vapi and other industrial estates. Umbergaon and the neighbouring Maroli village have also been successfully resisting a Greenfield port development project in the area, since early 2000s.

**Industrial overview of Valsad District:**

Valsad is known as the chemical hub of south Gujarat, with textiles, paper and paper pulp, horticulture, plastics, metal steel fabrication, rubber and furniture forming other prominent industries. It has a total of 2,983 industrial units and 63 medium and large scale industries. It also hosts the Vapi Waste Management Company, which is one of Asia's largest CETP. Unlike

[81] As per Census Data 2011

Dahej in Bharuch and Hazira in Surat, Valsad has fewer large industries and ports on the coastline, and the main cause of pollution has been the GIDC estates and other small and medium scale industries.

The following industrial estates are located in the coastal talukas of Valsad district:

Table 22: Main industrial estates in Valsad District

| GIDC | Area | Units |
|---|---|---|
| Vapi | 1135 | 1175 |
| Sarigam | 395 | 580 |
| Umargam | 396 | 681 |
| Pardi | 23 | 110 |
| Valsad | 106 | 435 |

*Source: Brief Industrial Profile of Valsad District, MSME Development Institute GoI*

Table 23: The following private industries are located in the coastal talukas of Valsad

| Taluka | Industry Name | Sector /Products |
|---|---|---|
| Pardi | Aarti Industries Ltd | Chemicals |
| | GHCL Ltd. | Textile |
| | Hindustan Inks Ltd. | Chemicals |
| | Pidlite Industries Ltd. | Chemicals |
| | Raymond Ltd. | Artificial and synthetic fibre |
| | Ruby Mascot Ltd. | Paper |
| | Sun Pharmaceuticals | Pharmaceuticals |
| | United Phosphorus Ltd. | Electronics |
| | Welspun Polyesters India Ltd. | Cotton textile |
| Valsad | Atul Limited | Chemicals |
| | Wyeth Lederle Ltd | Pharmaceuticals |
| Umbergaon | Sarigam Steel Ltd. | Iron, stainless steel products |

*Source: Brief Industrial Profile of Valsad District, MSME Development Institute, GoI*

**The Par river estuary**

The Par river originates at Paykhad in the Satpura mountains in Maharashtra and meets the Arabian Sea in Valsad. It is 52 km in length with a catchment area of 907 sq.km. In the 1980s, a weir dam was constructed 6 km upstream of the mouth of the estuary, to store water for the Atul Chemical Complex. The complex was to discharge 25,000 $m^3$ per day of wastewater into the estuarine region below the weir dam[82].

Table 24: Polluting industries, pollutants and impacts on the Par river

| Sources | Pollutants | Impacts |
|---|---|---|
| Wastewater from Industries | Heavy metals: Cadmium, chromium, lead, manganese, mercury. nickel and zinc<br>Organohallogen compounds | Low DO, alkalinity<br>Suspended solids can clog fish gills, either killing them or reducing their growth rate.<br>Reduced light penetration.<br>Reduced ability of algae to produce food and oxygen |
| Domestic sewage | | |
| | | |

*Source: Compiled by TRC*

Case study of Atul Industries Pvt Ltd.

Since the 1980s, one of the significant industries causing direct pollution in the Par river has been M/S Atul Ltd., established in 1947. Occupying a land area of 488 ha, Atul Industries manufactures dyes, chloral alkali, pesticides, bulk drugs, pharmaceutical resins and other chemicals, with a total capacity of 31,237.96 TPM. Atul Industries is a chemical company with subsidiary companies in the USA, the UK, Germany, China, Brazil and the UAE.

Atul Industries discharge wastewater and effluents into the estuary of the Par river through a 4 km long high-density polyethylene (HDPE) pipeline. The average wastewater generated is 7418 kl per day, as per the company's compliance report[83], whereas the environmental audit report for 2016 states that an average of 7009 kl per day is discharged. The total consumption of water is 6005 kl per day for domestic and industrial use, which is taken from the Par. Atul Industries generated electricity from a captive power plant of 34 MW and, as of May, 2016, has been granted environmental clearance for a further 22 MW expansion.

No compliance reports from before 2016 are to be found in the company or on the GPCB website. In the absence of previous compliance reports, some of the issues noted in the 2016 report were : no systems exist for the monitoring of effluent quality at discharge point, of data of ground water quality around hazardous storage facility as per EC conditions, of gaseous emissions and particulate matter such as SPM, SPZ and acid mist. The status of hazardous waste management rules and monitoring reports from SPCB were also not submitted to the CPCB, technological advances for cleaner production were not complied with or no such details were furnished, and the health and safety

[82] M D Zingde, Pollution in River Par and its abatement, Indian Journal of Marine Sciences, Vol 8 (1979)
[83] Atul Industries, Environmental Compliance Report, (2016) and Environmental Impact Assesment Report for expansion of Atul Limited (2015)

training and facilities for workers were inadequate. Moreover, the EC report states that a 22 MW captive power plant was constructed before clearance was granted, and the replacement of the mercury cell in the plastic soda ash plant and the construction of new chemical units were also undertaken without clearance, in violation of EPA, 1986. Irrespective of construction prior to permission, and the previous track record of compliance with environmental norms, permission has been given for further expansion of the industry for the manufacture of agro chemicals and construction of a captive power plant.

From 1980s till now, independent studies have established pollution in the estuaries of the Par. The key sources of pollution are identified as effluent discharge from Atul Industries, domestic waste, sewage and agricultural runoff from neighbouring fields. Physico-chemical investigations of the main estuaries of Gujarat took place during different periods across 1978 and 1986, and the Par was classified as highly polluted with 25 MLD (25000 kl per day) of effluent discharge per day. A study conducted in 1980 by the Donna Paula Institute of Ocean Studies observed that the water had highly acidic effluents (pH> 3, where 6.5 to 8.5 pH is desirable) and DO had decreased to 1.4 mg/l near the weir dam, which is too low for fish to survive[84]. Over three decades later, in 2015, Atul Industries was again identified as one of the key sources of pollution in the Par, along with other anthropogenic stressors and the addition of sand mining. The study from 2015 further concluded that "the water of the river Par at sampling site with lower value of DO represents serious threat to the ecosystem due to anthropogenic pollution[85].

**Impacts on fishworkers in Umarsadi Village, Valsad district**

**Village & History l** Umarsadi, in the Pardi Taluka of Valsad, is one of the largest fishing centres in south Gujarat. Located at the intersection of the Par estuary and the Arabian Sea, the village has 6000 fishing families that have carried out daily fishing through pagadiya and by small boat within 5 NM of the coast for generations. Fishworkers belong to the Tandel[86], the Koli and the Halpathi communities. Big fish such as sharks, Dada-Gol and Bombay Duck were caught and sold to Maharashtrian and local traders. The entire family of a fishworler is involved in fishing; traditionally, the men caught fish, the women cleaned and sold them in the local markets.

**Pollution/ River flow l** The entire coastal region of Valsad has been affected by pollution and a degradation of the estuarine zone. According to the villagers, the estuarine water has been impacted up to 5 NM downriver from the industry. Plastic sewage and waste accumulates in the intertidal zone, contributing to bottlenecks in the estuaries. While stiff opposition against effluent dumping by Atul Industries led to the installation of a filtering plant, villagers remain sceptical about whether the filtering process is regularly followed. Villagers also report that effluents from the Ankleshwar industrial area are illegally dumped in the Par, upstream of Umarsadi village.

[84] Narvekar (1980)
[85] Patel and Vaghani, On physical and chemical characteristics of estuaries of Southern Gujarat, Correlation Study for Assessment of Water Quality and its parameters of Par River Valsad, Gujarat, International Journal of Innovative Research in Engineering, Volume 2, Issue 2 (2015)
[86] Tandel referes to a community as well as boat overseers or deck boss hired by boatowners.

**Fisheries & Livelihoods |** Fishworkers report that fish catch has reduced drastically over the last 10 to 15 years. The catch now consists of Bombay Duck, prawn and pomfret andis sold either locally or to traders from Maharashtra. Two or three species of shark are also found in the fishing ground. High value are no longer found in the estuarine region, and fish that are found, are not fit to eat because of pollution. Fishworkers now use 15-20 feet boats with motors to travel 15-20 NM towards the sea on daily fishing trips. Each family has, at least, one boat and three people go out to sea on each trip. Each trip costs approximately Rs. 1,200 to Rs.1,500 per trip and each boat makes approximately Rs. 5000 to Rs. 10,000 per day during peak fishing season, from August to October. The more prosperous fishing families also employ Adivasi men from south Gujarat as labourers in their boats.

Fishworkers in Umarsadi believe that the next generation will no longer be fishing. Pagadiya fishing has suffered the most, affecting the poorest families in the village. More and more villagers, both men and women, are transitioning to daily wage labour in neighbouring industries. As in Danti and Budiya, the trend is towards contract employment with a salary of Rs. 5000 - Rs. 6000 per month. Women from the village are seeking employment in the plastics and paints industry, with long hours of work, less pay and hazardous conditions. Education, the villagers say, does not guarantee a better job, as either employment opportunities are not available or only materialise through donations to middlemen. Previously self-employed fishworkers, who are not able to sustain fishing, are also migrating to larger fishing harbours, such as Jakhau in Kutch and Porbandar and Veraval in Saurashtra, as labourers on mechanised boats.

Adding to the advantage of larger boats and longer trips is technology, such as fish finders, GPS, radios, battery, lights for signaling, etc. While a number of small fishworkers in Umarsadi have GPS, radios and signal lights, more sophisticated fish finding equipment is found only on larger trawlers who have the capital to invest in expensive technology.

**Conflict |** As pollution and a degraded estuarine belt, with resulting decreasing fish catch, force fishworkers to move further out into sea, conflict and competition between small-scale fishworkers and trawlers have been exacerbated. Purse seiners that are banned in Gujarat operate from Daman and Diu and fish in the same grounds, as do trawlers from Mangrol. Trawlers stay at sea for 10-15 days at a stretch and fish with active nets that dredge large swathes of the earth, catching small fish and large quantities of bycatch. Fishworkers from Umarsadi say that the big boats catch in one trip what a many smaller boats would catch together, leading to unsustainability of fish catch. Fishworkers also reported incidents of trawlers damaging their nets.

**Fisheries Department |** The lack of oversight and assistance by the government and the fisheries department is also apparent in other cases, such as the lack of basic fishing infrastructure in the village. The fishing jetty in the village has been broken for three years and the fisheries department has not repaired it after repeated requests. Similarly, fishworkers have no access to any loans or schemes for subsidy of basic equipment. The subsidy on diesel exists on paper but does not reach the fishworkers in time.

The Fishworkers Association of Umarsadi identified mechanised trawling in their fishing grounds as a major threat to their sustenance, and rued the lack of government regulation of fishing grounds. They believe that the government needs to play a role in ensuring equal access and opportunity to traditional fishwokers, through subsidies on technology, financial

assistance schemes and the protection of extended fishing grounds. They also indicated that the coastguard needs to play a regulatory role in ensuring protection of fishing grounds, as, for now, their role seems limited to security matters.

**Other issues l** Apart from issues of pollution by waste and effluents, salinity ingress and coastal erosion are also taking place across the coastal region. The quality of underground water has deteriorated and water from the well is no longer usable. Other issues like mining are also destroying the coastal ecology. Sand mining takes place at Dholai, 30 km upstream from Umarsadi. While sand mining within 5 km, with permission, is legal, villagers believe that mining contractors do not follow the guidelines and extract more sand than permitted.

In addition to pollution and the degradation of coastal waters and the estuarine region, Umarsari village raised a number of other issues that characterise the constraints o fish work today. Significant obstacles, all driven by the primary problem of industrial pollution on the estuarine and near-coastal fishing regions, are a) the changing nature of fishing technology and variegated access to the same, b) the conflict between fishing as livelihood and fishing as a business, c) over-fishing and d) conflict due to changing fishing grounds within the EEZ.

**The Kolak-Daman Ganga river estuary**

Daman Ganga rises in the Sahyadri hills of Maharashtra, which form the Western Ghats, and meets the Arabian Sea in Daman. It has a total length of 131.30 km with a catchment area of 2318 Sq.km. The important tributaries of the river are Dawan, Shrimant, Val, Rayte, Lendi, Vagh, Sakartond, Dongarkhadi, Roshni and Dudhni. The Madhuban Dam has been constructed on the river at Dharampur taluka, in Valsad, to supply water for domestic, industrial and irrigation use. River Kolak originates from the Satpura mountains in Maharashtra, like the Par, and meets the Arabian Sea in Daman. It travels over 50 km and has a catchment area of 584 sq.km.

Both the Kolak and the Daman Ganga rivers meet the Arabian Sea in Daman and Diu. The Daman Ganga river in the south and the Kolak river in the north cut through the UT. Daman & Diu also have a host of industries and distilleries that dispose industrial effluents and waste into both rivers. The Vapi Industrial Estate has been repeatedly classified as one of the top three critically polluted areas in the country, and the Vapi CETP is the oldest and largest CETP in Gujarat. Industrial effluents from the Vapi CETP are responsible for pollution in both rivers. Domestic waste from villages and sand mining also contribute to pollution and coastal erosion.

Contaminants were found in Daman Ganga in the early '90s[87]. Treated effluents and sediment samples beneath the untreated stream from the CETP was found to contain toxic chemicals and heavy metal contamination listed in the table below. The same report also found that solid waste, or sludge, was dumped in the periphery of the CETP, the runoff contaminated the river and that the CETP was "ineffective in removing a wide range of toxic, persistent and bioaccumulative compunds".

[87] Santillo D., Stephenson A., Labounskaia I. And Siddorn J. A preliminary survey of waste management practices in the chemical industrial sector in India: Consequences for environmental quality and human health. GRL Technical note 96/8, Greenpeace Research Laboratories, UK, (1996)

Table 25: Contaminants found in 1996 by Greenpeace

| Name | Description | Impact |
|---|---|---|
| Organohalogen compounds | Di, tri, tetra, penta and hexa chlorobenzenes,chlorinated benzamines, chlorinated diazobenzenes and polychlorinated biphenyls (PCBs), N-alkylated benzamines, carbazole derivative, chloropyrifos (pesticide), and linear aliphatic hydrocarbons | Identified as Dioxins and Organohalegons, the organic pollutants create toxicity in wildlife and fish. If released in water and soil, they also accumulate in fatty tissues of fish and other livestock, resulting in contamination being passed to humans through the food chain. Accumulation and direct exposure has adverse consequences on physiological development. A study from Italy[88] on an industrial accident found a correlation between halogenated hydrocarbons and Dioxin exposure and chloracne, neuropathy diabetes, respiratory and cardiovascular disease and increased incidents of cancer. PCBs were discontinued across the world in the '90s because of environmental concerns. |
| Heavy Metals | Cadmium, chromium, copper, lead, mercury, nickel, manganese and zinc | The main threats to human health from heavy metals are associated with exposure to lead, cadmium, mercury and arsenic. These can result in neurological damage in adults, and children are highly susceptibility. Specifically seen to accumulate in fish, leading to a transfer to human beings. Heavy metals can be toxic. |

*Source: Compiled by TRC*

Repeated attempts to take action against pollution from the GIDC estate and CETP have taken place over the years. Closure notices were issued to industrial units for lack of membership with the CETP in 1997, and court cases were filed in 1995 and 2005. In 2009 and 2013, the Vapi Industrial Estate was declared a critically polluted area and pollution abatement plans were identified. But data collected in 2014, via the RTI Act[89], indicated that BOD and COD levels at inlet and outlet norms of the Vapi CETP for five years were above permissable levels, indicating clearly that consent conditions are still being violated.

[88] Bertszzi, Bernucci et al, The Seveso Studies on Early and Long Term Effects of Dioxin Exposure: A Review, Vol. 106, Supplement 2, Environmental Health Perspective (1998)

[89] Patel and Goswami In Vapi, can decades of damage be finally turned around? (2015), India Together (based on RTI Information)

The table given below represents the main sources of pollution in the rivers and coastline across Valsad.

Table 26: The causes of pollution and pollutants in Kolak and Daman Ganga

| River | Sources of pollution | Pollutants | Impacts |
|---|---|---|---|
| Kolak | Vapi Industrial Area, Sarigam Industries, Domestic waste from towns Kathalwad and Sanjan, sand mining | Effluents and wastewater<br>High BOD<br>Low DO<br>Heavy metal contamination (zinc, manganese, mercury, nickel, chromium, copper)<br>Presence of contaminants such as organhalogen and dioxin compounds | Accumulation of toxic chemicals and pollunats in fish which are passed on to humans through consumption.<br>Toxicity of underground water<br><br>Change in chemical composition of water disturbing life of marine species |
| Daman Ganga | Vapi GIDC, distilleries Sarigam Industrial Area | High BOD<br>Low COD<br>Heavy metal contamination (zinc, manganese, mercury, nickel, chromium, copper)<br>Presence of contaminants such as organohalogen and dioxin compounds | |

*Source: Compiled by TRC*

**Impacts on fishworkers in Umbergaon village**

**Village & History |** Moving south towards Maharashtra, the Umbergaon-Maroli-Nargol belt in Valsad is one of the richest fishing grounds in south Gujarat. It is a popular tourist area and is also being promoted for eco-tourism by the state government. Umbergaon village is a fishing village with approximately 1800 fishing families in a panchayat with a population of 8000 people.

**Pollution/ River flow |** Interviews suggest that the entire belt, from Umbergaon to Nargol-Maroli- Talai-Daman and Umarsadi, a 50 km stretch, has been plagued by pollution over the years. Fishworkers from Umbergaon say that the coastal zone has transformed into a chemical zone. According to them, the Sarigam and Vapi Industrial Estates and private companies such as Atul Industries have been releasing untreated effluents into the estuarine system and the sea for decades. Adding to industrial pollution is the municipality waste from Umbergaon and neighbouring villages of Khattalwada and Sanjan. As mentioned above, the main rivers affected by pollution surrounding Umbergaon are the Kolak, the Daman Ganga and its tributaries, such as the Varoli creek. Fishworkers interviewed said the waters of Varoli creek have turned red because of contamination. Cases of fish kill or die-offs are common

and have been recorded by the villagers[90]. Along with water pollution, air pollution was also reported, as the stink from Sarigam Industries can be smelled 25 NM away in the sea, at night. Fishworkers report finding sewage waste in the sea, including plastic and polythene.

**Coastal Pollution**: Case study of Sarigam GIDC[91]
The Sarigam Industrial Estate is a separate estate situated 15 km from the Vapi Industrial Estate. Sarigam Industries have been accused of polluting groundwater with known carcinogens in its surrounding areas and dumping untreated effluents through an illegally constructed pipeline at Tadgam beach, in the Umbergaon-Maroli coastal stretch of Valsad district.

A report of water samples collected from a borewell at Okarkhadi, in the town of Sarigam, by Greenpeace in 1999, found that untreated wastewater was being pumped directly into borewells around the Sarigam estate. The study noted that "Chrlorinated solvents are largely used to manufacture chemicals to make synthetic, resin and nylon fibre and chlorinated benzene are used to manufacture solvents necessary for pesticides" and further stated "the concentration of trichloroethene present exceeded the US EPA permissible levels set for drinking water by a factor of four. Benzene is a known human carcinogen and dichlorobenzene is a persistent organic contaminant that is resistant to microbial breakdown and is suspected to inhibit the microbial degradation of other chemicals"[92].

In addition to dumping of untreated wastewater in neighbouring areas, Sarigam Industries has also been dumping effluents in the Tadgam beach of Valsad district through a 13.34 km long pipeline, since 1999. The pipeline crosses the villages of Maroli, Nargol, Saronda and Tadgam, with leaks and consequent leachates and seepage into the ground. Newspaper reports and interviews from 1999 onwards indicate that farming, horticulture and fishing in both regions have been adversely impacted. Frontline magazine, in 2010, reported that, according to the Directorate of Fisheries, there has been a 64.3 percent drop in the fishing industry of Daman and Diu, attributable to the growing pollution in the region. Effluent release is also reported to have caused skin and respiratory problems in the population of the four villages[93].

In 2009, a public interest litigation was filed by the residents of Lord's Housing Society in the Gujarat High Court, later joined by the affected villages, against the Sarigam GIDC. The petition sought to stop disposal of effluents until treated water met the discharge criteria of the GPCB. Closure notices were issued to 50 units after the court hearing in 2009, and newspaper reports from 2011 indicate further action on industries in Sarigam Industries. The logic for choosing these particular industries has been questioned by activists and villagers and, while a CETP has been proposed, the GPCB website indicates that no such CETP is currently functioning.

[90] Dead fish found on the banks of Kolak river, Himanshu Bhattl (2011)
[91] Compiled from newspaper articles and copy of petitions filed by affected persons.
[92] Greenpeace (1996)
[93] Lyla Badvam, Frontline poisoned beach (2010)

**Fisheries & Livelihood |** The bandar and makeshift jetty of Umbergaon village is situated on the banks of the river Kolak. Because of close proximity to rich fishing grounds, the turnover of Umbergaon bandar is an estimated Rs. 400 cr per annum, as found during interviews. Prosperous community members also operate trawlers from ports in Mumbai and Saurashtra. The 125 boats that operate from the Umbergaon bandar are wooden or fibre boats with doll-nets. Six to seven people, including the boat owner and the labour, go out to sea in one boat. Majority of boat owners in Umbergaon are infrom the Tandel community, and hire local Adivasi labour from neighbouring villages to do the work of sorting, cleaning and drying. In Umbergaon, labour is of two types; people from the traditional fisher community and Adivasis from the Dubra, Mitna or Warli communities from the forest areas of Sanjam, Udwada, Talaasi, Silvaasa and Tadvi. Fishworkers suggested that "the business survives because of them (Adivasi labour)". Male labour that goes out to sea is paid Rs. 300 a day on big boats and Rs. 200 a day on small boats, while women are paid Rs. 200 per day for sorting and cleaning the fish. Pagadiya fishing also takes place on the coast and small fish such as boi and jhinga are caught.

The peak fishing season in Umbergaon is in October and November, and the main catch consists of Bombay Duck, sold locally, and pomfret, lobster, ribbon-fish, squid and Dada-Gol, which are exported to Europe, China and Dubai. The air bladder of Dada-Gol (Jewfish) is the biggest and most profitable catch. Selling at up to Rs. 1.5 lakh per kg in the market, for export to Singapore, it forms the mainstay of the fishing economy, with other high value fish slowly dwindling in number.

The traditional fishing community is not optimistic about its survival. Fishworkers interviewed said that till the '80s, Umbargaon had about 100 traditional boats and enough fish stock available, and the '70s and the '80s were a great time for fishing. Over the last 20 years, fish catch has become unpredictable and boats often come back empty. Many high value fish species, such as different species of shark fish, pomfret, lobster, catfish have reduced. Fishworkers say that there has been a 50-75 percent reduction in fish stock in the area. They estimate that the fishing business will survive for another 10-15 years.

Fishworkers in Umbergaon identified the three key problems they face a) decreasing fish stock, b) a lack of labour to work on boats and c) the lack of available capital. Smaller fishworkers with traditional or mechanised boats are feeling the crunch most sharply, as the distance of fishing increases, leading to higher investment costs, which they are unable to recover. As diesel and ration become expensive, no avenues for loans are available and fishworkers fall into debt.

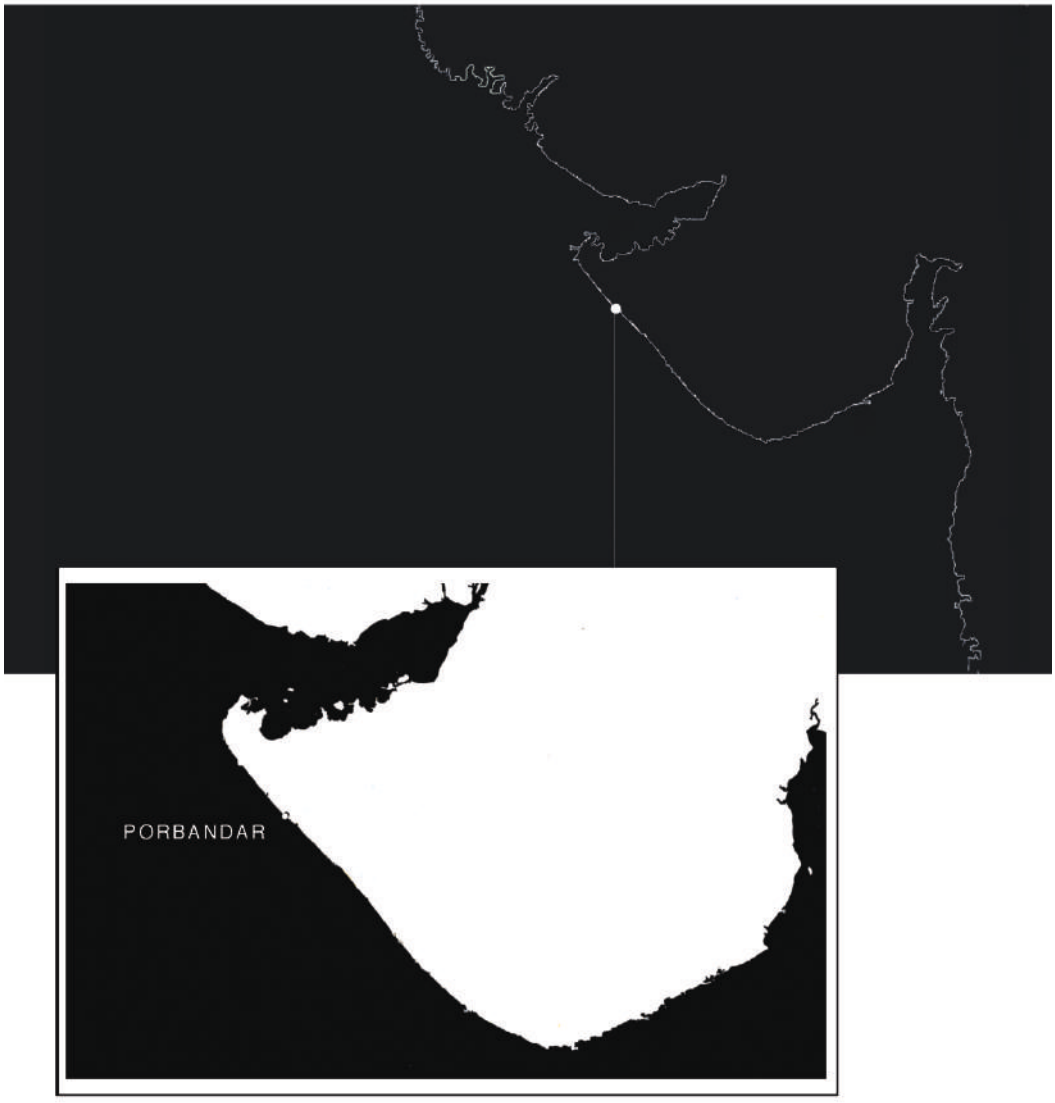
This has led to a number of actions by which the community is trying to ensure its survival. On the one hand, those who can afford it are getting their children educated so they have occupational choices. Boat owners are taking their boats (both trawlers and outboard engine boats) to larger jetties in Saurashtra and Kutch, while those without boats are migrating to the two regions to work as khalassi (labourers). Fishworkers in Umbergaon say that fishing survives because of Adivasi labour, as people belonging to the fishing communities in the village migrate elsewhere.

**Conflict |** As fish catch decreased in the '80s and '90s, fishworkers from Umbergaon now travel 25-30 NM into the sea for their daily fishing. As in the case of Umarsardi, this has led to a growing conflict with trawlers from Mumbai and Saurashtra that come to Umbergaon

because of its extensive fish catch. While purse seiners are banned in Gujarat, they operate from Mumbai. Purse seiners only have permission to fish in the deep sea, but are, instead, working only 15-20 NM away from the coast, creating a direct conflict with traditional fish-workers and smaller trawlers in south Gujarat. Fishworkers approximated that there are 15-20 such ships operating from the Daman and Diu and over 150 operating from Ratnagiri, in Mumbai. Fishworkers from Umbergaon have petitioned the Valsad fisheries commissioner with no recourse. Fishworkers are unclear about rules and regulations regarding fishing areas and have been advocating for some form of restrictions on the trawlers operating in their region.

**Fisheries Department |** Infrastructural problems identified by the fishworkers in Umbergaon unaddressed by the fisheries department are the fish processing centres situated in either neighbouring Mumbai or Saurashtra. The distance increases transport costs that cut into their profits. (Transport is at an average Rs. 5 per kg). Price of fish fluctuates and depends entirely on the market, with no basic minimum rates. Moreover, requests to the fisheries department, for the construction of a jetty, remain unmet. Limited state support is seen as the main disadvantage for the fishing community.

**Other issues |** Land erosion, sand mining, decreasing quality of drinking and underground water due to aquaculture were mentioned in the interviews. A lack of representation of fishworkers in politics, necessary for any kind of socio-economic benefit in the state, was acutely felt by the more prosperous fishworkers. It is evident that traditional fishing remains an anachronism in the industrial landscape of Gujarat.




# The Saurashtra Coast

The Saurashtra region falls in southwest Gujarat and has a coastline of approximately 600 km. The Saurashtra coastal region, for the purpose of this study, includes Devbhoomi Dwarka, Porbandar, Junagadh and Gir Somnath. The districts have ten coastal talukas that house a population of 35,510,873 persons.

Table 27: Coastal Districts & Talukas

| **Coastal districts** | **Coastal Talukas** |
|---|---|
| Junagadh | Mangrol, Mali, Junagadh |
| Gir Somnath | Sutrapada, Kodinar, Una, Verawal |
| Dwarka-Devbhoomi | Kalyanpur and Okkhamandal |
| Porbandar | Porbandar |

**Habitat I** Geographically and culturally unique, Saurashtra used to be an autonomous state till 1956, when it was merged with the Bombay state. The region, as a whole, forms part of the Kathiawar peninsula, a land formation surrounded primarily by water but also connected to the mainland. The Saurashtra coast faces the Arabian Sea directly and has the Gulf of Kutch towards its north and the Gulf of Khambat towards the south. The peninsula is largely rocky, with a central plain bisected by hills and rivers.

Detailed information is not available on the coastal belt of Saurashtra, even though it happens to be the main fishing region in Gujarat. It is reported that a study on the Saurashtra coast was commissioned by the Gujarat Ecology Commission in 2016, but is not available as of now. Moreover, since in 2013, the districts of Devbhoomi Dwarka and Morvi were carved out of Jamnagar, and Junagadh was split into Junagadh and Gir Somnath, the data according to the new district classifications is not available in some cases.

Saurashtra is broadly "characterised by its rich sandy and muddy intertidal zone harbouring rich and varied diversity of flora and fauna"[94]. The spread of wetlands in the coastal district of Saurashtra is as follows:

Table 28: District Wise Natural Coastal Wetlands

| **S.no** | **District** | **Total Area (ha)** | **Number of Wetlands (ha)** | **Coastal Wetland and Inland River/stream Area (ha)** |
|---|---|---|---|---|
| 2 | Junagadh (including Gir Somnath) | 883900 | 139 | 19,099 |
| 3 | Porbandar | 229400 | 41 | 16,608 |

[94] NWIA

| | | | | |
|---|---|---|---|---|
| 4 | Devbhumi Dwarka (covered in Jamnagar) | - | - | - |

*Source: NWIA*

**Rivers I** As in Kutch, rivers dry up in the summers. Key rivers here are the Aji, the Machhu and the Brahmani, Ojhat, the Kamb, the Surekh, the Somal, the Sangwada, the Hirani, the Kapila and the Saraswati. Saurashtra is considered arid with 400-800 mm of rain annually. The direct access to the Arabian Sea accounts for the eminence of Saurashtra as a fishing region and the India's biggest promoter of seafood.

The Saurashtra coast has unique oceanographic features; the coast has plentiful fishing grounds, where limestone reefs provide a habitat for diverse reef flora and fauna. They also act as a nursery and a breeding ground for finfish and shellfish. Consequently, Junagadh district houses three of the biggest fishing harbours in Gujarat, Veraval in Gir-Somnath, Mangrol in Junagadh district and Porbandar, in Porbandar district. Saurashtra has, historically, been the most popular fishing center in Gujarat, with over 50 percent of the fishlanding in Gujarat. It also accounts for the largest number of mechanised boats in the state.

The interviews in the Saurashtra region took place in Porbandar district. As per the Marine Fisheries Census, 2010, of Gujarat , there were 6420 fishworkers families in the district, and population saw a decrease from 33928 to 20937 between 2005-2010.

Across the south of Gujarat and in Kutch, mechanised boats or trawlers from Saurashtra were a source of anxiety and conflict for smaller fishworkers. Considering Saurashtra has naturally plentiful oceanic resources, the question of why fishworkers from Saurashtra are travelling across the coast, from south Gujarat to Kutch needs greater introspection. The most common argument put forward in mainstream news and literaure has been that mechanised fisheries are expanding and 'over-fishing has occurred', for which the fishing community is held responsible. But interviews in Porbandar establish a very different picture of a traditional fishworking community, struggling with the liberalisation of the fisheries economy and to remain part of India's 'growth trajectory'. Fishworkers were clearly transitioning to an unsustainable fishing model with a change in policy that demanded fish production for export. The results of this, described below, can now be seen most clearly.

Another oft-ignored aspect of fisheries in Saurashtra has been the impact of pollution on coastal waters since the early '80s. Newspaper reports from 1987[95] onwards show that water pollution from a chemical factory on the coast (then Saurashtra Chemicals Ltd. bought over by Nirma Ltd. in 2012) and air and noise pollution from cement and limestone manufacturing has plagued the fishworker communities for over decades now. Reports by the Coastal Monitoring and Prediction system, from as early as 1987, had pointed out that coastal waters were severely polluted. The same newspaper reports also said that fishworkers had been attempting to address these problems and had issued statements and petitions, to no avail. No reports of any action taken to counter such pollution could be found, and the same problem exists in 2017.

[95] Sanjh Samamchar, local newspaper (1987)

The following case study is based on interviews conducted at the fishing harbour (Old Port) in the Porbandar taluka of Porbandar district.

**Case 1: The Porbandar Fishing Harbour (Old Port)**

Owned by: Gujarat Maritime Board (a section of which has been given to the fisheries department)
Fish-landing capacity: 88450 MT per year
Total Value of fish (2014-2015): Rs. 315.51 cr
Number of Boats (mechanised and motorised): 4367- 5000 (approx)

**History I** The Kharwa community is the main fishing community in Porbandar and Saurashtra fishing regions. Originally from Rajasthan, they moved towards what is now the Gujarat state in the 10th century. Over generations, the Kharwa took up fishing as their traditional occupation. Till the '80s, fishing in Porbandar took place in fishing dhows (wooden boats) that were operated with sails and the use of gill-nets. One-day fishing was done with five to seven people in one boat. As in the rest of Gujarat, fishworker interviewed said, things started changing from the 1980s.

With the state intervening in the existing fishing economy, with an eye towards transforming it into a commercially viable sector, seafood export rather than self-sustenance became the primary impetus for fishing. From selling in their local markets, fishers started selling to Mumbai and then to exporters for markets in Singapore, Sri Lanka, the UAE. With the needs of the export industry governing fish catch, the composition of catch also changed. The demand for squid, lobster and cuttlefish, etc., for export, meant that fishworkers caught fish that they initially did not even eat. As the need for production increased, so did the quantity of fish catch. With state subsidies and policy driving this transformation, some members of the Kharwa community in Porbandar were the first in Saurashtra to start their own export companies[96]. As returns started flowing in, they assisted other fishworkers in transitioning their vessels and gears. By giving advance without interests, capital for fishing trips and sharing guidelines for export (originally got from states such as Kerala and Tamil Nadu), Saurashtra became one of the largest exporters of sea food in India.

The commercialisation, or capitalisation, of fisheries resources initiated a transition in gear and fishing technologies in use. The first phase, in the 1980s, was the motorisation of traditional crafts that were equipped with 40-50 Horsepower (hp) engines. By the 1990s, bigger engines of 70-80 hp were introduced and two to three day fishing started. This was a moment of transition the fishworkers remember clearly.

In the late '80s, 60 to 70 boats operated from Saurashtra, of which less than half had transitioned from using gill-nets to trawl-nets. Fishworkers say that 'development' happened rapidly and the first signs that fish catch was disappearing were seen. From fishing in nearshore regions off the Porbandar district, fishwokers started traveling north towards Okkha in Devbhoomi Dwarka, and towards south Gujarat in search of catch. Because diesel consumption and the costs of fishing in Kutch were less, fishworkers migrated towards Jakhau. By 2000, all boats from Porbandar were operating trawl nets and there were a

[96] Kanji Bhai Chaum and Babu Panjari are attributed with being the first seafood exporters in the region who assisted other fishers across the '80's and '90s.

negligible number of small boats left in the entire Saurashtra region. The number of hours spent at sea also increased from either daily fishing or two to three day trips to seven to eight-day trips. Fishing trips now last for 15-20 days on mechanised boats.

**Pollution I** If, the beginnings of seafood export changed the nature of fishing in the region, the state of the coastal waters also pushed fishworkers towards the deep sea. Fishworkers recalled the existence of rich marine life on the coast of Porbandar. Rocky beaches and limestone reefs and corals provided breeding and nesting grounds for marine life and villagers used to catch fish through line fishing. Prawns, lobster, clams, crabs, mullets, clupeidae, perches and sharks were common. According to the interviews, this is no longer the case. Coral bleaching has taken place over the last 20 years and the waters are foamy. Fishworkers also say that villagers no longer swim on the beach, as the waters irritate the skin. This change is attributed to industries on the Saurashtra coastline. Nirma Ltd. (formerly Saurashtra Chemicals Ltd.) is the major polluter in Porbandar[97]. As mentioned before, reports by the Coastal Monitoring and Prediction System from 1987 showed pollution in coastal waters. Fishworkers also allege that trucks transport effluents from other Nirma companies in Gujarat to dump in the sea via the Nirma premises, because of lack of regulation or monitoring in Porbandar. The three industrial estates in Porbandar (Porbandar GIDC, Vanana GIDC and Miyani GIDC) as well as wastewater are seen as primarily responsible for pollution in the district.

Studies on the state of coastal waters and estuaries in Saurashtra are limited, but a study on the estuaries of Saurashtra[98], states that while baseline information to asses impacts is not available, enough evidence exists to indicate that industrial effluents and domestic waste have played a role in the disappearance of fish species. Fishworkers also spoke of the Asmavati river that used to flow where the fishing harbour is; the damming of the river upstream slowly dried up the river channel and seawater has now intruded into the riverbed where the boats are docked. This has meant that freshwater fish, such as hilsa, have disappeared.

Since fishworkers from Saurashtra travel the length and breadth of the state, they have seen the state of waters across the coastline. As a one of the fishworkers recounted, “the sea is empty, there are no fish anywhere within 5 NM, from Vapi to Bharuch toAkleshwar there is chemical pollution, in Bhavnagar there is the ship breaking yard, here in Porbandar we have Saurashtra chemicals and the Nirma Factory,. Then, if you go ahead there is Reliance in Jamnagar, Essar and then Adani – the whole fishing belt has been spoilt."

Fishworkers said that the catch in the open sea has also decreased drastically in quantity, and some species have disappeared. According to the pattern they've observed, there is adequate catch in the beginning of the fishing season, in August, but reduces in a month or two. Prawn, lobster, pomfret, dara and ghol, which used to be common, are rarely found and that too for a couple of months. They say that even in Kutch, the fish catch is reducing.

**Fisheries & Livelihood I** Today, the Porbandar district, including the harbour at Porbandar Old Port, Madhavpur, Navi Bandar and Niyari, has approximately 4000 motorised and

[97] Manufactures and markets soap and detergents, linear alkyl benzene, soda ash, pharmaceutical products, salt and caustic soda.

[98] Kizhakudan, Kizhakudan et al., Investigations on the Creeks of Saurashtra, Veraval Regional Centre of CMFRI

mechanised boats. While boat owners are all from the Kharwa community of the district, majority of the migrant fishworkers or fish labourers are from south Gujarat. These include traditional fishworkers from the Macchi, Koli and Tandel communities, as well as Adivasi people from such as Dang, Sanjan, Katthalwada, from south Gujarat. A small number of workers (interviewees gave a rough estimate of two percent) also come from Utter Pradesh and Bihar.

Most families started with one boat but, interviews suggest. As they expanded across generations, some acquired more. The registration of new trawlers was banned in 2003, and new trawlers can only be bought on the basis of the old licenses. Fishworkers themselves had suggested the ban on new trawlers, as they realised that overfishing was becoming a concern. As a fishworker said, 'fishworkers don't have any other livelihood. Our lives depend on fishing and its continued existence."

Women fishworkers in Porbandar

The mechanisation of fisheries changed the 'family enterprise' nature of fishing, and most women in the Kharwa community no longer work as fishworkers engaged in sorting, drying, selling, etc. Many of the women, who were still selling fish, were single women[99], without other means of support. Women fishworkers told of how fish markets, such as this, have existed for generations and that their mothers used to also sell fish. They learnt the trade accompanying them over the years. Most of them had been working for 30 or 40 years in the market. The women sit in the market place from nine or ten in the morning to 2 pm in the afternoon, while some stay till 8 pm. For this, they make under Rs. 10,000 a month. The women say that the reduction in fish catch has meant a drop in their earnings, because of a lack of high value fish and reduced prices. The women have to feed their children, pay rent, school fees, all within this amount, and said they are barely managing.

As with all other issues, the state goverment ovt. and the fisheries department are indifferent to their needs. Some of the main issues they raised were a) lack of sanitation, water, drainage and proper bathrooms in the market, b) no roof in the market to prevent rains and storms from spoiling the fish, c) people without license selling fish at different locations and eating into their business.

Fishing by Mechanised boats

There are approximately 2400 mechanised boats in Porbandar. These are 20 meters in length, fitted with trawl nets and engines of 180 hp. While each fishing trip , initially, 12 days long, in the last 10 years, boats have started staying at sea for 15 to 20 days. Each boat employs seven to eight people, including one overseer, or tandel (boat overseer/ deck boss), and five or six khalassi.

Each fishing trip (in 2016-2017) can cost upto Rs. 1.5 to 2 lakh, which includes costs for

[99] Many of the women are single women.

diesel (2800 litres at Rs. 56 per litre), ration (Rs. 10,000), ice (Rs.10,000-Rs. 12,000). Other accessories, such as engine oil, wire rope for trawling nets, etc., cost another Rs. 15,000. This does not include wages for the tandel and the khalassi, which are paid monthly. The overseer is paid around Rs.10,000-Rs.15,000, while other fish labourers are paid Rs. 5,000 - Rs. 10,000, depending on experience. One-off costs, such as repairs or new nets, can cost up to Rs. 30,000 (the price of one trawl net). Considering the high capital expenses, as in other parts of Gujarat, the boat owners are constantly in debt. Loans are taken from fish traders, on the condition that fish catch will be sold to them.

Big boats travel as far as 70 NM into deep sea. Where some travel north towards Kutch and the Pakistan border, others travel south towards south Gujarat and Mumbai. Trips towards Mumbai can take up to 30 hours. Boats come back to Porbandar to land their catch.

Fishworkers say that fishing takes place mainly in the two or three months at the beginning of the nine month fishing season, and is not consistent through the year. Mechanised boats can earn (net) up to Rs. 3 lakh per trip, after which catch decreases and their earnings are put back into covering fishing trips which do not yield profits. To compensate, night fishing is undertaken.

Fishing by Small boats[99]

Motorised boats are fibre boats of 15 meters, equipped with 8 hp engines. There are approximately 2000-2400 motorised boats in Porbandar. Fitted with trawl and gill-nets, they can travel up to a maximum of 30-40 NM. Fishing trips last for a minimum of five hours and cost a minimum of Rs. 5000 per trip. Rather than monthly wages, the returns from each trip are shared between the boat owner and the labourers, where the tandel and the four workers employed on each boat divide 60 percent of the catch and the owner keeps 40 percent.

**Arjun Damu Vadu, Tandel from Sanjan Village, Valsad District**

"I have been working in Porbandar for 20 years. Over the years, I worked with three different boatowners. I am from Sanjan in Valsad. Before Porbandar, I was in Mangrol for a year, then Okkha and then here. The pay was less there, which is why I came here. In Mangrol and Okkha, I worked as a fish labourer and was paid Rs. 4,000- Rs. 5000. Here, you can get from Rs.7000 to Rs. 15,000 based on experience. I am an Adivasi and my village does mostly paddy cultivation. I first came here because people from my village also used to come. I was asked whether I would like to catch fish. They told me you would have to go out to sea. I agreed because I also want to know what the seas are like as I'd never seen it before. I was 16 or 17 years old then. It wasn't even about money the first time. I told them, you pay me Rs. 3000 for now, then we will see later. Here, there are seven to eight people on one boat. I am the tandel (overseer) and others are from Maharashtra and Gujarat. Most people come through other people who already come here, it works by word of mouth and through cellphones now. Others from my village also work in fishing. Other labour work near our village

[100] Small boats with kerosene-powered engines also operate in Porbandar.

pays too little and we can't get service jobs. Children from our village who don't study sometimes come here . What else will they do? They will also learn and join the fishing industry. I get leave once for 15 days in the fishing season (nine months). Or, Isend back money through post or with someone else going home. When demonitisation happened, we all had to get bank accounts. But it is difficult to use them because my family at home cannot access the bank and they have to take an educated person with them everytime.

I stay for nine months in a year. It also depends on whether we find fish or not. Sometimes, if we don't find catch we shut business early. Earlier, we used to fish for seven to eight days, now it has become 14 to 20 days. There is less fish now. We go towards the border and towards Mumbai. Sometimes, there is a fight with other ships, if lines get crossed, but not always.

We use GPS, fish finder, DAD (emergency machine), wireless radio, compass in the boats. The GPS indicates there might be fish according to water temperature, what fish it is we get to know only after we put the net. The fish that we don't want we put back, half live and half die. Over the day, we put the net, which takes around 5 minutes, then we wait as the net is dragged for three to four hours. Pulling it back takes half an hour. We do this four times a day and sometimes at night, also.

The GPS tells us when we are nearing the border. A red flag shows up. The coastguard is usually five or six km inside the border on both sides. We don't believe in this 'Indian fishermen' and 'Pakistani fishermen', we used to work together. The difference is only of governments. We are the same otherwise, all of us are fishermen. They (fishwermen from Pakistan) are also good people. It's funny, because the fish they want (tuna, surmai, etc.,) is in Indian waters, which are deeper, and the fish we want (cuttlefish, river fish) falls in their waters within the creek system, which are shallower".

**Conflict I** Fishing in waters around the International Maritime Boundary Line was common in the late '80s and fishworkers from Pakistan and India interacted with each other. It was only in the '90s, with increasing hostility between the governments of both countries, that the idea of territorial waters arose and arrests and detention of fisworkers began. Fishworkers say that relations between between the fishworkers are good, based on a history of friendship and support that has been disrupted by the arrests on both sides of the border. Fishing communities of both countries have similar practices and are part of a larger community that has been divided by the creation of borders. Fishworkers have been advocating for a no-release policy, common shared fishing grounds, the implementation of the Agreement on Consular Access and to fix time limit for issuing nationality certificate within 90 days. While compensation is meant to be provided to families of arrested fishworkers, it does not reach on time. Fishworkers are also demanding compensation for boatowners, as the boats are their only source of livelihood.

**Fisheries Department** | The inaction of the state and the fisheries department has exacerbated the crisis that fishworkers are facing. Authorities have failed to set up adequate infrastructure for fishing. While this was the case across Gujarat, it is particularly surprising in Porbandar, one of the main fishing harbours in Gujarat. Some particular issues stood out:

Fishworkers across Gujarat, including in Porbandar, complained of a lack of minimum price on fish. Prices are determined at what is estimated to be the market price but is governed by fish traders or exporters. The price fluctuates depending on availability leading to a Catch-22 situation. On the one hand, fish quantity has decreased so fishworkers are not earning enough, on the other, in times of good catch availability pushes the price down.

With increasing debt, as mentioned before, fishworkers are taking loans from traders, who in turn take a two to five percent commission on the catch sold to them. The commission is higher on low value fish, which most common now. The mechanisation of fisheries has meant that the entire business runs on a system of loans and advances, but the avenues for taking loans are limited. Banks need a guarantee in the form of a boat license or a mortgage on tangible assets, which the fishworkers do not prefer, leaving traders their only avenue for loans. Traders extend an advance, as they can afford to wait for payment from seafood exporters, a luxury denied to fishworkers .

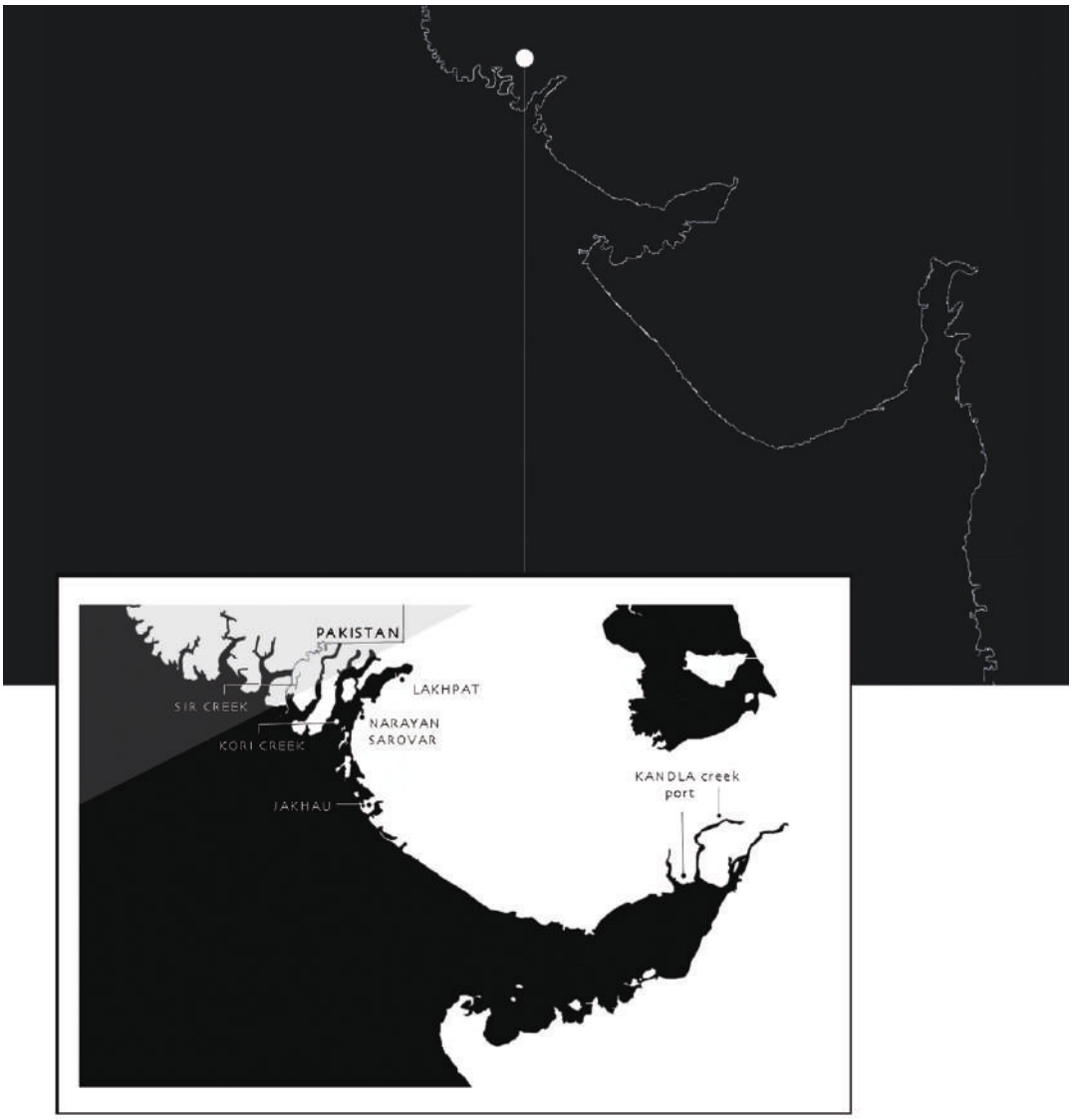
A lack of adequate infrastructure facilities further exacerbate the difficulties that fishworkers face. There are no cold storage facilities available in Porbandar. This means that fishworkers have to directly sell their catch, irrespective of the offered price at offer, because they have no bargaining power over the traders.

Another issue mentioned was that the harbour has no usable auction hall and fish have to be sorted and cleaned in the boat or the harbour. The harbour is overcrowded, and while plans for extension and revamping seem to be in the offing, the fishworkers do not have any information about them. The fishing harbour is actually owned by the GMB, which has handed over a section of the harbor to the fisheries department. The demarcated fisheries harbour is too small. This is also an unofficial arrangement and is, hence, uncertain. Moreover, fishworkers interviewed said there is a constant tussle between the fisheries department and the GMB about who is to provide basic facilities of water, electricity, etc. Currently, the Porbandar harbour is utilised entirely for fisheries, and GMB related activities are carried out at Simar Port, an all weather port seven km away, also under the GMB.

It was communicated that the fisheries department is understaffed with one person in charge of the four districts of Saurashtra. The main role of the department is also unclear. Fishworkers report that everyone has not yet received biometric cards and that the biometric system was a failure. As a fishworker said, “you cannot just impose things on people when you have no system in place.” Other examples also point to the dismal state and attitude of the fisheries department. In 2015, a storm hit the coast of Saurashtra. Indications of the storm were present before but the fisheries department only warned the fishworkers in Porbandar to evacuate the harbor the same day it hit. Considering the volume of people and boats at the harbor, this was close to impossible. Fishworkers also alleged that requests for the rescue of five fishers stuck on a boat at sea in the storm were ignored and the community had to risk seven more people to rescue the stranded fishworkers.

Diesel and kerosene subsidies have also been a source of constant negotiation between fishers and the fisheries department. A letter by Chiman Bhai Patel, a fishworkers' representative and leader from Gujarat, in 1992, to the central government stated that because of the lack of subsidy on kerosene, smaller boats could not be run. The president of the small boat owner's association  said that the same issue still persists. There is no subsidy but a refund system that does not work, and  the amount for the refund has been reduced from 450 litres to 34 litres, rednering even this useless.

Fishworkers also said that schemes such as the Sagar Khedu Yojna (a Rs.11,000 cr package for fishermen announced in 2012 before the general elections)  never reached them, and allege that money allocated under the scheme has been used for other purposes.




The Gulf of Kutch

The coastline of the Gulf of Kutch is 550 km long, 90 percent of it lined by mudflats. The region around the Gulf is arid and semi-arid, with low rainfall. The Kutch district, lying across the Tropic of Cancer, spans 406 km of the coastline and an area of 45,674 sq.km[101]. For the

purposes of this study, the Gulf of Kutch comprises the districts of Jamnagar and Kutch. These include the following coastal talukas:

Table 28: Districts and talukas around the Gulf of Kutch as per study classification

| **District** | **Talukas** |
|---|---|
| Jamnagar | Jamnagar, Lalpur, Jodiya |
| Kutch | Abdasa-Naliya, Anjar, Bachau, Gandhidham, Lakhpat, Mandvi, Mundra |

The population living around the Gulf of Kutch was estimated to be 3 million as per the 2011 census and is 5 percent of the total population of Gujarat. Kutch has a population density of 46 persons/sq.km$^2$. Urbanisation and population growth in Kutch deserves special mention; currently Gandhidham, Bachau and Anjar are the most highly industrialised districts. Industrial growth has led to urbanisation because of which a population growth of 24 percent has been recorded in the region. The population of the Mundra-Bachau-Abdasa-Mandvi coastal region increased by 1.5 percent between 1991 and 2011. This can be attributed to the increase in migrant labour, because of the creation of Special Economic Zones, and the increasing industrialisation in the region.

**Rivers |** A number of rivers drain into the Gulf, creating a network of creeks and tidal flats. These include Kali, Godhatad, Kehari, Mithi, Berachiya, Kankavati, Sai, Vingadi, Kharod, Rukmavati, Nagmati, Bukhi in the north and Gomti, Khari, Bhogat, Ghee, Siahn, Aaji, Und, Demi, Bevani, Jhinjhera, Kankvatai and Machchu in the south. Low levels of both surface and groundwater characterise the region, particularly the district of Kutch

**Habitat |** Both the northern and the southern shores have different geomorphology; while the north (300 km) has extensive mudflats, the southern shore (250 km), known as the Kathiawar peninsula is an intricate mix of mudflats, offshore islands, platforms and narrow beaches. The northern basin of Kutch is one of the most complex geological regions in the country. The coastal configuration of the Gulf is irregular, with islands, creeks and bays. The distribution of wetlands is as follows.

Table 29: Distribution of natural coastal wetlands in the Gulf of Kutch

| **S.no** | **District** | **Total Area (ha)** | **Number of Wetlands (ha)** | **Coastal Wetland and Inland River/Stream Area (ha)** |
|---|---|---|---|---|
| 1 | Jamnagar | 1412500 | 708 | 174,945 |
| 2 | Kutch | 4565200 | 1607 | 2,298,489 |

*Source: NWIA*

[101] Ecological Profile of the Coastal Talukas of the Gulf of Kutch, Gujarat Ecology Ecological profile (2014)
[102] Ecological profile (2014)

Kutch and Jamnagar districts have rich wetlands, as represented in the table above. Jamnagar is the only district to house corals, stretching over an area of 335.47 sq.km, while the maximum mangrove vegetation occurs in the inter-tidal zone in the district of Kutch. Kori creek in the northwest coastal belt, where a majority of fishing takes place, houses the largest mangrove area in the world. Mangroves in the four districts of Devbhoomi Dwarka, Jamnagar, Morbi and Kutch have been notified as forests. The Gulf also includes 42 islands or 'bets' of which 20 support mangroves. There are also four protected areas, the Narayan Sarovar Sanctuary, the Kutch Bustard Sanctuary, the Khijadia Bird Sanctuary, the Marine National Park and Sanctuary. Wildlife protected areas in the Gulf are the Wild Ass Sanctuary and the Naliya GIB Sanctuary.

Lying squarely on a seismically active zone, in the magnitude of Zone V, much of Kutch, it's believed, was formed through past volcanic activity. More recently, the earthquakes of 1819, 1956 and, more so, 2001 remain in memory as times of great distress. The region has also been historically prone to cyclones.

From the district of Kutch, north towards Pakistan, lies the network of creeks that form the main fishing grounds of traditional fishworkers. These consist of a series of interconnected creeks, small water bodies and islands forming multiple channels. Creek systems of Padala, Paba, Kori, Dewri, Dibri, ending with Sir Creek, demarcate the international border with Pakistan.

As the introduction and the industries sections indicated, the Gulf of Kutch varies greatly from the Gulf of Khambat and the Saurashtra coast. Having had a distinct geography and ensuing historical trajectory, fishing traditions around the Gulf of Kutch have also evolved differently. The geography and industrial history of south Gujarat necessitated a focus on the estuarine region as an entry point into the coastal region and then into fishing. This section approaches the coastal zone directly. The cases are centred on specific locations that are meant to offer a glimpse into key issues traditional fishworkers in Kutch face today. Fishworkers in Kutch are all traditional fishworkers, for whom fishing is entirely a family enterprise. They own and operate their own traditional and motorised boats, or undertake pagadiya fishing with the assistance of family members. While male fishworkers go out to sea, women fishworkers are equally involved through drying and sorting the catch. Fisherworkers live in temporary constructions on the intertidal zone, next to their boats, for at least eight to ten months a year,and most families have pucca or permanent houses further inland.

Across south Gujarat, people's woe was that there was no more fish to be found, and Kutch was held as the ideal location, where fishing could be a profitable business. While this holds true to a large degree, even across Kutch, there is clear indication that catch has reduced.

Since 2001, industrialisation has hit Kutch at a frenzied pace. Its impacts on the ecology and the livelihood of fishworkers, in a span of 17 years, are starkly evident. The militarisation of the region has been ramped up, as fishworkers reported, through the presence of multiple security agencies, such as the Coastguard, the Border Security Force (BSF) and the marine police.

The lack of catch in south Gujarat and in Saurashtra has had repercussions on the coastal waters and seas around Kutch, as mechanised boats from those regions are increasingly

fishing in these northern waters. This is leading to conflicts with traditional fishworkers and decreasing marine catch. As a result, fishing vessels are crossing into Pakistani waters. The subsequent arrests of the fishworkers in Pakistan, lead to detention and incarceration for long periods of time.

The following cases were chosen to give a glimpse of the challenges that are urgent now. Note: Multiple other issues and industries, particularly limestone mining and cement industries, could not be included due to limitations of time. These, too,are important issues warranting further research.

- Case 1 is based on interviews with fishworkers living in the Kandla Port Trust premise and is reminiscent of the Hazira village case study, highlighting issues of displacement and access that arise with coastal port development and changing utilisation of the coastal zone.

- Cases 2 and 3 are based on interviews in Lakhpat and Narayan Sarovar. They are the closest fishing villages to the International Maritime Boundary line between India and Pakistan, and highlight issues that arise with militarisation and access, as well as traditional debt practices operating in Kutch.

- Case 4 focusses on the only, and largest, fishing harbour in Kutch, the Jakhau fishing harbour in Abdasa taluka, where mechanised boats and trawlers operate.

**Case 1: The Kandla Port Trust**

Area: Gandhidham
Districts: Kutch
Location: The Kandla Port Trust
Fishing area: The Kori Creek and neighbouring waters

**Industrial Overview of the Kandla Port**

The Kandla Port, one of the largest major ports in western India, is located at the Kandla creek that leads to the Arabian Sea, in Kutch district. Since Kandla has a natural deep harbor, Maharao Sir Khengarji III - the king of the princely state of Cutch (1875-1942) - started a cargo jetty in Kandla, in 1931. The remains of the jetty can still be seen at the port. With the Partition of India, the existing major port of the western region, in Karachi, fell in Pakistan, necessitating the creation of the Kandla port. The then-existing jetty was taken over by the Government of India in the 1950s, and was declared a major port in 1955. The Kandla Port Trust of India was created in 1963. The Port has the following physical infrastructure[103]:

- Kandla Port at Kandla creek: Located over 310 ha, the port contains 15 berths for dry and six oil jetties for liquid cargo, a custom port area of 253 ha, one deep-draught mooring and four cargo moorings, container handling facilities, steel floating dry docks and an off shore oil terminal (OOT) at Vadinar, worked jointly with the Indian Oil

[103] Compiled from construction of 13th to 16th Cargo Berth at Kandla Port by M/S Kandla Port Trust, Letter from Kandla Port Trust to MoEF dated 2012, Kandla Port website &Essar Oil website.

Corporation, through a Single Buoy Mooring (SBM) system with a capacity of 54 MMTPA, created in 1978. In 2016, the operation of container terminals of berth 11 and 12 at Kandla Port were handed over, in a PPP model, to the Kandla International Container Terminal Ltd. of the J.M. Baxi Group.

- Tuna Tekra dry bulk terminal or the AdaniKandla Bulk Terminal (AKBT): built on a PPP port model with the Adani Port and Special Economic Zone (APSEZ), the port is located in Kara Creek, Anjar Taluka of Kutch, with a deep draught of 16.2 mts. It is situated 20 km southwest of the Kandla Port, and contains a mechanised, four-berth terminal with direct unloading facilities for coal, iron ore, and other dry bulk goods. The port was commissioned in 2015.

- A marine oil terminal servicing Essar Oil's Vadinar refinery in Vadinar, DevbhoomiDwarka district, at a distance of 46 NM from the Kandla Port.

Kandla has, historically, had swathes of salt flats. The Land Development Commissioner of KPT allotted 6520.2 ha of this land to salt pan companies during 1962 and 1964. This comprises 60-70 km of land between Jungi village and Kandla.

The existing Kandla Special Economic Zone (KASEZ) is situated 9 km from the port. In 1965, the Kandla Free Trade Zone was created with 163.7 ha of land. This was later converted to a Special Economic Zone under the SEZ Act of 2005. In 2006, the KASEZ was granted an additional 300.44 ha of land from the Kandla Port Trust, for the expansion of industrial area. The KASEZ is a multi-product export-processing zone and has approximately 248 units over a total area of approximately 468 ha[104]. Key industries in the SEZ are trading and warehousing, engineering, chemicals and allied products, garments, plastics and other furniture, ceramics, food processing units, etc.

The year 2015-2016 saw a 54 percent rise in net profit at Kandla, from Rs. 322 cr to Rs. 651 cr. This was, largely, due to increase in liquid and cargo container and auctioning of land that falls under the Port Trust[105].

The Kandla Port holds one of the largest land banks in the country, with approximately 220,000 acres, much of which is situated in the intertidal zone. Newspaper reports suggest that the government is suggesting the conversion of the Kandla Port from a service port to a landlord port model, in a bid to utilise its large land bank. In such a model, the port authority acts as a regulator and leases out facilities and land to private players. This includes generating rent from land through increasing saltpans and the creation of a Coastal Economic Zone (CEZ), under the Sagarmala programme of the Government of India. In 2010, new allotments of 303.5 ha were made through a tender process. The CEZ is being set up on 5000 ha of land in Kandla. The project has received approval from the Ministry of Commerce & Industry, for two areas; 3600 ha at Kandla and 1400 ha at Tuna. This includes plans for a Smart Industrial Port City Project (SIPCP) that is under development, and an industrial zone and smart township at Gandhidham.

[104] Figures differ marginally between different sources
[105] New management of the port also possibly has a hand in the same

Labour at the Kandla Port consists of (possibly undocumented) migrant workers from Hyderabad, Tamil Nadu, Delhi, Bihar and UP, who have limited interaction with the fishworking communities. These migrant workers also run small shops frequented by other migrant workers.

**Impacts on fishworkers**

The Kandla Port stretches across the talukas of Gandhidham and Anjar, of which the following coastal villages have a population of fishworkers, as per Gujarat's Marine Fisheries Census, 2010:

Table 30: Fishworkers in Kandla

| Taluka | Village | Fishing families | Traditional fishworker families | BPL | Population |
|---|---|---|---|---|---|
| Anjar | Rampar | 25 | 25 | | 150 |
| | Sangadh-Vira | 28 | 28 | | 182 |
| | Tunavadi | 113 | 113 | 2 | 1115 |
| Gandhidham | Kandla | 291 | 291 | 4 | 1501 |
| | Mithaport | 35 | 35 | 13 | 189 |
| **Total** | | **492** | **492** | **37** | **3137** |

*Source: Marine Fisheries Census, 2010*

According to the Census, there were 382 motorised boats and two non-motorised boats in Anjar and Gandhidham talukas, in 2010. Small fish landing centres exist in Kandla, Rampar and Tuna Vadi. Details of fish catch and on the landings were not available.

An Environment Impact Assessment (EIA) report from 2013, for the expansion of jetties and barges at Kandla and Tuna, states that the Kandla and the Mitha ports are responsible for three percent of the fish catch in Kutch. The EIA report[106] infers that the Kandla-Tuna region has low fish stock as compared to other fishing regions, such as Jakhau. But fishworkers says that the reduction in fish stock is a recent phenomenon. Substantiating this, an ecological profile of Kutch by the Gujarat Ecology Commission notes that fishing in Anjar reduced from 36,000 tonnes in 1998 to 400 tonnes in 2007 and active fishworkers have declined by 50 percent.

The report notes, “There is very small fishing activity in the KPT area as the fishing in this region is prohibited. Only some illegal fishing activity is done in some creeks by nearby village persons.” The reality in Kandla is very different. There are at least 5000 fishworkers living within the area of Kandla Port, who are dependent solely on fishing for their livelihoods. Boats

[106] Integrated Impact Assesment Report for Developing Integrated Facilities within Existing Kndla Port at Kandla, Kandla Port Trust (2013)

are docked inside the Port premises and fishworkers live within Trust area, so as to be near their boats, clearly negating that EIA's claim that no fishworkers live in the area.

**Displacement and Access** | In the history of Kandla, as well as in the current expansion of the Port, there has been no recognition that traditional livelihoods of the region consisted of fishing, and that fishworkers have been affected by the construction of the Port. Much of this information is not in written records, and is only available through testimonies of the fishing community. Interviews with the fishworkers of Kandla Port established that they have been fishing in the creeks of Kandla, Nakhti and Khara that meet the Arabian Sea, for generations. One can speculate that there are two reasons for the non-recognition of the region's fishworkers and their ensuing eradication from all written and legal documentation. First, the Port land, some of which used to belong to the royal family, was handed over to the government. In the '50s and '60s when there was no provision or concept of resettlement, rehabilitation or compensation. Second, the pattern of fishing is such that communities live in temporary settlements on the coast during most of the year. But the state has never recognised community claims or their right to the land that falls in the intertidal zone. The original village of the fishing community from Kandla Port is Chirri village,30 km away. Fishworkers only travel there once or twice a year, during festivals, as has been the practice for generations.

Fishworkers narrate that when Kandla was created the area was a jungle, with only one Indian Oil Corporation Ltd. jetty. In the 1950s, when Kandla Port came under the central government, fishworkers were made to shift from their homes on the shore and move back from the water. Yusif Adam Parit explained that their family used to live in a makaan (house) at what is now Berth 12. He says, ”we were told to clear the land because a port was being made”. Adam Parit and his family were moved to the edge of the Port property, where the Indian Farmers Fertiliser Cooperative (IFFCO) has a plant. As the Port expanded, they had to shift again. Similarly, other fishworkers interviewed, have been relocated multiple times. They've received no assistance from the government or the Port Trust. With every relocation, families construct their own temporary houses from planks of wood purchased from Gandhidham.

Even in 2016, when the right to consent as well as to rehabilitation and compensation had been established, the tradition of continuing to ignore the presence of fishworkers in the port land continues. The impact assessment report for expansion in port facilities in 2013 notes that, “there is no fishing that takes place in the Kandla Port Trust, it being a no fishing zone”, hence, “No Resettlement or Rehabilitation (R & R) is envisaged”. This is blatantly inaccurate and false as fishers are very much present, which the port authorities knowledge. In reality, the port athourities are attempting to relocate the fishworkers to Gandhidham, 15 kilometres away from Kandla, where land is available. This in effect will mean an end to their livelihoods that are dependent on access to the coast and sea. Fishers interviewed clearly say that they will only move if land is made available near the sea.

Not only has displacement taken place, but also fishing families are visibly caught between the stockpiles, containers, storage areas and saltpan areas; negotiating their way to the coastline and creek, where their boats are moored, through an un-demarcated yet obviously divided and contentious landscape inside the port. With no recognition of land or home, access to basic services and amenities are also absent. While the port authorities supply water by an informal arrangement, no electricity or sanitation services exist. As a fishworker

said “they (the government) say that the sea is our farming ground, that it is all very good, but really, what is the sea is like? Water is everywhere, but there is no water to drink, no electricity or light. We have to steal electricity and water to live here”. Fishworkers get electricity unofficially from the supply given to the KPT with knowledge of the port athourities. “We don't even have a house in our name. We, the public here are not happy, there is no doctor or proper school for our children either”.

The quality of marine waters in Kandla is also undergoing change. Fishers identified two key issues for the decrease in fish catch as discussed below.

**Pollution I** Pollution takes place from both within and around the port premise. Within the port premise, fishers indicated that the fertiliser company, IFFCO releases wastewater through a 10-15-kilometre pipeline in the sea, which has changed water quality in the proximity of the coast. The large number of saltpans releases bittern, which, as mentioned before, changes the chemical composition of the water, impacting marine life. The abovementioned EIA report writes that 'the runoff from nearby saltpans is responsible for the high salinity in the marine waters', with salinity values varying from 37.6 percent to 42.5 percent as per samples. Fishers explain this by saying that the water has become harsh ('kadak'). It was further observed that coal is stocked without any coverage in the port premise and mangroves and other vegetation in in the port premise were coated with coal dust. Fishers also observed that the sea is coated with coal dust. Like at Hazira, the cleaning of oil tankers and ships lead to small oil spills and oil sludge that coast the nearshore sea surface.

Outside of the port premises multiple sources of pollution exist. Wastewater from Welspun City, Anjar that manufactures engineering and textile products, as well as wastewater from Anjar city, is disposed in the Nakti creek, approximately 10 km from Kandla creek. At the southern shore of the Gulf of Kutch, in Jamnagar, petrochemical refineries and fertiliser and chemical plants, such as the Reliance refinery and Gujarat State Fertiliser& Chemicals Ltd. and the Essar Oil refinery at Vadinar were identified as sources of pollution.

**Fisheries & Livelihood I** While Indian salmon, pomfret and prawns, and end of season, crab and prawns are the main catch nowadays, interviews revealed that Kandla used to be a more diverse fishing area. Salmon, croaker fish, Kut, Gol, Dada, surmai and shrimp used to be abundant but have disappeared in the last four or five years. As Yusuf Adam Parit said, “Where are they now? The fish are not coming at all.” Raus, still a popular catch, has seen a sharp drop in numbers. Parit approximates that there has been at least a 90 percent drop in fish catch. He emphasises how substantial a drop that is. Most starkly, Bombay Duck, a common catch across the western coast has completely vanished in the last seven or eight years. Rainfalls might also be responsible for the change in fish composition, particularly that of Bombay Duck[107]. Fishworkers say that the 2015-2016 saw less rain than usual, which resulted in increasing water temperature, affecting fish breeding. This has had an unnoticed impact on the women of the community, who used to clean and dry fish but no longer have work.

The fishworkers in Kandla use 7 to 9 m fibre boats with outboard engines, manufactured in Bhavnagar. Four people go out to sea in one boat for day-long trips of six or seven hours. Each family has one or two boats and the entire family is engaged in fishwork. While some

[107] Kutch falls in the arid belt of the Thar Desert and receives a limited rainfall of 319.8 mm annually, of 93 percent is during fromJune-end to mid September.

boats travel 30 km towards the open sea, others used to go towards Tuna port, 40 km away near Bhadreswar in Kutch. With the Tuna Port now operational, there have been instances of boats getting caught in shipping channels, which has discouraged many from using that route. In the past two to three years, approximately 60-100 boats from Kandla have started fishing from Jakhau Port, the only fishing port in Kutch.

Because of the drop in fish catch, the economics of fishing have taken on an unsustainable character for Kandla's traditional fishworkers. Each trip leads to a catch of 20-25 kg, but this is not uniform. In a year, fishworkers in Kandla make approximately Rs. 3 lakhs, which amounts to around Rs. 30,000 a month (for ten months of fishing). Each fishing trip costs approximately Rs. 2000 (diesel, rations, boat repairs, etc.). Most fishworkers are mired in debt and operate on informal loans from fish traders, largely businessmen from the same community, based in Gandhidham. Fishworkers interviewed were candid about the fact that they do not earn to sustain themselves and their families. Fishworkers have debts of up to Rs. 10 lakhs and are obligated to sell their catch to the trader who doubles up as a moneylender.

**Conflict |** Interviews also suggest that trawlers from fishing harbours of Jamnagar, Sachana and Jodiya, in Saurashtra, travel towards Kori creek, crossing Kandla to fish. Their moving nets destroy the sea floor and kill small fish. This has had a large role to play in decreasing fish catch in the region and are a source of agitation for Kandlafishworkers.

**Case 2: Lakhpat Village**

Area: Lakhpat Taluka
Districts: Kutch
Location: Lakhpat Village
Fishing area: Kori Creek-Sir Creek

**Village & History |** Lakhpat, a village in the Lakhpat taluka, is situated at the northwest corner of the Kutch district. Lakhpat is a walled city that faces the Great Rann of Kutch, towards Pakistan, near the intersection of Kori Creek and the Arabian Sea. Lakhpat was a prosperous port and trading city connecting Gujarat to Sindh before an earthquake in the 18th century changed the course of the Indus River. With the river drying up, the port city saw its first exodus. Elders in Lakhpat say that with the Partition in 1947, mass migration occurred for the second time, further reducing the number of people living in the Port's premises. With the creation of the Kandla Port, in 1995, new opportunities opened up in Kutch, and people moved from Lakhpat to the Port region.

The Lakhpat village is within a walled fort that now stands practically uninhabited, with 108 families and a total number of 566 persons still living in Lakhpat, as per the 2011 census. The main occupations are farming, fishing and animal husbandry. Of the 108 families in Lakhpat, approximately 80 undertake fishing. Unlike in other areas of Kutch, here the Sodha community, a Rajput clan from Rajasthan and Sindh, are traditional fishworkers. Originally farmers, oral accounts indicate that they migrated to fishing many generations ago, due to a lack of rains in the region. Fishers say that their occupation does not dependent on caste. Fishworkers in Lakhpat also do dry farming of jowar and bajra, and animal husbandry in the fields outside the fort. But as sweet water decreases and underground water becomes saline, farming has taken a hit in 2016-2017.

**Pollution |** While industrialisation has not yet hit Lakhpat city, fishworkers mentioned that catch composition has been changing in Akri Moti, a village 15 km away. The Akrimota Thermal Power Project in NaniChher is 2x125 W lignite fired power plant, run by the Gujarat Mineral Development Corporation (GMDC), began operations in 2005. Lignite is sourced from GMDC owned mines in Panandhro, Mata-no-Madh and Umarsar. Water is drawn from Kori Creek and treated water is released back. This, the fishworkers say, has led to an increase in water temperature and a consequent decline in fish catch. Fishers from Buneri gaon nearby and Nani Cherr have felt this change over the last few years, and say that prawn production has been the most hit. This corresponds with reports from other fishing areas, such as in Mundra. For example, Kafri, a species of black coloured pomfret that used to be plentiful in both Lakhpat and Bhadreswar, in Mundra is now found only in Lakhpat.

**Fisheries & Livelihood |** The pattern of fishing in Lakhpat has remained the same for many decades; motorised fishing takes place for eight to nine months and pagadiya continues throughout the year. Each fishing trip lasts for three days. Approximately two fishing trips take place every week, with a one or two-day break in between to sort the fish, clean the nets and refresh supplies. Of the, approximately, 20 boats in Lakhpat, 12-13 boats go out to sea, each with six or seven people on board. The division of money happens according to catch, 50 percent going to the boat owner and the rest divided equally amongst the remaining fishworkers. Each trip consumes approximately 15 litres of diesel and costs Rs. 9000. As in all other areas, no fuel subsidy is available in Lakhpat, and the fish catch is sold to traders from Gandhidham, Bhuj and Jakhau. All the families undertake pagadiya fishing and, an estimated 50 families survive on this form alone, managing to catch fish worth Rs. 4000-Rs. 5,000.

The fishing areas off Lakhpat is 15-20 NM out to sea by boat and 1 NM inside in Kori Creek for pagadiya fishing. The quality and quantity of fish in the open sea are fairly abundant. Fish caught are largely Indian white mullet, rawas, spotted seer fish, Indian salmon, croaker, cuttlefish, clam etc. and about 5-6 kg of small shark. White prawn was a common catch found in the creek but has reduced in numbers. Fishers attribute this to decrease in water in the creek, which, they believe, is slowly drying, up like the Sindhu river did. Each fishing trip can get up to 60-100 kg of catch, with a good day netting even 150 kg. But fishworkers say that fishing, like hunting, is unpredictable. Fishing areas around Lakhpat and Narayan Sarovar village are regulated by the BSF and the Coast Guard, and only boats from the area, with requisite paperwork, can fish here. This, by default, seems to act as a protective mechanism against the overexploitation of fish stock.

**Debt Bondage |** But even with better fish catch, fishworkers are caught in a cycle of debt. They do not have surplus money or capital, and need loans to tide them over the months of the fishing ban. An exploitative form of debt, called 'bandhelu' or bondage, ensures that even with adequate fish catch, fishworkers remained mired in debt. Like in south Gujarat and in Kandla, fish traders give loans to the fishworkers on the condition the latter will sell their catch back to the trader. But, unlike Kandla and south Gujarat, the rate of fish is fixed for each season, at practically half its market value. Fishworkers have no other options for obtaining loan and also no bargaining power to increase prices, geting trapped in a cycle of perpetual debt and poverty. With no institutional credit or cooperative in the region, fishers have no choice but to rely on the traders.

**Conflict |** While border areas seem to have created an unintentional quota system, by controlling the movement of boats and people, the BSF and the Coast Guard have also become an impediment and a source of fear for fishing families. Fishworkers living in border areas were obviously conscious of the need to distance themselves from any affinity to Pakistan, and a palpable sense of caution existed in the interviews, reflected in repeated statements such as, “it is not like there is any conflict (with the BSF)” But security concerns have caused a loss in livelihoods of the fishworkers over the last 20-30 years, as the BSF have issued restrictions on fishing and fishing regions.

Strict regulations existed during the 1990's, when only day fishing was allowed. Because the movement of boats is dependent on tides, this stopped fishing in the region and an unspecified number of fishworkers from Lakhpat moved to Narayan Sarovar in the '90s. While such restrictions were relaxed after negotiation with the fishworkers, they are invoked on certain days, such as the 15th of August, and when reports of 'terrorist movement' are received by the intelligence agencies. Fishers in Lakhpat were circumspect and unwilling to talk about anything related to the security agencies operating in the region.

**Fisheries Department |** The fisheries department was mentioned only in passing during the interviews, unless specifically asked about. The key role of the department in Lakhpat currently consists of ensuring paperwork and identity cards. Fishworkers operating in the border regions need a boat registration, a fisheries card, a customs registration and a fishing license. The new smart card given by the fisheries department is a biometric data card, which is meant to replace all other identification and has been issued to the Lakhpat fishworkers.

**Case 3: Narayan Sarovar, Koteswar Bandar**

Area: Lakhpat
Districts: Kutch
Location: Koteswar Bandar, Narayan Sarovar Village
Fishing area: Kori Creek to Sir Creek

**Village & History |** The Narayan Sarovar village is in the Lakhpattaluka of Kutch. Fishworkers from the Narayan Sarovar village fish from the Koteswar bandar (landing center) situated a kilometre away. As per the 2011 Census, the fishing village had 273 households, with a population of 1,145 persons. Fishers say that the Maharaja of Kutch gave the Wagher community of Kutch nets in the 16th century, and fishers have, for generations, carried out pagadiya and boat fishing in the intertidal zone and in the creek systems of the region. Women from Narayan Sarovar village also undertake pagadiya fishing.

**Fisheries & Livelihood |** Pagadiya fishing takes place on the beach towards the right of the Koteswar Bandar, 1-2 km out to sea and yields catch of at least 10 kg per day. Along with pagadiya, approximately 30 boats operate from the bandar. Fishers use 20 m motorised boats with fixed nets, and with bouys. Fishing takes place in three-day trips, and six people go out to sea on one boat. As according to fishworkers, each trip costs Rs. 7000, largely because of boat and net repairs, ration (food and water), ice and fuel. Of the entire catch, half the profit goes to the boat owner and half is split between the khalassi, or boat labourers. Each boat can make up to Rs. 20,000 a trip, but the amount varies depending on season. The catch consists of fish such as lobster, Indian salmon,

barammundi or asian sea bass, mackarel, kingfish red snapper, jewfish. While crustaceans, such as lobster and crab are also easily found, they cannot be sold, as traders who buy from Narayan Sarovar do not deal in them.

Fishworkers identified increasing pollution and trawlers from Saurashtra as threats to their livelihood. Pollution has had localised impacts, and the water in Kori Creek is affected by the Sanghi Cement factory. Prawn, lobster, threadfin fish, previously common catches, are disappearing.

**Debt Bondage l** The debt pattern is a primary challenge for fishworkers in Narayan Sarovar. The practice of 'bandhelu' (bondage) has trapped them in a cycle of debt. Even with ample catch, all fishworkers bear debts of Rs. 10-15 lakhs. As in Lakhpat, loans are only available from traders to whom the catch has to be sold, and these traders arbitrarily fix rates for fish. As per interviews, pomfret, for example, that sells for Rs. 600 in the open market is sold for Rs. 200. Jewfish that sells at Rs. 4000 is sold at Rs. 2500. Air bladders of the jewfish, that can fetch up to Rs.1.5 lakhs, are also the paltry sum of Rs. 2500. Lobster, which can fetch Rs. 1200-Rs. 1500, are sold for Rs. 650. Prices are slashed to almost half, ensuring that fishworkers can never make enough to pay off their debt. Any special occasions in the family, such as a marriage, or illness, push them further into debt.

**Militarisation l** Both the Coast Guard and the BSF are present at the Koteswar Bandar, but fishworkers say that the BSF is the primary source of conflict and harassment. According to interviews, the BSF dominates over the community, the local police as well as government authorities, such as the fisheries department. With no one to monitor or oversee them, the BSF behaves like the "malik of the region". Like in Lakhpat, the BSF presence has meant daily harassment as well as a drop in earnings for fishworkers of Narayan Sarovar.

BSF presence in Narayan Sarovar is around 20-25 years old. According to BSF sources, there are six companies with 100 members each, and 300 supporting staff members in all of Kutch. Six to seven big boats, and 40-50 small boats, of the BSF are stationed at Narayan Sarovar for six months, from October to March, after which they move to Jakhau Port. As per stipulations, no outside boats can fish in this region, and no outward migration has taken place either. Arbitrary restrictions are put on fishing practices, which is harming the livelihood of the community. As per security restriction, only six people can go out to sea in one boat, at a time. Boats are also not allowed to carry any GPS devices for tracking location, or smartphones. They are only allowed to carry 80 litres of fuel, with further restrictions on water and ration. Within the creek systems, where fishing takes place, restrictions on where they can go, change from day to day. The logic behind the shifting boundary lines was unclear to the fishworkers, particularly since their fishing region is not around the IMBL or Sir Creek, This indicates that the restrictions are arbitrary.

Constant harassment, in the form of having sniffer dogs dirty their rations under the guise of checking, making fishers lose precious time by offloading entire boats, and forcefully seizing catch, are everyday occurrences. On high alert days, such as the 26th of January, or based on Intelligence reports, fishing areas are restricted to 4-5 km (2-3) of the sea. This leads to a drop in earning of, at least, Rs. 18, 000 per day, according to the fishworkers interviewed. For fishworkers who earn on a daily basis, each missed day could mean further debt. Fishers do understand the need for security, and say they personally inform the Coast Guard and the BSF whenever any unknown person is sighted at sea. However,they believe that much of the

BSF's activities are unnecessary and constitute harassment. They also say that such intimidation has increased in the last three or four years. At times of political pressure, and conflict between India and Pakistan, tension also heightens in Narayan Sarovar. Stil, boats from Narayan Sarovar have never been caught in Pakistani waters.

According to newspaper reports from 2015[108], the BSF is to set up a new marine battalion headquarters in Bhuj district, in Kutch. With a possible increase in presence of the BSF and emphasis on marine security, the fishworkers' interests are at risk.

**Fisheries Department I** The fisheries department is conspicuously absent from Narayan Sarovar. Fishers narrated that fisheries cooperatives that were started went bankrupt because of lack of guidance or resources. Banks do not give fishworkers loans, both because of social discrimination and a lack of assets as guarantee. The only role of the fisheries department fulfillswas to supply fishworkers with identity and registration documents. With these being high security areas, the fishworkers keep with them a profusion of identifications, including the fisheries creek pass, the boat log, a fishermen's identity card, an Aadhar card and a logbook with the BSF and the fisheries department, to counter harassment. The fisheries department has been entirely ineffective and complaints or needs are only met through negotiating or pleading with the BSF.

**Case 4: Jakhau Fishing Harbour**

Area: Abdasa Taluka
Districts: Kutch
Location: , Jakhau Fishing Harbour/Port
Fishing area: Kori Creek to Sir Creek
Ownership: Centre and State
Developed in/ operational since: 1991
Fishing season: August 15th to June 10th
Number of trawlers: 1300 approx.
Number of small boats: 3000
Small Boat Size/Net: Less than less than 20 m
People from: Saurashtra, Kandla and south Gujarat
Total Population: 18,000-30,000
Distance to border: 70 km

**History I** The idea of the Jakhua fishing port first arose after India gained Independence. Afraid that the dry climate of Kutch would lead to migration (hijrat) of its people to the more fertile lands of neighbouring Pakistan, former Prime Minister Jawaharlal Nehru requested BhawanjiArjunKhemji, a prominent local businessman, to create employment for the people of Kutch. The first big business set up by Khemji was a salt company in Jakhau. Following this, the proposal for a fishing port was first floated in 1969 and materialised in 1971. Construction began with a loan from the World Bank and the central and the state governments. The jetty was finished only in 1991, at a cost of Rs. 31 cr. Jakhau is a Centre controlled fishing port. However, contrary to its intentions, rather than benefiting the people of Kutch, who had no capital for large-scale fishing and stuck to pagadiya fishing, wealthy businessmen and affluent

[108] BSF to set up marine battalion HQ in Kutch, Daily Excelsior, December 2015

fishworkers from Saurashtra (Gir Somnath, Sachana) and south Gujarat (Valsad, Diu), and Kandla began migrating to Jakhau.

Outside the Jakahu port area, the local Kutchi population carries out pagadiya fishing. The differences in language and culture ensure that the communities do not mingle. Some locals from neighbouring villages are also involved in fish trade and ancillary businesses, such as transport. Exact figures were not available during the course of this research.

**Fisheries & Livelihood |** Jakhau harbor today is not just a fishing port but also a settlement of migrant fishworkers from across Gujarat. While boat owners says that it is only in the last 12 years the jetty has fully developed and expanded in business, fishworkers (both boat owners and migrant labourers) from districts of south Gujarat, Saurashtra and Kandla have been coming to dock their boats at Jakhau for the past 30 years. Migrant workers interviewed had migrated from their home villages to the bigger ports of Verval or Okkha, and then Jakhau, where both wages and work hours are better. Approximately 1200-1300 trawlers/ mechanised boats of 35-40 feet, and 3000 smaller boats of less than 30 feet (not classified as trawlers) operate from Jakhau port. The port falls under the aegis of the fisheries department but is essentially run by different boat owners' associations. Central associations exist for trawlers and small boats, followed by boat associations for the different places of origin of the migrant fishworkers, each region, a unit within the larger boat association, which wields considerable power.

About 17,000-30,000 fishworkers live in the Jakhau settlement, which consists of both temporary and permanent houses. Trawler boat owners also bring their families and children not of school-going age. Synonymous with the fishing season, most fishers live in Jakhau for ten months, from August to June of each year. Others, particularly small boats, come according to reports of catch, or in the winter season, when fish stock across the Arabian Sea starts reducing and Jakhau offers relatively better catch.

There are different types of fishworkers in Jahkhau, categorised according to their function and labour. Boat owners are primarily, according to interviews, from the more prosperous Tandel community, who do not go out to sea. Khalassi (overseer/ deck master in Jakhau) oversee and manage the boats and also go out to sea for navigation. In the hierarchy of Jakhau, they fall in between the labour and boat owners, hoping to transition to being owners themselves. Khalassis, moreover, are usually from the fishing community, whereas labourers who live on the boats and are paid a wage of approximately Rs.10000-Rs.13,000 a month, are either fishworkers or from the Adivasi communities in south Gujarat.

Hingaraj, Boat Labour from Valsad in Jakhau Port

"I have been coming herefor three years. Before that, I used to do fishwork in Verawal. I was there for 10 years and worked on a trawler. I came here because the wages are better. There, they used to be Rs. 8,000 per month and here they are Rs. 12,000-Rs. 13,000. It is also easier here than it was in Veraval. There, we had more work and less fish and we had to stay in the waters for longer. Before Veraval, I was in my village. I used do pagadiya fishing and work as a labourer on the boats. I earned Rs.100 per day, which was not enough. So I came to work

on the big boats here. We find small fish in my village. I got in touch with trawler boat owners in Valsad, which is how I came here to Jakhau. Others from my village have also come to Jakhau. People from my village migrate to Jakhau and Verawal for work, but they come separately. I don't know how many people from my village are here.

I have one daughter in college now. My father was also a fishworker who did pagadiya fishing and I am from the fishworker community. There is no jetty in my village. My village is near a tributary (khadi) of Auranga river.

Six of us go people in one boat; one guy is a cook- the old man there- he is also from Valsad. The Coast Guard and the BSF are there but don't interfere in my experience. We stay for four to five days in the ocean. If we get the maal we come back in two or three days, if not, we also stay for 15 days. It depends on the catch. Every trip we have to catch at least Rs.1 lakh worth of fish.

The main work is putting the net out, waiting for three hours, and puling it in again, the sorting and separating of fish, repairing nets, etc. We sleep in the cabin, whenever we get time. We take medicine (dawai) with us on the trip. When we dock, we stay and sleep on the boat. I don't have a fishermen card, but have an aadhar card; that's enough for the Coast Guard. I also have a customs card, which has the name of this port and my home village.

I am here for eight months and go back during off-season, for three months. We get ration, broken rice and wheat in the village. My wife doesn't work, but my girl is in college. At home, I catch small fish in the Auranga tributary. What will we do sitting at home? I'll keep coming back, but its not fixed. I will find out in monsoon if there is work available. Its uncertain, I could also have to sit at home. The boat owners call and tell us to come. I go with same boat every year.

Boat owners increase wage by a Rs. 1000, or so after some time and my wife saves. We get paid in cash and I it take back with me or send it home with someone going from here. We don't keep money in the bank. We had Rs. 40,000 rupees saved in cash during demonitisation, but my wife did some adjustment so we didn't lose too much money. We need the cash to build our house. I have no loan on my name, not even one rupee!”

As according to fishworkers interviewed, there are two main reasons that boat owners leave their homes and villages to stay in Kutch. First, reductions in fish catch in their regions. Fishworkers reported a decrease in quantity of fish catch and quality or kind of fish caught. Second, the urge to increase profits as, through the more plentiful fish catch available at Jakhau at lesser distances, the capital costs of each trip decrease. As a fishworker said, "Otherwise the catch does not justify expenses”. To find the same amount of fish, 1600 to 2000 litres of diesel is consumed in Okkha and only 400 litres in Jakhau.

In Jakhau, the inconsistent nature of returns on fishing, as was seen in south Gujarat and in Kandla, is mitigated. For most fishworkers interviewed across Gujarat, one bad day's catch could mean the difference between poverty and wealth, or lead one into debt.

The assessment of risk seemed to be in Jakhau's favour; whereas in other areas of Gujarat, fishers have to go out further to sea, here time and expense are both saved. The trawlers' fishing grounds are 50 NM from the harbor and small boats go only 5 NM out, as opposed to the minimum of 12-15 NM in south Gujarat. This is even though the rate for fish is lesser in Jakhau than in Saurashtra because of transport costs to reach processing centres (the difference is Rs.30-35 per 100 rupees made) Moreover, a boat owner from Valsad mentioned that the lack of infrastructure – jetty, ice facility, etc. in their home village is also another reason to migrate to Jakhau.

However, as in the rest of Gujarat, fishworkers and traders at Jakhau say that fish catch has reduced by at least 50 percent, in the last 15-20 years. Interviews indicated that in the same fishing grounds, catch that took 5 days, now takes 15. Fishing grounds are also moving further into the deep sea and away from the coast. While the kinds of fish caught remain the same, the quantity, fishworkers say, particularly of lobster and jewfish have seen a reduction.

**Fishing by Mechanised boats**

Each trawler takes approximately 25-30 trips in one fishing season (not including the months of the fishing ban), where each trip is 10-15 days long. Weather conditions are of prime importance, and both wind and rain interfere with fishing trips. Boats travel 50 NM in the deep sea, relying on GPS navigation and coordinates given by the security agencies to stay within the IMBL approximately 40 NM from Jakhau.

Each fishing trip costs Rs. 70, 000-Rs.90,000 in terms of oil, ration and ice. Wage for six to ten people come to, approximately Rs. 60,0000 a month. Overall, the total cost for each trip is approximately Rs. 1.5 lakhs. Adding to this, are the costs of boat repair and maintenance. Repairs are done off-season in Veraval or Rajkot by private companies. According to different interviews, profits depend on fish catch. Sometimes, a trip garners profit while other times there is no catch and capital is required to prepare for the next trip. Similar to small boat owners, loans are accessed from fish traders, to whom catch is sold. Jakhau is a big port, but small in relation to the ports of Saurashtra, namely Veraval and Porbandar. Most boat owners are also fishworkers and have a maximum of two or three boats. Boat owners at Jakahu believe that "those guys [at Veraval] can also then [if they don't make profit from a trip] sell their boats. We can't do that. We are small business people. If we don't get [catch], we have to wait for 15 days and somehow manage the next trip".

Trawler owners complain that they are not made aware of export prices, under the Marine Products Export Development Authority (MPEDA), and suspect that fish exporting companies do not pay them accordingly. This also corresponds with complaints from other parts of Gujarat, that the lack of a minimum fixed price is hurting fishworkers.

**Fishing by small boats**

Small boats are less than nine to ten metres and come from areas in Saurashtra, such as Sachana, Sikka, Salaya, Nava Bandar, Devbhoomi Dwarka and Kandla. They mainly use gill-nets, interchanged with different mesh size depending on catch (these can be 4mm, 8 mm, 10 mm for example). Lobster is the main two-day catch in August, and jellyfish (exported to Singapore) is caught daily from March till the end of the season. Other fish caught include shark, hilsa, jewfish, pomfret, catfish etc. Travelling up to 5 NM from the coast, small boats

stay at sea for one night and return the next day. Four to six people are employed on each boat, where they live and work. After each trip, one day is spent removing bycatch from the nets and repairing them. Many of the small boat owners and labourers also do fishwork in their own villages and come to Kutch to supplement their incomes. The distribution, or resource-sharing pattern, is different in small boats and closer to that found in Narayan Sarovar and Lakhpat. Each day's share is divided into seven parts if there are four people, and six parts if there are three people. The owner gets four shares and the rest (three or two shares, respectively) are distributed amongst the others. Small boat owners also indicated that loans are essential for them to survive. New nets and repairs cost Rs. 50,000- Rs. 60,000 and loans are taken from fish traders to whom they sell the catch. The loan system is not bonded/ bandhelu, like in Narayan Sarovar or Lakhpat, where fish rates are fixed in advance. At Jakhau, approximately 10 percent is taken from the fish catch to compensate for the loan. Overall small boats spend approximately Rs. 3,000-Rs. 4000 per trip, and earn Rs. 4,000-Rs. 5000 per trip.

**Conflict I** All fishworkers and boat/ fish-labourers interviewed say that mechanised boats from fishing jetties in Saurashtra, namely, Porbandar, Veraval, Mangrol and Okkha, come in large numbers to the fishing grounds of Kutch. The president of the boat owner's association estimated the number to be at least 300-400. Fishers say that fishing legislations do not specify the lateral or horizontal movement of boats, and there is no stopping boats from one region to go fish elsewhere.

While overfishing by Indian trawlers one of the reasons for depletion of fish stock, fishers also say that they have seen 'Taiwans' fishing in the Kutch region within the Indian EEZ. 'Taiwans' indicates Taiwanese made industrial fishing vessels or purse seiners that are known for highly destructive fishing mechanisms that wipe out shoals of fish and destroy entire seabeds. International fishing vessels do not have permissions to fish in the Indian EEZ.

Technology, increasingly, is becoming an important mediator and tool for fishing, and came up repeatedly during the interviews in Jakhau; wireless satellite communication systems, Global Positioning system (GPS) and fish finders aid boats in navigating and locating fish catch. Fishworkers say that such technology has made fishing easier. "While earlier experience mattered, now it is GPS." On the one hand, this implies that the value of traditional knowledge and skills, essential to the fishing community, are decreasing, on the other, it opens up the profession of fishing to other castes and communities. At the same time, the low rates of literacy within the fishing community become a barrier here, as supervisors who operate such gear have to be literate. As a trawler owner shared, "a graduate will not do fishing. They will handle operations and supervise, but not do labour."

With the marine border approximately 40 NM away, the fear of drifting outside the Indian border came up repeatedly in the interviews. Wireless radios on vessels report of boats caught by Pakistani security agencies instantly, and fishers are the first to know of any arrests. As in other parts of Kutch, fishworkers reiterate that boats caught are always from Saurashtra (Veraval, Okkha, Porbandar) and not from Kutch. But fishing trips are full of uncertainty created by, both, nature and economic exigencies. All fishworkers are defensive about and have sympathy for those caught at sea. As a fishworker says, "There is no marker, how is one to even know where the border is? If you don't find enough fish during a trip, what is one to do?  How will you give pagar (wage) or maintenance?"

**Fisheries department I** Unexploited fish catch in Kutch have made Jakhau a more secure fishing area. But living conditions and infrastructure at Jakhau port remain abysmal. There is no maintenance, sanitation or provision of basic amenities. One of the key complaints of fishworkers has been the lack of cellphone reception in Jakhau. The boat associations have been petitioning for a cellphone tower. Officials say that this is for security purposes, considering proximity to the borders. The fishers do not believe this and counter the rationale and ask why cellphone reception is present in Narayan Sarovar? Another complaint has been the lack of access to an auction house inaugurated in 2006, by Narendra Modi, then the CM of Gujarat. The structure, much to the consternation of fishworkers in Jakhau, lies unused, as it has been occupied by the BSF, which has restricted its use, due to 'security reasons'. Fishworkers see this as an illegal occupation, but have no avenue to register a complaint, since the BSF is the ultimate authority in border areas. The president of the Boat Owners Association of Jakhau reported, that despite repeated complaints, the police, the local administration and the fisheries department have refused to address this issue.

A presentation of the Commissioner of Fisheries claims that the department has created facilities costing Rs. 21.5 cr, to provide water. However, no such facility is functional in Jakkho. While a pipeline carrying sweet water from Narmada and the Mithi Dam was built (locals say it cost Rs. 14 cr according to official documents they accessed), due to evasion of responsibility between the water department and the fisheries department, no one operates the pipe. It stands unused, rusting due to effects of nearby salt production, while fishworkers working and living in the Jakhau port area buy bottled water for Rs. 35 per 200 litres and clean their fish with seawater. Fish processing centres do not exist in the entire region and the catch is taken to Verawal or Mumbai for processing.

Fishworkers interviewed from both in Valsad and Kutch say that they have to work together and pool in their own resources to survive. A fishworker from GirSomnath recounted how migration from his village stopped when villagers pooled in money to build a jetty and made provisions for ice, water and diesel. This was after repeated attempts to get help from the fisheries department. Fishworkers say," We have made it [Jakhau] livable ourselves. We built houses, since we stay here for eight or nine out of twelve months." Most fishworkers have extended families, and one brother's wife will stay back in the village of origin to take care of older parents and children who might be going to school. "Here, there is nothing to study, why bring [children] uselessly? If good teaching happened here then we would send for them. I will send my child to the village next year, to study," says a fishworker from south Gujarat, in Jakhau.

The nearest hospital is at Naliya, 26 km away, and two or three private clinics run by doctors and hakims (traditional doctors) have come up over the years in Jakhau. Boat owners bring their children with them and a basic primary school exists inside the compound of the harbour. No ration or PDS shop is currently present and most schemes are applicable for fishwokers only in their home villages, a common issue with migration across the country.

The fisheries department remains ineffectual and has taken no initiative to provide any kind of assistance to the fishworkers. A fisheries department office is present in Jakhau but its key role is to collect landing data. "There is development above, but it doesn't reach us," says a fishworker interviewed at the harbour. He added, "The fisheries department has made schemes and subsidies for technology but nothing has ever reached us. We have filled forms, but that's it. We keep filling out paperwork. The government releases money, but who knows where it goes."

# CONCLUSION

*"We will have to move out of fishwork, eventually, but someone else will come. The business will not die as long as there are fish in the sea. How long will be the fish will be there, remains to be seen."*

*Abdullasha Pirjada, Jakhau Fishing Harbour*

Across the state, economic processes put in motion since the '70s have adversely impacted the fishing communities and their livelihoods. Gujarat has been defined by the liberalisation of its economy and the thrust on export-oriented manufacturing. The coastline, the longest in the country, has been the biggest advantage in that process.

The power of the media, of the corporate-political nexus, and the public acceptance of the dominant growth model, either voluntarily or through coercion, has played out in Gujarat over 30 years. As elections approach once again, there is a renewed attempt to sync state and central policies to transition the 'Gujarat model' into an international template of pro-poor and pro-nation development. For the reader who has reached this far, they can safely surmise that Gujarat's growth model has been anything but that. Whether they re-visit decimation of the estuarine and coastal ecosystem in the Gulf of Khambat, the fisheries conflicts in Saurashtra or the impending disaster in the Gulf of Kutch, that coastal industrialisation and infrastructure have wreaked havoc on the lives of fishworkers across Gujarat's mighty 1600 km coastline is undisputed. Some of the key concerns that have arisen from this research are presented below:

**Fisheries |** The analysis of marine fish landing data shows that the rate of marine catch decelerated by almost 70 percent from 1995 till now, indicating a drastic change in fish catch across the year. At the same time, export of fish catch increased drastically and has remained stable. Both these changes have corresponded with the expansion of mechanised fishing. From the late '80s and the early '90s on, fishers started moving away from specific local fishing grounds, crisscrossing across the state to find catch for export. From daily fishing, fishworkers now spend up to 15-20 days at sea. This shift took place because of the needs of the market, facilitated through state schemes and policies that required the complete exploitation of fisheries resources. This made the fisheries industry and the livelihood of the fishing communities unsustainable.

The impact on fisheries resources has been drastic. Reports from across the state suggested that a number of fish species have disappeared from coastal waters, and the quantity of catch has decreased in the open seas, from south Gujarat to Kutch.

**Pollution |** This shift to mechanisation was exacerbated by the decreasing catch in coastal waters near the shore. The impacts of 30 years of pollution are starkly visible. Studies, from as far back as 1977, suggest pollution in the rivers of south Gujarat. Reports of non-compliance and release of untreated water, toxic waste and hazardous chemicals came to light during the last 20-30 years. Despite the various studies that point to different causes and varying intensity of pollution's impact - fish are no longer present in the waters. Across Gujarat, from Valsad to Navsari, from Surat to Porbandar, fishworkers recounted that the estuarine systems have become completely degraded. Considering the importance of coastal and estuarine waters as fish breeding grounds, and as ecological entities that protect the

coast from a range of climate change impacts, this is deeply disturbing. Fishers from Hazira, Umbergaon and Umarsadi villages, recounted how dolphins, sharks, kingfish, jewfish, etc., which used to be found right off the shore, have disappeared. Cases of fish die-off, polluted fish, waters that cause skin irritation, and, also, the fear of cancer amongst fishworkers, were common across the coast.

Pollution and the resulting degradation of coastal areas have severely impacted the economic viability of fishing. Estuarine areas are ecologically critical and act as breeding grounds for fish. Their destruction has led to fish stock disappearing and ensuing livelihood collapse. Traditional fishing communities, using motorised crafts, with gill-nets or doll-nets, are travelling up to 15-30 NM to be able to find enough catch to meet expenses. Mechanised boats are travelling 60-70 NM. Fishworkers from Kutch are also reporting disappearance of fish species from areas where coastal industries have come up since early 2000.

The above processes have meant that older forms of labour and capital are not adequate to address present needs of fishing. Longer distances travelled, mean more fuel and ration for the fishworkers, indicating a greater need for initial investment or capital. Between supplies, labour costs and other incidentals of net and boat repair, there is no scope for a profit. The lack of labour is being compensated by the Adivasi labour from forest regions of south and central Gujarat.

Across districts, the study found that fishworkers are in debt to fish traders, in the absence of any formal loan systems from banks or fisheries cooperatives. While this did not form part of the study, the role of the fish trader and the exporter, and the dynamics of fish pricing need further scrutiny, to understand the distribution of returns from fishing activities.

The state's key protective mechanism has been to protect territorial waters up to 5 NM for the utilisation of fishworkers in traditional boats. However, case studies and interviews show that such a demarcation is no longer adequate as there is hardly any fish catch left within 5 NM, particularly in south Gujarat and Saurashtra. This also raises the question of the role of the state in protecting the livelihood of fishworkers.

Decreasing fishing grounds, due to pollution and overexploitation, are also exacerbating existing conflict between small-scale fishworkers and mechanised fishing. As a fishworker from Porbandar said, the scarcity of catch is breeding conflict within the community.

**Migration or Displacement |** One of the questions with which this study began, was whether coastal industrialisation is, in any way, leading to migration. However, rather than just migration, we encountered displacement of multiple forms. We categorised these as spatial and occupational displacement. The lack of fish catch in south Gujarat has led fishworkers to transition to insecure wage labour in highly polluting factories. Even relatively prosperous fishing villages, such as Umarsadi village in Valsad, have women from the fishing communities employed as contract labourers in the regions' plastic factories. More affluent fishworkers, from regions such as Valsad and Daman and Diu, are moving along the coastline on longer trips or are migrating to bigger jetties, where fish catch is more easily accessible. Poorer fishworkers are moving to harbours such as Veraval, Mangrol, Porbandar and Jakhau, to work as labourers on boats.

The other, more visible, form of displacement results from the changing utilisation of coastal lands. Thermal power plants, ports and other coast-based infrastructure have cut off fishworkers' access to the sea. The fishing communities in Kutch live on the intertidal zone for

least nine months a year, and use the coast for their boats and the landing, sorting and drying of fish. The physical displacement of fishworkers not only shifts their physical location but also destroys their livelihoods. Both Kandla Port and Hazira are classic examples of this. In both places, fishworkers now live in a highly industrialised landscape. If in Kandla, they have been displaced multiple times, in Hazira, only one boat now goes out to sea and fishworkers make their living from selling steel scrap.

Ports and related infrastructure also damage coastal waters. Dredging at ports, and pollution because of oil tankers, has affected the waters. In Hazira, dredging has destroyed mangroves, while in Kandla, ancillary construction, as well as saltpans, have blocked creeks and led to increasing salinity of water. Factoring in climate change, even the most common fish, such as Bombay Duck, have disappeared. Moreover, while fishworkers are not even recognised as project -affected people, their livelihoods continue to be severely impacted.

**Conflict |** The border regions used to be a space of interaction between people, and fishworkers across India and Pakistan have many similarities in culture. But the demarcation of boundaries has transformed this region into a zone of conflict, as fishworkers now navigate their boats based on the presence of the Coast Guard and the invisible boundaries demarcated through technology (GPS) or floating devices.

Along with militarisation of the sea, the Kutch district has also seen an increasing presence of the BSF, since the early 2000s.The presence of security agencies and the arbitrary harassment of fishers, results in everyday humiliation. The nature of security is such that the forces supersede other forms of government, and the fishworkers have no means to address the daily harassment from the BSF.

Physical impacts: Fishers reported arbitrary restrictions on fishing areas in the waters, restrictions of supply of fuel, water and food and the number of fishers per boat, unnecessary checking of boats by dogs during their departure and landings, and confiscation of papers. The auction hall inaugurated in 2005, in Jakhau Port, has been occupied by the BSF with no explanation to the fishing communities. Whereas, fishworkers understand the necessity of security in border areas and also assist security forces as and when needed, they report that unnecessary restrictions have led to a sharp drop in earnings and are damaging their livelihoods.

Psychological effects: Both traditional fishworkers as well as mechanised boats from Jakhau face harassment and intimidation from security forces. Cases of harassment by the BSF are common and fishers live in a constant state of anxiety and fear because of the Forces' unpredictable behavior. The fishworkers also live under constant surveillance and, the fish landing jetty near Koteswar temple has particularly heavy security.

Further militarisation of coastal areas seem imminent with the formation of a special branch of police called the Gujarat Marine Police, as well as the tendency to use state reserve forces to guard 'critical infrastructure', such as dams, ports and oil terminals.

**Fisheries department |** The current data collection mechanisms are inadequate to understand and assess the actual state of fisheries, fishing patterns, fish landings and discards in Gujarat, indicating that the current reality of traditional fishworkers and small-scale fisheries is both understudied and unrecognised.

As mentioned before, fishworkers across the coast are in debt to fish traders. State or bank loans are not available, and this means that fishworkers get loans or advances from fish traders. Debt systems that are feudal in nature are being replicated, with fish traders becoming the new 'sahukars'. In places such as Kutch, the bandhelu system is highly exploitative and resembles the advance system practiced with brick kiln workers across central India. In Narayan Sarovar and Lakhpat, fish traders who give loans and buy back the catch, fix extremely low prices of fish, with no regards to the market, leading to a perpetual cycle of debt. These issues point to a lack of state support, in  fixing basic minimum prices.

The fisheries department is apathetic and physically absent from the regions where interviews took place. The only role of the fisheries department that was mentioned, across the state, was to provide identification documents. Jetties in Koteshwar, Umarsadi, and Umbargaon are broken. Repeated attempts to get them fixed have not yielded any results. Basic amenities at the Jakhau port are non-existent, and fishwokers associations have repeatedly petitioned the department, to no avail. Women's markets were also in bad shape, with no proper roofs or drainage and water systems.

Better technology and navigation equipment are changing the nature of fishing. Importantly, access to new technologies is variegated and dependent on access to capital or state schemes. In the absence of an effective fisheries department, this translates into unequal access determined by caste and class – once again disadvantaging traditional and particularly, the poorer fishing communities. Even prosperous villages like Umarsadi in Valsad District are feeling the handicap clearly.

As estuarine systems are destroyed and fish catch decreases, the gaze of the state turns towards what lies beyond the Exclusive Economic Zone (EEZ). Fishworkers from Porbandar told us that the fisheries department, that hasn't even replaced broken jetties or provided diesel subsidies, displayed deep-sea fishing techniques for the mechanised boat owners in the early 2000s. The fishing community dismissed these outright as they realise that this would be a radical transition in their access to coastal commons and livelihood. This is of particular importance because the Draft National Policy on Marine Fisheries, 2017, is pushing deep-sea fishing, much like it pushed mechanisation in the '80's without consulting the fishing communities.

Fishers have lost their place in the seas, their traditional livlihoods and a secure existence. The state, offers them solutions they have no use for. Questions of climate change and mitigation, and irresponsbily used technology, are now being considered. But, the solutions being offered are increasingly technocratic in nature. It assumes that a new science, devoid of people and historical practice has answers. It believes that a speculative finance and private property regime will eventually set things right. But these are only leading the fishing community to dispossession. Does this seem a fair compromise?

# Annexure 1: Community

Table 1: Fishworker Population in Gujarat

| | |
|---|---|
| 1980 | 1,52,015 |
| 2005 | 3,23,215 |
| 2010 | 3,36,181 |

*Source: Compiled from Marine fisheries census of 2005, 2010 and marine census, 1980 by CMFRI*

Table 2: Active fishworkers

| **Year** | **Full time** | **Part time** | **Occasional** | **Total** |
|---|---|---|---|---|
| 1980 | 25,616 | 6841 | 4070 | 36527 |
| 2005 | 68,956 | 10,185 | 4,181 | 83,322 |
| 2010 | 65,002 | 10,983 | - | 82,901 |

*Source: Compiled from Marine fisheries census of 2005, 2010 and marine census, 1980 by CMFRI*

Table 3: Full time fishwokers across districts

| **District** | **1980** | **2005** | **2010** |
|---|---|---|---|
| Valsad | 8345 | 9135 | 5,793 |
| Surat | 994 | 4,712 | 1704 |
| Bharuch | 997 | 2,273 | 2,831 |
| Kheda | 73 | NA | NA |
| Bhavnagar | 119 | 1282 | 1282 |
| Amreli | 2619 | 1414 | 1414 |
| Junagadh | 8101 | 28177 | 28177 |
| Jamnagar | 1582 | 6,513 | 6,513 |
| Rajkot | 1146 | 171 | 171 |
| Kutch | 1640 | 4,137 | 4,137 |
| Navsari | | 5556 | 5556 |
| Anand | | 220 | 220 |
| Porbandar | | 5,366 | 5,366 |
| **Total** | **1640** | **68,956** | **68,956** |

*Source: Compiled form Census of 1986,2005 & 2010*

Table 4: District wise population of fishworkers

| District | 1980 | 2005 | 2010 |
|---|---|---|---|
| Valsad | 58954 | 45,401 | 49,187 |
| Surat | 8440 | 11,575 | 15,089 |
| Bharuch | 5408 | 10,523 | 13,173 |
| Kheda | 436 | NA | NA |
| Bhavnagar | 1179 | 6,854 | 7,765 |
| Amreli | 14559 | 12,730 | 24,623 |
| Junagadh | 42843 | 1,19,420 | 92,076 |
| Jamnagar | 8098 | 31,910 | 45,253 |
| Rajkot | 4658 | 4,286 | 7,847 |
| Kutch | 7440 | 19,107 | 20,982 |
| Navsari | NA | 26,418 | 27,872 |
| Anand | NA | 1,063 | 1,378 |
| Porbandar | NA | 33,928 | 30,937 |
| **Total** | **1,52,015** | **3,23,215** | **3,36,181** |

*Source: Compiled from Marine fisheries census of 2005, 2010 and marine census, 1980 by CMFRI*

Table 5: Fishworkers engaged in allied activities

| Table 8:Fisherfolk engaged in allied activities | | | |
|---|---|---|---|
| **Year** | **Male** | **Female** | **Total** |
| 1980 | - | - | |
| 2005 | 44,879 | 30,203 | 75082 |
| 2010 | 23,212 | 35,784 | 51794 |

*Source: Compiled from Marine fisheries census of 2005, 2010 and marine census, 1980 by CMFRI*

District 6: Wise Fishing villages

| District | 1980 | 2005 | 2010 |
|---|---|---|---|
| Valsad | 42 | 22 | 24 |
| Surat | 12 | 19 | |
| Bharuch | 1 | 20 | 23 |
| Kheda | 4 | NA | NA |
| Bhavnagar | 8 | 10 | 8 |
| Amreli | 22 | 8 | 6 |
| Junagadh | 20 | 72 | 27 |
| Jamnagar | 5 | 23 | 24 |
| Rajkot | 50 | 5 | 4 |
| Kutch | NA | 62 | 68 |
| Navsari | NA | 16 | 18 |
| Anand | | 1 | 1 |
| Porbandar | | 5 | 5 |
| **Total** | | 263 | 247 |

*Source: Compiled from Marine fisheries census of 2005, 2010 and marine census, 1980 by CMFRI*

Table 7: Fishlanding centers in districts

| District | 1980 | 2005 | 2010 |
|---|---|---|---|
| Valsad | 39 | 23 | 22 |
| Surat | 15 | 10 | 6 |
| Bharuch | 11 | 9 | 6 |
| Kheda | 1 | NA | NA |
| Bhavnagar | 4 | 9 | 8 |
| Amreli | 7 | 3 | 2 |
| Junagadh | 16 | 17 | 16 |
| Jamnagar | 21 | 17 | 18 |
| Rajkot | 8 | 1 | 4 |
| Kutch | 51 | 19 | 22 |
| Navsari | NA | 9 | 12 |
| Anand | NA | 1 | 1 |
| Porbandar | NA | 5 | 4 |
| **Total** | **173** | **123** | **121** |

*Source: Compiled from Marine fisheries census of 2005, 2010 and marine census, 1980 by CMFRI*

Table 8: District wise distribution of fish catch for 2011-2011

| S no. | District | Quantity in Tonnes | Percentage |
|---|---|---|---|
| Gulf of Khambat | | | |
| 1. | Valsad | 87,594 | 12.65 |
| 2. | Navsari | 20,159 | 2.91 |
| 3. | Surat | 3,208 | 0.46 |
| 4. | Bharuch | 6,405 | 0.92 |
| 5. | Anand | 456 | 0.07 |
| 6. | Rajkot | 955 | 0.14 |
| 7. | Bhavnagar | 2640 | 0.38 |
| 18.1. | Amreli | 60,576 | 8.75 |
| Saurashtra Coast | | | |
| 9. | Junagadh | 2,80,897 | 40.56 |
| 10. | Porbandar | 89,555 | 12.93 |
| Gulf of Kutch | | | |
| 11. | Jamnagar | 67,146 | 9.70 |
| 12. | Kutch | 72,897 | 10.53 |
| Total | | 6,92,488 | 100.00 |

*Source: Gujarat Industrial Development Board commissioned report by PriceWaterhouse Cooper for the Saurashtra region.*

# Annexure 2: Industry (compiled by TRC)

Table 1: Approximate List of Ports and Jetties GMB to give scale/ types of operations of workds under the GMB

| District | Location | Name | Description / Type of Jetty as per GMB | Commodities handled |
|---|---|---|---|---|
| 1.1 Gulf of Khambat | | | | |
| Valsad | | - | - | |
| Navsari | | - | - | |
| Surat | | Magdalla Port | GMB Owned Lighterage port on bank of River Tapi | Coal, cement, clinker |
| | Hazira | M/s Reliance Industries | Captive Jetty (BOMT) | Ethyl, EDC-RoRo |
| | | M/s Essar LPG Jetty | | LPG. |
| | | M/s Essar Steel Ltd (1st Extension) and Bulk terminal | Captive Jetty (BOMT) | Sponge Iron, coal, Steel, Limestone |
| | | Larson &Tubro | Captive Jetty (BOMT) | Cement |
| | | Gujarat Ambuja Cement Co. | Captive Jetty (BOMT) | Cement |
| | | M/s Essar Steel | Captive Jetty (BOMT) | Sponge iron |
| | | M/s EBTL (2nd Expansion) | Captive Jetty (BOMT) | Sponge Iron |
| | | AdaniHazira Port Private Ltd. | Private Port | Coal and general cargo, crude oil, steel, LNG |
| | | KRIBHKO Fertilizers | Private Jetty | Fertlizers |
| Bharuch | Dahej | GMB jetty | | |
| | | M/s DahejHarbour Infrastructure Ltd. | Captive Jetty (BOMT) | Liquid Cargo |
| | | GMB Port | | |
| | | M/S. IPCL (now RIL) | Captive Jetty (BOMT) | Liquid Jetty |
| | | Reliance Industries Ltd | Captive | Petrol |
| | | DahejHarbour Infrastructure Ltd. | Captive Jetty (BOMT) | General Cargo, coal |
| | | Gujarat Chemical Port Terminal Co. Ltd | Private | |
| | | Petronet LNG | Private | LNG |
| | | AdaniPetronet Pvt. Ltd | Private | Coal |
| Amreli | Jaffrabad Port | | GMB Port | |
| | | Pipavav Victor (GMB Jetty) | GMB jetty | Coal, |
| | | APMTerminalPipavav | Private Port | Coal, steel. Limestone |
| | | Larson and Toubro Ltd | Captive jetty | Coal |
| | | M/s Ultratech Cement | Captive Jetty (BOMT) | Cement Jetty |
| | Bhavnagar Port | | GMB owned | Limestone |
| | | AlangSosiya Ship breaking yard jetty | LDT- GMB owned | Ship breaking |
| 1.2-Saurashtra Coast | | | | |
| GirSomnath | Muldwarka | Gujarat Ambuja Cement New Jetty | Captive Jetty (BOMT) | Cement Jetty |
| | | Gujarat Alkalis & Chemicals Limited (GACL) | Captive Jetty (BOMT) | Cement Jetty |
| Porbandar | Porbandar | Porbandar Port | GMB owned Jetty | Soda ash, bauxite |
| | | Saurashtra Cement | Captive | Cement Jetty |

| | | | | |
|---|---|---|---|---|
| Junagadh | Veraval | GMB Port | GMB Jetty | Food grains |
| | | GMB jetty | GMB jetty | GMB jetty |
| | | United Shippers Ltd | Private Jetty | Coal cement, sulphur, scrap, food, iron ore etc |
| | | Shrijee Shipping Services Ltd | Private jetty | Coal cement, Sulphur, scrap, food, iron ore etc |
| | | Chaugule& Co | Private Jetty | Salt |
| | | Jaydeep Associates | Private Jetty | Coal, Salt |
| Jamnagar | Rozi, Bedi | Bedi Port (GMB Jety) | GMB - Sikka, Sachana, Salalya | Coal , bauxite |
| | | | and Jodiya sub ports | |
| | Bedi port, Sikka | M/s Reliance Ports and Terminals Ltd | Captive Jetty (BOMT) | Ro-Ro |
| | | Sachana Port | | Ship breaking |
| | | Salaya Port | | Sailing Vessels |
| | | Jodiya | | - |
| | | Shree Digvijay Cement | Captive Jetty (BOMT) | Cement, coal |
| | | Gujarat State Fertilizer Company | Captive Jetty (BOMT) | Ammonia |
| | | GACL new jetty | Captive Jetty (BOMT) | Cement Jetty |
| | | M/s Reliance Ports and Terminals (Ltd.) | Captive Jetty (BOMT) | Ro-Ro |
| | | M/s Reliance Ports and Terminals Ltd – 4 Tanker Berth | Captive Jetty (BOMT) | Liquid Cargo- SPM 2 |
| | | M/s Reliance Ports and Terminals Ltd | Captive Jetty (BOMT) | Liquid Cargo- SPM no. 3 |
| | | M/s Reliance Ports and Terminals Ltd | Captive Jetty (BOMT) | Liquid Cargo- SPM no. 4 |
| | | M/s Reliance Ports and Terminals Ltd | Captive Jetty (BOMT) | Liquid Cargo- SPM no. 5 |
| | | M/s Reliance Ports and Terminals Ltd- 5th berth at product jetty | Captive Jetty (BOMT) | Liquid Cargo |
| | | BORL- SPM | Captive Jetty (BOMT) | Crude Oil |
| | Bhogat | Cairn Energy India Pvt, Ltd. | Captive Jetty (BOMT) | Crude oil |
| | | JM Baxi& CO | Private | Soyabean, wheat, rice, fertilizers |
| | | Gujarat State Fertilizer Corporation Ltd. (Captive Jetty) | Captive | Fertilizers, cement |
| | | Digvijay Cement Co Ltd. | Captive Jetty | Cement, clinker, coal |
| | | Reliance Ports and terminals Ltd | | Petrol |
| | | Bharat Oman Refineries Ltd | Captive | Petrol |
| | | Shakti Clearing Agency | Private - Subsidiary of United Shippers | Coal, petcoke, sulphur |
| | | Ruchi Infrastructure Ltd | Private | - |
| | | Shantilal Multiport Infrastructure | Private | Bauxite |
| | | Continental Warehousing Co Ltd. | Private | - |
| | | Sachana Ship Breaking Yard | | - |
| Devbhoomi-Dwarka | | Okha port | GMB Owned Port | Soda ash, limestone, bauxite |

| 1.3 Gulf of Kutch | | | | |
|---|---|---|---|---|
| Kutch | Mandvi | Mandvi | GMB Jetty | Food grains, salt |
| | Mundra | Old Mundra | GMB Jetty | - |
| | | Adani Port & SEZ Ltd. | Private Port | Coal, cement. Crude oil, food grains, steel , salt, limestone |
| | Jakhau | Old GMB Jetty | | |
| | | M/S Sanghi Industries | Captive Jetty (BOMT) | Cement/ Clinker, Coal |
| | | Jakhau Salt Co. Pvt. Ltd | - | Salt |
| | Kharo Creek | JP Associates Ltd. | Captive Jetty (BOMT) | Cement/ Coal |
| | | ABG Cement Ltd. | Captive Jetty (BOMT) | Cement /Coal |
| | | Vadraj Cement | Captive Jetty (BOMT) | Cement /Coal |

Source: Collated form GMB website and documents

Table 2: Greenfield projects (Proposed and Operational)

| | | | | |
|---|---|---|---|---|
| | | | and Jodiya sub ports | |
| | Bedi port, Sikka | M/s Reliance Ports and Terminals Ltd | Captive Jetty (BOMT) | Ro-Ro |
| | | Sachana Port | | Ship breaking |
| | | Salaya Port | | Sailing Vessels |
| | | Jodiya | | - |
| | | Shree Digvijay Cement | Captive Jetty (BOMT) | Cement, coal |
| | | Gujarat State Fertilizer Company | Captive Jetty (BOMT) | Ammonia |
| | | GACL new jetty | Captive Jetty (BOMT) | Cement Jetty |
| | | M/s Reliance Ports and Terminals (Ltd.) | Captive Jetty (BOMT) | Ro-Ro |
| | | M/s Reliance Ports and Terminals Ltd – 4 Tanker Berth | Captive Jetty (BOMT) | Liquid Cargo- SPM 2 |
| | | M/s Reliance Ports and Terminals Ltd | Captive Jetty (BOMT) | Liquid Cargo- SPM no. 3 |
| | | M/s Reliance Ports and Terminals Ltd | Captive Jetty (BOMT) | Liquid Cargo- SPM no. 4 |
| | | M/s Reliance Ports and Terminals Ltd | Captive Jetty (BOMT) | Liquid Cargo- SPM no. 5 |
| | | M/s Reliance Ports and Terminals Ltd- 5th berth at product jetty | Captive Jetty (BOMT) | Liquid Cargo |
| | | BORL- SPM | Captive Jetty (BOMT) | Crude Oil |
| | Bhogat | Cairn Energy India Pvt, Ltd. | Captive Jetty (BOMT) | Crude oil |
| | | JM Baxi& CO | Private | Soyabean, wheat, rice, fertilizers |
| | | Gujarat State Fertilizer Corporation Ltd. (Captive Jetty) | Captive | Fertilizers, cement |
| | | Digvijay Cement Co Ltd. | Captive Jetty | Cement, clinker, coal |
| | | Reliance Ports and terminals Ltd | | Petrol |
| | | Bharat Oman Refineries Ltd | Captive | Petrol |
| | | Shakti Clearing Agency | Private - Subsidiary of United Shippers | Coal, petcoke, sulphur |

| | | | | |
|---|---|---|---|---|
| | | Ruchi Infrastructure Ltd | Private | - |
| | | Shantilal Multiport Infrastructure | Private | Bauxite |
| | | Continental Warehousing Co Ltd. | Private | - |
| | | Sachana Ship Breaking Yard | | - |
| Devbhoomi-Dwarka | | Okha port | GMB Owned Port | Soda ash, limestone, bauxite |
| 1.3 Gulf of Kutch | | | | |
| Kutch | Mandvi | Mandvi | GMB Jetty | Food grains, salt |
| | Mundra | Old Mundra | GMB Jetty | - |
| | | Adani Port & SEZ Ltd. | Private Port | Coal, cement. Crude oil, food grains, steel , salt, limestone |
| | Jakhau | Old GMB Jetty | | |
| | | M/S Sanghi Industries | Captive Jetty (BOMT) | Cement/ Clinker, Coal |
| | | Jakhau Salt Co. Pvt. Ltd | - | Salt |
| | Kharo Creek | JP Associates Ltd. | Captive Jetty (BOMT) | Cement/ Coal |
| | | ABG Cement Ltd. | Captive Jetty (BOMT) | Cement /Coal |
| | | Vadraj Cement | Captive Jetty (BOMT) | Cement /Coal |

Source: Collated form GMB website and documents

Table 3: GIDC Estates

| Table 3.1 - Gulf of Khambat | | | |
|---|---|---|---|
| **S. No.** | **District** | **GIDC** | **Area** |
| 1 | Valsad | Vapi Industrial Estate | 1163.77 |
| 2 | | Sarigam Industrial Estate | 401.3 |
| 3 | | Umbergaon Industrial Estate | 388 |
| 4 | | Valsad/ Gundlav Industrial Estate | 106.63 |
| 5 | | Pardi Industrial Estate | 22.74 |
| 6 | Navsari | Navsari Industrial Estate | 55 |
| 7 | | Billmori Industrial Estate | 44 |
| 8 | Surat | Sachin Industrial Estate | 775.13 |
| 9 | | Hazira Industrial Estate | 127.04 |
| 11 | | IcchaporeBhatpore Industrial Estate | 844.02 |
| 12 | | Katargama Industrial Estate | 38.33 |
| 13 | | Olpad Industrial Estate | 31.26 |
| 14 | | Khatodara Industrial Esate | 3.08 |
| 15 | | Pandesara Industrial Estate | 218.27 |
| 16 | | Hazira-Mora Industrial Estate | 428.04 |
| 17 | | Mahuva Industrial Estate | 5.19 |
| 18 | Bharuch | Dahej II Industrial Estate | 4695.78 |
| 19 | | Dahej III Industrial Estate | 1477 |
| 20 | | Ankleshwar Industrial Estate | 11611.65 |
| 21 | | Dahej Housing Industrial Estate | 283 |
| 22 | | Bharuch Industrial Estate | 85.52 |
| 23 | | Jhagadia Industrial Estate | - |
| 24 | | Jambusar Industrial Estate | 2.23 |
| 25 | Anand | Khambat Industrial Estate | 37.83 |
| 26 | Ahmadabad | Dhandhulka Industrial Estate | 42.71 |
| 27 | Bhavnagar | Mahuva Industrial Estate | 18.21 |
| 28 | Amreli | Damnagar Industrial Estate | 14.81 |
| 29 | | Amreli Industrial Estate | 14.15 |
| 30 | | Rajula Industrial Estate | 3.92 |
| 231 | | Jafrabad Industrial Estate | 1 |
| | Total | | 22939.61 |

Table 3.2 GIDC Estates Coast

| S. Number | District | GIDC - | Industry Type | Area | Pollution Category |
|---|---|---|---|---|---|
| | Gir- Somnath | | | | |
| 1 | Junagadh | Junagadh I Industrial Estate | | 14.29 | |
| 2 | | Junagadh II Industrial Estate | | 85.89 | |
| 3 | | Veraval Industrial Estate | | 56.56 | |
| 4 | Porbandar | Porbandar Industrial Estate | | 200.68 | |
| | Dwarka-Devbhoomi | | | | |
| Total | | | | 357.42 | |

Table 3.3 - GIDC Estates in the Gulf of Kutch

| S. No. | Distr ict | GIDC | Area |
|---|---|---|---|
| 1 | Jam nag ar | Jamnagar I Industrial Estate | 50.59 |
| 2 | | Jamnagar II ( Shankar Tekri) Industrial Estate | 136 |
| 3 | | Jamnagar III | 176 |
| 4 | Kutc h | Anjar Industrial Estate | 22.73 |
| 5 | | Mandvi Industrial Estate | 19.94 |
| 6 | | Bhuj Industrial Estate | 19.5 |

Table 4: Thermal power

| Table 4.2: TPP across Saurashtra Coast | | |
|---|---|---|
| **District** | **TPP (coal)** | **Capacity (MW)** |
| GirSomnath | | |
| Junagadh | | |
| Porbandar | | |
| Dwarka-Devbhoomi | Mojap GSECL Plant | 384 |
| | **TOTAL** | **384** |

Source: Compiled from various state official sources and plant websites

Table 4.3 TPP across Gulf of Kutch

| **District** | **TPP (Coal)** | **Capacity (MW)** | **TPP (Gas)** | **Capacity (MW)** |
|---|---|---|---|---|
| Jamnagar | Saurahstra Super Thermal Power Plant/Bhatwadi Power Plant | 3960 | | |
| | Sikka Thermal Power Statiobn | 240 | | |
| | Essar/Vadinar Power Gujarat Ltd. | 1,200 | | |
| Kutch | Tata Ultra Mega Power Project | 4,000 | Panandhro/Kutch Thermal Power Plant | 290 |
| | Mundra Thermal Power Station | 4,620 | Nana Lajya Power Plant | 2000 |
| | Akrimoti Thermal Power Station | 250 | Jamnagar VadinarEssar Power | 1010 |
| | Nan LayjaMota Power Plant | 3960 | | |
| | **TOTAL** | **18,230** | | **3,300** |

Table 5: Overall Distribution of installed capacity (2015-2016)

| **Sector** | **Unit (MW)** | **Percentage produced** |
|---|---|---|
| Thermal | 13,782 | 55.29% |
| Gas | 4,806 | 19.28% |
| **Sub Total** | **18,588** | **74.58%** |
| Wind farm | 3933 | 15.78% |
| Solar | 1016 | 4.08% |
| Hydro | 788 | 3.16% |
| Nuclear | 559 | 2.24% |
| Biomass | 41 | 0.16% |
| Total | 24,925 | |

Table 6: Consumption of electricity by use (as of 31.03.2012)

| **Type of use** | **Number** |
|---|---|
| Domestic | 10067 |
| Commercial | 2571 |
| Industrial | 27606 |
| Public lighting | 275 |
| Agriculture | 13955 |
| Public water works | 1323 |
| Railway traction | 708 |
| Others | 7210 |
| Total consumption (million units) | 63715 |
| Per capita Consumption (kHW) | 1642 |

Where have the fish gone? – a study that investigates the impact of coastal industrislisation on the fishworkers of the state of Gujarat. Drawing upon secondary research and case studies across the Gulf of Khambat, the Saurashtra Coast and the Gulf of Kutch, it establishes that the fishing community is caught between an increasingly industrialised coastline, rapidly depleting marine resources and territorial boundaries in the sea. With the increasing usage of coastal land for industry acros the country, the study offers a suggestion as to what the future of the Indian coast could be.

The Research Collective, the research unit of the Programme for Social Action (PSA), facilitates research around the theoretical framework and practical aspects of development, industry, sustainable alternatives, equitable growth, natural resources, community and people's rights. Cutting across subjects of economics, law, politics, environment and social sciences, the work bases itself on people's experiences and community perspectives. Our work aims to reflect ground realities, challenge detrimental growth paradigms and generate informed discussions on social, economic, political, environmental and cultural problems.