CENTRE FOR SCIENCE AND ENVIRONMENT

MAIN OFFICE: 41, Tughlakabad Institutional Area, New Delhi-110 062 INDIA
Tel: 2995 5124, 2995 6110, 2995 6394, 2995 6399 **Fax:** 91-11-2995 5879 **Email:** cse@cseindia.org **Website:** www.cseindia.org
BRANCH OFFICE: Core 6A, Fourth Floor, India Habitat Centre, Lodhi Road, New Delhi-110 003
Tel: 2464 5334, 2464 5335

April 18, 2013

LEAVES OF IMPORTANT SURVIVAL TREES IN INDIA -- MAHUA, KHEJDI, ALDER, PALMYRA AND OAK

Ms. Jayanthi Natarajan
Minister of State (IC)
Ministry of Environment & Forests
Paryavaran Bhawan
CGO Complex
Lodhi Road
New Delhi-110003

Dear Ms. Natarajan,

Once again, my colleagues in the Committee and I would like to thank you for the opportunity to review and inspect M/s Adani Port and SEZ Ltd, Mundra Gujarat. As you will see in the report, which we presented to you today, our attempt has been to provide a fact based assessment of the project to ascertain the violations and non-compliances on the issues listed in the terms of the reference.

We have suggested an agenda for remedial action, which we hope, will provide the opportunity to mitigate and repair the damage that has occurred in the area because of the project.

We have also made recommendations about the reform needed for better regulation and monitoring of environmental clearances and CRZ. We hope you will find the report useful in the deliberations in the Ministry on these critical issues.

Given these larger reform related recommendations need wider dissemination, we would be grateful if the Ministry can publish the report on its website. We hope this will build a dialogue and understanding of the problems and the possible way ahead.

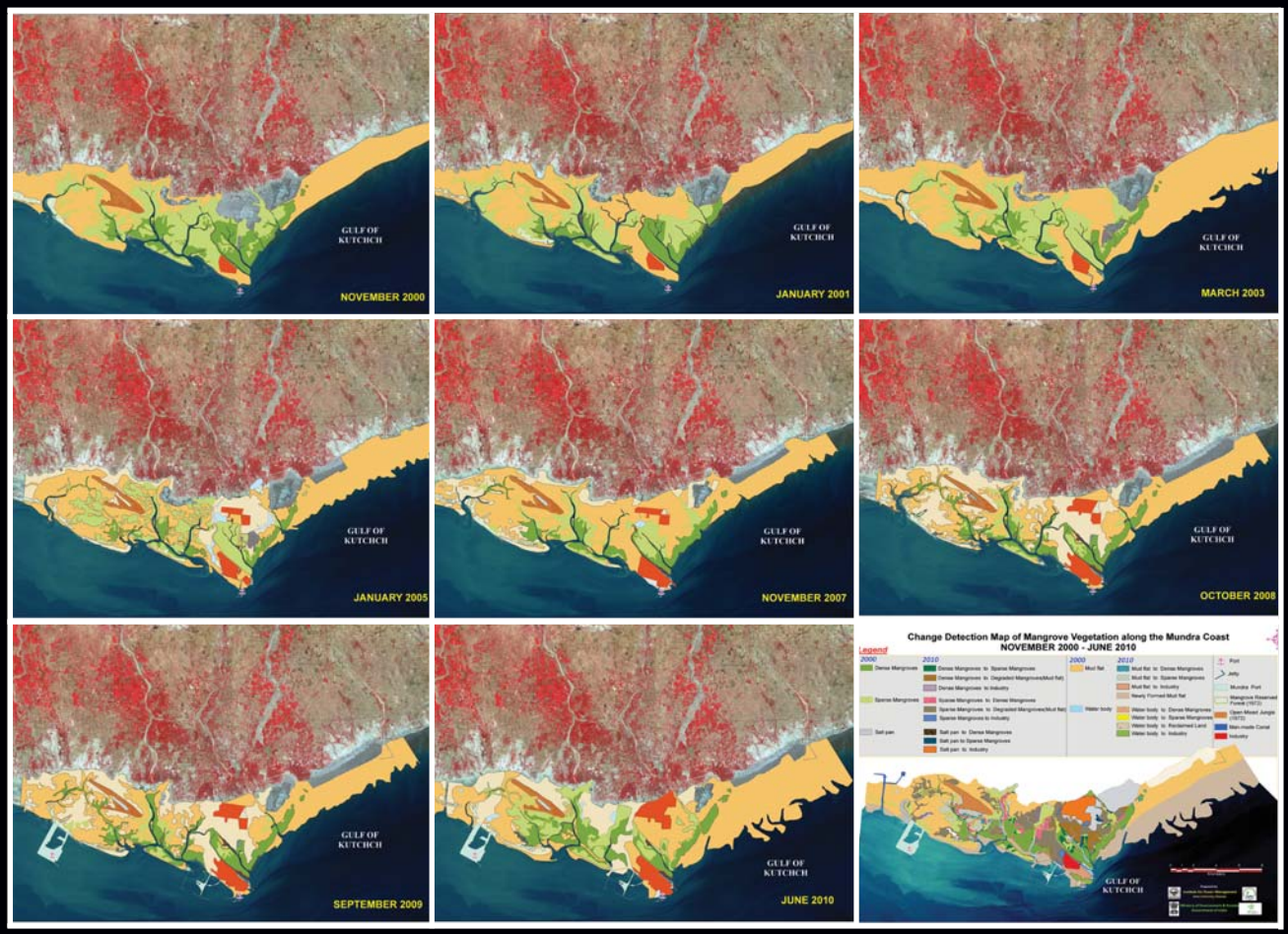
With warm regards,

Yours cordially,

Sunita Narain

REPORT OF THE COMMITTEE FOR INSPECTION OF M/s ADANI PORT & SEZ LTD. MUNDRA, GUJARAT

APRIL 2013



MINISTRY OF ENVIRONMENT AND FORESTS, NEW DELHI

April 18, 2013

Ms Jayanthi Natarajan
Minister of State
Ministry of Environment and Forests
Paryavaran Bhawan, CGO Complex
New Delhi

Dear Ms Natarajan,

We would like to thank you for the opportunity to be part of the Committee to inspect M/s Adani Port and SEZ Ltd., Mundra, Gujarat. We are aware that the issues before us are important in terms of safeguarding coastal ecology as well as livelihoods of people. We are also aware that our Committee is not the first to examine allegations of non-compliance with environmental conditions of this company. But we hope, that this report will help to settle the controversy and conflict to a large extent, by presenting factual information and analysis on what has gone wrong, as well as detailed recommendations on the future plan for remedial action.

Our objective has been to base our conclusions on evidence and thorough assessment of adverse impacts. This, we believe, is necessary for the report to be credible and independent.

Our overall assessment is that there are instances of violations and non-compliance with environmental conditions, which need to be addressed. We need effective deterrents for the future. But it is equally important that urgent steps are taken to repair damage and to mitigate future harm. We have in our recommendations set out the agenda for action in this case.

But this is just one part of the action plan we have recommended. It is equally necessary for us to reform and strengthen the policy and regulatory system of coastal zone management and environmental clearances. We believe that the need for this Committee and many others could have been obviated if there is a robust monitoring system, in the public domain. We hope that you will direct action on this matter, with the urgency that is required.

We hope that our report will provide the analysis for future directions on this specific case and many other related issues.

With warm regards,

Sunita Narain
(Chairperson)
Director General, CSE

R Ramesh
(Member)
Director, NCSCM

A Mehrotra
(Member)
Director, MoEF-Bhopal

Lalit Kapur
(Member)
Director, MoEF

Antony Gnanamuthu
(Member)
Member, EAC-II (Industry)

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1. Constitution of Inspection Committee and ToR

On September 14, 2012, the Ministry of Environment and Forests (MoEF) constituted a Committee for inspection of M/s Adani Port and SEZ Ltd., Mundra, Gujarat. The Committee was set up based on complaints received from Kheti Vikas Sewa Trust and Machimar Adhikar Sangharsh Sangathan (MASS) regarding severe impact upon environment safety and integrity in the Mundra Port and SEZ Limited area committed by M/s Adani Port and SEZ Limited (*Annexure 1*).

The broad terms of reference (ToR) of the Committee are as follows:

- The allegations regarding bunding/diversion/blocking of creeks and reclamation etc., and thereby distortion of original High Tide Line (HTL).
- The HTL submitted by the proponent and HTL of the approved Coastal Zone Management Plan (CZMP).
- Whether construction of Mundra port, roads, railway was taken up prior to grant of Forest/ Environmental Clearances.
- The development of port with respect to the approved components.
- Compliance to the conditions of the Environmental Clearance (EC) and Coastal Regulation Zone (CRZ) Clearance granted for the port development.
- The destruction of mangroves and leveling of sand dunes.
- The development of power plant with respect to the approved components.
- Compliance to the conditions of the EC granted for the power plant.
- The likely impacts on agriculture due to ingress of salinity resulting from creation of huge water body of sea water for Adani Power Plant at Mundra Taluka.
- The issues related to handling of fly ash by Adani Power Limited and particularly with reference to the Notification on utilization of fly ash.
- The issues related to earthquake/tsunami/other natural calamities and soil liquefaction which may be impacted adversely by the project.

2. Background of Clearances Granted

There are three distinct components of the project area, which need to be understood in terms of activities and clearances to make an assessment of environmental impact and non-adherence to conditions stipulated at the time of clearance. These are:

- Mundra Port area later called Waterfront Development
- Thermal Power Plant
- Special Economic Zone (SEZ)

These activities are located in a contiguous region and therefore, environmental and social impacts are also inter-related, and often cumulative. The project has also sought and got approvals in different phases.

2.1: Mundra Port Area (Mundra Port and SEZ Limited)

August 25, 1995, the first clearance was granted to M/s Adani Port Limited for the handling facility of general cargo, LPG and chemical storage terminal.

September 20, 2000, clearance was granted to port expansion project, including bulk cargo container, railway link and related ancillary and back up facilities to M/s Gujarat Adani Port Limited (GAPL).

July 21, 2004, clearance was granted for single point mooring; crude oil terminal etc., to GAPL.

February 5, 2007, clearance was granted for multipurpose berth (Terminal 2) at the Mundra Port to GAPL.

September 28-29, 2007, CRZ, infrastructure and miscellaneous projects Expert Appraisal Committee (EAC) meeting (57th) discussed EC for Multi Product SEZ (Phase 1B and Social Infrastructure) in Mundra, by Mundra Port and SEZ Limited (MPSEZL). This meeting considered the entire project, including waterfront development, to be in the SEZ. The EAC was of the view that the project proponent should get CRZ mapped by Space Application Centre (SAC) and National Institute of Oceanography (NIO).

April 23, 2008, CRZ, infrastructure and miscellaneous projects EAC meeting (64th) discussed EC for waterfront development of MPSEZL. The project proponent informed the EAC that the West port ToR was given on August 1, 2007; South port ToR on October 9, 2007. Now the project proponent sought clearance for all components of the project, which also included additional ports namely, North port, East port and a shipyard. The EAC noted that the project had been considered in the September meeting where the CRZ map for SEZ had been sought and accordingly MoEF had informed the project proponent through its letter dated October 9, 2007. This letter laid down ToRs for preparing the Environment Impact Assessment (EIA) report for South Port (South Basin, bulk terminal, LNG, chemical terminal etc.). EAC noted, "As on today, no information has been received from the project proponent with regard to the SEZ project. Now M/s Adani proposes to develop the foreshore facilities for the project in Phase 1, while the Phase 2 of the project which involves development of project on the onshore area will be taken up later."

October 12, 2008, public hearing held for the proposed waterfront development plan where issues of livelihood were raised strongly (fishermen and gauchar land).

November 26-28, 2008, CRZ, infrastructure and miscellaneous projects EAC meeting (71st) said that the project proponent now proposed only to carry out waterfront activities relating to the SEZ project. It noted that about 63 hectare (ha) of mangroves would be destroyed, but as per CRZ regulation 1991 the destruction for such activities is not permissible.

December 19-20, 2008, during the CRZ, infrastructure and miscellaneous projects EAC meeting (72nd), the project proponent informed that no destruction of mangroves would take place in the North Port. The EAC also noted that only waterfront activities will be taken up; the SEZ project will be taken up separately. EAC recommended clearance for the project.

January 12, 2009, the waterfront development project – which includes the North, South, West and East ports – was granted clearance to M/s Mundra Port and SEZ Limited.

January 19, 2009, additional clearance letter giving description of the South and West ports was issued. The EC also included the provision for laying down intake and outfall system for the Adani thermal power plant.

January 30-31, 2009, CRZ, infrastructure and miscellaneous projects EAC meeting (73rd) finalized ToRs for the LNG terminal at Mundra Port by M/s Gujarat State Petroleum Corporation (GSPC) LNG Limited. The application for transfer of EC from M/s MPSEZL to M/s GSPC LNG Limited was made, and the EAC said that public hearing has to be conducted for the project as per EIA notification 2006. It was informed that M/s GSPC will have 50 per cent equity, M/s Adani Infrastructure will have 25 per cent equity and balance 25 per cent will be of financial institutions. It was also informed that this project was part of the waterfront development project that received clearance in January 2009.

August 27-28, 2009, CRZ, infrastructure and miscellaneous projects EAC meeting (79th) exempted the GSPC LNG project from public hearing after the proponent informed that this project is part of the waterfront development project that received clearance in January 2009 and public hearing was already conducted for the waterfront development project.

February 25-26, 2010, CRZ, infrastructure and miscellaneous projects EAC meeting (85th) recommended the LNG terminal EC transfer subject to conditions like fishing activities in the area should not be hindered, Environmental Management Plan (EMP) should be complied with, etc.

November 30, 2010, CRZ, infrastructure and miscellaneous projects EAC meeting (94th) received a complaint against the LNG terminal. The EAC suggested to obtain comments from the state government and deferred the decision on the project.

September 19, 2012, CRZ, infrastructure and miscellaneous projects EAC meeting (116th) considered the proposal of M/s Adani Port and SEZ Limited (APSEZL) for a crane roll jetty at West Port. It was informed that this project is within the approved waterfront development. The EAC recommended the project for environmental and CRZ clearance.

2.2: Power Project (Adani Power Limited)

The project has expanded primarily in three phases over a period of five years, between 2007 and 2011. Over this period, ECs and Consents to Establish (CTEs) or No Objection Certificates (NOCs) have been assessed and granted for the following activities:

October 13, 2006, Public hearing for Phase I of the thermal power plant (TPP) of 660 megawatt (MW) capacity was held.

January 29, 2007, Gujarat Pollution Control Board (GPCB) gave CTE for Phase I of TPP (660 MW capacity).

February 27, 2007, GPCB issued a revised NOC for Phase I with respect to using coal as fuel. The previous consent was given for lignite based TPP.

March 12-14, 2007, TPP and coal mine EAC meeting (42nd) discussed the proposal of M/s Adani Power Private Limited for setting up a 660 MW imported coal based TPP. EAC asked for information before considering the project further – marine EIA, impact of withdrawal of water from Kotdi creek on mangroves, details of intake and discharge points, details of dredging and widening of creek, etc.

May 10, 2007, Ministry of Commerce and Industry notified power SEZ under Adani Power Private Limited of 293.881 ha in Tunda and Siracha villages.

July 9-10, 2007, reconstituted TPP and coal mine EAC meeting (2nd) recommended clearance for Phase I of TPP. The EAC took the view that even though the map of HTL provided was not clear, it would depend on the letter from Gujarat government. This letter said that the power plant location as demarcated on the HTL map, prepared by SAC, is outside CRZ area.

August 13, 2007, MoEF gave EC for Phase I of TPP.

November 29-30, 2007, CRZ, infrastructure and miscellaneous projects EAC meeting (59th) considered the proposal for CRZ clearance for intake and disposal facility of Phase I of TPP. It was informed that the length of the intake channel is 1.8 km and an effluent discharge pipeline of 3.5 km into Kotdi creek for dilution is to be set up. The discharge pipeline is with a diffuser and the discharge point is as per NIO recommendation. The temperature difference of effluent from receiving body was estimated to be 7^{o}C. The EAC recommended the project for clearance subject to some conditions.

February 11-13, 2008, reconstituted TPP and coal mine EAC meeting (16th) considered the proposal from M/s Adani Power Limited (APL) for Phase II (1980 MW) of TPP. The EAC exempted the project from public hearing as it was in a notified power SEZ. It was discussed that the thermal discharge from Phase II is going to be much higher than Phase I and the need for a marine EIA was felt. The EAC thus deferred its decision on the project and asked for information like fly ash utilization plan, marine EIA, status of CRZ clearance for Phase II, etc.

April 8-10, 2008, reconstituted TPP and coal mine EAC meeting (20th) recommended clearance to the Phase II TPP of APL. This was subject to CRZ clearance for the same.

May 29, 2008, MoEF awarded CRZ clearance for intake and disposal facility of Phase I of TPP.

June 6, 2008, GPCB gave CTE for Phase II of TPP.

August 12-13, 2008, reconstituted TPP and coal mine EAC meeting (28th) reconsidered the proposal for Phase II of TPP since while processing the clearance it was 'observed that the wind

rose data provided for Phase I and Phase II of the project was a variance'. Clarifications were sought and after discussion the EAC recommended the proposal for clearance.

September 18-19, 2008, CRZ, infrastructure and miscellaneous projects EAC meeting (69th) discussed the CRZ clearance for intake and disposal facility of Phase I and II of TPP. It was informed that CRZ clearance has already been obtained for Phase I for the same purpose. The EAC noted that there is no change in the components proposed in the CRZ area and hence decided that the clearance granted on May 29 holds good for Phase II of TPP as well.

October 21, 2008, MoEF gave EC for Phase II of TPP. The letter states that the project is exempt from public hearing as the site is located in a notified power SEZ.

November 10-11, 2008, reconstituted TPP and coal mine EAC meeting (34th) gave ToRs for Phase III (1980 MW) of the TPP to APL. It was informed that Phase III will be run on blending of imported coal and Indian washed coal. It was also informed that the location is partly within the SEZ and partly outside.

January, 19, 2009, MoEF issued an addendum to the EC granted to waterfront development project on January 12, 2009. The addendum also made provision for laying down of intake and outfall system for the thermal power plant with revised locations.

August 3, 2009, GPCB gave CTE for use of outlet for discharge of effluent by Phase I of TPP.

September 10-12, 2009, reconstituted TPP and coal mine EAC meeting (54th) discussed the project, saying it is in Mundra SEZ and coal linkage is now from Mahanadi Coal Fields (70:30 ratio of imported: indigenous). Committee noted CRZ clearance has been accorded for Phase I and II of the project, while Phase III (1980 MW) is outside CRZ area. EAC recommended clearance of project in this meeting. The application form (Form 1) submitted to MoEF for Phase I by the project proponent states that the site boundary is at a distance of 500 meters (m) from the HTL while the plant facilities are at a distance of 1,700 m from HTL implying that both the Phases are outside CRZ. Thus it is unclear why it is mentioned that Phase I and II of the TPP have received CRZ clearance. Maybe the CRZ clearance received for intake and outfall facility for Phases I and II was being referred to here which has been incorrectly mentioned. But it is not clear on what basis was the distance of TPP from HTL submitted. NIO had carried out the HTL/LTL demarcation southwest of the thermal power plant site in 2005 (report release 2007). This demarcation is unclear since the setback line abruptly ends at the boundary of the thermal power plant (*Refer to Section 5 on HTL*).

December 21-23, 2009, EAC meeting (83rd) for CRZ, infrastructure and miscellaneous projects recommended clearance to the revised location of discharge channel and also to the coal handling system for transportation of coal by M/s Coastal Gujarat Power Limited (CGPL), Ultra Mega Power Project of Tata. It was informed that CGPL has received CRZ clearance by MoEF vide Letter No. 11-11/2007-IA-III dated April 25, 2007, for disposal and withdrawal of sea water in the CRZ area. CGPL submitted that APL has proposed a 660 MW TPP in the vicinity and in order to minimize impact and save cost, it is proposed that both the companies use common intake water channel being developed by MPSEZL. It was also informed that the location of the intake channel that was recommended by NIO will now be changed, due to engineering reasons. Because of this, the location of the discharge point will also have to change to minimize impact on plant efficiency and marine ecology. CGPL submitted a superimposed route of the channel on CRZ map prepared by SAC. Gujarat Coastal Zone Management Authority (GCZMA) recommended the project.

March 9, 2010, amendment to CRZ clearance granted for revised location of discharge channel to CGPL. The amendment states that CGPL and APL are to use a common intake channel.

March 12, 2010, Public hearing for Phase III held where people raised issues regarding salinity ingress, shortage of grazing land, blocking of creeks and impact on fishermen livelihoods.

March 19-20, 2010, reconstituted TPP and coal mine EAC meeting (67th) revisited the clearance given to the project because public hearing was held on March 12, 2010 based on MoEF letter, which it quotes in the EAC minutes. Public hearing was held because MoEF noted that "environmental clearance for SEZ wherein the project is to be located has not been accorded and therefore informed the project proponent that either they shall go for public hearing separately for expansion of power plant or EC for the SEZ shall be obtained before their project is processed for approval of EC."

May 20, 2010, MoEF gave EC for Phase III of TPP.

June 25, 2010, GPCB gave CTE for Phase III of the TPP.

February 19, 2011, GPCB gave CTE for use of outlet for discharge of effluent by Phase II of TPP.

June 1, 2011, Corrigendum to the original EC granted to Phase III of TPP in March 2010. Coal quality ratio was corrected to domestic:international as 70:30 instead of 30:70.

2.3: Mundra SEZ, Forest and Airport Clearances

May 13, 2004, In-principle forest clearance was granted to Adani Chemicals Limited for diversion of 168.41 ha of forest land in only one consolidated patch in survey area number 169/36 for salt washery and desalination plant.

May 13, 2004, in-principle forest clearance was granted to Adani Chemicals Limited for diversion of 1840 ha of forestland for high purity salt works.

August 4, 2005, EC was granted to Adani Chemicals Limited for the establishment of high purity salt works, involving an area of 2946.22 ha, of this 1850 ha is forestland, for which the in-principle clearance was granted in May 2004. The Forest Clearance (FC) and EC letters specify that 10 ha of interspersed mangrove forest, which was deleted from the proposed area shall be transferred back to the state government and maintained at the project cost.

November 30, 2005, Gujarat Adani Port Limited (GAPL) obtained NOC from the Ministry of Defence for construction of private air landing strip.

January 10, 2006, GPCB asked for clarification from the Mundra SEZ Limited if "only airstrip or airport will be constructed."

January 18, 2006, Mundra SEZ Limited replied saying, the proposed airstrip is to be used for landing private aircrafts and it is not meant to be used for commercial services as an airport in foreseeable future.

February 21, 2006, a letter from Mundra Special Economic Zone Ltd. to GPCB, clarified that the permission of the Director General of Civil Aviation (DGCA) is generally granted when the airstrip is ready for use. The permission from DGCA is not available as of information in hand with this Committee. However, on the website of DGCA (June 30, 2012), the "aerodrome" at Mundra is categorized as a licensed aerodrome . The EIA report of the multi-product SEZ mentions an airport spread over an area of 1200 ha as part of the project. The report also acknowledges that in order for the airstrip to carry out commercial operations, it will need permission. While an airport is definitely more established as a commercial place involving operation of commercial planes, the definitions of aerodrome and airstrip are vague. All

airports are aerodromes but the vice versa is not true. However, given that the DGCA has categorized the airstrip as an aerodrome, the definition issues are not important. In that case, under EIA notification 2006 (as amended in 2009), the project will need an EC if commercial operations are proposed. More importantly, if it is part of SEZ then it should not have been constructed without the SEZ having an EC.

March 4, 2006, GPCB issued a site clearance certificate to Mundra SEZ Limited for airstrip development at survey No. 52/53 of Village Goersana in Mundra.

June 23, 2006, Ministry of Commerce and Industry notified multi product SEZ under GAPL of 2406.7592 ha in Mundra and Anjar *talukas.*

September 6, 2006, Ministry of Commerce and Industry transferred the notified multi product SEZ under GAPL of 2406.7592 ha in Mundra and Anjar *talukas* to M/s Mundra Port and Special Economic Zone Limited.

May 10, 2007, Ministry of Commerce and Industry notified power SEZ under Adani Power Private Limited of 293.881 ha in Tunda and Siracha villages.

July 3, 2007, Ministry of Commerce and Industry notified an additional area of 251.4308 ha was notified as part of the SEZ.

September 28-29, 2007, CRZ, infrastructure and miscellaneous projects EAC meeting (57th) discussed EC for Multi Project SEZ (Phase 1B and Social Infrastructure) in Mundra, by MPSEZL. This meeting considerd the entire project, including waterfront development, to be in the SEZ. The EAC was of the view that the project proponent should get CRZ mapped by SAC and NIO.

June 23, 2006, Ministry of Commerce and Industry notified an additional area of 74.6145 ha as part of the multi product SEZ under MPSEZL.

May 2, 2008, Ministry of Commerce and Industry notified an additional area of 1074.1755 ha under the multi product SEZ in favor of MPSEZL.

August 11, 2008, Ministry of Commerce and Industry notified an additional area of 2113.7962 ha under the multi product SEZ in favor of MPSEZL.

January 31, 2009, CRZ, infrastructure and miscellaneous projects EAC meeting (73rd) finalized ToR for the development of Multi-Purpose SEZ (Phase 1B and Social Infrastructure). The project involves development of SEZ on plot area of 18,000 ha, of which 5,920.7762 ha is notified under SEZ. EAC also said it will take a view on holding of public hearing based on court and other data to be provided by company.

February 27, 2009, MoEF granted in-principle FC for 1840 ha and 168.41 ha of forestland to MPSEZL.

March 31, 2009, MoEF wrote to MSEZ on the finalized ToR.

April 23-24, 2009, CRZ, infrastructure and miscellaneous projects EAC meeting (75th) discussed the matter of public hearing of SEZ. EAC notes, "The proponent has submitted information regarding court cases and SEZ clearance and also stated that there is an Special Leave Petition (SLP) in the Supreme Court, however there is no stay order in any of the cases and requested for exemption from public hearing." The EAC recommended to exempt the public hearing based on the details submitted. But it noted that projects coming within the SEZ in future, shall undergo the procedure as per EIA notification 2006.

May 27, 2009, Ministry of Commerce and Industry renotified and consolidated the SEZ area of 6472.8684 ha.

September 30, 2009, Gujarat forest department wrote to MoEF on Compensatory Afforestation Fund Management and Planning Authority (CAMPA) fund requirement fulfillment by MPSEZ.

November 25, 2009, the possession of 1840 ha of forest land was given to MPSEZL for development of port based SEZ.

February 20, 2010, State Environment Impact Assessment Authority (SEIAA) granted EC to MPSEZ Utilities Pvt. Limited for the establishment of Common Effluent Treatment Plant (CETP) of 17 million litres per day (MLD) capacity within the notified SEZ.

February 20, 2010, SEIAA granted EC to Adani-Mundra SEZ Infrastructure Private Limited for the proposed Township and Area Development Project in Survey No. 141 in Mundra village. The project area of 255 ha required for development of social infrastructure such as housing colonies, hospitals, public amenities and other physical infrastructures is located within the non-processing zone of MPSEZ. The letter states that since the proposed project is Item No 8 of EIA notification of 2006 it does not need public hearing. The letter states clearly that the project proponent shall not obstruct the flow or encroach on River Bhukhi, which passes through project area. The natural drainage of the river cannot be altered or affected.

October 4, 2010: Gujarat High Court order under Special Civil Application (SCA) 12898 of 2010 and SCA 12903 of 2010 regarding public hearing. Fishermen and farmers and a group of residents from Gandhidham filed the SCAs. The grievance was that the public hearings for two projects were being organized on the same day October 5, 2010, at the same venue with a small time lag only. One of these was for the Mundra Port and SEZ Limited. GPCB justified that the location for public hearing (Luni village) is equidistant from both project sites and the project affected people are common and hence convenient. The High Court ordered that public hearing be conducted at the same time and venue for one project and till the time all objectors are heard it be carried on. If necessary, the hearing may continue the next day too. The hearing for the second project to then follow the first one at the same venue.

October 5, 2010, Public hearing for the project was held. Main concerns were SEZ notification and area requirement, status of CRZ clearance, mangrove destruction, blocking of creeks, gauchar land, fishermen access, etc.

April 16-17, 2012, CRZ, infrastructure and miscellaneous projects EAC meeting (111th) discussed the CRZ clearance for intake and outfall pipeline and desalination plant by MPSEZL. Under CRZ notification, only laying of the pipeline is permitted. It was informed that the ongoing court cases do not have any stay in the present project. EAC sought more information.

May 9, 2012: High Court directions on lack of EC in SEZ given. In December 2011, a Writ Petition (194/2011) was filed by Ranubha Rajmalji Jadeja and others against Alstom Bharat Forge and Kalyani Alstom Power, two companies setting up their plants within the Mundra SEZ. The allegation was that these units have started construction within the SEZ without the SEZ having received an environmental clearance. The companies argued that individually they do not require an EC since they do not fall under the purview of EIA Notification 2006. The High Court on May 9, 2012 ordered that these units immediately stop construction/implementation of their projects till the time the MPSEZ is granted an EC.

June 4-5, 2012, CRZ, infrastructure and miscellaneous projects EAC meeting (113th) for proposed Multi Product SEZ by MPSEZ. After discussion, EAC, "recommends the proposal for

environmental and CRZ clearance with the above conditions in the clearance letter for strict compliance by the project proponent."

July 9-10, 2012, CRZ, infrastructure and miscellaneous projects EAC meeting (114th) mentioned the project by way of confirmation of minutes of 113th meeting. It was informed that of the 18,000 ha SEZ plot area, 8481.2784 ha is notified which was earlier mentioned as 5920 ha. The intake and outfall channel was discussed. It was informed that length of the intake is 5km and the location is on the eastern side of East Port basin (22° 48' 30.76"N and 69° 46' 34.06"E). For outfall, a 5.7 km length pipeline will be laid through the East port back up area and discharge on the western side of the East Port basin (22° 46' 44.04"N and 69° 45' 5.51"E). The proponent also submitted for change of name to M/s Adani Port and SEZ Limited.

October 12, 2012, the Ministry of Commerce and Industry denotified 1840 ha of Mundra SEZ .

October 26, 2012: Letter from MoEF to GCZMA to calculate SEZ area outside CRZ as per the approved CZMP. The Ministry brought out the fact that distortion of HTL is an allegation against the company as per representation received by MoEF, and since SEZ is not a permissible activity within the CRZ, it was necessary to get clarity.

January 1, 2013, GCZMA, in its 17th meeting, discussed the response to MoEF's October 26 letter. Adani Port and SEZ Limited (APSEZL) made a presentation on notified area within SEZ and informed that 8481.2784 ha of notified SEZ has been recommended EC and CRZ clearance by EAC meeting of July 2012. Since Ministry of Commerce and Industry has denotified 1840 ha of forestland from SEZ area, present notified SEZ area is 6641.2784 ha. The minutes read that the "MPSEZ has also submitted the CRZ maps showing the total SEZ area and areas that fall, within CRZ boundary, which is prepared by Centre for Earth Science Studies (CESS), one of the authorized agencies by MoEF." As per the CRZ map submitted, the notified SEZ and CRZ, including CRZ buffer is indicated and area given. Based on this, GCZMA upheld its recommendation for EC for the SEZ.

February 14, 2013: The High Court on February 14, based on a contempt petition ordered 12 units within SEZ to immediately stop operations till EC is granted to the SEZ. The company approached the Supreme Court for an appeal and the Court granted interim relief to Mundra SEZ by staying the High Court order on February 15.

3. Examination of Issues: Specific Environmental Impacts

3.1: Diversion, Blocking of Creeks and Reclamation to Distort HTL

In all conditions for clearance it has been made clear that no creeks are to be blocked during the construction and operation of the project (see *Table 1: Conditions for Creeks in Different Clearances*). It has also been repeatedly conveyed that the natural drainage of the area should not be affected due to the project and no filling/reclamation of creeks is allowed.

Table 1: **Conditions for Creeks in Different Clearances**

Clearance date	Condition stipulated for creeks/waterways
1. August 25, 1995: General Cargo/Storage	Adequate culverts should be provided for smaller creeks so that breeding grounds for crabs, mud snappers and other marine organisms are not cut off by road construction activities.
2. September 20, 2000: Port Expansion	Project proponent shall ensure that no creeks are blocked and the natural drainage of the area is not affected due to project activities.
	Project proponent shall ensure that there will be no disposal of sullage and sewage, surface run offs and oil/grease spillage in the creeks.
	Project proponent shall work out the maximum quantity of spilled material, which can find its way into the coastal waters, and their impact on aquatic life should be studied. A mitigation plan is to be then drawn out before operations commence. Action taken report to be submitted to MoEF.
	No effluent or other liquid waste should be discharged into water bodies without proper treatment.
3. July 21, 2004: Crude Oil Terminal	It must be ensured that the effluent/liquid wastes are not discharged into the seawater.
4. August 13, 2007: Phase I of thermal power plant (TPP)	The seawater intake structure shall be designed in a manner to ensure that continuity of free flow of water in the two arms of Kotdi creek is not hampered.
5. May 29, 2008: CRZ clearance for intake and disposal facility for TPP	Effluent discharge pipeline into Kotdi creek for dilution as per NIO recommendation.
6. October 21, 2008: Phase II of TPP	The seawater intake structure shall be designed in a manner to ensure that continuity of free flow of water in the two arms of Kotdi creek is not hampered.
7. January 12, 2009: Waterfront Development	There shall be no filling up of the creek and reclamation of the creeks.
8. February 20, 2010: SEIAA clearance to township and area development	The project proponent was ordered not to obstruct the flow of River Bhukhi passing through the social infrastructure area and not do any encroachment of the river. They were asked to take all necessary precautions/measures to ensure that natural drainage of River Bhukhi is not altered/affected.
9. May 20, 2010: Phase III of TPP	Activity of the power plant should not disturb the marine biology in the Kotdi creek and Gulf of Tunda. Continuous monitoring should be carried out on this account.
	No water bodies including natural drainage system in the area shall be disturbed due to activities associated with setting up/operation of the power plant.

Source: Analysis by Centre for Science and Environment, New Delhi based on clearances granted by MoEF

In the environmental clearance of May 2008 for the intake and outfall of the thermal power plant, the condition states that the outfall pipeline will open in the Kotdi creek for dilution as per NIO recommendation in its 2006 EIA.[1] All other related clearances, state that the water intake structure should be designed in a way that it does not affect the flow of water in both arms of the Kotdi creek or its marine biology.

In addition, the SEIAA clearance of February 2010 states that the project proponent is not to obstruct the flow of the River Bhukhi passing through the social infrastructure area nor affect its natural drainage.

EAC has discussed creek blocking and reclamation many times. While recommending clearance for the waterfront development in December 2008, the EAC imposed a condition that there shall be no filling of creeks or reclamation affecting it. In several other meetings, the impact of water withdrawal on mangroves, widening of creeks, discharge of effluents in creeks/water bodies, etc., was discussed.

3.1.1: Observations on Blocking of Creeks by Monitoring Committees/Courts

The issue of creek blocking has been discussed and reported by different agencies.

Gujarat Coastal Zone Management Authority (GCZMA) 2006: In May 2006, GCZMA first discussed the issue of destruction of mangroves based on newspaper reports. It formed a sub-committee headed by Prof Nikhil Desai, director of Gujarat Ecological Education and Research (GEER) Foundation, who reported that the company has built many bunds in the inter-tidal area and blocked many creeks feeding water to the mangrove patches.

Ministry of Environment and Forests (MoEF) December 2010: An inspection team under one of the Ministry officials was sent based on complaints from local people. The report presented after the visit, found many instances of non-compliances. Observations included large scale reclamation, using dredged material on mangrove area behind the West and North port sites, laying down of a pipeline in the inter-tidal zone obstructing the tidal flow affecting mangroves, large scale destruction of mangroves especially at the north port site, obstruction of creek systems and natural flow of seawater because of reclamation.[2]

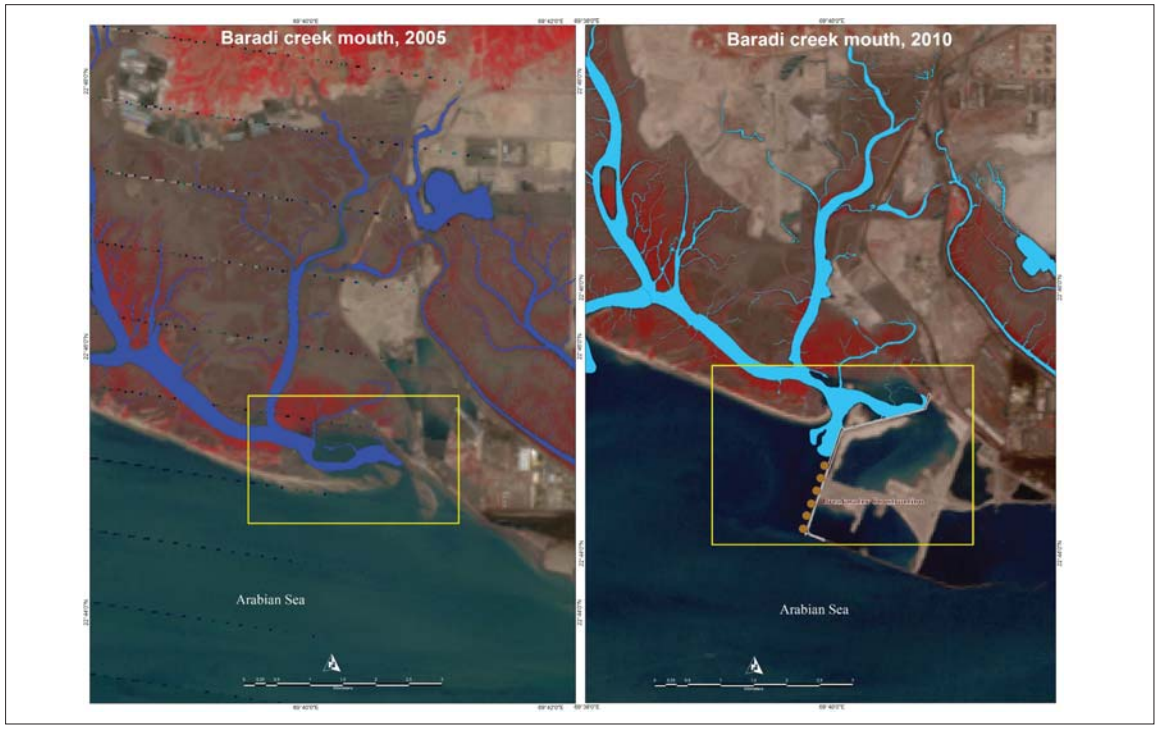
3.1.2: Examination of Issue by this Committee

The Committee carried out an analysis based on satellite imagery (*Landsat 5 TM*) and Google Earth imagery from different years. A few points were identified based on the allegations by local communities (Baradi Mata, Kotdi creek, creeks north of Bocha Island, etc.).

Baradi Mata creek mouth (January 2005 and June 2010): Baradi Mata creek has witnessed a distinct change at its mouth where the creek meets the sea. In 2005, the creek mouth had a natural outfall into the sea (see Figure 1: *Satellite Imagery of Baradi Mata Creek Mouth*). In 2010, the creek opening shifted and got constricted. This is clearly because of construction for the Water Front Development Project (WFDP). Under the EC conditions, no changes in creek or creek mouth are allowed. If no remedial action is taken urgently, there is danger of closing of the creek mouth due to accretion.

North of Bocha island (January 2005 and June 2010): The creek branches (proposed North port site) have completely disappeared over the years (see Figure 2: *Satellite Imagery of Bocha Island*). This is bound to have an impact on the mangrove vegetation in the area in addition to the change in hydrological regime. Also a water body, north of the Bocha Island, visible in the 2005 image is not visible in the 2010, pointing towards a loss of the same.

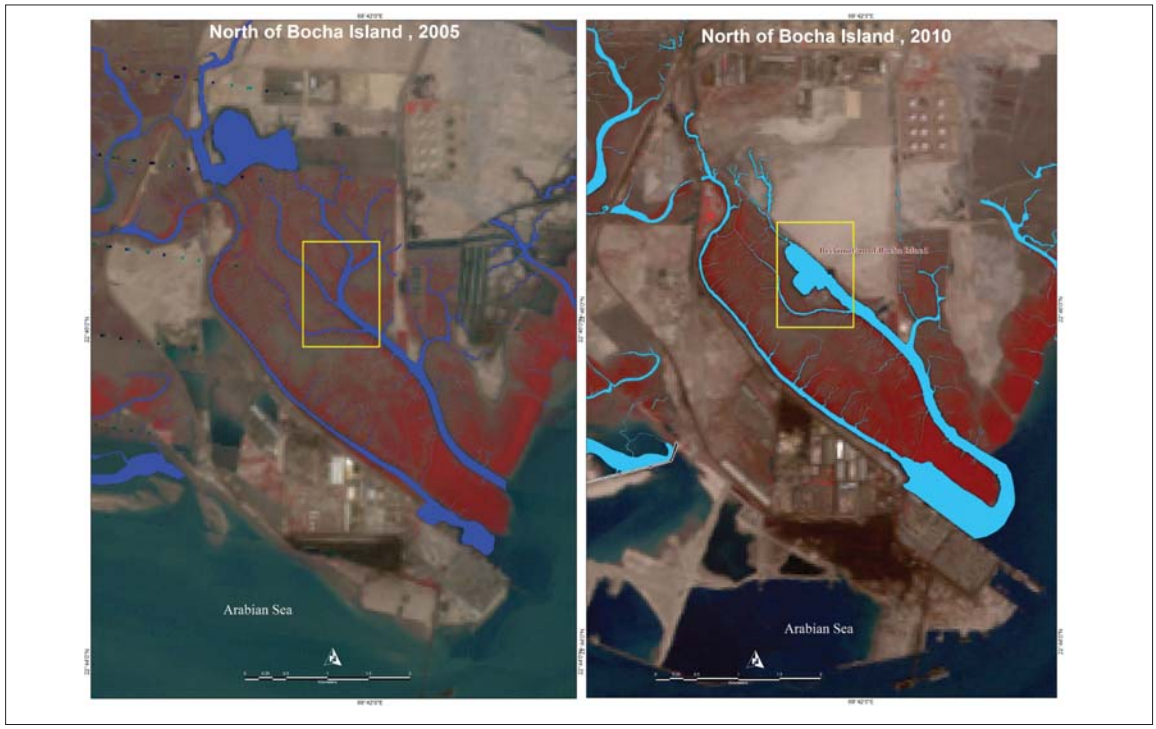
Figure 1: **Satellite Imagery of Baradi Mata Creek Mouth**



Changes in creek mouth post development at South port site.

Source: Analysis by National Centre for Sustainable Coastal Management, Chennai, March 2013

Figure 2: **Satellite Imagery of Bocha Island**

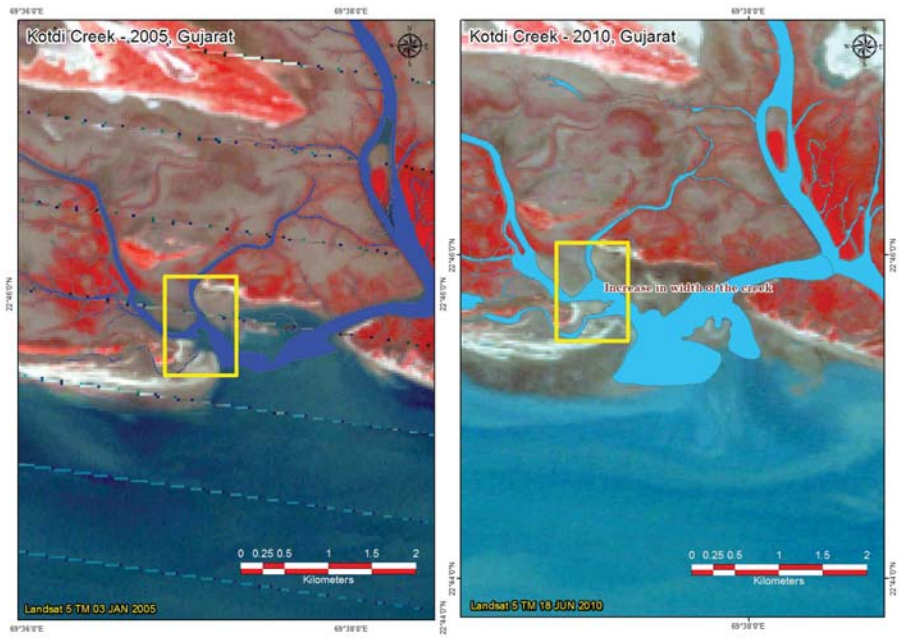


Creeks and water body north of Bocha disappeared over time.

Source: Analysis by National Centre for Sustainable Coastal Management, Chennai, March 2013

Kotdi creek mouth (January 2005 and June 2010): A general accretion is observed which could be due to construction in the nearby inter-tidal area. This has led to widening of the mouth (see Figure 3: *Satellite Imagery of Kotdi Creek Mouth*). There does not appear to be any major change in the Kotdi creek network (see Figure 4: *Satellite Imagery of Kotdi Creek Network*).

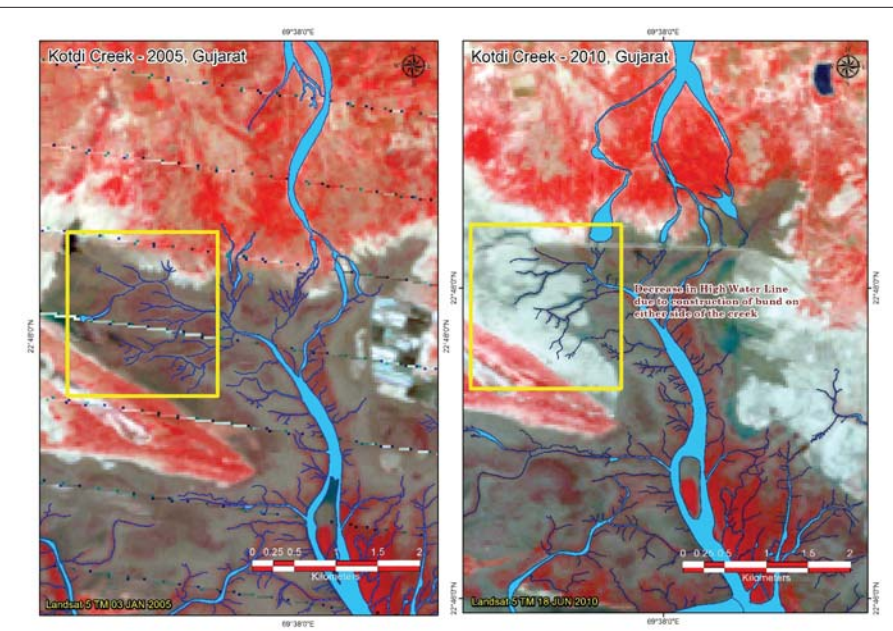
Figure 3: **Satellite Imagery of Kotdi Creek Mouth**



No major change observed at Kotdi creek mouth.

Source: Analysis by National Centre for Sustainable Coastal Management, Chennai, March 2013

Figure 4: **Satellite Imagery of Kotdi Creek Network**



No major change observed in Kotdi creek network.

Source: Analysis by National Centre for Sustainable Coastal Management, Chennai, March 2013

3.1.3: Observation and Recommendation of this Committee

The Committee is clear that there have been huge changes in the landscape of the Adani Port and SEZ area, including changes in the creeks – crucial to ensure the health of the mangroves and water system of this marine outfall area. These have been noted over the years by different committees which have visited the site during construction.

This Committee has visited the area in January 2013, after construction and development had been completed for key activities. The major creeks, as viewed from the lighthouse – which gave the Committee a vantage point – did open out into the sea, suggesting that no major creek mouths were blocked.

However, the Committee did note that there were creeks showing signs of damage, because of soil deposition blocking access of seawater into the area. Over time and without adequate mitigation efforts, this would block the creek and lead to eventual death of mangroves, depending on the inter-tidal water action.

For instance, at a site near the lighthouse (South Port), villagers accompanying the Committee, during the January 2013 visit, informed that the Baradi Mata II creek has been blocked (22° 45' 36.564"N, 69° 40' 17.706"E). The Committee saw stagnant water. The Committee decided to walk along the bund parallel to the creek and found blockage at another point near the NIO 2000 HTL board (22° 45' 44.096"N, 69° 40' 28.061"E). The Committee discussed that the creek may have been blocked due to the filling of the area adjacent to the High Court contempt area (22° 45' 48.340"N, 69° 40' 7.516"E). This was also discussed with the company representatives accompanying the team, who said they were prepared to take urgent remedial action to protect the area.

The examination of the issue through satellite imagery has confirmed that there are indeed cases of creeks being blocked (North port) and of creeks in danger of being blocked (South port).

In the case of North port, the responsibility is not clear, as APSEZ maintains that the area is under Gujarat Maritime Board (GMB). The Committee wrote to GMB, seeking clarification. The response is unclear about the responsibility for the creek reclamation at the proposed North port site. The Committee is clear that creeks have vanished in this area and there is clear violation of EC conditions.

In the case of South port, the accretion is evident and this suggests that there is every possibility of eventual blocking of the creek mouth, unless urgent action is taken.

The Committee recommends the following:

1. **The North port area, adjoining Bocha has connecting creeks, critical for maintaining inter-tidal action of the region. This area should be protected and all creeks and waterbodies restored and brought to pre-2005 status including that reclaimed by GMB/APSEZL. The entire area should be declared as a conservation zone**, as it is contiguous to Bocha island and its important mangrove system. This conservation zone should be clearly earmarked and demarcated using lat-long so that monitoring is possible.

2. **The opening of Baradi Mata creek should be kept protected so that it is not damaged or blocked.** This must be done for all other creek systems.

3.2: Destruction of Mangroves and Leveling of Sand Dunes

The conditions set at the time of clearance have made it clear that mangroves would not be destroyed during and after the construction of the project (see Table 2: *Conditions for Mangroves in Different Clearances*). Only the July 2004 clearance for the oil terminal, states that 0.25 ha of mangrove will be destroyed during the laying of pipelines, which will be compensated through afforestation. No other mangrove area can be destroyed.

Table 2: **Conditions for Mangroves in Different Clearances**

Clearance date	Condition stipulated for mangroves
1. August 25, 1995: General Cargo/Storage	100 metres (m) mangrove belt should be created all along west of Navinal creek till its junction up to new road.
	Green belt of 50 m along periphery of plant and road (at 1500 trees per ha); in consultation with forest department (FD); details to be sent to MoEF.
2. September 20, 2000: Port expansion	Mangrove afforestation shall be undertaken at the identified sites and progress report to be sent to MoEF; all recommendations of NIO for restoration of the coastal habitat by mangrove afforestation at Navinal Island to be strictly implemented.
	Project proponent to ensure that construction workers do not cut mangroves for fuel wood, etc.
	While dumping the dredged material sufficient distance should be ensured from the existing mangroves so that there is no damage to the ecology.
3. July 21, 2004: Crude oil terminal	EIA prepared by NIO estimates that 0.25 ha of mangrove habitats would be destroyed due to laying of pipelines. Mangrove plantation in 25 ha after identification with FD.
	Green belt development in 30 acres of land in and around the project.
	Camps for labour to be outside CRZ; arrangements for cooking so that mangroves are not cut/destroyed for this purpose.
	Since the pipeline passes along mangrove area and the mud flats of Mundra area, project proponent will ensure adequate protection to the mangroves.
4. February 5, 2007: Multipurpose berth	The project proponent should not undertake any destruction of mangroves during construction and operation of the project.
	The sand dunes and mangroves should not be disturbed in any way.
5. August 13, 2007: Phase I of TPP	There should be no adverse impact on mangroves due to the project.
6. May 29, 2008: CRZ for intake and disposal of TPP	There should be no adverse impact on mangroves/sensitive coastal ecosystems. If any damage to mangroves is anticipated or envisaged as a result of project activities, the CRZ clearance will be canceled and project proponent will need to seek fresh approval from the Ministry.
7. October 21, 2008: Phase II of TPP	There should be no adverse impact on mangrove due to the project.

Continued…

Table 2: **...continued**

Clearance date	Condition stipulated for mangroves
8. January 12, 19, 2009: Waterfront Development	The proposed expansion of the existing channel affecting mangroves was dropped. As per the Marine EIA for Waterfront Development, prepared by NIO in July 2008, the proposal of expansion involved dredging of the Bocha creek existing at -5m Chart Datum (CD) in the entrance, and +6.5 m CD at the distant end, to a depth of -17.5m CD with two turning circles of 550 m each.
	Bocha Island (88 ha); East of Bocha Island (155 ha) and Kotdi Mouth (981 ha) and Mouth of Baradimata (30 ha) have been identified as conservation zones to be maintained by Horticulture department, Mundra.
	Project proponent has already undertaken 1000 ha of mangrove afforestation and will do additional 200 ha.
	No existing mangroves shall be destroyed during construction/operation of project.
	The sand dunes, corals and mangroves, on the site shall not be disturbed in any way.
9. May 20, 2010: Phase III of TPP	Project proponent to prepare action plan within three months for regeneration of mangroves with financial commitment for the same.

Source: Analysis by Centre for Science and Environment, New Delhi based on clearances granted by MoEF

In addition, as per the EC of January 12, 2009, four areas have been earmarked as mangrove conservation areas: Bocha Island (88 ha); East of Bocha Island (155 ha) and Kotdi Mouth (981 ha) and Mouth of Baradimata (30 ha). In other words, a total of 1,254 ha should be strictly protected and regenerated.

3.2.1: Observations on Mangroves by Monitoring Committees/Courts

The issue of mangrove destruction has been discussed time and again by different agencies. In many cases, mangrove destruction has been noted; it has also been said that there is a need for third party audits to ensure afforestation is being done and remedial action has been called for.

GCZMA, May 2006: A GCZMA sub-committee headed by Prof Nikhil Desai, director of GEER, reported "rampant destruction of mangroves by Adani Group." The report also mentioned that the company had built many bunds in the inter-tidal area and blocked many creeks feeding water to the mangrove patches. In addition, mangroves had also been cut for laying pipelines and construction of roads; and mangroves in Bocha island have been cut. Based on this report, GCZMA on June 9, 2006, issued a show cause notice to the company on the destruction of mangroves because of developmental activities at the port site. The notice served asked the company for a clarification within 15 days on the alleged non-compliance with the EC conditions on mangroves. Based on representations by the Company, GCZMA on May 31, 2008 directed for compensatory afforestation over five ha of area for the violation of mangrove destruction of a 0.35 ha.[3]

MoEF, December 2010: The team, headed by a Ministry official observed large scale reclamation using dredged material on mangrove area behind the West and North port sites; laying down of a pipeline in the inter-tidal zone obstructing the tidal flow affecting mangroves; large scale destruction of mangroves, particularly at the north port site. Based on this report, show cause notice was issued and the matter is still pending.[4]

High Court Committee headed by District Collector (Kutch), October 2011: The Collector Committee was directed to check compliance with High Court order of July 12, 2011 that no

mangroves would be cut in the project area post the order. The Collector committee observed dead mangroves and signs of movement of heavy machinery in many sites. But what the committee could not conclude was the period of destruction of mangroves, whether prior or after the High Court order.[5]

3.2.2: Examination of Issue by this Committee

This Committee carried out an analysis based on satellite imagery (*Landsat 5 TM*) and Google Earth imagery from different years. This was done to ascertain the changes in mangrove cover in the project area, particularly in the conservation areas stipulated under EC conditions as well as those areas where local communities had alleged destruction.

Mangrove along Navinal creek: As per the EC granted in August 1995, for general cargo and storage at Navinal, a 100 meters mangrove belt was to be created west of the Navinal creek. There is a very clear mangrove patch along the west of Navinal creek in the year 2005 (see Figure 5: *Google Earth Imagery of Navinal dated December 7, 2005*) but the same has vanished in 2011 (see Figure 6: *Google Earth Imagery of Navinal dated April 6, 2011*).

This is in violation of not just the EC condition on mangrove destruction but also the specific EC condition related to Navinal. The Committee also observed previously cut remnants of a few mangroves during their January 2013 visit in the same area (22° 44' 59.389"N, 69° 42' 17.842"E).

Mangrove destruction and Bocha conservation area of 88 ha (January 2005 and June 2010): The 'head' portion of Bocha Island is a mangrove conservation area as per the EC granted in January 2009 for waterfront development (see Figure 7: *Satellite Imagery of Bocha Island*).

Figure 5: **Google Earth Imagery of Navinal dated December 7, 2005**

Mangrove belt along Navinal creek in 2005.

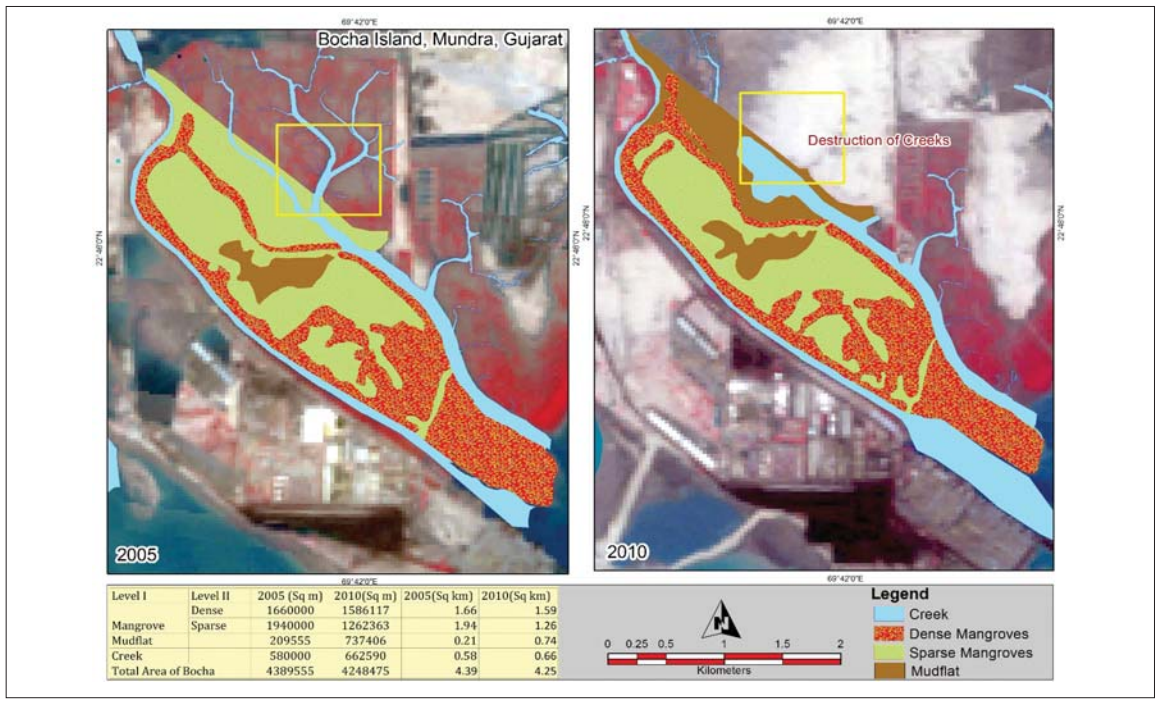
Source: Analysis by Centre for Science and Environment, New Delhi, March 2013

Figure 6: **Google Earth Imagery of Navinal dated April 6, 2011**

Evident destruction of the mangrove belt along Navinal creek in 2011.

Source: Analysis by Centre for Science and Environment, New Delhi, March 2013

Figure 7: **Satellite Imagery of Bocha Island**



Level I	Level II	2005 (Sq m)	2010(Sq m)	2005(Sq km)	2010(Sq km)
Mangrove	Dense	1660000	1586117	1.66	1.59
	Sparse	1940000	1262363	1.94	1.26
Mudflat		209555	737406	0.21	0.74
Creek		580000	662590	0.58	0.66
Total Area of Bocha		4389555	4248475	4.39	4.25

Loss of 75 hectare of mangrove cover in Bocha Island.

Source: Analysis by National Centre for Sustainable Coastal Management, Chennai, March 2013

The satellite imagery analysis, done by scientists from the National Centre for Sustainable Coastal Management shows that there has been a loss of seven ha of dense mangrove and 68 ha of sparse mangrove implying that a total of 75 ha of mangrove in Bocha Island have been lost. The area over mudflat has increased from 21 ha in 2005 to 74 ha in 2010. The navigation creek area has increased from 58 ha in 2005 to 66 ha in 2010. The loss is concentrated on east of Navinal creek and southeast of the tip of the island which is the conservation area. The modification in the island size and vegetation cover could be attributed to erosion because of vessel movement from the Navinal port, and clearly shows that the company had not taken any precaution to safeguard this conservation area. In such a scenario, if the proposed North port is developed, it will exacerbate the loss of mangroves and the area of the island, as it would involve vessel movement on both sides.

The reduction in the area of the tip of the Island is confirmed when Google Earth imagery is geo-referenced for this location. The coordinates when compared for 2005 (see Figure 8: *Bocha Tip Google Earth Imagery dated February 14, 2005*) and 2011 (see Figure 9: *Bocha Tip Google Earth Imagery dated April 6, 2011*) show that a particular coordinate which was land area in 2005, in 2011, at the same lat-long the location falls into the sea.

Bocha and proposed North port site: If the Bocha Island is considered with the contiguous area of the proposed North port site, then also mangrove destruction/loss can be noted. As per 2005 imagery, the Island appears as an almost contiguous patch with the mangroves at the proposed North port site on its northeast (see Figure 10: *Bocha Island Google Earth Imagery dated February 14, 2005*). Also, very dense mangrove can be observed at its tip, periphery and along

Figure 8: **Bocha Tip Google Earth Imagery dated February 14, 2005**

Conservation area at Bocha Island as visible in 2005.

Source: Analysis by Centre for Science and Environment, New Delhi, March 2013

Figure 9: **Bocha Tip Google Earth Imagery dated April 6, 2011**

Loss of land area (mangrove) from the Bocha conservation area.

Source: Analysis by Centre for Science and Environment, New Delhi, March 2013

Figure 10: **Bocha Island Google Earth Imagery dated February 14, 2005**

Bocha and North port site mangrove area as a contigous patch.

Source: Analysis by Centre for Science and Environment, New Delhi, March 2013

the small creeks flowing into the island on all sides. Rest of the island could be classified as having sparse mangrove and mudflat.

According to the 2011 imagery, the mangroves at the proposed North port site have completely vanished (see Figure 11: *Bocha Island Google Earth Imagery dated April 6, 2011*). Also, there is a stark reduction along the tip of Bocha. Just near the north port site (22° 46' 10.68"N, 69° 41' 46.8"E), an entire patch of mangrove has disappeared. The creek has disappeared clearly due to the reclamation work at North port site. This has caused the water to accumulate and has formed a small water body-like structure.

Figure 11: **Bocha Island Google Earth Imagery dated April 6, 2011**

No mangrove left at the proposed North port site after reclamation of the area.

Source: Analysis by Centre for Science and Environment, New Delhi, March 2013

During the Committee visit to the proposed north port site in January 2013, the company had explained that GMB had carried out the reclamation work at the proposed North port site. In GMB's response to the Committee, it has remained unclear if GMB is indeed responsible for this 'reclamation'. As asked by the Committee, GMB did not provide any cost estimates for carrying out this work. Instead, GMB states[6], "Regarding North port location of Mundra port, our team has visited the area and reclamation done in the past has been noticed. As far as the reclamation on the land owned by Gujarat Maritime Board is concerned, the acquisition process for the entire Bocha Island was under process before it was finalized." The GMB goes on to add "the area under question as a part of Bocha Island, it may be emphasized that it didn't have much vegetation in the early 1990 as per topo-sheet No. 41F/9 and F/10 of the Survey of India. You may appreciate that growth of such coastal vegetation and mangroves expand over the period and also enter in the area of acquisition as acquisition process takes long time.[7]"

In other words, GMB has not clarified but prevaricated on this matter. It's response does not sufficiently explain if it is doing the reclamation on the area in question, and if so, has it got the necessary environmental clearances. It has also not explained on what land reclamation is being done and which areas now have vegetation, which was not there earlier.

It is important to note that the proposed North port was granted EC in January 2009. Thus, it is not clear why the mangrove situation of 1990 is being discussed by GMB. But however, in the same correspondence, GMB contradicts itself by stating, "In the present case, any compensatory afforestation as may be suggested, the same may also be realized.[8]" In other words, they admit that there could be possible violations and if that is the case then they will make good, by planting more.

Mangrove conservation near Baradi Mata mouth: In its field visit in January 2013, the Committee noted places where degradation of mangroves was visible and if corrective action was not taken, it could lead to irreversible loss. The Committee observed this in the mangrove conservation area near the lighthouse at the South port (22° 45' 22.680"N, 69° 40' 13.724"E). There because of construction and reclamation activity, gradual deposition of sand was observed to have taken place, which was blocking small creeks. This would eventually lead to mangrove destruction. The company had clearly not taken precaution to ensure protection of mangroves. This is a clear violation of EC conditions. The Committee noted that it was important to build a bund along the mangrove conservation area, which would provide buffer and allow for water inflow without any impediment. The NIO representative accompanying the Committee informed that at least a distance of 50 metres should be left from the mangrove patch to build the bund.

3.2.3: Observation and Recommendation of this Committee

The EC conditions on the issue of mangrove destruction are stringent and non-negotiable. Each clearance that has been given to the project, has clearly mentioned that mangrove destruction is not allowed. It is the responsibility of the project proponent to ensure that during and after reclamation, construction or operation, no mangroves are lost.

In its examination of the specific ToR on the destruction of mangroves and leveling of sand dunes; the Committee has used satellite imagery and Google Earth maps. The objective is to ascertain the changes in the mangrove area in the past seven years, since clearances were given.

It is clear from the examination of material at hand, including reports of past committees, which observed changes during the period of construction and reclamation, that there is evidence of destruction of mangroves. This is undisputable in our view.

The Committee recommends the following:

1. **Bocha island and its conservation zone must be protected at all costs**: It is clear that there is a possibility of further degradation of the remaining mangrove areas in the conservation zone. This is not acceptable. The Committee has identified the contiguous conservation area (See map). This area should be georeferenced with lat-long and put in public domain. There should be regular monitoring on the status of land mass and vegetation of the island.

2. **The North port, which has received environmental clearance under the waterfront project, should be cancelled**: This proposed port is on the other side of Bocha island. Already, ship movement to and from Navinal port, which borders the island has had serious deleterious impact on the protected mangroves. This is visible both in terms of the loss of mangroves in the vicinity of the Navinal port as well as the loss of vegetation and land area of Bocha island.

   It must be noted that the Marine EIA of the Waterfront Development Plan, prepared by NIO in 2008, had mentioned that mangroves are dense in portion of the area considered for the channel for North port. It therefore, said that adequate care should be taken to ascertain that the shore protection of the western bank of the Bocha creek does not induce erosion of the inter-tidal area.[9] These measures are needed to protect the dense mangroves of Bocha

island bordering the high tide level as well as island formation. To do this, NIO recommended that dredging of the Bocha creek should be planned so that the eastern shore (North port side) is not disturbed.

The protection of the channel would require specifications for the turning circle and depth, as that sets limits on the size of ships that can enter the area. The EIA document says that the company proposes to dredge to a uniform depth of -17m CD with two turning circles of 550 m each.[10] The company also proposed to expand the width of the channel. The EC, while dropping the expansion, has allowed two turning circles of 550 m each and also dredging to a slightly deeper uniform depth of -17.5 m. This is seemingly contradictory, as it would have the same result, and lead to destruction of mangroves.

It is also important to consider that if indeed protection has been provided in the EIA and EC condition, it is inadequate. The satellite imagery shows sharp decline in the area and vegetation cover of the island. Therefore, it is necessary to take even more stringent measures for Bocha conservation, including the cancellation of North port.

The North port area, adjoining Bocha exhibits mangrove in the year 2005. This area, as a contigous mangrove patch with Bocha Island, should be protected and all mangroves in the area be restored and brought to pre-2005 status including that reclaimed by GMB/APSEZL. The entire area should be declared as a conservation zone, as it is contiguous to Bocha island and its important mangrove system. This conservation zone should be clearly earmarked and demarcated using lat-long so that monitoring is possible (see Figure 12: *Proposed Conservation Zone to be Brought Back to 2005 Condition*).

3. **The mangrove conservation area near the mouth of Baradi Mata must be protected and regenerated**: An embankment to stop soil deposition into the creek, with buffer between the mangrove area and reclaimed land, should be made.

Figure 12: **Proposed Conservation Zone to be Restored to pre-2005 Condition**

Mangroves at Bocha Island and proposed North port site seen as a contiguous patch in 2005

Source: Analysis by Centre for Science and Environment, New Delhi, April 2013

4. **All identified mangrove conservation areas as per the EC of January 2009 must be protected with adequate measures against erosion**: These areas should be marked with lat-long so that regular monitoring for compliance, based on high-resolution maps, can be made publicly available.

5. An action plan for protection of all mangrove conservation areas including the proposed mangrove conservation area, may be prepared and put in public domain, within three months, for monitoring.

3.3: Handling of Fly Ash

In clearances granted to the thermal power plant by MoEF and the CTEs given by GPCB, the issue of fly ash management and disposal has been emphasized (see Table 3: *Conditions for Fly ash Utilization/Disposal in Different Clearances*).

Table 3: **Conditions for Fly ash Utilization/Disposal in Different Clearances**

Clearance date	Condition stipulated for Fly Ash
1. January 29, 2007: CTE by GPCB for Phase I of TPP	Company should comply with fly ash notification.
2. August 13, 2007: EC for Phase I of TPP	Fly ash should be collected in dry form, and it should be ensured that 100 per cent of it is utilized from the day of the commissioning of the plant. In case of emergency, the utilized ash may be disposed in the ash pond through High Concentration Slurry Disposal system.
	Regular monitoring of ground water quality including heavy metals should be undertaken around the ash dyke to check for leaching of contaminants from ash disposal.
3. June 6, 2008: CTE by GPCB for Phase II of TPP	Company should comply with fly ash notification.
4. October 21, 2008: EC for Phase II of TPP	Fly ash should be collected in dry form and it should be ensured that 100 per cent is utilized from the day of the commissioning of the plant. In case of emergency, the utilized ash may be disposed in the ash pond through High Concentration Slurry Disposal system.
	Regular monitoring of ground water quality including heavy metals should be undertaken around the ash dyke to check for leaching of contaminants from ash disposal.
5. May 20, 2010: EC for Phase III of TPP	100 per cent fly ash collection and utilization from day one of the operation of the plant. Status of implementation should be reported to the Regional Office of the Ministry from time to time.
	Ash pond should be lined with HDP/LDP lining or any other appropriate impermeable media so that no leaching occurs. No dumping of flyash is permitted in low-lying areas.
	Fly ash to be stored in dry form and storage facility (silo) should be provided. Unutilized fly ash to be disposed off in slurry form in the ash pond area.
6. June 25, 2010: CTE by GPCB for Phase III of TPP	Unit should have a fly ash handling system.
	Company should comply with fly ash notification.
7. February 19, 2011: CTE of GPCB for use of outlet for the treated effluent	Proper utilization of fly ash ensured as per the Fly Ash Notification 1999 and the amendment in 2003.

Source: Analysis by Centre for Science and Environment, New Delhi based on clearances granted by MoEF and consents by State

Expert Appraisal Committee (EAC), MoEF: The meeting in February 2008, that discussed the clearance of Phase II of the TPP, required detailed plan of fly ash utilization to be produced by the company before further decisions could be made. The meeting held in November 2008, concerning the clearance of Phase III of the TPP, also required plans for the same. Meetings in September 2009 and March 2010 emphasized 100 per cent utilization of fly ash generated from Phase-I and II. It was further indicated that fly ash from Phase-III should also be fully utilized from day one of operation.

3.3.1: Observations on Fly Ash Utilization/Disposal by Monitoring Committees/Courts

Gujarat Pollution Control Board Inspection, 2011: A site inspection was undertaken by GPCB on April 8, 2011.[11] The site visit was organized as a result of a complaint filed by residents of nearby villages. The visit indicated that fly ash generated from the plant was being collected in fly ash silo. Regarding utilization of fly ash, it was observed that about 17 per cent of the total fly ash generated (7,512 MT of 43,639 MT fly ash generated) was being sent to cement manufacturing industries.

GPCB inspection also revealed that about 27,127 MT of fly ash was found to be disposed off in low-lying areas of MPSEZ between APL and West port (as per the EC condition for phase III of project, no disposal is allowed in low-lying area). Disposal of fly ash in the low-lying areas was going on through open dumpers. Fugitive emission was observed due to movement of fly ash loaded dumper and other heavy vehicle during the GPCB site visit.[12] The company was also required to sprinkle water and ensure regular wetting of ground to curb generation of dust.

Following such observation, GPCB issued a directive to the company on April 18, 2011, regarding controlling of fugitive emissions. The company was directed to carry out compliance actions for fugitive emissions within 15 days of the issuance of the directive. However, no follow up is reported to check for compliance with these directions.

3.3.2: Examination of Issue by this Committee

3.3.2.1: Quantum of fly ash: As per the application made to MoEF, Phase I operations of the TPP (660 MW) is based on imported coal at 6,000 tonnes per day (TPD) rate, which is 1.98 million tonnes per annum (MTPA).[13] Its ash content is reported to vary between 5-8 per cent. Fly ash generation as per the application form submitted by the company to MoEF is 368.64 TPD (0.12 MTPA). The EIA report states that ash will be generated at the rate of 480 TPD (0.16 MTPA).[14] While the application form states that fly ash will be utilized/managed in cement/brick manufacturing units and in land filling/ construction at the project site, it also says that all the fly ash – 368.64 TPD – would be sent to cement industry.

As per the EC granted to Phase II of the TPP, 6 MTPA of imported coal of four per cent ash content will be used. The EIA for Phase II states that 6.4 MTPA imported coal with ash content of 4.5 per cent will be used for power plant operations.[15] This is based on coal analysis done in February 8, 2008, by Inspectorate Pvt. Ltd. (Singapore), with one coal sample imported from Indonesia. The ash content in the sample as per the analysis was indicated to be 3.59 per cent.

As per the EC granted for Phase III on May 20, 2010, coal utilization is 8.39 MTPA just for this phase. The coal ratio of 30 per cent domestic and 70 per cent imported is indicated. However, MoEF issued a corrigendum on June 1, 2011 to the Phase III EC amending the domestic coal utilisation as 70 per cent and international coal as 30 per cent. Domestically the coal will be sourced from Mahanadi Coalfields Ltd. (MCL). The marine EIA for Phase III prepared by NIO states that the primary fuel (9.6 MTPA) used will be domestic, sourced from Korba/Talcher.[16] The ash content for Phase III has not been specified, but the marine EIA mentions that 35 per cent of the coal will be ash.[17] This is merely an assumption. Therefore the real ash content of coal is not available in the absence of proximate or ultimate analysis. The ash content in domestic coal is typically high, as much as 45 per cent.[18]

The Committee has analyzed the total quantum of fly ash production in the TPP as follows. This estimation is based on 80 per cent plant load factor (PLF) as it is done to estimate the quantity that will need to be planned for. The Company has informed the Committee that currently it is working at 65 PLF because of paucity of coal.

Coal utilization for Phase I: 1.98 MTPA
Ash content in the coal: 8%
Therefore total ash content: 8% of 1.98 MTPA = 0.16 MPTA
80% of ash is fly ash: 80% of 0.16 MTPA = 0.13 MTPA

Coal utilization for Phase II: 6 MTPA
Ash content in the coal: 4%
Therefore total ash content: 4% of 6 MTPA = 0.24 MPTA
80% of ash is fly ash: 80% of 0.24 MTPA = 0.19 MTPA

Coal utilization for Phase III: 9.6 MTPA
Coal mix: 70% domestic (6.72 MTPA) and 30% international (2.88 MTPA)
Ash content in the domestic coal: 35%
Ash content in the international coal: 4%
Total ash content from domestic coal: 35%-45% of 6.72 MTPA = 2.4 – 3.02 MTPA
Total ash content from international coal: 4% of 2.88 MTPA = 0.12 MTPA
Total ash = 2.52 MTPA – 3.14 MTPA
80% of ash is fly ash: 80% of 2.52 MTPA = 2.02 – 2.52 MTPA

The total fly ash generated from the TPP (all phases) will range from 2.3 to 2.8 MTPA.

The total ash generated will be 2.8 to 3.4 MTPA.

The quantum of fly ash generated has changed dramatically since the commissioning of phase III, which is based on domestic coal, with substantially higher ash content – 35-45 per cent as compared to 4-8 per cent in imported coal. The source of coal will determine the quantum of fly ash and given the present coal crunch any blending of coal from different Indian coal fields will change the fly ash composition.

3.3.2.2: Fly ash management: According to the Phase III EIA report, the plant has proposed a ash-handling system (AHS), which would be equipped to handle top and bottom ash separately.[19] The AHS is designed taking into consideration worst coal consumption at full load and considering that 80 per cent of total ash generation will be fly ash. The fly ash handling system of the plant is expected to continuously remove fly ash from the electrostatic precipitator hoppers and store it in silos, which thereafter will be carried out using pneumatic conveying system.

According to the EIA report prepared by Telos Consultancy for Phase I, fly ash will be collected in dry form in one silo of 15 hour holding capacity.[20] According to the Phase III EIA report, two fly ash silos shall be provided for a capacity of 16 hours each for the storage of fly ash generated.[21]

3.2.2.3: Fly ash utilization and/or disposal: ECs granted to all phases of the power plant emphasize on 100 per cent utilization of fly ash. Meetings of the EAC, held on September 10, 2009 and March 19, 2010 also emphasized that fly ash generated from Phase III operation should be fully utilized from day one.

Even though 100 per cent utilization is directed, the EC conditions also lay down that the unutilized fly ash from plant operations will be disposed off in slurry form in the ash pond area. Monitoring of ground water quality including heavy metals should be carried out around the ash dykes to check for leaching of contaminants from ash disposal. In the EC for Phase III, because of the use of domestic coal with high heavy metal content, an additional condition is imposed that flyash disposal or use will not be allowed in low-lying areas, as there is danger of groundwater contamination.

Adani Power has been asked by MoEF to submit its fly ash utilization plan for different phases. In March 2008, the company submitted its plan for the Phase I and Phase II. Under this plan fly ash generation is 0.2499 MTPA of which 20 per cent will be utilized in the 1st year. There would be a 10 per cent increase in utilization every year, reaching 100 per cent in the 9th year. The fly ash would be commercially used by cement industries; the company had already signed MoU with Sanghi Cement and Hazelberg Singapore Pvt. Ltd.[22] EIA report of Phase III expansion of the power project also confirms such agreement.[23] The unutilized ash would be diverted to ash storage yard. An area of 24 ha with storage capacity of 2.16 million tonnes has been proposed for the storage of diverted ash as per the ash utilization plan.[24]

The question then is how much is being generated and how much is utilized?

The company provided fly ash generation and utilization estimates to GPCB, following its site visit on April 8, 2011.[25] According to details provided by the company to GPCB, about 0.044 million tonnes of fly ash was generated in March 2011, out of which about 0.0075 million tonnes was sent to cement manufacturing industries and 0.027 million tonnes was disposed off in low-lying areas of MPSEZ.[26] In this case, in 2011, utilization was 79 per cent of total monthly fly ash generated, with only 17 per cent going to cement industries.

These figures do not reconcile with compliance reports filed by Adani Power to MoEF stating that between 2010 to 2012 fly ash utilization was 100 per cent. In 2013, the company has reported for the first time a slight drop in utilization to 90 per cent.[27]

On its visit to Mundra in January 2013, the Committee asked for details on utilization of fly ash. According to the information provided by the Company to the Committee, 45 per cent of the fly ash is utilized by the cement industry, eight per cent by the brick/construction sector, 37 per cent for the reclamation of low lying area, and 10 per cent in ash dykes (see Table 4: *Fly ash Utilization and Disposal (in tonnes) (April 2012-December 2012)*).

The Committee then asked for details of the cement companies where the fly ash had been used and also a confirmation on the quantum received by them for verification of the same. GPCB

Table 4: **Fly ash Utilization and Disposal (in tonnes) (April 2012-December 2012)**

Month	Cement	Brick/ Construction	Reclamation of Low Lying Areas	Ash Dyke	Total	Percent Utilization
Apr	40912.0	7549.0	15063.0	6445.0	69969.0	90.8
May	40668.0	7239.0	17434.0	7287.0	72628.0	90.0
June	40978.0	6518.0	17948.0	8214.0	73658.0	88.8
Jul	35540.0	7374.0	23313.0	7342.0	73569.0	90.0
Aug	34252.0	4326.0	12599.0	6211.0	57388.0	89.2
Sep	35499.0	7360.0	28627.0	7342.0	78828.0	90.7
Oct	43641.0	6993.0	45812.0	8793.0	105239.0	91.6
Nov	35097.0	7233.0	52034.0	12811.0	107175.0	88.0
Dec	43361.0	8439.0	70520.0	11657.0	133977.0	91.3
Total	**349948.0**	**63031.0**	**283350.0**	**76102.0**	**772431.0**	**90.1**

Source: Information submitted by Adani Power to Committee during its January 2013 field visit

provided information, as it received from cement companies; which accounts for roughly half the fly ash generated during the year (see Table 5: *Monthly Ash Quantity Dispatched to Cement Plants (in tonnes) (April 2012-February 2013)*).

Table 5: **Monthly Ash Quantity Dispatched to Cement Plants (in tonnes) (April 2012-February 2013)**

Monthly	Ambuja Cement	Ultratech Cement	Fly Ash Resources	Jaypee Cement	Binani Cement	Others	Total Monthly to Cement
Apr	8824.9	3324.2	8831.9	6917.3	1233.2	11780.5	40912.0
May	12920.6	4171.2	7457.4	6850.8	1320.6	7947.6	40668.0
June	14923.7	5058.0	6695.9	7273.6	1274.8	5752.1	40978.0
Jul	11745.2	6498.4	6500.5	4884.2	2005.7	3906.0	35540.0
Aug	8742.6	11079.2	5319.3	2951.4	2248.5	3911.1	34252.0
Sep	9574.5	7144.7	5123.6	7387.3	3736.5	2532.4	35499.0
Oct	11010.8	4953.6	11261.7	9208.3	6031.4	1175.1	43641.0
Nov	9609.5	5618.0	9262.7	6379.2	3506.9	720.7	35097.0
Dec	14881.9	6258.1	9505.7	5537.6	3896.2	1556.1	41635.5
Jan	20132.9	8301.5	11598.0	5210.0	3577.8	0.0	48820.2
Feb	22750.9	11876.6	11770.3	4782.7	19927.8	0.0	71108.3
Total	**145117.4**	**74283.6**	**93326.9**	**67382.3**	**48759.5**	**39281.4**	**468151.0**

Source: Information provided by GPCB to Committee, March-April, 2013

3.3.5: Observation and Recommendation of this Committee

The issue of fly ash utilization and disposal is technically manageable. Given all the technologies, plans and capabilities that the company has at its disposal, it should be able to satisfactorily mitigate the hazards. But it is clear that there has been a problem in management on the ground. The GPCB field inspection report of April 2011 shows that there was disregard for local pollution because of fugitive emissions and discrepancy in accounting for utilization. There is no follow up report or additional monitoring reports, which would show that all issues have been satisfactorily resolved. The compliance report filed by the company to regional office of MoEF, have also been non-serious about these issues. There is no report available on the compliance with the notification on utilization of fly ash.

This Committee, after assessment has also concluded that the inventory of fly ash given by the company/GPCB does not satisfactorily demonstrate proper utilisation/disposal of ash. For instance the data from April 2012 to February 2013 indicates 90 per cent utilisation (including disposal in ash dyke). The unresolved issue is where the remaining ten per cent of the fly ash and bottom ash (over 1,00,000 tonnes) is being disposed or utilised. This suggests that there would be possibility of dumping ash which would lead to air pollution and land degradation.

The EC conditions require the company to conduct regular monitoring in and around the ash pond area. However, in the compliance reports filed by the company, it is submitted that this condition is 'not applicable' – with the justification that there is 100 per cent utilization. But clearly, this is not the case. The company is in non-compliance with this condition. The issue

of monitoring must be taken seriously as it will build a credible system to allay the fears and problems faced by local people. The problem of fly ash and its disposal continues to agitate local people. The ToR of this Committee includes examination of "the issues related to handling of fly ash by Adani Power Limited and particularly with reference to the Notification on utilization of fly ash".

The Committee would recommend the following:

1. GPCB should set up a robust monitoring system, which is in the public domain that tracks and reports on:

One, the quantum of fly ash generated by all the phases of the Adani thermal power plant, which will vary based on the source and quality of domestic coal: It is important to note that the quantity will vary greatly based on the source of coal that is utilized in the plant. A careful examination of the papers submitted by the company show that there are key assumptions made to estimate the fly ash quantity, which may or may not be correct. For instance, it is estimated that coal used in Phase I will have ash content of 5-8 per cent and Phase II will have ash content of four per cent, based on one coal sample imported from Indonesia. It is not clear if this measurement has been validated subsequently. In Phase III, the quantity of ash that is being generated is expected to be much higher as the plant will utilize domestic coal. The EC for Phase III is based on 70 per cent domestic and 30 per cent imported coal. The EIA document assumes that domestic coal will have 35 per cent ash content; but the source of the assumption is unknown as domestic coal has typically 45 per cent ash content.

The monthly/annual monitoring system must be designed to ensure that there is complete clarity about the source of coal utilized; its quantum and as a result the fly ash generated. This is important, as the greater use of domestic coal – particularly in conditions where market for imported coal is more hostile – will change the fly ash generation scenario manifold. Therefore, it is imperative that there must be a greater clarity on source of coal utilization to understand fly ash generation, which in turn is necessary to verify the budget for utilization. Without this, it is not possible to state, whether the company meets the compliance condition of 100 per cent utilization of fly ash.

Two, verify and audit the utilization of fly ash. While it may be difficult to check the use of fly ash for reclamation and brick making, it is certainly possible to audit the quantum of fly ash used for cement manufacturing. As per compliance reports filed by the company, little information is available that helps to check or audit the claim of 100 per cent utilization. As per the information provided by the company to the Committee in 2012, cement companies utilized 45 per cent of the fly ash.[28] GPCB has provided information on the companies that use the fly ash – name and quantum. The next step would be to cross check these claims through logbook information, receipts from truckers, receipts from the cement manufacturers and to do so regularly. This will provide greater clarity about the utilization of at least half the fly ash generated.

2. **The Company should submit a revised fly ash utilization plan to MoEF, which does not provide for its use in reclamation. This is because it is not possible to monitor and verify that domestic coal fly ash is not being disposed or used for reclamation in low-lying areas**. In May 2010 EC, a condition was stated that fly ash generated from Phase III cannot be used for disposal or reclamation in low-lying areas. This is because it assumes correctly that this fly ash will come from Indian coal, which is known to be higher in heavy metals, including mercury. This conditions was not there in Phase I and II EC. The 2011 site inspection by GPCB noted that there was disposal of fly ash in low-lying areas.[29] However, it is not clear how this practice is being checked or monitored subsequently after the Phase III operation has started. The company has submitted information to this Committee that 37 per cent is used for reclamation of low-lying areas. It is virtually impossible to imagine that the company can separate out the fly ash based on different plants. Given this situation and the need to ensure compliance, it

would be advisable for the company not to use any fly ash for disposal or reclamation, unless it can show a robust and verifiable system that can separate out the ash, based on its power plant units.

3. The concern about fugitive emissions from transport and disposal of fly ash and contamination of the groundwater near the fly ash dyke and pond must be taken seriously by the regulating agencies and public monitoring systems must be evolved to check for contamination around the ash pond in particular.

3.4: Earthquake/Tsunami and Project Clearance

Conditions for clearances have specified the need for the proposed project to comply with the disaster management plan as mentioned in the EIA reports (see Table 6: *Conditions stipulated for Earthquake/Tsunami in Different Clearances*).

Table 6: **Conditions stipulated for Earthquake/Tsunami in Different Clearances**

Clearance date	Conditions stipulated for Earthquake/Tsunami
1. September 20, 2000: Port Expansion	Regular drills should be conducted to check the effectiveness of the on-site disaster management plan.
	The recommendations made in the Environment Management Plan and disaster management plan, as contained in the EIA and Risk analysis of the project shall be effectively implemented.
2. July 21, 2004: Single Point Mooring	Regular drills should be conducted to check the effectiveness of the on-site disaster management plan.
	The recommendations made in the Environmental Management Plan and Disaster management plan, as contained in the Environmental Impact Assessment and Risk analysis reports of the project, shall be effectively implemented.
3. January 29, 2007: GPCB 's CTE for Phase I of TPP	Applicant shall have to comply with the risk assessment and disaster management plan.
4. February 5, 2007: Multipurpose Berth	A disaster management plan covering emergency evacuation mechanisms etc., to deal with natural disasters should be prepared and furnished to the ministry.
5. January 12, 2009: Waterfront Development	The recommendations of the risk assessment shall be implemented.
6. June 25, 2010: GPCB 's CTE for Phase III of TPP	Applicant shall have to comply with the risk assessment and disaster management plan.

Source: Analysis by Centre for Science and Environment, New Delhi based on clearances granted by MoEF and consents by State

3.4.1: Observations on Earthquake/Tsunami by Monitoring Committees/ Courts

Kala Committee Report: Concern about the risk of a natural disaster in the area was raised in Gujarat High Court under Special Civil Application (SCA) no. 10104 of 2010. Gujarat High court in its July 2011 order constituted the J C Kala committee to look into the issue. The committee was asked to furnish its expert opinion on viability of the said project located on the beachfront, keeping in view the earthquake of severe intensity that happened in Japan.

The report[30] states that Mundra port is in the highest risk zone (Seismic Zone V) of earthquake as per seismic zoning map of India. It also acknowledged that the area has suffered some big earthquakes ranging between 5.5 to 8 magnitudes. Prof. Ashwin Kumar of IIT Rorkee, member of the Kala Committee did the Tsunami hazard analysis for the Mundra port site (Lat 22^0 49' 48" N and Long 69^0 30' 58"). Five seismographic sources namely F3 fault, F4 fault, Kim Fault, Makaran convergent boundary and mid oceanic ridge were selected for the study. Tsunami magnitude and tsunami run-up height due to earthquakes occurring along these sources were

computed, and it was predicted that the maximum amplitude of a tsunami wave at Mundra Port generated due to various seismogenic sources located at different distances would be 1.26 meter (maximum). The study concluded that tsunami hazard at Mundra port is low. However the study admitted that it has not taken into account the shape and sub surface topography of the Gulf of Kutch, which is likely to amplify the Tsunami wave amplitude. The study noted that this needs to be estimated.

3.4.2: Examination of Issue by this Committee

The Mundra port site has experienced shaking due to moderate and major earthquakes in the past. Some of the prominent earthquakes as also pointed out in the IIT report that have occurred in the region include the Great Rann of Kutch earthquake of 1819 (Magnitude = 8.0) the Anjar earthquake of 1956 (Magnitude = 7.0), Bhuj earthquake of 2001 (Magnitude = 6.9). Several small earthquakes occur in Gulf of Kutch and one moderate earthquake (M = 5.5) occurred in the Arabian Sea in 1927 at a distance of 50 km from Mundra Port.

The Great Rann of Kutch earthquake in June 1819 took a toll of about 1534 human lives and heavy damage to the property in the epicentral area. Extensive damage was observed up to Ahmedabad in the east, Porbandar in the west, Jaisalmer in the north, Bhuj and Anjar. The earthquake was felt up to an average distance of 1280 km from the epicenter. This region suffered a devastating earthquake (M = 7.8) that triggered a Tsunami in November 1945 causing more than 4000 deaths and loss of property along the Makran coast of Pakistan, coasts of Western India, Iran and Oman. The Anjar earthquake in July 1956 was severely felt at Mundra, that contributed to considerable damage to property and loss of life in the epicentre area. The felt area of Bhuj earthquake in January 2001 extended up to Delhi, Kolkata and Chennai. Bhuj town and the Bhachau village located 60 km east of Bhuj suffered heavy damage and destruction. Many other areas of Gujarat including capital town Gandhinagar, Ahmedabad were badly hit. The earthquake took the toll of 13,805 human lives and 12,05,198 houses suffered damage of varying degrees. Due to strong shaking that lasted for a longer duration, heavy to very heavy damages was inflicted in eight districts of Gujarat, whereas the remaining districts witnessed moderate damage to civil structures.

Risk of tsunami around Mundra port due to moderate and large submarine earthquakes can be attributed to tectonic motions along the tectonic features (coastal faults), which are mapped and located close to and up to a distance of 100 km. In addition Prof Ashwin Kumar has identified three tectonic sources along which tsunamigenic earthquakes can occur and generate tsunamis.[31] These are:

1. Infrequent occurrence of large earthquakes along Makran convergent boundary leading to destructive tsunami along the Makran coast of Pakistan and in the Northern Arabian Sea.

2. Under thrusting of Oman oceanic lithosphere at a shallow angle beneath the Iranian micro-plate is causing uplift and turning Makran coast in Baluchistan and Sindh provinces into a very densely faulted belt.

3. The segment of mid-Oceanic Ridge located at a distance of 1,900 km from Mundra Port – a divergent plate boundary between Africa and Indo–Australian plates. In addition, tectonic sources, submarine landslides along Makran coast and Mid-oceanic ridges can also cause tsunamis.

The report adds that in addition to above tectonic sources, submarine landslides along Makran coast and Mid-oceanic ridges can also cause tsunamis. Submarine landslides can be triggered even by small and moderate earthquakes occurring along offshore tectonic features. Historic tsunamigenic earthquakes might have occurred on the various tectonic sources as identified but in the absence of data, it is difficult to ascertain the heights of the tsunami waves.

3.4.3: Observation and Recommendation of this Committee

The issue of coastal safety is a matter of great concern. As established by the analysis above, tsunami and earthquakes are threats to the area owing to its geological settings. But there has been no comprehensive assessment in terms of risk/hazard analysis.

The Committee recommends that the Government should carry out an Impact Study especially in light of the Japan tsunami in 2011. Also, **the disaster management plan of different project proponents of MPSEZL should be linked to the 'District Disaster Management Plan'**. This will be in the interest of the vulnerable people in and around the project area to ensure human safety with early warning practices. The Committee also recommends carrying out periodic mock drills along with district administration in and around the project area.

3.5: Salinity Ingress and Impact on Agriculture

In all conditions of clearances it has been made clear that the proposed project should not carry out any activity, which will result in saline water ingress (see Table 7: *Conditions for preventing Salinity Ingress in Different Clearances*). Groundwater extraction in coastal areas can be a cause for salinity ingress therefore conditions restricting the same have also been imposed in the clearances. In fact, the conditions say that there will be no groundwater withdrawal during and after construction. The clearance conditions for different projects stipulate that the company should install piezometers at strategic places to monitor groundwater levels.

Table 7: **Conditions for preventing Salinity Ingress in Different Clearances**

Clearance date	Condition stipulated for Salinity Ingress
1. September 20, 2000: Port Expansion	Project proponent shall ensure that ingress of the saline water into the ground water does not take place as a result of the proposed project. Piezometers shall be installed for regular monitoring for this purpose at appropriate locations at the project site.
	No groundwater shall be withdrawn for this project.
2. August 4, 2005: Clearance for salt work	Pizeometers shall be installed at appropriate locations and ensure that groundwater is not affected by saline intrusion.
3. February 5, 2007: Multipurpose Berth	The proponent shall ensure that as a result of the proposed project, ingress of the saline water into the ground water does not take place. Piezometers shall be installed for regular monitoring for this purpose at appropriate locations at the project site.
4. January 29, 2007: NOC to power plant from GPCB	Applicants shall not use/withdraw ground water either during construction and/or operation phase.
5. August 13, 2007: EC for Phase I of TPP	Regular monitoring of ground water quality including heavy metals shall be undertaken around ash dyke and the project area to ascertain the change, if any, in the water quality due to leaching of contaminants from ash disposal area.
6. May 29, 2008: CRZ Clearance for intake and disposal facility for TPP	It shall be ensured that due to the project, there is no adverse impact on the drainage of the area and recharge of groundwater. No groundwater shall be tapped in the project area falling in the coastal regulation zone.
7. October 21, 2008: EC for Phase II of TPP	Regular monitoring of ground water quality including heavy metals shall be undertaken around ash dyke and the project area to ascertain the change, if any, in the water quality due to leaching of contaminants from ash disposal area.
8. May 20, 2010: EC for Phase III of TPP	No groundwater shall be extracted for use in operation of the power plant even in lean season
9. February 20, 2010: Environment Clearance for Common Effluent Treatment Plant	Groundwater shall be monitored on regular basis with piezometer bore wells at suitable locations in consultation with GPCB and its records shall be maintained. The monitored data along with interpretation shall be submitted at least once in six months.
10. February 20, 2010: Environment Clearance for Samundra Township	No groundwater shall be used and the water required during construction phase shall be sourced from Gujarat Infrastructure Ltd.

Source: Analysis by Centre for Science and Environment, New Delhi based on clearances granted by MoEF and consents by State

3.5.1: Observations on Salinity Ingress by monitoring committees

GPCB Inspection, April 15, 2011: The Gujarat Pollution Control Board conducted a site inspection. During the inspection, it was noted that the Company has provided an open unlined (kachcha) channel and kachcha reservoir for storage of seawater.[32] The Board had received representations from surrounding villagers regarding increase of salinity in groundwater. Therefore, the Board issued directions on April 18, 2011 to the company to carry out a detailed assessment of underground water quality, including salinity ingress, in surrounding area through a reputed agency. Based on this direction, the Company commissioned the National Productivity Council (NPC) to do a study to assess salinity problems and groundwater quality.

M/s Adani Power Ltd commissioned NPC, Gandhinagar to conduct the study. A total of 36 borewell water samples were drawn from 18 locations in two seasons during 2011 and tested at M/s SGS India Pvt Ltd in Ahmedabad. It reports that except for two samples, all other samples were found to be unfit for drinking water as per IS:10500 specifications because of different reasons – from taste, to high dissolved solids to coliform. There was slight improvement in the post-monsoon season.[33]

3.5.2: Examination of issue by this Committee

The Committee has a specific ToR on this matter: to examine, "likely impacts on agriculture due to salinity ingress due to the creation of huge water body of sea water for Adani Power Plant at Mundra Taluka."

In order to examine this issue in-depth and comprehensively, data is required on groundwater quality, which would provide time series information on salinity levels in the area around the water body.

3.5.2.1: Data on groundwater quality: EC requirement of groundwater monitoring by Company – Under the EC condition, the company is required to monitor groundwater levels, using piezometers, to check against salinity ingress. In addition, it is required to monitor groundwater quality, including heavy metals around the ash dyke and the project area to check against contamination because of fly ash from the thermal plant.

But data is unavailable for analysis and interpretation. As per the compliance reports submitted by the Company to MoEF's regional office, piezometers to monitor ground water levels have not been installed. One of the latest compliance reports, simply says it will comply with this condition and report back to Regional office but no time frame is given as to by when the condition will be met. The same is the situation with the condition on monitoring of ground water quality around the ash pond area for heavy metals.

NPC final report on groundwater quality July 2012: The NPC report finds that in 80 per cent of the villages, borewell water tested pre-monsoon season, exceeded standards for total dissolved solids (TDS) – with levels going up to 3,616 mg/l in Tragadi and over 2,500 mg/l in Navinal.[34] But it does not explain the location of the well or the depth. There is also no indication of the increase in trend, if any, of TDS levels in wells. The report does not specifically collect well water samples – open and borewells – from the areas around the open drain and reservoir. Furthermore, as is well known, electrical conductivity is a much better measure of salinity. This analysis was not done.

In our assessment, the NPC report provides inadequate data and analysis and therefore, does not allow for conclusive interpretation on the problem of salinity ingress. This data cannot be used to assess compliance with the condition to prevent salinity ingress in the area. GPCB, which had issued directions to the company on the assessment of water quality, based on

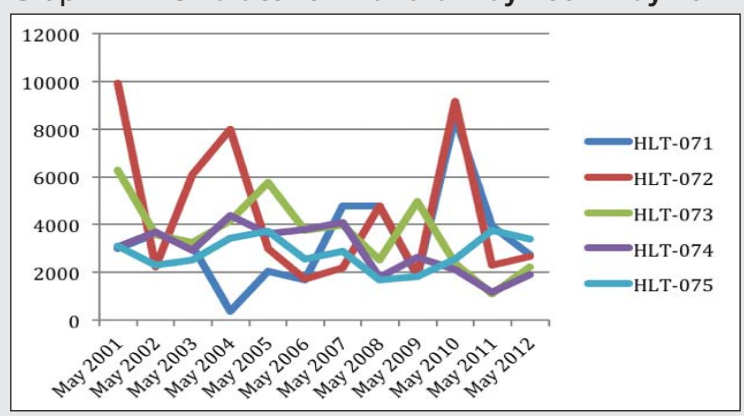
complaints by villagers, must reject this analysis and proceed accordingly with is investigations and actions.

State groundwater board monitoring data: The Gujarat Pollution Control Board (GPCB) provided the Committee data on electrical conductivity, TDS and chloride monitored by the state Ground Water Board in wells at Mundra and Tunda. The data for Tunda was very sporadic and hence was not used for analysis. As per the data for Mundra, five wells were monitored in May and October every year from 2001-2012. The data does not give any clear trend on parameters vital for human consumption but it does depict that none of the wells have water fit for human consumption (see Box 1: *Salinity analysis based on data from Gujarat Ground Water Board*).

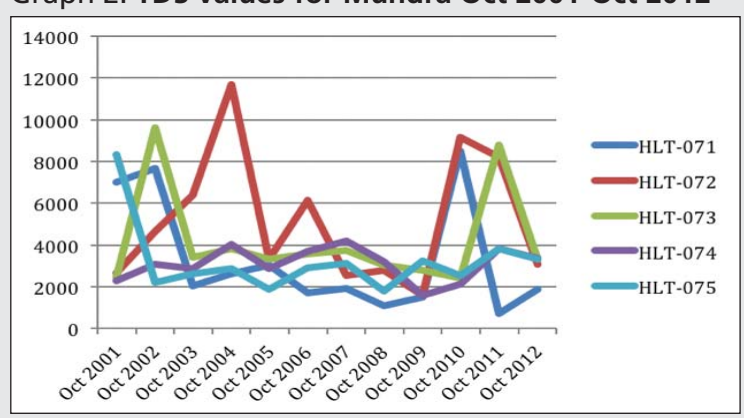
Box 1: **Salinity analysis based on data from Gujarat Ground Water Board**

Total Dissolved Solids (TDS) is plotted against all individual monitoring values for May and October through 2001-12 (two season monitoring is important to capture the contamination in the pre-monsoon and post-monsoon season. (Graph 1: *TDS values for Mundra May 2001-May 2012* & Graph 2: *TDS values for Mundra Oct 2001-Oct 2012*). As per the Indian drinking water specification (IS: 10500), the desirable limit of TDS is 500 parts per million (ppm) and the permissible limit (in the absence of an alternate source) is 2000 ppm. Beyond desirable limit, palatability of water decreases and it may cause gastrointestinal irritation. The lowest TDS was recorded for well HLT-071 in May 2004 (360 ppm), which seems to be discrepancy since all the other figures are at least above 1000 ppm. The highest TDS recorded was for the well HLT-072 in October 2004 (11,680 ppm). Although there is no trend emerging from the data, when compared to the TDS desirable limit of 500 ppm, none of the water samples are of drinking quality. If compared to the permissible limit of 2000 ppm, then as per October 2012 data, only HLT-071 well is below the limit (1,900 ppm). Also, water from none of the wells is drinkable throughout the year.

Graph 1: **TDS values for Mundra May 2001-May 2012**



Graph 2: **TDS values for Mundra Oct 2001-Oct 2012**



Chloride: As per IS: 10500 drinking water standard, the desirable limit for chloride is 250 ppm while the permissible limit is 1000 ppm. Beyond the desirable limit, taste, corrosion and palatability are affected. The lowest chloride recorded is for well HLT-071 in May 2004 (40 ppm) while the highest was for well HLT-072 in May 2010 and October 2010 (5,000 ppm). Although there is no trend emerging from the data, when compared to the chloride desirable limit of 250 ppm, none of the water samples are of drinking quality. If compared to the permissible limit of 1,000 ppm, then as per October 2012 data, only HLT-071 well is below the limit (672 ppm). Also, water from none of the wells is drinkable throughout the year.

3.5.2.2: Data on intake-outfall and water requirements: The Committee is unable to assess groundwater contamination and salinity ingress based on the available data. It therefore, decided to examine the issue of intake and outfall – the quantity of seawater that is transported inland for use and for discharge from the thermal power plant – and therefore, to understand implications of this activity on salinity ingress (see Box 2: *Water requirement, discharge and capacity of channel*).

Box 2: **Water requirement, discharge and capacity of channel**

Another issue which could affect salinity ingress is the quantum of water that will be transported for use in the thermal power plant. Though the impact will clearly be because of the deficiency in the lining of the channel and not in the quantum *per se*.

According to the application for submitted under EIA Notification 2006 for Phase I of the project the water requirement is 173 million litres per day (MLD), which is also in line with the data provided in the EIA prepared by Telos.[1] The EC granted to Phase I of TPP (dated August 13, 2007) also notes the water use as 173 MLD. The marine EIA prepared by NIO for Phase I (June 2006)[2] states that about 148 MLD of water is required for Phase I. As per the CRZ clearance granted on May 29, 2008, for intake and disposal facility for Phase I, the total water requirement for Phase I along with the desalination plant will be about 530 MLD. The NIO 2006 EIA states that the desalination plant is for potable water use of the Mundra SEZ. The capacity of the desalination plant is unclear but NIO has estimated a water requirement of 200 MLD for the same.

As per the EAC meeting (February 11-13, 2008) it was indicated by the project proponent that the plan for setting up the 80 MLD desalination plant has been dropped. It is however unclear whether this is the same desalination plant that was proposed along with Phase I of the TPP or an additional desalination plant proposed with Phase II. The EC for Phase II (dated October 21, 2008) indicates the water requirement for Phase II as 313 MLD. According to the consent given by GPCB for Phase II on June 6, 2008, the water requirement is about 319 MLD.

Water requirement for Phase III is 385 MLD as per the EIA report.[3] It is also estimated that the water requirement for the Flue-gas desulfurization (FGD) and the desalination plant for this phase of the TPP will be 6,510 MLD, making the total water requirement 7,000 MLD. The EC granted for Phase III on May 20, 2010, states that the total water requirement for all three phases including FGD and desalination plants combined is 7,560 MLD.

As per the Rapid Marine Environmental Impact Assessment Report by NIO in June 2006,[4] the effluent discharge from Phase I operations of the power plant will be 137 MLD. The discharge will have a temperature of 7°C above the ambient temperature, and high salinity. According to the consent given by GPCB for Phase I on January 29, 2007, the rate of effluent discharge is also 137 MLD. But as indicated in the CRZ clearance for intake and disposal facility for Phase I, the rate of effluent discharge is 396 MLD, which is much higher than that indicated in the GPCB consent and EIA. It should be noted, that the consent for use of outlet for discharge of effluent by TPP as granted by GPCB on February 19, 2011, based on capacities for Phase I and II of the power plant, specifies that the trade effluent from factory should not exceed 267 MLD. As per the EIA report[5], wastewater discharge from Phase III is 476 MLD. Moreover it is estimated that 6,210 MLD will be discharged from FGD for and the desalination plant. The total water discharge is estimated to be 7,080 MLD combining all three phases.

According to NIO report, a new discharge point is required as it was recognized that the earlier location would not be able to handle the quantity of effluent following the Phase III expansion.[6] The new outfall, with a capacity of 2,328 MLD, will be located at 22° 45' 17.8"N and 69° 36' 45.5"E. Therefore, the plant, which is based closed water cycle, will have to recirculate its water, the total discharge combining all three phases is 7,080 MLD. The company should prepare a comprehensive water audit, which explains the quantum and quality of discharge and the capacity of the effluent channel to carry the waste.

Location of intake for thermal power plant: Salinity has been a concern for thermal power plant from the intake and outfall channels carrying a huge quantity of saline water through the land – which, if not built with impervious lining could seep into the ground. There is a lot of confusion on the different intake and outfall channels that have been proposed by the Company at different stages of the project (see Box 3: *Too many channels and no clarity*).

As per clearances granted, water required for the power plant would be seawater sourced through an open channel. According to the Application Form (Form I) submitted to MoEF by the company, the water source is Kotdi creek, which is mentioned as a perennial source of water. The Rapid EIA prepared for the Phase I by Telos Consultancy states that open intake is technically more suitable for the project.[35] The EIA also states that cooling water for the power plant will be drawn from the sea from the mouth of Kotdi creek but it does not mention coordinates of this intake point. The DPR prepared by Fitchner also only states that the intake of seawater will be from Kotdi creek mouth.[36] The NIO 2006 rapid marine EIA for Phase I states that an open channel for intake is an attractive option from techno-economic considerations.[37] The NIO report 2006 provides the probable intake location from Kotdi as 22° 47' 11.7"N and 69° 33' 3.26"E.[38] The same has been reiterated for Phase II of the TPP including the marine EIA by NIO, April 2008.[39] The location was granted CRZ clearance on May 29, 2008.

However, the intake channel location and clearance that is being used by the company is the one given under its waterfront development project. In January 19, 2009, the MoEF issued an Addendum to its CRZ clearance for the proposed waterfront development project at Mundra. This says "the project also involves laying of intake and outfall for the thermal power plant which is located outside CRZ area." This clearance is based on the NIO report of July 2008 prepared for the waterfront development project.

The intake channel, which has got clearance under the waterfront development project is a common facility for Adani and Tata power (CGPL). In March 2010, MoEF letter to CGPL says "It is proposed by both M/s CGPL and M/s APL to use common intake water channel for intake of seawater being developed by MPSEZL. The location of the common intake water channel is suggested by NIO."

It is now given to understand that the common intake, suggested by NIO is part of its EIA 2008 for waterfront development.

Lining and construction conditions of intake channel: The Addendum for CRZ clearance, dated January 19, 2010 for "laying of intake and outfall" for thermal power plant does not give any details of the lining and construction of this intake. The EIA report (probably as it is for waterfront and not for quality of effluent from thermal power plant), only discusses the need for mitigating impact of effluents on final discharge into the sea. It provides for guiding rock bund of three km length on the eastern side of the effluent discharge spillway up to a natural depth of 4 m below CD. Therefore, this EIA does not investigate the problem of salinity increase because of the conveyance through the channel.

Location of outfall channel: Similar to the intake channel, the outfall channel has also undergone number of changes**.** Thee clearance has been sought for outfall channel in different phases.

The final outfall, similar to the intake, the outfall for the thermal power plant is based on the 2008 EIA for the waterfront development project and the Addendum clearance given by MoEF on January 19, 2009.

Lining and construction conditions of outfall channel: The EC letter for waterfront project (Addendum, January 19, 2009) only says that the project involves laying of intake and outfall system for TPP. The NIO EIA 2008 for waterfront project[40] says that 97,000 m^3/hr of effluent

Box 3: **Too many channels and no clarity**

Intake: As per the EIA report for Phase III of the TPP prepared by Envirotech, seawater will be drawn through a combined intake channel developed by MPSEZL for which Adani Power Limited has signed an MoU with MPSEZL.[1] The intake point is stated to be located near Kotdi creek at 22° 44' 35.9"N and 69° 32' 23.2"E as per the MoU.[2] According to the Marine EIA for Phase III of the TPP prepared by NIO in 2009, it is said "the total water requirement of 1 million m^3/hr is considered under the Water Front Development Project (WFDP) of MPSEZ.[3] The report further states that a "combined seawater intake channel catering to the requirements of UMPP, APL, port clusters, industries and social infrastructure is proposed as part of the water infrastructure of the WFDP."[4] The UMPP being referred to here is that 4000 MW TPP of Coastal Gujarat Power Limited (CGPL).[5] The report states that the location of the intake point is 22° 47' 11.7"N and 69° 33' 3.26"E". It can be noted here that the two EIAs for Phase III provide different locations for the intake point.

According to the Marine EIA of the Water Front Development Plan (WFDP) of Mundra Port prepared by NIO in 2008, an open channel located at 22° 44' 35.9"N and 69° 32' 23.2"E is proposed for all users in the area as part of the WFDP for the intake of 1 million m^3/hr of water. This again is a different intake coordinate than the one explained earlier which is being attributed to WFDP but it matches the coordinate mentioned in the Envirotech EIA report for Phase III. The channel will travel approx 7 km northwards towards the power plants and will bifurcate into two perpendicular arms terminating into concrete fore bays of the intake pump houses of the power plants. As per the EC granted to WFDP in January 2009, "seawater intake channel is planned for power plants, desalination plant and other industrial requirement."

The proposal for a new location for the intake channel was discussed during the 83rd EAC meeting held on December 21, 2009. During the meeting, it was submitted by CGPL, that the 660 MW power plant of Adani Power Ltd. (APL) is close to CGPL. And it is proposed that both APL and CGPL will use a common intake water channel developed by MPSEZL, to save costs and minimize impacts on marine ecology.[6]

Table 1: **Different intake locations over project cycle**

Document Type	**Latitude/ Longitude**
NIO June, 2006, Phase I TPP	22° 47' 11.7"N and 69° 33' 3.26"E
NIO 2007	22° 47' 11.7"N and 69° 33' 3.26"E
NIO April, 2008, Phase II TPP	22° 47' 11.7"N and 69° 33' 3.26"E
GPCB Consent June, 2008, Phase II TPP	As per NIO recommendation
NIO July, 2008, WFDP	22° 44' 35.9"N and 69° 32' 23.2"E
EC October, 2008, Phase II TPP	As per NIO recommendation
EIA report Phase III (Envirotech)	22° 44' 35.9"N and 69° 32' 23.2"E
NIO December, 2009, Phase III TPP	22° 47' 11.7"N and 69° 33' 3.26"E
Amendment to CRZ Clearance for revised location of	As per NIO recommendation

Source: Analysis by Centre for Science and Environment, New Delhi based on EIA reports of different project components

Outfall: The rapid marine EIA of Phase I of TPP (June 2006), identifies the point of discharge of wastewater at 22° 45' 48.25"N and 69° 32' 3.67"E.[7] The EC granted said that outfall is as per NIO recommendation. Also, the CRZ clearance granted in May 2008 for intake and outfall facility for Phase I of TPP states that the outfall be a pipeline with diffuser as per NIO recommendation. The same has been repeated for Phase II of TPP.

According to the Marine EIA for Phase III prepared by NIO in 2009,[8] APL has received approval for intake point for Phase I and II at is located at 22° 45' 48.25"N and 69° 37' 03.67"E. The report further adds that a new discharge point was required as it was now recognized that the earlier location would not be able to handle the quantity of effluent following the Phase III expansion. Thus the "coolant and desalination rejects of the power plant were proposed to be shifted to MPSEZ facilities."[9] The 'approved outfall' of MPSEZ as mentioned in the EIA report is 22° 45' 17.8"N and 69° 36' 45.5"E.[10] The July 2008 NIO[11] marine EIA for WFDP also confirms with the same point of effluent discharge as does the Envirotech EIA of Phase III.

Table 2: **Different outfall locations**

Document Type	Latitude/ Longitude	Lining/construction
TPP Phase I		
EIA NIO 2006	22° 45' 48.25"N and 69° 32' 3.67"E	Pipeline with 20 port diffuser and suitable dia-pipeline
EC, August 13, 2007		No mention of outfall
GPCB Consent, January 29, 2007,	22° 45' 48.25"N and 69° 32' 3.67"E	As per NIO recommendation
CRZ clearance for intake and outfall May 29, 2008	As per NIO recommendation in Kotdi creek	Pipeline as expected to have high salinity of 55 ppt as against 37 ppt of intake seawater
TPP Phase II		
EIA NIO 2006	Same as phase I	Same as phase I
GBCB Consent, June 6, 2008	22° 45' 48.25"N and 69° 32' 3.67"E	Collected in effluent holding tank and released through diffusers
EC October 21, 2008	Recommendations of NIO will be implemented	NIO recommendations
TPP Phase III		
EIA NIO, 2009	22° 45' 17.8"N and 69° 36' 45.5"E	Changed for thermal plant because of phase III expansion and higher discharge; shifted to MPSEZ Channel of 11 km, with guiding rock bund of 3 km on eastern side of effluent discharge spillway
EC May 20, 2010	No mention of outfall	To prevent salinity, necessary preventive measures such as lining of guard pond, used for treatment of intake and outfall adopted; Brine water to be discharged only after it meets average salinity of seawater
GPCB consent, June 25, 2010	No mention of outfall	No mention of lining
Waterfront Development		
EIA NIO 2008	22° 45' 17.8"N and 69° 36'45.5"E	97,000 m^3/hr effluent disposal expected; of 54 ppt; dredged channel uniform depth of 2.5 m/ top width of 19 m and bottom width of 17 m; 11 km, terminating to depth of 4 m below CD through spillway depth of 4.5m,100 m away from breakwater
EC Addendum January 19, 2009	No mention	Project involves laying of intake and outfall system for TPP which is located outside CRZ area
MPSEZ		
EIA NIO, 2010	22° 46' 44.04"N and 69° 45' 5.51"E	Pipeline with subsurface diffuser

Source: Analysis by Centre for Science and Environment, New Delhi based on different EIA reports and clearances from MoEF and State

The Company has clarified to the Committee that its intake is common with CGPL and the coordinates are those given in the WFDP EIA prepared by NIO in July 2008 (see Figure: Final Intake and Outfall channels for the TPP). The Company further adds that its outfall is the one based on WFDP EIA of July 2008 for which it received clearance under the WFDP EC in January, 2009.

Figure: **Final intake and outfall channels for the TPP**

Adani power uses common intake with CGPL but uses its own outfall channel

Source: Analysis by Centre for Science and Environment, New Delhi, April 2013

with high salinity (54ppt) will be discharged. It proposes a channel of 11 km, which will go through Kotdi creed and terminate below 4 m through spillway.[41]

It does not specify the lining that will be provided to check against salinity contamination. It is clearly because the proposed and now constructed outfall, originally came from the Phase I and II of the thermal power plant, which was planned as a pipeline with 20-port diffuser.

While the clearance for the outfall under waterfront does not specifically provide for the type of lining, the EC condition for phase III of thermal power plant clearly mentions the need to prevent salinity. It says that necessary preventive measures, such as lining of guard pond, used for treatment of intake and outfall will be adopted. Brine water will be discharged only after it meets the average salinity of seawater (37 ppt as against 57 ppt in discharge).

The issue of lining was also discussed during the 59th EAC meeting held on November 29, 2007, while recommending CRZ clearance for the intake and outfall facility. At this meeting the project proponent was asked to provide details about the lining of the outfall channel, which is important for preventing saline intrusion in the ground water.

Strangely enough, the CGPL, located adjoining to APL has been directed to use impervious layering like geo-membrane lining to prevent contamination of groundwater.

A site visit conducted by GPCB on April 8, 2011, observed that a 7 km long *kutchha* (unlined) intake channel has been developed for seawater intake for cooling and other uses of the power plant.[42]

The Committee also noted that the channel, which was nearing completion during its field visit, was only lined using stone pitching – which is a method to stablize the sides of the channel and will not have any effect on reducing saline infiltration. It is also to be noted that all EIA reports have accepted that the outfall effluent will be substantially higher in salinity levels – 37 ppt of seawater and 55 ppt of effluent.

Soil Permeability

The Company states that the intake and outfall channels have been proposed without any lining since the soil in the area is impervious. However the soil analysis done in the different EIA reports of the project and the data provided by the Company to the Committee present a different picture.

As per the soil analysis presented in Phase I TPP EIA, prepared by Telos, five different village soil samples have been analysed (including Tunda and Wandh).[43] The soil testing has been done by Gujarat Institute of Desert Ecology, Bhuj in February, 2006. The soil type identified at each of the site is 'sandy loam' which is a mixture of sand, clay and silt. The soil at Tunda is said to be about 45 per cent sand, 16 per cent silt, eight percent clay and rest are coarse particles (Wandh analysis is not available). The EIA report further adds that the porosity of soil at Tunda is 80 per cent while that of soil at Wandh is 77 per cent implying highly porous soil. Permeability is directly related to porosity, which implies that higher porosity means higher permeability.[44] Permeability also depends on certain other factors like grain size, etc. The relationship between grain size and permeability says that smaller the grain size, lower the permeability and vice versa.[45] The EIA states that the coarse particles being referred to as soil composition are particles more than 2mm in size. Clearly the porosity and grain size conditions point towards high permeability of soil in the area. The same analysis is given in Phase II EIA report prepared by Envirotech East.[46]

Another soil sample testing in the same five villages has been done by the same institute in April, 2007 for Phase III EIA prepared by Telos. It also concludes that the area has a sandy loam textured soil. Porosity of soil sample at Tunda is reported to be 84 per cent and that at Wandh as 90 per cent, again implying high porosity or permeability.[47] Thus from all the EIA reports of the TPP it can be inferred that the thermal power plant area has highly porous soil pointing towards high permeability.

The company has submitted various documents to the Committee on soil analysis too in March and April 2013 which have been analysed (see Table 8: *Soil analysis done by Company for different projects under SEZ/WFDP*). These reports pertain to different projects under the SEZ or the waterfront development and not specifically to the TPP site. Hence it is diffuclt to conclude on soil permeability using these reports.

Clearly, the project proponent is relying on different set of data for different purposes. In Committee's view, the data in the TPP EIA reports is the one to be believed since it is for TPP that the intake and outfall has been built and also Tunda and Wandh monitoring has been done which are the impact zone villages.

3.5.2.3: Pond for treatment and storage before outfall: The Company has informed the Committee that at present only the cooling water blow down and the FGD effluent is stored in their raw water reservoir. This temporary reservoir is 400m x 350 m x 14m in dimension. The FGD effluent is treated through aeration and diluted using make-up seawater. This along with the diluted cooling tower blow down is pumped back into the system. The Company also states that it does not plan to move to a once through cooling system. Some little effluent is discharged into the intake channel itself. In such a scenario, it is unclear to the Committee why is the Company making the investment in building a new unlined outfall.

Table 8: **Soil analysis by the Company for different projects under SEZ/WFDP**

Date of Study	Document Name	Consultancy	Study Conclusions	Inference
December 2007	20 MLD capacity desalination plant at Adani Power SEZ, Adani Power Ltd, Village Tunda & Siracha, Mundra	K.C.T Consultancy Pvt. Ltd.	The report looks at porosity of different soil samples ranging between 18% to 39%.	The GIDE results for the same year (in April) differ hugely with this analysis.
February 2006	Proposed construction and upgradation of Mundra port road project	K.C.T Consultancy Pvt. Ltd.	The report states that the coefficient of permeability for the different soil samples varies between 0.2-0.5x10^{-6} cm/sec.	These results point towards the soil being not permeable which differ from the GIDE results for monitoring around the TPP in February 2006.
July 2006	Proposed 20 lacs litre capacity RCC water tank & Pump house for place 1B at SEZ Mundra	K.C.T Consultancy Pvt. Ltd.	The report finds that permeability of two soil samples is 0.58 – 0.62x10^{-6} cm/sec. The porosity of the samples is found to vary between 23-45%.	Again the GIDE analysis in 2006 (in February) differs from this analysis.

Source: Information submitted by the company to the Committee, April 2013

3.5.3 Observation and Recommendation of this Committee

The careful review of all environmental clearance conditions show that the Company was sufficiently warned about the need to take all precautions to prevent salinity intrusion in the groundwater. However, it is apparent that the company has failed to fulfill this condition.

The intake channel, the outfall channel and the raw water reservoir/guard pond are operational but without any lining/protection to protect against contamination of groundwater. This is a clear violation of the environmental clearance condition.

The examination by the Committee shows that the soil in the area is permeable and without safeguards it will lead to contamination.

The Committee is unable to establish if contamination has already occurred in the area, because of lack of data.

However, this lack of data is also because the company has not monitored groundwater levels. This is a clear violation and shows non-compliance with the environmental clearance conditions. The EC conditions stipulate that the company must monitor groundwater regularly for salinity and pollution. But it has failed to do so.

The other important conclusion based on the Committee's analysis is that there is clear mismatch between the discharge capacity of the outfall and the total quantum of wastewater that will be generated. The capacity of the outfall is 2,328 MLD, whereas the total wastewater discharge is 7,080 MLD. The question is what will happen to the huge quantity of wastewater, which cannot be discharged through the outfall. This can only be handled through water use systems, based on closed cycle cooling tower, which the Company is currently practicing. This completely rules out the use of one-through cooling system in the thermal power plant.

The Committee would recommend the following:

1. **The intake and outfall channel must be reconstructed/repaired so that it has impervious lining at the bottom and sides.**

2. **The raw water reservoir/guard pond must also be reconstructed/repaired so that it has impervious lining at the bottom and side.**

3. **The Company should install network of piezometers with coordinates in the project area for monitoring of groundwater quality and water levels in all the seasons. These reports should be put in public domain, including its periodical submissions to GPCB and RO, MoEF, Bhopal.**

4. **An independent study should be undertaken every five years to study saline water intrusion and to suggest remedial action.**

5. **The Company should continue with closed cycle cooling system and recycling of FGD wastewater so as to reduce discharge and remain within the capacity of the outfall channel.**

4. Compliance with Environment and Forest Conditions

The Committee has the following ToR to examine in this regard:

(i) Whether construction of Mundra port, roads, railway, was taken up prior to grant of Forest/ Environmental Clearances.
(ii) The development of port with respect to the approved components.
(iii) Compliance to the conditions of the EC and CRZ clearance granted for the port development.
(iv) The development of the power plant with respect to the approved components.
(v) Compliance to the conditions of EC granted for the power plant.

The previous section (3) has already examined development and compliance with the critical environmental components of waterfront project and TPP like mangrove destruction, blockage of creeks, fly ash disposal and salinity because of seawater intake and outfall channels.

This section examines the compliance reports with approved development, and issues in procedures for clearance.

4.1: Development and Compliance for Port, Roads (Waterfront Development)

Waterfront development project received EC on January 12, 2009. It comprises of North port, South port, East port and West port and associated activities.

Regional office MoEF has made two compliance reports available to the Committee on the waterfront development project – one in June 30, 2011 and another in July 31, 2012. The reports merely state that they are complying with conditions like 'no mangrove should be destroyed' and 'there shall be no filling up of the creeks'. The reports also state that they are carrying out regular marine biology monitoring, but the annexure is not available with the Committee to carry out any analysis. It is the same case with the condition on 'shore line changes to be monitored by the company every six months and submit the report to MoEF regional office'. The reports state that the same is being complied with, but the annexure is not available for the Committee to analyse the issue. The reports state that the environmental clearance condition of 'movement of fishermen vessel of the local communities are not interfered with' is being complied with.

MoEF granted in-principle forest clearance for 1,840 ha and 168.4 ha to Adani Chemicals Limited in May 2004. In February 2009, in-principle clearance for the same land was granted to MPSEZL and in September 2009 final clearance was granted.

Naran Gadhavi of Kheti Viask Trust has submitted an undated and unstamped letter to the Committee. This letter (in Gujarati), from Deputy Forest Conservator, Forest Department, East Kutch', is addressed to the Collector of Kutch.[48] The letter states that of the 2,598 ha of land allocated to Adani Chemicals for salt production, 2,159 ha is mangrove forest and mentions that prior permission of the central government is needed for such allocation of land involving mangrove forest. However, since the letter does not bear any official stamp/signatures/date, it is difficult to verify the same.

4.2: Development and Compliance for Thermal Power Plant

4.2.1 Examination of Compliance with Public Hearing Process

The Committee has received representations that the necessary procedure of holding public hearing was not complied with. An examination of the issue shows the following:

Public hearing for Phase I of the TPP was held in October 2006. The application form (FORM 1) submitted to MoEF by the company states that the plant is not in any notified industrial estate/area.

In May 2007, the Ministry of Commerce and Industry notified the area as a power SEZ of Adani Power Limited (APL). Phase II of thermal power plant (TPP) was exempt from a pubic hearing on the grounds that it was part of a notified power SEZ. According to Section 7 of the EIA Notification, 2006, "projects or activities located within industrial estates or parks approved by the concerned authorities, and which are not disallowed in any approvals" do not require to hold a public hearing.

As per the EIA Notification 2006, any SEZ/industrial estate where "at least one industry in the proposed industrial estate falls under the Category A, entire industrial area shall be treated as Category A, irrespective of the area." Thus any SEZ with even one category 'A' industry will have to hold a public hearing and go through the EC process as a category 'A' project. In this case, the TPP being a category 'A' industry, the SEZ needed to go through public hearing and appraisal for EC.

The Power SEZ was notified before the project was placed under EAC for consideration. Therefore EAC's decision to exempt Phase II of TPP from public hearing is valid, provided that the SEZ had all the necessary approvals including EC, which it did not.

For Phase III public hearing was held on March 12, 2010. On March 19, 2010, MoEF noted that public hearing has to be held because "environmental clearance for SEZ wherein the project is to be located has not been accorded and therefore informed the project proponent that either they shall go for public hearing separately for expansion of power plant or EC for the SEZ shall be obtained before their project is processed for approval of EC." Thus in light of EIA notification 2006, the EAC recognized that since the multi-product SEZ did not have EC, it was important for the company to carry out the public hearing or wait till the SEZ is granted a clearance.

This approach should have been taken while granting EC to Phase II of the TPP and the company should have been asked to hold the public hearing, because, the Power SEZ also did not have EC.

As per this examination, the MoEF decision to exempt the phase II expansion of the thermal power plant was not valid. The public hearing was a necessary part of the compliance to procedure, unless the plant was located in an SEZ with environmental clearance.

4.2.2. Air Pollution Control – Compliance

In most of the conditions for clearances it has been made clear that proposed project should curb air pollution (see Table 9: *Conditions Stipulated for Air Pollution Control in Different Clearances*).

4.2.2.2 Examination of the Issue by the Committee: The Committee has analyzed the six-monthly compliance reports of the TPP submitted to the regional office of MoEF at Bhopal. Phase I of TPP of Adani received EC on August 13, 2007. Five compliance reports have been

Table 9: **Conditions Stipulated for Air Pollution Control**

Clearance date	Conditions stipulated for Air Pollution Control
1. January 29, 2007: Consent to Establish Phase I TPP	Flue gas emission from the common stack of 275 m height attached to the boiler 1 & 2 shall confirm to the standards.
	Following air pollution control system shall be installed for control of flue gas emissions, process emissions and fugitive emissions - ESP, Bag house at coal handling sites, water sprinkling over coal yard. All steps shall be taken for control of fugitive emissions/dusting due to handling of coal; fly ash etc. and ambient air quality shall conform to standards.
	Stack monitoring facilities like porthole, platform/ladder etc., shall be provided with stacks/vents chimney in order to facilitate sampling of gases.
2. August 13, 2007: Phase 1 TPP EC	A bi-flue stack of 220 m height with exit velocity of 22m/s shall be provided with continuous online monitoring system.
	High efficiency ESPs having efficiency of 99.9% shall be installed so as to ensure that particulate emissions do not exceed 100 mg/Nm^3.
3. June 6, 2008: Consent for Phase II TPP	Four boilers shall be provided with 275 m high common twin-flue concrete chimney
	The standards of SO2 and NOX emission for coal/lignite based thermal power plants are under development and therefore norms once finalized/declared/notified in that respect or otherwise will automatically be applicable to this project.
	Following air pollution control system shall be installed for control of flue gas emissions, process emissions and fugitive emissions/dusting due to handling of coal, fly ash etc. and ambient air quality shall conform to the following standards - ESP, low NOx burners, bag house at coal handling sites/crusher house, water sprinkling over coal yards and fly ash storage areas, pucca roads within industrial premises, wind breaking walls within the premises, covered conveyors, covered transportation, etc.
4. October 21, 2008: Phase II TPP EC	Two bi flue stacks of 275 m height each for the four boilers shall be provided with continuous online monitoring equipments for SOx and NOx and Particulate.
	High efficiency ESPs shall be installed.
5. May 20, 2010: Phase III TPP EC	High efficiency ESPs shall be installed.
	Adequate dust suppression system such as cyclones/bag filters and water spray system in dusty areas such as in coal handling and ash handling points and other vulnerable dusty areas.
6. June 25, 2010: Consent to Establish Phase III TPP	The flue gas emission through stack attached to kiln/boiler/furnace/heater shall conform to the following standards.
	The crusher house for coal shall be provided with dust control as APC equipment. Bag filters shall be provided for bunkers.
	There shall be no process gas emission from your industrial plant.
	To control and manage the air pollution problem, dust extraction system shall be provided with stacks/vents chimney in order to facilitate sampling of gases.
	Stack monitoring facilities like porthole, platform/ladder etc., shall be provided with stacks/ vents chimney in order to facilitate sampling of gases.

Source: Analysis by Centre for Science and Environment, New Delhi based on clearances granted by MoEF and consents by State

made available to the Committee for Phase I (see Table 10: *Compliance Reports of Adani Thermal Power Plant*). For Phase II, four compliance reports have been made available while only two compliance reports are available for Phase III with the Committee.

Table 10: **Compliance Reports of Adani Thermal Power Plant**

TPP	Compliance Report Submission Date	Monitoring Period
Phase I	October 7, 2008	Not available
	December 30, 2010	April 2010 to September 2010
	June 29, 2011	October 2010 to March 2011
	December 19, 2011	April 2011 to September 2011
	June 19, 2012	October 2011 to March 2012
Phase II	June 30, 2010	October 2009 to March 2010
	June 29, 2011	October 2010 to March 2011
	December 19, 2011	April 2011 to September 2011
	June 19, 2012	October 2011 to March 2012
Phase III	December 30, 2010	April 2010 to September 2010
	December 19, 2011	April 2011 to September 2011

Source: Compliance reports provided by Regional Office MoEF, Bhopal to the Committee, March-April 2013

All compliance reports of Phase I state that the company has air pollution control devices in places like Electrostatic Precipitator (ESP), flue stacks of 275 m, online flue gas analyzers for determining Suspended Particulate Matter (SPM), sulphur oxides (SO_x) and nitrogen oxides (NO_x). The company has provided photographs of the flue stack and ESPs installed.[49] The reports mention annexures that record the air quality parameters through the online system but these are not available with the Committee. For fugitive emissions, the reports state that regular water sprinkling is being carried out at all strategic locations within the plant. The same is the case with Phases II and III.

The reports do not say anything on other important conditions like covering of conveyors, use of low-NO_x burners and covered transportation.

On April 18, 2011, GPCB issued a notice to the TPP for fugitive emissions. GPCB officials observed fugitive emission due to movement of fly ash loaded dumpers and other heavy vehicles.[50]

Even though the company submits that it has adequate pollution control equipments in place, their operation is an aspect that cannot be verified/commented upon by the Committee. It will prove to be a good practice to maintain separate electricity meters for the ESPs and the electricity consumption should be monitored regularly to ensure that this equipment is being operated. There needs to be a verification system put it place to ensure that air quality monitoring is done regularly by the Company and appropriate measures are taken to avoid stack and fugitive emissions. Displaying the monitoring data on the company's website will enhance transparency.

4.2.4 Observation and Recommendation of this Committee

It is clear that the company has been less than serious about reporting on compliance with the conditions set at the time of clearance. In many cases non-compliance with reporting conditions have been observed.

The reports, which are a critical way to ensure that attention is being given to the remediation measures, are at best perfunctory and non-committal. Strict and regular adherence with these conditions, and regular and transparent monitoring would have obviated the need for site visit by this Committee and many others who have visited the project site. It would have also increased public confidence on the issue of compliance, i.e., whether conditions are being met or not.

For instance, it is an EC condition to monitor the effluent discharge temperature to ensure that it does not exceed 7°C. It is stated that the inlet and outlet temperature should be measured daily and the difference should be within the stipulated limits. Temperature records enclosed as an annexure with the compliance report are not available. Fishermen in the area allege that the hot water released into the sea is affecting their small fish catch. Clearly, open and transparent monitoring would help to allay such concerns.

The system of monitoring and its scrutiny must be greatly strengthened. The Committee would recommend that the system must be designed so that all monitoring data is publicly available.

Continuous ambient air quality monitoring stations in the nearby villages should be set up as per the maximum GLC and proper modeling of emissions. The periodical reports should be put in public domain.

5. HTL Line Demarcation

5.1. Possible HTL Violations in Construction of Samundra Township and Sterling Hospital

December 6-7, 2010, based on a representation made by Bharat Patel, Machimar Adhikar Sangharsh Sangathan (MASS), MoEF team, led by its official, A Senthil Vel visited the area. The team in its report noted that Samundra township did not have the required CRZ clearance while Sterling hospital has been constructed within 20 meters of the creek violating the CRZ notification.

December 15, 2010, MoEF issued a show cause notice[51] under Section 5 of the Environment Protection Act 1986 to MPSEZL. It also asked GCZMA to submit a report on Sterling hospital and Samundra township within four weeks, and to have a revised CRZ map prepared for the site with permissible activities super imposed.

January 6-7, 2011, GCZMA team visited the site and recorded in their report[52] that Samundra township is located at about 100-110 m from existing bank of Bhukhi river and Sterling hospital is located at a distance of 100 m. The coordinates of locations taken by the GCZMA team during the site visit are not available in the report. The report also records that the CRZ map demarcating HTL/LTL was under preparation by CESS, and once received lat-long taken by the team will be superimposed on the map.

January 14, 2011, MPSEZL in a letter to MoEF clarified that Samundra is located keeping the required 100 meters distance from the banks of the river. The company added that the township is not located on level raised land but on erstwhile salt works which was not functional.[53]

February 23, 2011, Subsequent to hearing the company on February 15, MoEF wrote to GCZMA asking the CRZ map demarcating HTL and LTL from an authorized agency based on which approval was sought for various components including port, township, hospital, aerodrome, etc. It was also asked to submit a revised CRZ map for the site to show permissible structures and those that would need to be dismantled/removed. MoEF asked the company to not carry out any further construction/development at the site.[54]

March 28, 2011, MPSEZ in a letter to MoEF informed that CESS map is under preparation and will take at least two months to be finalized.[55]

April 29, 2011, The 12th meeting of GCZMA discussed the show cause notice, which directed the Authority to submit a report within four weeks with regards the CRZ violation in construction of Samundra and Sterling.[56] The minutes state that the maps were under preparation by CESS, an agency retained by MPSEZL. For the verification of the exact distances of Sterling hospital and Samundra township "it was necessary as per CRZ notification to identify the same through CRZ maps, prepared by any of the agencies, authorized by MoEF."[57]

July 27, 2011, GCZMA submits documents to MoEF on the show cause notice for violation of the provisions of CRZ 1991 by M/s Mundra.[58] The documents include, "a set of the CRZ maps demarcating HTL and LTL from an authorized agency namely CESS, on which approvals were sought for various components of the project and approved by MoEF. The letter also submits, "a CRZ map indicating the location of the Sterling Hospital and Samundra township with respect to river Bhukhi done by CESS."[59]

5.1.1: Examination of Issue by this Committee

There are two reports, which demarcate the CRZ area in the vicinity of Samundra township and Sterling hospital.

NIO 2005: NIO during a field visit in 2005 (report dated 2007)[60] carried out the HTL/LTL demarcation and CRZ map preparation for two sites – **SITE I**: bounded by Mundra port on the west and Mundra Bandar on the east, Indian Oil Corporation (IOC) oil tanking facility along Mundra new port (south of proposed North port site, Lat 22° 46' 30", Long 69° 42' 35.11") and **SITE II**: bounded by branches of Kotdi creek on the east and west, villages Tunda and Siracha on the north and water front of Gulf of Kutch on the south (Lat 22° 48'6.8", Long 69° 31' 56.64") (see Figure 13: *HTL demarcation sites of NIO 2005 field survey*). The CRZ maps are prepared in 1:5000 and 1:25000 scales. The report states that as per the CRZ notification, using draft MoEF guidelines, HTL was demarcated by physical survey done in August 2005.

Figure 13: **HTL demarcation sites of NIO 2005 field survey**

HTL demarcation done by NIO only for these two sites for the Company in 2005

Source: Analysis by Centre for Science and Environment, New Delhi based on NIO 2007 report submitted to the Committee

A tidal barrier earthen bund, apparently used for salt works, is said to support the present day HTL and was considered for demarcation. No analysis about who built the bund, whether permissible or not and its impact on original HTL has been done in the report. In its response to the Committee, NIO justifies that the earthen bunds were already existing at the times and sites of the survey. "We do not know who had built the bund. These were considered as HTL. Due to the lack of data prior to the construction of the bunds, an exact analysis of their impact could not be carried out."[61] In the view of the Committee, clearly, these issues require greater clarity as agencies demarcating HTL/LTL do not have common guidelines to ensure that human interventions made subsequent to February 1991, are understood, recorded and taken into account in policy.

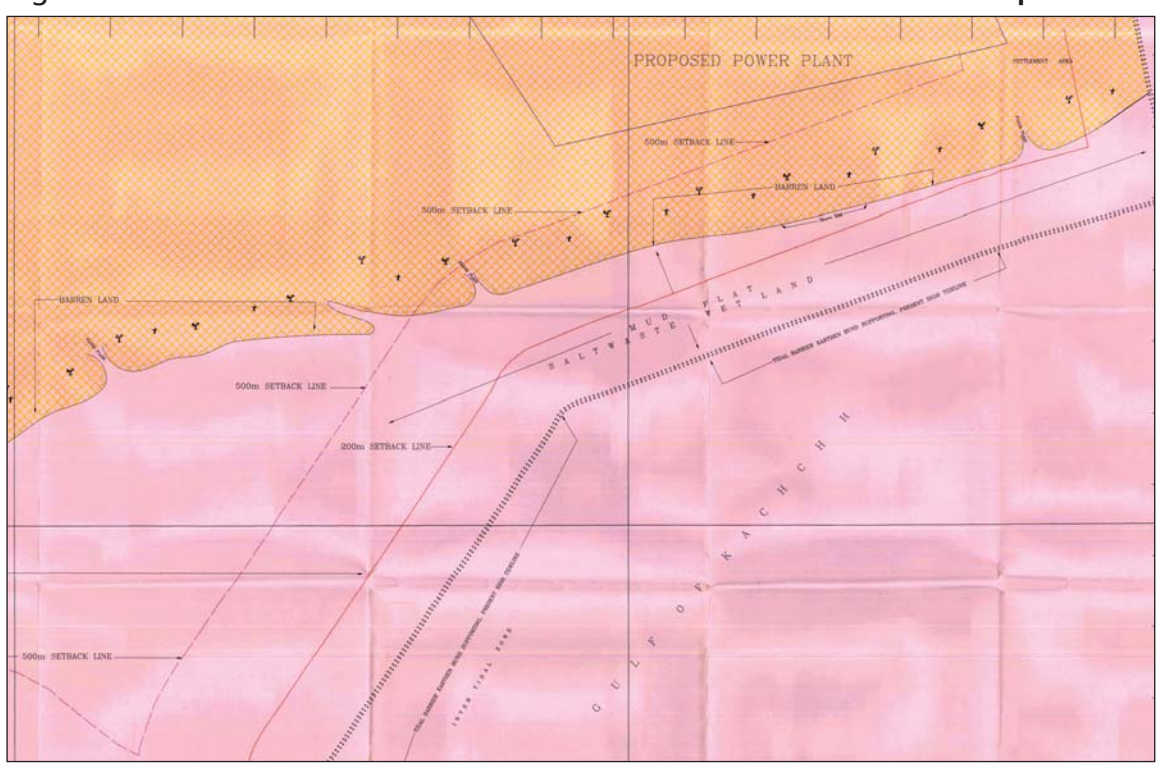
The report states that prior to port development, the site was covered with extensive saltpans, salt marsh, mangrove swamps and tidal flat system.[62] At Site I, "the development is said to be abutting the vast mangrove swamp and some of the salt waste wetland is said to be elevated by dredge fill activities." It is stated that major portion of the HTL is abutting the earthen bund separating the salt wasteland from the tidal flat. The report acknowledges that modification of northern part of site I has changed the topography of the area and influenced the dynamics of water movement.

The 2007 NIO report states that Site II is surrounded by wetland, salt waste and settlements. Tunda waterfront is a virgin area falling within the rural area at Site II. The development site is located along the sand dunes and forestland.[63] At this site, the waterfront side of the mudflat is "enclosed by earthen bund on east and west sides and by reserve forest and vegetated sand dunes on the south". The earthen bund constructed as a barrier between the salt wasteland and water body was "accepted as the present day high water line"[64] and thus accepted as present day HTL. Again there is no discussion on who has built the bund and how it can be taken to mark the HTL.

The report states that at both the sites, "drainage from tidal creeks was passing through the proposed area."[65]

Interestingly, the map at 1:5000 shows a setback line marked with respect to the earthen bund. This setback line turns towards the proposed TPP site and abruptly ends into its boundary (see Figure 14: *Adani Thermal Power Plant shown to be outside CRZ in NIO Report*). In the report, the TPP is not mentioned. In its response to the Committee,[66] NIO says they have not stated in the report that the TPP is outside the CRZ area. "The person who led the project has retired from service, so the exact reason of why the setback line ends abruptly at the thermal plant

Figure 14: **Adani Thermal Power Plant shown to be outside CRZ in NIO Report**



The setback line turns towards the power plant site and abruptly ends in its boundary as per NIO 2005 survey

Source: NIO, January 2007, Demarcation of HTL, LTL and Delineation of CRZ Boundary at Mundra and Tunda, Gulf of Kuchchh, Gujarat

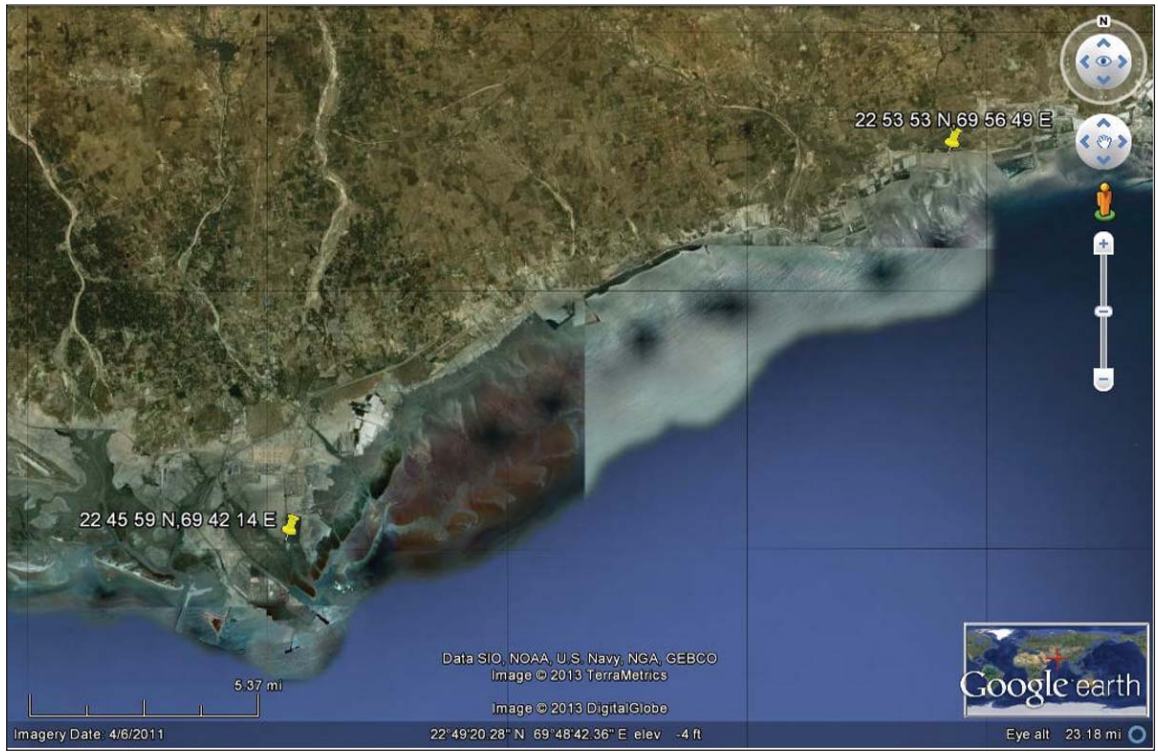
boundary could not be ascertained. However, we think it may be because the exact location of the power plant was not known at the time of the survey." Once again, this shows the poor application of scientific procedures for assessment of HTL and how the lines marked cannot be verified.

CESS 2008 and 2011: The Thiruvananthapuram based Centre for Earth Science Studies did two separate reports for the Adani project at Mundra. Report 1, done between April-September 2008 was for area extending from Mundra Bandar (old port) to Chokhand Mahadev.[67] Report 2, for which the field visit was done during February-April 2011, was for the area extending from Mundra Bandar to Kotdi creek.[68] CESS also studied the CRZ of Bhukhi river and its banks in this report, at the request of M/s Adani Port.

Report 1: The site for Report 1 stretches from near south of proposed North port site approximately till the end of the SEZ boundary (see Figure 15: *HTL demarcation sites as per CESS 2008 Report*). The report states that coastal zone of Mundra consists of tidal flats, saltpans and mangroves in general. In operational saltpans, the reach of tidewater is up to the landward boundary of the saltpans.[69] This would imply that once the bund is removed, which should have been the case once salt work stopped operation; the HTL would have shifted. It would have moved further into land without the barrier.

The report further states that most of the saltpans east of Mundra Bandar are unused/abandoned "as per the information made available by APSEZL." Many of the saltpans in the area, which are now abandoned, have large bunds to limit the incursion of seawater. These bunds have recently been strengthened "so that the landward flow of tide water is limited at the bunds"[70], states the report. Essentially these bunds have been used to demarcate the HTL by stating that "the HTL is along these bunds".

Figure 15: **HTL demarcation sites as per CESS 2008 Report**



The 2008 CESS HTL demarcation was from south of the proposed North port site till near Bhadreshwar

Source: Analysis by Centre for Science and Environment, New Delhi based on CESS, 2008, Demarcation of HTL and LTL for the Proposed Port & Ancillary Infrastructure Development at Mundra in Gulf of Kachchh, Gujarat - Report 1

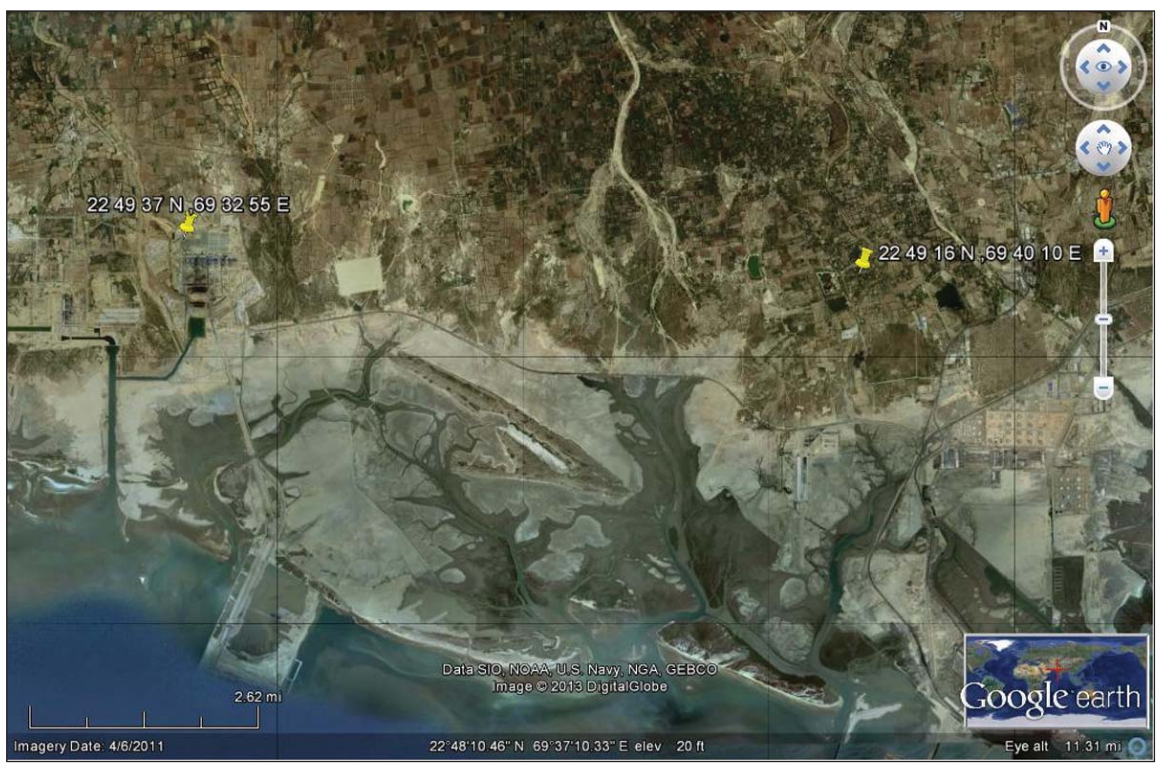
In its response to the Committee, CESS's justification is that "the earthen bund was accepted as the HTL since it was large enough to accommodate the tidal range there and it prevented tidal incursion further landward."[71] The line of the earthen bund is taken as the HTL since the bund is a distinct morphological signature for tidal limit. CESS acknowledges that no analysis was made to find out when the bund was constructed. CESS states that with the construction of bunds the original HTL is shifted towards the line of bunds and has moved towards the shore and in the absence of the bund, the HTL would have been along the landward boundary of the tidal flat/intertidal zone for which morphological signatures exist.

The question of the human-made bund modifying the HTL needs to be resolved as it has major implications for policy on CRZ demarcation in the country. It can be argued that the HTL should have been demarcated along the landward boundary of the salt work, as a new and different project was now being proposed.

Report 2: The sites for Report 2 prepared by CESS for the Company is for the area near West port to Baradi Mata creek (see Figure 16: *HTL demarcation sites as per CESS Report 2011*). It also included the development sites on the banks of Bhukhi river. For this report, field investigations were done during February-April 2011. Cadastral maps of 1:8000 pertaining to the project site were used as base maps.[72] The coordinates given for Bhukhi in this report are a matter of dispute (see Box 4: *Where is Bhukhi?*).

In the case of Bhukhi, the report states, "mangroves (CRZ 1A) are abundant in the intertidal zone of the river." CESS has marked a 50 m buffer zone around the mangrove area; and a 100 m CRZ landward of HTL along the banks of Bhukhi. On this the "*layout of buildings as provided by Adani Ports & SEZ Limited has been superimposed on the CRZ map.*"[73]

Figure 16: **HTL demarcation sites as per CESS Report 2011**



One of the HTL demarcation sites was the waterfront development project from West port to Baradi Mata creek

Source: Analysis by Centre for Science and Environment, New Delhi based on CESS, 2011, Demarcation of HTL and LTL for the Proposed Port & Ancillary Infrastructure Development at Mundra in Gulf of Kachchh, Gujarat – Phase 2

Box 4: **Where is Bhukhi?**

CESS Report 2 pertains to study area[1]: Lat 22º 49' 16", Long 69º 40' 10" and Lat 22º 49' 37", Long 69º 32' 55". Also the development sites on the banks of Bhukhi river are mentioned to be located at Lat 22º 49' 27", Long 69º 43' 29" and Lat 22º 47' 19", Long 69º 40' 10" and Lat 22º 47' 14", Long 69º 42' 16" and Lat 22º 44' 36", Long 69º 40' 00" (see Figure: *Confusion over River Bhukhi's location*).

Interestingly, when the coordinates given as the location of "development sites on the banks of River Bhukhi"[2] are mapped, it is found that these are not in the vicinity of the river – in fact, in some cases, not even close to the river.

The Committee wrote to CESS on March 22, 2013, asking for clarification on the basis developments considered in the report were considered to be on the bank of the river Bhukhi[3]. It also asked for coordinates. In its response, dated March 26, 2013, CESS says that the developments were considered on the bank of Bhukhi, "as per the boundaries given by the company the site for which they requested CESS to prepare the CRZ map lies on either side of Bhukhi River[4]." In this reply, CESS provided the following coordinates[5], "the site extends from SW of Bhukhi (22^0 47' 14" N; 69^0 42' 16"E: about 2 km SW of Bhukhi) to NE of Bhukhi (22^0 49' 27" N; 69^0 43' 29"E: about 2.8 km NE of Bhuki). Coordinates of one location (almost middle) in Bhukhi is 22^0 47' 58" N; 69^0 43' 08"E."

The coordinate for the Bhukhi (middle of river) given now by CESS is not in the report of 2011, titled, '*Delineation of HTL and LTL for the proposed port and ancillary infrastructure development at Mundra in Gulf of Kutch, Gujarat, Phase 2*'.

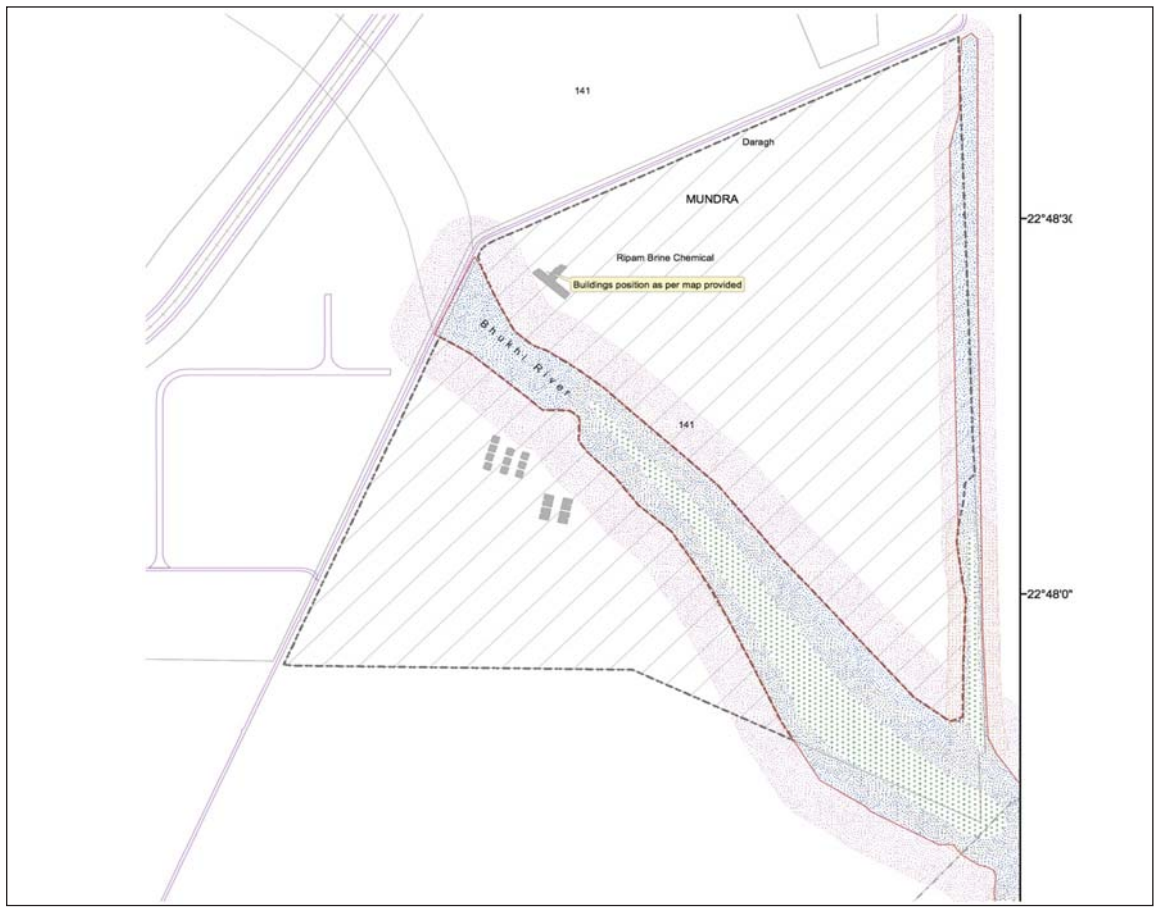
The Committee is finding it difficult to reconcile these variances and to understand how CESS could have missed out on the key coordinate in its report. It is also not clear why concerned authorities never detected these inaccuracies. It would be prudent for CESS to improve its procedures in the light of this finding and for MoEF to review the working of the authorized agencies.

Figure: **Confusion over River Bhukhi's location**

Source: Analysis by Centre for Science and Environment, New Delhi based on CESS, 2011, Demarcation of HTL and LTL for the Proposed Port & Ancillary Infrastructure Development at Mundra in Gulf of Kachchh, Gujarat – Phase 2

In its response, dated March 26 2013, CESS has replied, "normally it is not the mandate of CESS to superimpose the layout and this was done only as requested by project proponents. CESS did not verify whether the company has constructed as per the layout given since it is not our mandate. There was no reason for CESS to disbelieve the layout of buildings provided by M/s Adani."[74] (see Figure 17: *Location of Sterling and Samundra as per CESS Report 2011*).

Figure 17: **Location of Sterling and Samundra as per CESS Report 2011**



CESS used the layout of Samundra and Sterling provided by the Company and marked its location outside CRZ

Source: CESS, 2011, Demarcation of HTL and LTL for the Proposed Port & Ancillary Infrastructure Development at Mundra in Gulf of Kachchh, Gujarat – Phase 2

5.1.2: Observation and Recommendation of this Committee

The Committee is finding it difficult to reconcile the available reports to ascertain if the Sterling hospital and Samundra township have been constructed in violation of the CRZ. The coordinates taken by GCZMA inspection committee are not available on record for it to verify the location taken on this visit. The CESS report uses layout as provided by the company, which shows the structure to be outside CRZ. But using layout provided by the company cannot be used to establish the veracity of the exact location of the structures particularly in this instance of show cause notice.

Given this situation, the Committee would recommend that MoEF should urgently take up this matter with GCZMA and ask for review and reassessment of the matter. This assessment should be based on fresh collection of coordinates, through a joint team. GCZMA should be directed to take necessary actions based on this visit. The map should be available in the public domain so that it can be verified and the matter closed satisfactorily.

5.2 Possible HTL/LTL Distortion in Project Area/HTL of approved CZMP

HTL/LTL demarcation for different parts of the project has been done over a period of time. Company's justification is that the project was conceived in various stages and hence demarcation has also been done accordingly. Essentially what is present is a grid of different HTLs marked in different project areas on different scales and by different organizations (see Table 11: *Variations in Demarcation of HTL/LTL*).

Table 11: **Variations in Demarcation of HTL/LTL**

Organisation	Year for field survey/visit	Scale	Area	Coordinates
NIO	1999	1:12500	Navinal	No coordinates available
NIO	2005	1:25000 & 1:5000	South of north port	Lat 22o 46' 30", Long 69o 42' 35.11"
			Near TPP	Lat 22o 48'6.8", Long 69o 31' 56.64"
CESS	2008	1:8000 and 1:5000	IOCL to Bhadreshwar	Lat 22o 45' 59", Long 69o 42' 14" till Lat 22o 53' 53", Long 69o 56' 49"
CESS	2011	1:8000 and 1:5000	Bhukhi River	Lat 22o 49' 27", Long 69o 43' 29" and Lat 22o 47' 19", Long 69o 40' 10" and Lat 22o 47' 14", Long 69o 42' 16" and Lat 22o 44' 36", Long 69o 40' 00"
			Mundra Bandar to Kotdi creek	Lat 22o 49' 16", Long 69o 40' 10" and Lat 22o 49' 37", Long 69o 32' 55"

Source: Compiled by Centre for Science and Environment, New Delhi from different HTL demarcation reports submitted to the Committee by NIO and CESS, March 2013

5.2.1: Examination of the Issue by this Committee

There are key issues that needs to be understood, before arriving at a conclusion about the HTL/LTL line demarcation and its possible distortion or violation.

1. Why have different scales being used to demarcate the HTL/LTL?
2. What is the implication of different scales on drawing a uniform HTL/LTL in the entire project area?
3. What is the implication of the current methodology of using cadastral level mapping on the HTL/LTL demarcated in 1991?

A. Implication of different scales: In 1998, MoEF issued guidelines on the methodology for demarcation of HTL/LTL. The guidelines specify that base maps of 1:25000 will be acquired from the Survey of India. The topography on the map will be updated using latest satellite imageries/aerial photographs. The High Water Level and Low Water Level marked on the Survey of India maps will be transferred to the Coastal Zone Management (CZM) maps.

In addition, local CZM maps will be prepared to facilitate the implementation of CZM plans. In this case, 1:4000 will be used for the base map. These maps are revenue maps with cadastral level data. The HTL/LTL will be demarcated based on detailed physical verification using coastal geomorphological signatures and features. It also says that the classification (CRZ I/II/III) will be transferred to local level CZM maps from the base map (at 1:25000 scale).

However, in this case, 1:4000 maps have not been used or prepared. Even though the first exercise of HTL demarcation by NIO was carried out in 1999 for Adani, the resulting map was of 1:12500 scale, all subsequent maps prepared by MoEF authorized agencies and accepted by the

government have not been at 1:4000, not conforming to the guidelines issued by MoEF. When asked specifically about these issues, the agencies responded to the Committee as follows:

NIO: "the CRZ map and report of Mundra and Tunda were submitted in the year 2007 and the scale of the map was 1:5000 and 1:25000. A map in the scale of 1:5000 was prepared in order to have even multiplicity (easy to multiply) to obtain 1:25000 scale. CSIR-NIO has not submitted the map in scale of 1:3960 as it was considered by the leader of the Project as an odd scale at that time."[75]

CESS: "MoEF has directed to make local level CRZ maps in cadastral maps in 1:3960 scale. This has 2 components: the map to have cadastral information (i.e. survey plots) and the scale of the base map to be 1:3960 which is the true scale of cadastral maps which are surveyed and prepared during British times. (Present day resurvey maps are of different scale: mostly in 1:5000 scale). The Adani group wanted the CRZ maps in 1:8000. Hence the maps were converted from 1:4000 to 1:8000 and given to Adani group. The field information was collected in 1:4000 or larger scales and the CRZ maps were also prepared in 1:4000 scale. Maps prepared in larger scales (1:4000) would not lose the accuracy when converted to smaller scales (1:8000). The CRZ maps provided have the required cadastral information."[76] However, CESS has made available to the Committee maps at 1:5000.

B. Implications on uniform HTL/LTL accuracy: The implication of using different scales at different time and different methodologies is that it is difficult to ascertain if the HTL/LTL has been drawn uniformly and if there has been any distortion in this process.

This was also found when the Committee examined the issue of the map, which has HTL/LTL indicated for the entire project area, done by different agencies at different times. As the map has been authenticated by NIO scientists, the Committee wrote asking for clarification on the methodology used by NIO to reproduce and combine the different scales on which HTL/LTL was marked. The NIO director, in his reply has explained that the different maps were merged into a single map using AUTOCAD by APSEZL and not by NIO. The company had brought the original maps to the regional office of NIO in Mumbai for authentication. This was done by the NIO scientist-in-charge of the regional office by selecting random points from the authenticated maps and verifying these on the AUTOCAD map.[77]

The question before the Committee is how accurate this 'combined' map is, considering the fact that the entire CRZ zoning and proposed developments under the project depend on this map. The process of combining maps prepared at different scales will not be scientifically accurate. This once again speaks of the complexity in this matter, and clearly shows the urgency to review and revamp systems of CRZ regulation and demarcation.

C. Implications on 1991 line/original HTL: How does the HTL/LTL correspond with HTL/LTL of 1991? Can it even be compared? These are the questions, which confronted the Committee.

Coastal Regulation Zone Notification 1991 imposes restrictions from the date of the notification on activities that are permitted based on the HTL/LTL. This implies that HTL/LTL had been demarcated across the country. In 1998, MoEF issued a notification saying that the HTL would be demarcated uniformly in all parts of the country by the demarcating authority or authorities authorized by the Central government as per the guidelines.[78] The guidelines specify that HTL/LTL will be done at 1:25000 and local CZM maps at 1:4000.

According to information given to the Committee, MoEF did commission the Space Application Centre (SAC) based in Ahmedabad in the mid-1990s and then again in mid-2000 to undertake the exercise of preparing a uniform HTL/LTL for the country. But these maps, prepared at 1:25000 are only used for broad policy guidance.

Under the 1991 CRZ notification, there is a provision for states to prepare coastal zone management plans, which will detail out the areas, governed by different categories of CRZ – I, II, III, which in turn require HTL/LTL demarcation. However, these plans were not prepared. In April 1996, the Supreme Court ordered all states to complete plans within two months, that is by June 20, and the Central government was directed to finalise and approve the plans within five months of the order with or without modification.

The confusion arises because of the question of 'approval' of the plan and the map. In September 1996, MoEF wrote to all states, including Gujarat, giving conditional approval to the coastal zone management plan (CZMP). Its letter says that the states, which have prepared maps on 1:25000 through satellite imagery for the purpose of delineating the HTL should submit these maps to the chief hydrographer for the purpose of demarcation.

However, it is unclear, how this map, prepared by SAC in 2000 is being used for policy and particularly for project level demarcation. The Gujarat government in its correspondence with MoEF has said it is unable to make the map available publicly, because of the objections from the Ministry of Defence.

In the meantime, it became an accepted practice that project proponents, which required CRZ clearance, would go to any of the authorized agencies and pay to get the 1:4000 map prepared. This would be submitted at the time of clearance. The 2011 CRZ revision has recognized this practice and made it part of the clearance procedures. In the notification, for the first time, it is said that project proponents will submit a CRZ map, indicating HTL/LTL demarcated by an authorized agency in 1:4000.

However, the question still remains, how this map prepared at 1:4000 is verified against the 1991 map (which exists in 1:25000).

It is well accepted that this 'comparison' at such vastly different scales will be scientifically incorrect. Therefore, in reality, the 1991 HTL/LTL is not used for project clearances.

The question now is, if this line of 1991, which is in fact, the 'legal' line demarcating the zone regulated for coastal protection, can be fixed or is it dynamic. If it is dynamic, what will be allowed and what not? The 1991 CRZ notification as well as its latest amendment in 2011 is silent on this issue.

In this case for instance, embankments because of saltpans in the area – incidentally allowed under CRZ – have changed the HTL/LTL. The port which is built subsequently, or the large reclamation allowed for this project, will also change the HTL/LTL. Similarly, reclamation legally allowed under the clearance given to the company will also shift the HTL/LTL.

But the problem is that while it is well accepted that the HTL/LTL will change with modifications in the shorefront, the 1991 and 2011 CRZ Notifications are silent on the issue. So, practice accepts it, but policy does not.

The notifications depend on the preparation of CZMP by the state government, which is to be the basis of this demarcation and categorization into CRZ I/II/III. But both notifications say that this CZMP will be done on the basis of a map prepared for the state at 1:25000. The approved CZMP, therefore, cannot be used to crosscheck or verify the HTL/LTL, which is drawn on the basis of cadastral maps of 1:4000, using field survey and geomorphological features to identify the HTL/LTL.

This confusion about the original HTL/LTL adds to the mistrust between project proponents and village communities and environmentalists. These issues need urgent resolution.

5.2.2 Observation and Recommendation of this Committee

The Terms of Reference of this Committee include two specific issues regarding HTL that need to be examined:

a. The allegations regarding bunding/diversion/blocking of creeks and reclamation etc. and thereby distortion of original HTL.

b. The HTL submitted by the proponent and HTL of approved CZMP.

The detailed examination of these issues as done above shows the following:

First, the original HTL/LTL is at 1:25000, while as per the CRZ notification, the project level HTL/LTL is done at 1:4000. In this case, it has been done at various times, using different scales of 1:12500 to 1:5000. The original HTL cannot be matched to check against distortions, as there will be a large difference in the process of changing the scale from 1:25000 to 1:5000. It is at best a rough indication of the change.

The National Centre for Sustainable Coastal Management has carefully re-created the HTL demarcation done by different agencies for this project area over a period of time. The map clearly shows that the SAC map done at 1:25000 cannot be transferred between maps without distortion.

Secondly, the CZMP is also at the same scale of 1:25000 and it cannot be matched against the HTL submitted by the project proponent, which is at 1:5000.

Therefore, it cannot be verified if there has been a distortion of the original HTL.

The Committee has no doubt that the original HTL has got modified over the years. This modification is partly natural, partly human made because of the embankments created for saltpans, and it is also the result of direct project activities like setting up of the port or the extensive reclamation.

The map comparing HTL over the years shows clearly how this line has shifted. It also shows that the HTL done by different agencies for the project area cannot be compared or merged (see Box 5: *HTL demarcation for Adani by different agencies*). What is clear is that the policy for demarcation of CRZ needs urgent reform.

The Committee would recommend the following:

1. **There should be an urgent review of the functioning and scientific protocols used by the agencies authorised by MoEF to undertake CRZ demarcation**. There should be common guidelines for their operations so that there is uniformity and reproducibility of the work that is done. This is critical for ensuring verification and review. All codes of operation, including rates to be charges should be reviewed and made uniform for all agencies.

2. **New agencies should be authorised and added to undertake this work**, including state remote sensing agencies. All agencies should be required to follow uniform code of conduct and scientific practice.

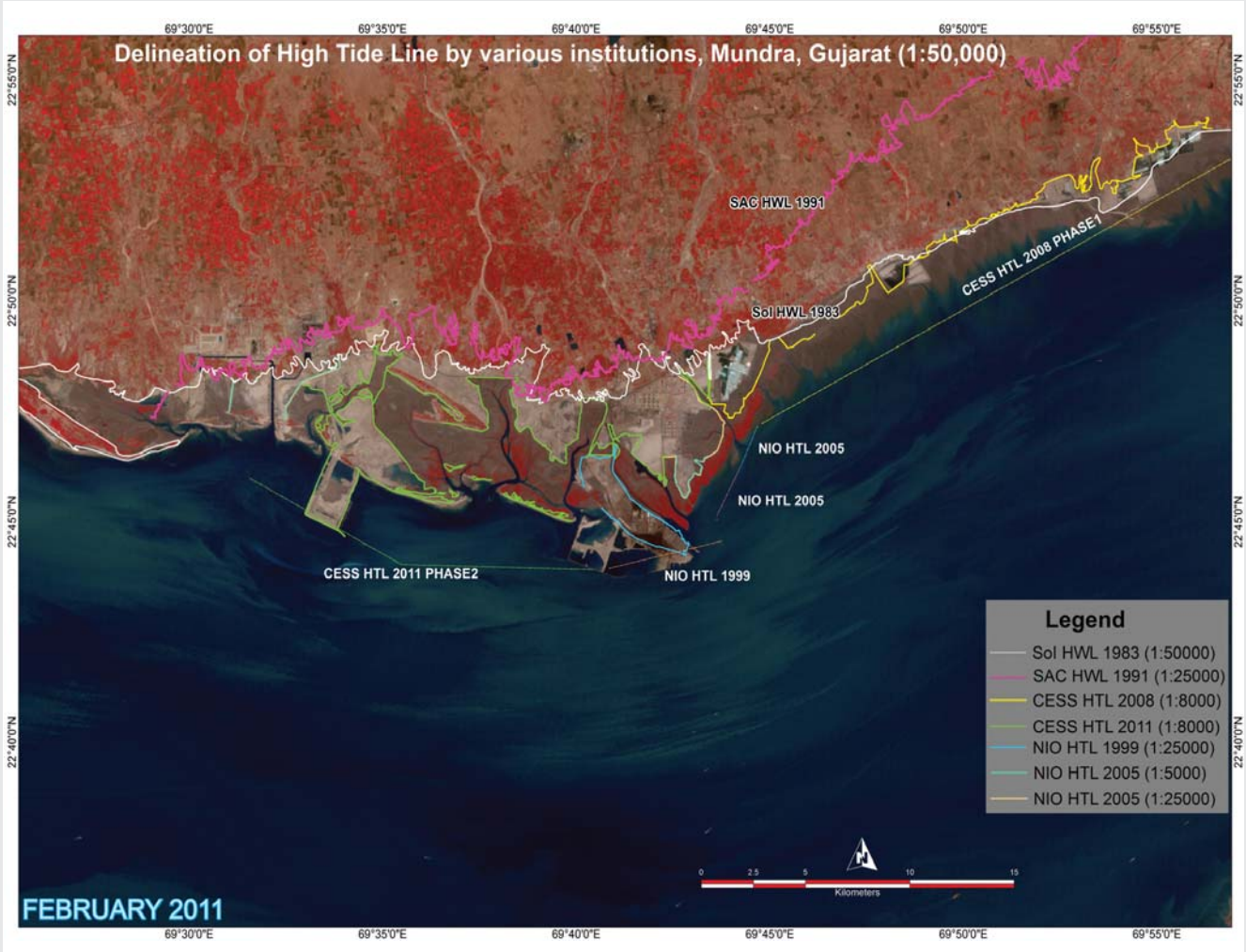
3. **All reports and maps prepared by the authorised agencies should be put in the public domain**. We would recommend that all digitized maps at 1:4000 scale prepared by the agency for a project proponent should be sent to the National Centre for Sustainable Coastal Management. The Centre should collate all specific project maps on a national map based on the lat-long, and publish this on a national CRZ map in the public domain.

Box 5: **HTL demarcation for Adani by different agencies**

The National Centre for Sustainable Coastal Management (NCSCM) superimposed all the HTLs demarcated by different authorised agencies for the project area over different times and scales (see Figure 1: *HTLs demarcated by Different Authorised Agencies for MPSEZL*). On this the Survey of India High Water Line of 1983 and the SAC High Water Line of 1991, as prepared under an MoEF project, was superimposed.

As can be clearly seen, it is not possible to get one HTL for the entire project area using the work done by authorised agencies for the project proponent due to variations in scales, sites and methodologies. It is also not possible to compare these to the SAC 1991 High Water Line (which is the approved/original HTL) since the error as evident is huge again owing to difference in scales at which the SAC line and the project level lines have been marked.

Figure 1: **HTLs Demarcated by Different Authorised Agencies for MPSEZL**



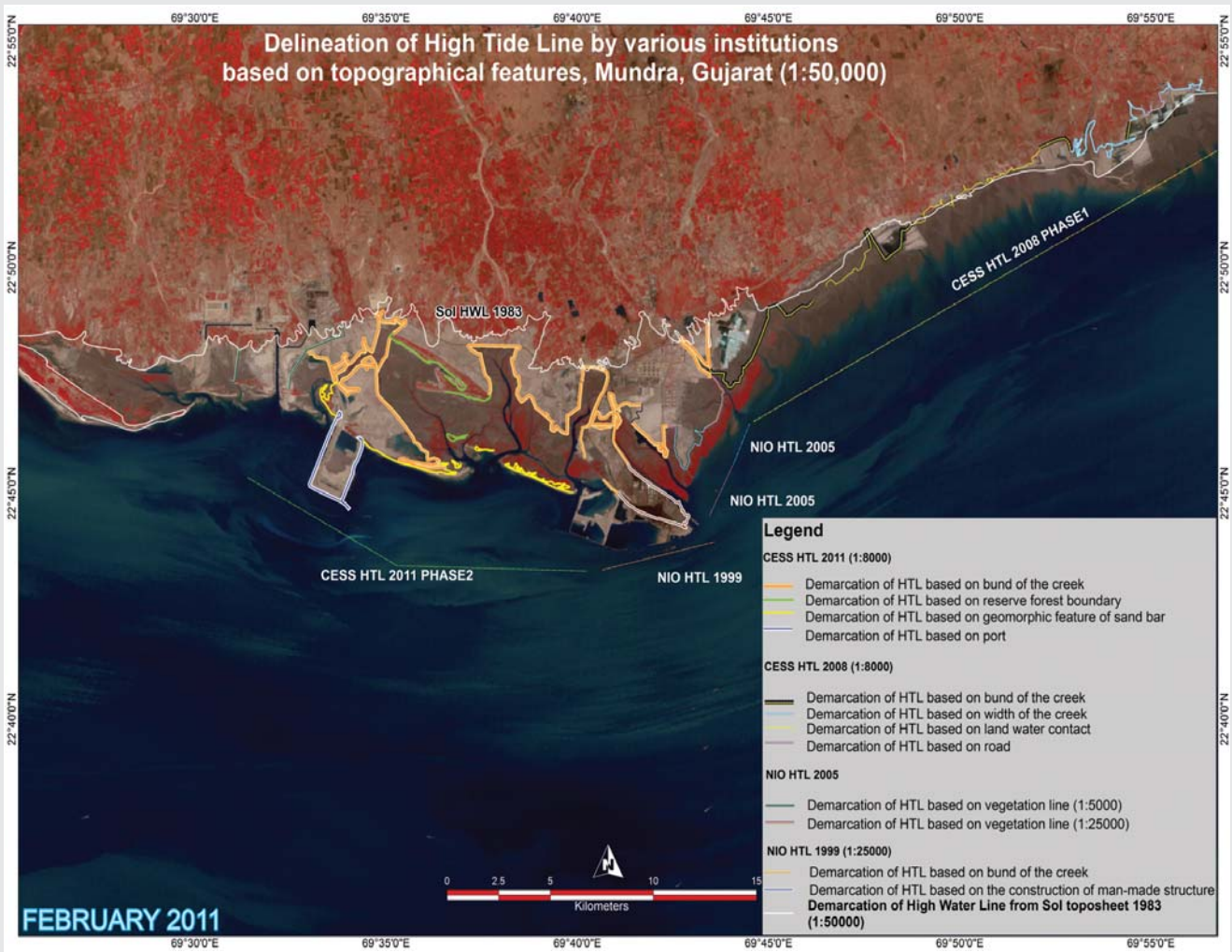
None of the HTLs demarcated by different agencies for the Mundra SEZ and Waterfront development project match

Source: Analysis by the National Centre for Sustainable Coastal Management, Chennai, March 2013 based on different HTL demarcation reports submitted to the Committee by NIO, CESS and MoEF (SAC)

At best for indicative purposes, the Survey of India 1983 High Water Line can be used for a comparison considering it to be the original HTL. Clearly, the HTL has shifted as envisaged due to interventions that happened in different project areas at different times. What is interesting is that none of the HTL demarcated by any of the agencies for the project proponents match either the SAC or Survey of India High Water Line. The CESS 2008 HTL demarcation is closer to the Survey of India line which maybe attributed to the fact that no development has yet happened for that area under the project and hence the area is devoid of any direct intervention.

The NCSCM carried out another analysis for the Committee. It analysed the HTL demarcation by different agencies in terms of the geomorphological signatures used by these agencies in marking the HTLs (see Figure 2: *Basis of MPSEZL project HTL demarcation used by Different Authorised Agencies*). As is evident, different organisations have used different geomorphological features to demarcate HTL. While CESS demarcated HTL based on width of creek, land-water contact, road and creek bund in 2008, it used sand bar, reserve forest boundary, existing port and bund for creek for its 2011 report. NIO used vegetation line for demarcating HTL for its 2005 survey while for the earlier survey (1999), it had used bund of the creek and man-made intervention. This again points to the flaw in methodology.

Figure 2: **Basis of MPSEZL project HTL Demarcation used by Different Authorised Agencies**



Agencies have used various geomorphological features top demarcate HTLs pointing towards lack of uniformity in methodology

Source: Analysis by the National Centre for Sustainable Coastal Management, Chennai, March 2013 based on different HTL demarcation reports submitted to the Committee by NIO, CESS and MoEF (SAC)

4. **Project-level HTL/LTL demarcation that is paid for by the proponent, should be replaced by state level exercise funded by the government**. This will require greater clarity about the scales that will be used to do the local/project level map and the CZMP map. The current mapping guidelines, at two distinctly different scales (1:25000 and 1:4000) does not allow for verification of the HTL/LTL maps. It also does not allow for assessment based on the 'original' HTL/LTL and to check for deviation or distortions.

5. **There is a need to decide on the issue of the 'original' HTL/LTL and how policy can and should reflect the dynamic nature of the coastline**. The January 2011 CRZ notification recognizes the need for regular revisions. It directs state governments to prepare CZMPs within two years with maps of 1:25000, and also says that these plans will be revised every five years. Till then, the approved plans prepared under the 1991 notification will remain valid. Therefore, policy accepts that the coast is dynamic and changes must be monitored and captured in the demarcation. But the problem is that this map will be at the scale of 1:25000 and cannot be used to check against the project level map. Therefore, this issue needs urgent clarification and resolution.

6. **MoEF should reexamine the current mapping being done in the country, in terms of the need for the clarity of the policy of scales and accuracy**. Under MoEF, the Survey of India has mapped the country's coasts at an accuracy of 10 cms for hazard line demarcation. In addition, currently exercises are being undertaken at the state level for preparation of CZMPs. But since these are being done using different methodologies and different scales, the use of these efforts for uniform national policy and practice is not possible. It is critical at this stage, when all this is being done, to prescribe a strict policy guideline so that the CRZ maps can be used for both state-level mapping and classification, and project level HTL/LTL demarcation.

7. **MoEF should ensure that these maps are put in the public domain**. Currently, there is resistance from defence and mapping establishments to the public use of these maps. But given the fact that CRZ is a regulated zone, it is critical there is transparency about developments on the coast. Regulation and monitoring is not possible without this.

6. Critical Issues not in ToR

6.1 Fishermen Livelihood and Access to Fishing Grounds

Concerns have been expressed repeatedly regarding the impact of Mundra Port and SEZ and the thermal power plant (TPP) on the fishing community. Given such concerns, in most clearances granted by MoEF, conditions have categorically outlined the need to minimize the impact of the project on the fishing community and provide adequate and unobstructed access to fishing communities of their fishing grounds (see Table 12: *Conditions Stipulated for Fishing Community*).

Table 12: **Conditions Stipulated for Fishing Community**

Clearance date	Condition stipulated for Fishing Community/Fishermen Access
1. September 20, 2000: Port expansion	Project proponent shall ensure that commercial fisheries are not hampered due to the barges/vessels and activities in the region. Necessary plan in this regard shall be prepared in consultation with the NIO and submitted within 3 months.
2. July 21, 2004: Single point mooring at Navinal	It shall be ensured that there is no displacement of people, houses and fishing activity as a result of the project.
3. February 5, 2007: Multipurpose berth at Navinal	Fishing activities by the fishermen living along the creek should not be hindered and a mechanism maybe evolved for the movement of fishing boats vis-a-vis shipping activities.
	Relocation of fisherman and local communities in the area to be done strictly in accordance with state government norms.
4. May 29, 2008: CRZ clearance for intake and outfall of TPP	Intake and outfall should not cause any hindrance to the movement of local communities including fishermen.
	It shall be ensured that there is not displacement of people, houses of fishing activity as a result of the project. The pipelines shall not disturb the movement of fishing vessels or fishermen.
5. January 12, 2009: Water front Development	Shall be ensured that during construction/operation of the proposed jetty the movements of fishermen vessels of the local communities are not interfered with.
	Relocation of fisherman community in the area to be done strictly in accordance with state government norms.
6. May 20, 2010: Phase III of TPP	Project proponent should not hamper the vocation of the fishing community in the area and the local fishers should be allowed to carry on their activities in the creeks.
	Project proponent shall adopt the fishing community if displacement is to occur, especially those residing in and around Zarpara, Kotadi, Navinal and Tragadi.
	A Fishermen Welfare Fund shall be created which will work towards creation of facilities for fish landing platforms/harbours/cold storage, etc., and providing relief in case of emergency.
	Suitable screens shall be placed across the intake channel to prevent entrainment of life forms including eggs, larvae, juvenile fish, etc., during extraction of seawater.

Source: Analysis by Centre for Science and Environment, New Delhi based on clearances granted by MoEF and consents by State

6.1.1 Observations on Fishing Community and Fisherman Access by Monitoring Committees/Courts:

Special Civil Application (SCA) No. 9309 of 2008 filed on July 15, 2008, by Jat Imran Salim and others, and Civil Application (CA) No. 8642 of 2008 filed on July 24, 2008 also by the same appellants, raised issues about filling work being done at Kotdi Creek-2, Baradi Mata Creek-1, Baradi Mata Creek-2. CA No. 8642 of 2008 additionally expressed concerns about inconvenience in fishing operations in the area due to limited or no access to fishermen in the area. Upon reviewing affidavits produced by the project proponents, the court observed that activities of the fishing community will not be affected, as licensed fishermen will be able to continue fishing as usual and hence disposed the cases.

Regarding concern about fishermen access to the coast raised during the public hearing held on October 5, 2010, the project proponents claimed that four locations have been identified as approach roads which are 4 m wide for fishermen to reach the coast. However the locations of the approach roads have not been clarified.

6.1.2 Examination of Issue by this Committee

On its visit to Mundra, the Committee met people from the fisher community and also visited their temporary settlements – where communities live for large parts of the year and undertake all activities connected to their profession. At Juna Bandar, APSEZL showed its work, that was being done to provide facilities like housing, sanitation, solar lighting and education. The community leaders at this site said that they had no problems with access to their fishing grounds.

However, at Bhadreshwar, the Committee met with fishers who had come from different settlements like Navinal and Luni. In this meeting, fishers explained how developments along the coast were impinging on their livelihoods. They explained that access to their settlements was often blocked. One specific instance, was the outfall channel of CGPL, which they said did cut off their access to the mainland and villages.

They also said that in all other cases the barriers prevented them to reach their settlements and often the guards did not recognize their identity cards. The Committee also saw these barriers – constructed for the SEZ and other projects – which would not allow for easy access to the coast.

They further pointed out that they had been promised an exclusive fishing harbor, which has remained half built.

Fishers who the Committee met said that they were beginning to see falling catch of fish, which they put down to the growing industrialization along the coast; discharge of hot water from TPP and depletion of mangroves, which provide breeding grounds for fish.

Their living conditions were also poor and inadequate. In certain cases, water supply was not available; education and health facilities non-existent and sanitation unavailable. Little attention had been given to their living conditions or welfare. The development on the coast – which was inhabited by them – had clearly little space for them.

6.1.3: Observation and Recommendation of this Committee

It is clear that this community, which depends on the coasts for their livelihood is the most vulnerable and most hit by development projects. Their economy depends on the health of the sea and its interface with land. Projects at the coast do not often respect the rights of fisherfolk, as unlike farmers and settled villagers, their access is not encoded and recognized. This is what clearly has happened in Mundra and needs to be urgently addressed.

The Committee would make the following recommendations:

1. **There must be a specific plan for fishers; access and their livelihood to address all these concerns.** The EC conditions are also specific in this regard. But what is needed is much more than just paperwork and cursory attention. The plan must indicate the location of each settlement; its guaranteed access and facilities that will be provided. APSEZL must prepare this settlement-wise plan within six months with a clear schedule of implementation and monitoring.

2. **The exclusive fishing harbor proposed at Badreshwar should be built so that there is facility for livelihood support.** In addition, all fishers settlements located in the Waterfront (port) area must get adequate facilities for carrying out their economic activity. This facility should be built within a time period of two years.

6.2 Village Common Land (Gauchar)

Villages have time and again contested land allocation for the development of port based Mundra SEZ. They argue that when gauchar land – village common lands used for livestock rearing – is transferred for industrial purposes, it adversely affects their agro-pastoral based livelihood security. Villagers also expressed concerns during the public hearing for SEZ on October 5, 2010, when it was contested that gauchar land in Luni village has been purchased by illegal means.

The only time a specific condition was stipulated was in the EC for Phase III of the TPP granted on May 20, 2010. It was indicated that project proponent should identify and develop new fodder farm/grazing land (gauchar). Financial commitment for the same was to be submitted to MoEF within three months of the clearance.

6.2.1 Observations on Gauchar Land by Monitoring Committees/Courts:

In SCA No. 7254 of 2008, filed on May 5, 2008 by Alabhai Rajde Batiya and others, it was argued that 1000 acres (42 hectares) of gauchar land has been allocated for industrial development in village Zarpara, for Mundra SEZ. Such allocation, according to the villagers is unlawful and unjustified, as gauchar land cannot be diverted for anything other than public purpose. Development of industries in SEZ according to them cannot be considered as public purpose. Concerns were also expressed regarding the gauchar land to cattle ratio, which villagers feared would be misbalanced, following such resumption.

The Gujarat High Court through order dated June 22, 2011 noted that the Zarpara village Panchayat adopted a unanimous resolution agreeing to allocate 1000 acres to MSEZL. Only after passing of such resolution by the Panchayat, the gauchar land was resumed by the Collector of Bhuj on November 19, 2007. Also the company was directed by the Collector to provide valuation of the land and amount required to be paid taking into consideration premium and conversion tax. Regarding the availability of gauchar land, the court concluded that cattle population to gauchar land ratio is adequately satisfied, and there was excess of gauchar land even after allocation. Based on such observations, the Court disposed the case.

However the court noted that resumption of Gauchar land should be followed by appropriate compensatory action by the Government. It is required for the Government, if possible, to earmark similar area of land out of Government wasteland to the Panchayat for gauchar. In the case of unavailability of wasteland, premium should be given to village Panchayat through Taluka Panchayat for acquisition of land for gauchar.

SCA No. 5386 of 2008 filed on February 22, 2008 by Valji Manshi Tapariya and others, also raised issues about gauchar land being allocated for industrial purpose to Mundra SEZ. SCA No. 17 of 2010 filed on December 24, 2009 by Ravubha Premsangji Jadeja and others, additionally brought out that land has been given to the company without extracting the appropriate value. According to the petition, gauchar land has been allotted for industrial purpose without charging additional 30 per cent market price from the respondent. Also no alternative grazing land has been given to the villagers.

The Gujarat High Court observed that Adani Trust Foundation vide a letter dated December 25, 2009, to the Sarpanch, Gram Panchayat, and villagers of Siracha, set forth proposal for 16 public projects to benefit the residents of the village in lieu of appropriation of gauchar land for industrial development. The proposal involved provisions for allocating areas for cowshed, providing drainage and drinking water facilities, construction of roads and infrastructure, health-care centers, etc. The purpose was to obviate some difficulties that might arise for the villagers from shrinking of gauchar land following its transfer for Mundra SEZ. Gram Sabha of

Siracha unanimously agreed to accept the proposals set forth by Adani Foundation and agreed to cooperate as required.

Regarding valuation of land, the Court ordered that while resuming gauchar land for industrial purpose, State Government should collect 30 per cent of the market value by the way of premium from the project proponents. The court disposed the case on September 27, 2010.

6.2.2: Examination of Issue by this Committee

APSEZL has so far acquired 1200 ha of gauchar land for the purpose of SEZ development as per information provided by the company in March 2013.[79] Information on the area of gauchar acquired as a percentage of the village common was requested from the Collector of Bhuj. But the information has not been made available, in spite of written requests from the Committee.

The break-up of Gauchar land, as acquired in nine villages is represented in the Table 13 given below. It can be seen that maximum amount of gauchar land acquisition has been in Mundra 489 ha and Zarpara village 405 ha.

Table 13: **Gauchar Land Acquired for Mundra SEZ**

S No.	Village	Gauchar Land (in ha)
1	Navinal	93.5
2	Goyrsama	27
3	Mundra	489
4	Mokha	42
5	Gundala	9
6	Luni	74
7	Baroi	20
8	Zarpara	405
9	Siracha	41

Source: Information provided by the Company to the Committee during the January 2013 site visit (for conversion from acre to hectare, 1 acre = 0.404 hectares)

6.2.3 Observation and Recommendation of this Committee

During its visit, the Committee learnt that in many villages the entire common land had been acquired. Given the pastoral nature of local economies, there is no doubt that this would have had adverse impacts on people, particularly the poor. It is well known that the poorest are most dependent on village commons as they do not have alternative sources for fodder or grazing lands.

The company officials explained to the Committee that they have decided to ask for government land and not purchase private land, which they would have got at cheap rates at the start because they wanted private landowners to benefit from the rising price of land in the years post-development of Mundra. While this approach does have merit, it does not consider the impact of the common land takeover on the poorest and the landless. This needs to be considered and repaired.

The key impact of a policy for takeover of village common lands used for critical functions of grazing and fodder in pastoral communities, is greater resentment against the project. This takeover hurts the poor, makes them more vulnerable and marginalized.

The Committee recommends the following:

1. **The state government should review the policy of acquisition and transfer of village common lands, not just in the specific case of APSEZL but also in other cases.** These lands cannot be viewed as wastelands which are unproductive, and so transferred for what is considered a more productive purpose. Village common lands are degraded today because of overuse, not under-use. In other words, large number of people and their livestock depends on these lands, which leads to intensive use and degradation. Village common lands need strategies for improving productivity, which in turn will require investment and management by the community.

2. **APSEZL should consider the voluntary return of grazing land and also invest in improving productivity of this land with villagers.** The Committee notes that APSEZL has agreed, after discussions with Zarpara village to give back 161 ha of the 404 ha acquired by it. This is a welcome step. In the village meeting in Zarpara, the local community also appreciated this move by APSEZL.

   But much more is required to be done. The fact is that many other villages are in a similar situation. The takeover of commons, in some cases all the land of the village, is leading to stress on the poorest and most marginalized. Given this, APSEZL should discuss with other villages and return back portion of the land, particularly of those settlements where there is no common land left, after acquisition.

   In addition, it should work with the villagers, particularly, the poorest and landless, to improve productivity of the common lands. There should be investment in this area and this should be monitored for impact.

6.3: Cumulative Impacts of Power Plants and Port Projects

There is no assessment of the cumulative impacts of power plants and port projects, which have been granted EC or are awaiting clearance. But the combined environment and social impacts could be potentially massive and must be understood so that remedial actions is taken.

6.3.1 Examination of Issue by this Committee

The Committee has analysed clearances for the coastal districts of Gujarat from the website of MoEF. This data is for the period April 2007 to March 2012 – 11th Plan Period.

In terms of TPP, only in Kutch district, 6195 MW has been sanctioned in the past five years (see Table 14: *Power Projects in Coastal Districts of Gujarat – Cleared between 2007-2012*). If this is added to clearance for CGPL and the Adani project Phase I (clearance given in 2007), then this district will have TPP of roughly 11,000 MW capacity. There is no assessment of the combined impact of these plants, which will require coal handling facilities, will emit air pollutants, discharge effluents and take seawater for cooling and process use. The combined

Table 14: **Power Projects in Coastal Districts of Gujarat – Cleared between 2007-2012**

Project	District	Capcity (MW)
Adani Power Plant	Kutch	660
Gallant Power Plant	Kutch	12
Sanghi Industries Ltd.	Kutch	120
Welspun Corporation Ltd.	Kutch	123
Adani Power Plant Expansion	Kutch	1980
Sanghi Energy Ltd.	Kutch	1320
Adani Power Plant Expansion	Kutch	1980
Saurashtra Super Thermal Power Plant	Jamnagar	3960
Orient Abrasives Ltd.	Porbandar	9
Saurashtra Cements Ltd.	Porbandar	40
Shapoorji Pallonji Energy (Gujarat) Pvt. Ltd.	Junagadh	1320
Videocon Industries Ltd.	Amreli	1200
GSPC Gas Power Plant	Amreli	1050
Bhavnagar Energy Co. Ltd.	Bhavnagar	500
Dhuvaran Gas Based Thermal Power Plant Expansion	Anand	395
Gujarat Paguthan Energy Gas Power Plant Expansion	Bharuch	1050
Adani Power Dahej Ltd.	Bharuch	2640
DGEN Gas Power Plant	Bharuch	800
Raymond Ltd.	Valsad	7.2
N R Agarwal Industries Ltd.	Valsad	15
TOTAL		**19181.2**

Source: Analysis by Centre for Science and Environment, New Delhi based on clearances granted by MoEF

impact of temperature of the water discharged into the sea and its implications for fish stock is not considered or assessed.

Similarly, in the case of ports (see Table 15: *Status of Environmental Clearance of Ports in Gujarat*), there is huge impact on the coastal environment with barriers impeding the natural movement of sand and destroying the formation of beaches.

These developments, taken together, could have huge adverse impacts on the environment and also on the livelihoods of fishing communities.

Table 15: **Status of Environmental Clearance of Ports in Gujarat**

Project	District	Company
Ports granted EC		
Expansion and modernization of Pipavav Port	Amreli	Gujarat Pipavav Port Ltd.
Ship Building and Repairing yard	Bhavnagar	Modest Infrastructure Ltd.
Cargo Port Terminal	Bharuch	Adani Petronet (Dahej) Pvt. Ltd.
Expansion of waterfront facility		Gujarat Maritime Board
Waterfront development	Kutch	MPSEZL
Ports awaiting EC		
Development of Nargol Port	Valsad	Cargo Motors Pvt. Ltd.
Expansion of LNG Terminal	Surat	Hazira LNG Pvt. Ltd.
Expansion of Marine Terminal of Essar	Jamnagar	Vadinar Oil Terminal Ltd.
Port Crane Assembly Unit at APSEZ	Kutch	Anupam MHI Industries Ltd.
Ports granted ToR		
Construction of Outfitting Jetty in existing Water Front facility at Hazira manufacturing Complex	Surat	Larsen and Turbo Ltd.
Crane Roll- On Jetty at West Port	Kutch	Adani Ports and SEZ Ltd.
Expansion of jetty and enhancement of the capacity of the desalination plant	Kutch	ABG Cement Ltd.
Port based Multiproduct SEZ	Bhuj	Kandla Port Trust
Installation of terminal facilities to handle LNG	Bharuch	Petronet LNG Ltd.
Expansion of Port Facility	Surat	Essar Bulk Terminal Ltd.
Development of Multipurpose Jetty within Navalakhi Port	Rajkot	DMCC Oil Terminal (Navlakhi) Ltd.
Multi Cargo Port with supporting utilities and infrastructure facilities	Surat	Adani Hazira Port Pvt. Ltd.
Development of Captive Jetty on Kori Creek	Kutch	Goodearth Maritime Ltd.
LNG Import Terminal at Pipavav Marine Facility	Amreli	Swan Energy Ltd.
Single Mooring Point (SMP) and Allied Facilities	Kutch	Kandla Port Trust

Source: Analysis by Centre for Science and Environment, New Delhi based on clearances granted by MoEF

6.3.2 Observation and Recommendation of this Committee

It is imperative that development on the coast must take into account the cumulative impact and assess impacts on the environment.

The Committee recommends that MoEF should commission a comprehensive study on the cumulative impacts of projects, which have already been granted clearance. This study should be used to assess and mitigate impacts in the region. All future port and power plant projects should be assessed for clearance based on cumulative impacts.

7. Summary of Observations and Recommendations

The Committee was tasked to examine specific issues, related to complaints regarding compliance with environmental conditions and allegations of distortion of the original HTL/LTL by M/s Adani Port and SEZ Ltd, located at Mundra in Gujarat. The Committee has in its review, taken a detailed, fact based assessment of each issue, based on documents, field visit and meetings with local community and company representatives. In addition, it has used satellite and Google Earth images to assess the time series changes in the landscape. This was done because it was not possible for the Committee to assess allegations of damage to mangroves and creeks systems, which have taken place over the past 6-7 years during the period of construction of ports, power plant and its ancillary facilities.

The allegations made against the company have centered on the following:

a. There has been widespread destruction of mangroves, which was strictly prohibited in the clearances granted;
b. The creeks and inter-tidal system has been adversely affected, particularly, the Kotdi creek, which has been blocked;
c. There has been mismanagement of fly ash from the thermal power plant, which has resulted in fugitive emissions during disposal and pollution of groundwater;
d. The large volume of seawater stored in the unlined pond and conveyed through the intake and outfall channel has increased salinity and contaminated water sources;
e. The original HTL/LTL has been distorted because of human made bunds and blocking of creeks;
f. The company is non-compliant with conditions imposed at the time of environmental clearance.

7. 1 Overall Observation and Assessment

In the Committee's view the Adani Waterfront and Power Plant project, which has been granted clearance in different phases beginning 1995, has led to massive ecological changes with adverse impacts. The question before the Committee was to examine how much of this modification has been planned and allowed and how much is in violation of environmental conditions.

The Committee's overall assessment is as follows:

7.1.1: Cases of procedural lapses

- There has been an attempt to bypass the statutory procedures, by using different agencies, at the Centre and state, for obtaining clearances for the

same project. For instance, while initially, the project was a combined SEZ and port project, in 2008, it was delinked so that MoEF clearance was sought only for the waterfront development component. At this stage, the company stated that it was seeking approval for phase 1 of the project (waterfront development) and the phase II project (remaining SEZ) would be taken up later. The Waterfront Development clearance was given to the company in January 12 and 19, 2009 and in the same month, on January 31, 2009 it approached MoEF for Phase II, which included social infrastructure. But simultaneously, it also applied to SEIAA for social infrastructure and common effluent treatment plant and both were granted clearance by SEIAA in February 2010.

- The public hearing procedure, which is a critical part of project clearance and helps to understand and mitigate the concerns of local people, has been bypassed on one pretext or another. For instance, in the Phase I of thermal power plant, public hearing was conducted. But in Phase II of TPP, the company asked for exemption saying that the project is within a notified power SEZ. This is even though the power SEZ did not have EC clearance, which would have allowed this exemption. In the case of multiproduct SEZ once again, the Company requested for an exemption and this was granted by EAC on the condition that the future projects within the SEZ would have to go through all procedures required for EC. Similarly, in all the expansions of the Waterfront Development project, the company has requested for exemptions to hold public hearing.

- The airstrip/aerodrome is part of SEZ and it was constructed without SEZ having an EC.

- The EAC on April 23-24, 2009, exempted the SEZ from public hearing, but put a strict condition that the project coming in SEZ in future shall undergo procedure as per EIA notification 2006. This would imply that all projects constructed within the SEZ should have EC as per EIA notification 2006. The Company has not adhered to this condition.

7.1.2: Cases of violations and non-compliance

Blocking of creeks, including Kotdi

Committees which have visited the site during construction, have noted violations by the company in the matter of blocking of creeks. In 2006, the GCZMA committee had recorded that the company had built bunds in inter-tidal region and blocked many creeks. It is important to note that in the period that the GCZMA committee visited the site, the company had not received any environmental clearance, other than the development of Navinal port and related infrastructure. This could even mean that the company had started

work prior to receiving environmental clearance. But it certainly suggests that there was work being done at the site, which was affecting creeks and mangroves.

Similarly, the 2010 MoEF Inspection Committee had also found obstruction of creek system and obstruction of natural flow of seawater because of reclamation.

The analysis of this Committee carried out based on satellite imagery (*Landsat 5 TM*) and Google Earth imagery from different years clearly shows:

- Baradi Mata creek has witnessed a distinct change at its mouth where the creek meets the sea. In 2005, the creek mouth had a natural outfall into the sea. In 2010, the creek opening shifted and got constricted. This is clearly because of construction for the Water Front Development Project. Under the EC conditions, no changes in creek or creek mouth are allowed. If no remedial action is taken urgently, there is danger of closing of the creek mouth due to accretion.

- The creek branches in the proposed North port site have completely disappeared over the years. This is bound to have an impact on the mangrove vegetation in the area in addition to the change in hydrological regime.

- A general accretion is observed in Kotdi Creek, which could be due to construction in the nearby inter-tidal area. This has led to widening of the mouth. There does not however appear to be any major change in the Kotdi creek network.

Destruction of mangroves

Committees which have visited the project during its construction phase, have recorded rampant destruction of mangroves. It is important to note that the GCZMA committee visited the site before environmental clearance had been given for the project, except for Navinal port.

The analysis of this Committee clearly shows:

- Navinal creek: As per the EC granted in August 1995, for general cargo and storage at Navinal, a 100 meters mangrove belt was to be created west of the Navinal creek. Based on Google Earth imageries it is clear that there was a mangrove patch along the west of Navinal creek in the year 2005, but the same has vanished in 2011. This is in violation of not just the EC condition on mangrove destruction but also the specific EC condition related to Navinal for mangrove regeneration.

- Bocha conservation area: The satellite imagery analysis, done by scientists from the National Centre for Sustainable Coastal Management shows that there has been a loss of seven ha of dense mangrove and 68 ha of sparse mangrove implying that a total of 75 ha of mangrove in Bocha Island have been lost. This clearly shows that the company had not taken any precaution to safeguard this conservation area.

- Proposed North port site: The mangroves at the proposed North port site have completely vanished. The creek has disappeared clearly due to the reclamation work at North port site.

- Mangrove conservation near Baradi Mata mouth: In its field visit in January 2013, the Committee noted degradation in the mangrove conservation area near the lighthouse at the South port. This was because of construction and reclamation activity. The company had clearly not taken precaution to ensure protection of mangroves. This is a clear violation of EC conditions.

Flyash utilization and disposal

The issue of fly ash utilization and disposal is technically manageable. Given all the technologies, plans and capabilities of the company, it should be able to satisfactorily mitigate the hazards. But it is clear that there has been a problem in management on the ground. The GPCB field inspection report of April 2011 shows that there was disregard for local pollution being caused by fugitive emissions and discrepancy in accounting for fly ash utilization.

This Committee after assessment has also concluded the following:

- The inventory of fly ash given by the company/GPCB does not satisfactorily demonstrate proper utilisation/disposal of ash. For instance, the data from April 2012 to February 2013 indicates 90 per cent utilisation (including disposal in ash dyke). The unresolved issue is where the remaining 10 per cent of the fly ash and bottom ash (over 1,00,000 tonnes) is being disposed or utilised. This suggests that there would be possibility of dumping of ash, which would lead to air pollution and land degradation and would be termed as non-compliance.

- The EC conditions require the company to conduct regular monitoring in and around the ash pond area. However, in the compliance reports filed by the company, it is submitted that this condition is 'not applicable' – with the justification that there is 100 per cent utilization. But clearly, this is not the case. The company is in non-compliance with this condition.

Increase of salinity because of guard pond/intake and outfall

The careful review of all environmental clearance conditions show that the Company was sufficiently warned about the need to take all precautions to prevent salinity intrusion in the groundwater. However, it is apparent that the company has failed to fulfill this condition.

- The intake channel, the outfall channel and the raw water reservoir/guard pond are operational but without any lining/protection to protect against contamination of groundwater. The examination by the Committee shows that the soil in the area is permeable and without safeguards it will lead to contamination. This is a clear violation of the environmental clearance condition.

- The Committee is unable to establish if contamination has already occurred in the area, because of lack of data. However, this lack of data is also because the company has not monitored groundwater quality. This is a clear violation and shows non-compliance with the environment clearance conditions. The EC conditions stipulate that the company must monitor groundwater regularly for salinity and pollution. But it has failed to do so.

Samundra/Sterling

The Committee is finding it difficult to reconcile the available reports to ascertain if the Sterling hospital and Samundra township have been constructed in violation of the CRZ. The coordinates taken by GCZMA inspection committee are not available on record for it to verify the location taken on this visit. The CESS report uses layout as provided by the company, which shows the structure to be outside CRZ. But using layout provided by the company cannot be used to establish the veracity of the exact location of the structures particularly in this instance of show cause notice.

Non-compliance with monitoring and reporting conditions

It is clear that the company has been less than serious about reporting on compliance with the conditions set at the time of clearance. In many cases non-compliance with reporting conditions have been observed.

For instance, it is an EC condition to monitor the effluent discharge temperature to ensure that it does not exceed 7°C. It is stated that the inlet and outlet temperature should be measured daily and the difference should be within the stipulated limits. Temperature records enclosed as an annexure with the compliance report are not available. Fishermen in the area allege that the hot water released into the sea is affecting their small fish catch. Clearly, open and transparent monitoring would help to allay such concerns.

The reports, which are a critical way to ensure that attention is being given to the remediation measures, are at best perfunctory and non-committal. Strict and regular adherence with these conditions, and regular and transparent monitoring would have obviated the need for site visit by this Committee and many others who have visited the project site. It would have also increased public confidence on the issue of compliance, i.e., whether conditions are being met or not.

7.2. Recommendation for effective deterrence for non-compliance and remedial measures

In the Committee's assessment there is incontrovertible evidence of violation of EC condition and non-compliance. It must also be recognized that the Company has bypassed environmental procedures in certain cases.

The question before the Committee is to determine the future course of action. One option would be to recommend the cancellation of clearances, where procedures have been bypassed. In addition, legal proceeding could be initiated against non-compliance and violations of EC conditions. But it is also clear that these steps, however, harsh they may sound, are in the nature of being procedural and would only lead to delay without any gains to the environment and the people. The Committee is cognizant of the fact that large scale development has already been undertaken and it is not possible or prudent at this stage to halt or cease its operations.

Therefore, the Committee has decided to recommend a different course of action, which is both intended to be an effective deterrent and also suggests the way for future remedial action to improve the environment.

Given this the Committee recommends the following:

7.2.1 MoEF should impose a substantial deterrent for non-compliance and violations through the creation of an Environment Restoration Fund.

The Committee is aware that it is practically difficult to assign tangible and intangible costs to non-compliance and violations. However, the inability to quantify these costs should not deter us from setting precedence for the future. This will only result in the issue remaining unresolved and conflicted and will delay action to improve the environment and the livelihoods of people.

- Considering the scale of the project, the Committee would recommend that the Environment Restoration Fund should be 1 per cent of the project cost

(including the cost of the thermal power plant) or Rs 200 crore, whichever is higher.

- The Environment Restoration Fund should operate under the chairmanship of the Secretary, MoEF and be used specifically for remediation of environmental damage in Mundra and also for strengthening the regulatory and monitoring systems.

- The purpose of the Fund should be the following:
  a. Protection of marine ecology;
  b. Protection and conservation of mangroves, including development of new mangrove conservation areas;
  c. Restoration and conservation of creeks;
  d. Independent studies and monitoring of the entire project areas, including cumulative impacts and public data disclosure systems.
  e. Social infrastructure and livelihood support for fishers community, including development of access of fishers from their temporary settlements to villages.

7.2.2. Cancel environmental clearance of North Port

There must be an increase in the mangrove conservation area to ensure ecological balance in this coastal zone. To do this, North port, which has received environmental clearance under the waterfront project, should be cancelled. The proposed North port is on the other side of Bocha island. Already, ship movement to and fro Navinal port, which borders the island, has had serious deleterious impact on the protected mangroves. This is visible, both in terms of the loss of mangroves in the vicinity of the Navinal port as well as the loss of vegetation and land area of Bocha island.

7.2.3 Specific recommendations on key remedial action

Creeks and inter-tidal system

- The North port area, adjoining Bocha has connecting creeks, critical for maintaining inter-tidal action of the region. This area should be protected and all creeks and waterbodies restored and brought to pre-2005 status including that reclaimed by GMB/APSEZL. The entire area should be declared as a conservation zone, as it is contiguous to Bocha island and its important mangrove system. This conservation zone should be clearly earmarked and demarcated using lat-long so that monitoring is possible.

- The opening of Baradi Mata creek should be kept protected so that it is not damaged or blocked. This must be done for all other creek systems.

Mangrove conservation

- Bocha island and its conservation zone must be protected at all costs. It is clear that there is a possibility of further degradation of the remaining mangroves areas in the conservation zone. The Committee has identified the contiguous conservation area, which includes portions of the North port. This suggested increased conservation area has been plotted on a map (see section: mangroves). Based on the maps prepared by the Committee, the area of Bocha should be geo-referenced with lat-longs. This should be put in the public domain and there should be regular monitoring on the status of the land mass and vegetation of the island.

- The mangrove conservation area near the mouth of Baradi Mata must be protected and regenerated. An embankment to stop soil deposition into the creek, with buffer between the mangrove area and reclaimed land, should be made.

- All identified mangrove conservation areas as per the EC of January 2009 must be protected with adequate measures against erosion. These areas should be marked with lat-long so that regular monitoring for compliance, based on high-resolution maps, can be made publicly available.

- An action plan for protecting of all mangrove conservation areas including the proposed mangrove conservation area may be prepared and put in public domain, within three months, for monitoring.

Fly ash management and disposal

- GPCB should set up a robust monitoring system, which is in the public domain that tracks and reports on, one, the quantum of fly ash generated by all the phases of the Adani thermal power plant and two, that can verify and audit the utilization of fly ash.

- The Company should submit a revised fly ash utilization plan to MoEF, which does not provide for its use in reclamation. This is because it is not possible to monitor and verify that domestic coal fly ash is not being disposed or used for reclamation in low-lying areas.

- The concern about fugitive emissions from transport and disposal of fly ash and contamination of the groundwater near the fly ash dyke and pond must be taken seriously by the regulating agencies and public monitoring systems must be evolved to check for contamination around the ash pond in particular.

Earthquake/Tsunami and project clearance

The issue of coastal safety is a matter of great concern. Tsunami and

earthquakes are threats to the area owing to its geological settings. But there has been no comprehensive assessment in terms of risk/hazard analysis.

- The Government should carry out an Impact Study especially in light of the Japan tsunami in 2011. Also, the disaster management plan of the different project proponents of MPSEZL should be linked to the 'District Disaster Management Plan'. This will be in the interest of the vulnerable people in and around the project area to ensure human safety with early warning practices. The Committee also recommends carrying out periodic mock drills along with district administration in and around the project area.

Salinity because of storage pond/intake and outfall

- The intake and outfall channel must be reconstructed/repaired so that it has impervious lining at the bottom and sides.

- The raw water reservoir/guard pond must also be reconstructed/repaired so that it has impervious lining at the bottom and side.

- The Company should install network of piezometers with coordinates in the project area for monitoring of groundwater quality and water levels in all the seasons. These reports should be put in public domain, including its periodical submissions to GPCB and RO, MoEF, Bhopal.

- An independent study should be undertaken every five years to study saline water intrusion and to suggest remedial action.

- The Company should continue with closed cycle cooling system and recycling of FGD wastewater so as to reduce discharge and remain within the discharge capacity of the outfall channel.

Samundra/Sterling

- MoEF should urgently take up this matter with GCZMA and ask for review and reassessment of the matter. This assessment should be based on fresh collection of coordinates, through a joint team. GCZMA should be directed to take necessary actions based on this visit. The map should be available in the public domain so that it can be verified and the matter closed satisfactorily.

Fishermen livelihood and access to fishing grounds

- There must be a specific plan for fishers; access and their livelihood to address all these concerns. APSEZL must prepare this settlement-wise plan within 6 months with a clear schedule of implementation and monitoring.

- The exclusive fishing harbor proposed at Bhadreshwar should be built so that there is facility for livelihood support. This facility should be built

within a time period of two years. In addition, all fishers settlements located in the Waterfront (port) area must get adequate facilities for carrying out their economic activity.

Village common land (Gauchar)

- The state government should review the policy of acquisition and transfer of village common lands, not just in the specific case of APSEZL but also in other cases.

- APSEZL should consider the voluntary return of grazing land and also invest in improving productivity of this land with villagers.

Cumulative impacts of power plants and port projects

- MoEF should commission a comprehensive study on the cumulative impacts of projects, which have already been granted clearance. This study should be used to assess and mitigate impacts in the region.

- All future port and power plant projects should be assessed for clearance based on cumulative impacts.

7.3 Specific recommendations on reform of CRZ regulations

- There should be an urgent review of the functioning and scientific protocols used by the agencies authorised by MoEF to undertake CRZ demarcation. There should be common guidelines for their operations so that there is uniformity and reproducibility of the work that is done. All codes of operation, including rates to be charges should be reviewed and made uniform for all agencies.

- New authorised agencies should be added to undertake this work, including state remote sensing agencies.

- All reports and maps prepared by the agencies should be put in the public domain. We would recommend that all digitized maps at 1:4000 scale prepared by the agency for a project proponent should be sent to the National Centre for Sustainable Coastal Management. The Centre should collate all specific project maps on a national map, based on the lat-long and publish this on a national CRZ map in the public domain.

- The project-level HTL/LTL demarcation, which is paid for by the proponent should be replaced by state level exercise, which is funded by the government. This will require greater clarity about the scales that will be used to do the local/project level map and the CZMP map. The current mapping guidelines, at two very different scales (1:25,000 and 1:4000) will not allow

for verification of the HTL/LTL maps. It also does not allow for assessment based on the 'original' HTL/LTL and to check for deviation or distortions.

- There is a need to decide on the issue of the 'original' HTL/LTL and how policy can and should reflect the dynamic nature of the coastline.

- MoEF should relook at the current mapping work being done in the country, in terms of the need for this policy clarity. Under the MoEF, the Survey of India has mapped the country's coasts at an accuracy of 10 cms for the hazard line demarcation. In addition, there are current exercises being undertaken at the state level for preparation of coastal zone management plans. But because these are being done using different methodologies and different scales, the use of these efforts for uniform national policy and practice is not possible. It is critical at this stage, when all this is being done, that there is careful policy guidance so that the CRZ maps can be used for both the statewise mapping and classification and the project level HTL/LTL demarcation.

- MoEF should ensure that these maps are put in the public domain. Currently, there is enormous resistance from defence and mapping establishments to the public use of these maps. But given the fact that CRZ is a regulated zone, it is critical there is transparency about developments on the coast. Regulation and monitoring is not possible without this.

7.4 Recommendations on project clearance conditions and post clearance monitoring

It is our assessment that the current regulatory system is not able to handle the complexity and size of projects of this nature. There is an urgent need to strengthen the monitoring abilities and to bring in public oversight.

The monitoring and auditing of such a large project is only possible, if the clearance conditions are specific and detailed, geo-referenced and there is a landsat imagery analysis to benchmark the project area, pre-construction. Without these benchmarks, it is not possible, to ascertain the extent and scale of the violations committed during construction and operation phase.

More importantly, a system should be developed so that all monitoring data is widely accessible by local communities to use and comprehend in terms of impacts.

There is a need to create a monitoring system to ensure that corrective action suggested by this report is taken within a time-bound manner.

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68. Centre for Earth Science Studies, 2011. CRZ Report for Mundra Port SEZ-Phase 2
69. Centre for Earth Science Studies, 2008. CRZ Report for Mundra Port SEZ-Report 1
70. Centre for Earth Science Studies, 2008. CRZ Report for Mundra Port SEZ-Report 1
71. Centre for Earth Science Studies, March 26, 2013, Electronic mail response
72. Centre for Earth Science Studies, 2011, CRZ Report for Mundra Port SEZ-Phase 2
73. Centre for Earth Science Studies, 2011, CRZ Report for Mundra Port SEZ-Phase 2
74. Centre for Earth Science Studies, March 26, 2013, Electronic mail response
75. National Institute of Oceanography, April 5, 2013. Letter No. NIO/NCZMA/1-12
76. Centre for Earth Science Studies, March 26, 2013, Electronic mail response
77. National Institute of Oceanography, April 5, 2013, Letter No. NIO/NCZMA/1-12
78. Ministry of Environment and Forests, December 1998, Demarcation oh High Tide Line/Low Tide Line in the Coastal Regulation Zone.

Box 2: **Water requirement, discharge and capacity of channel**

1. *Telos Consultancy Services Pvt.Ltd. Rapid Environmental Impact Assessment for 2x330 MW Thermal Power Plant, Mumbai.*
2. National Institute of Oceanography,2006, *Rapid Marine Environmental Impact Assessment of Proposed Thermal Power Plant at Wandh, Kachchh district.*
3. *Envirotech East Pvt. Ltd., 2010, EIA Study for Phase III (3*660 MW) Coal Based thermal power project at Tunda village, Kachchh, Gujarat.*
4. National Institute of Oceanography,2006, *Rapid Marine Environmental Impact Assessment of Proposed Thermal Power Plant at Wandh, Kachchh district.*
5. *Envirotech East Pvt. Ltd., 2010, EIA Study for Phase III (3*660 MW) Coal Based thermal power project at Tunda village, Kachchh, Gujarat.*
6. National Institute of Oceanography,2009, *Marine Environmental Impact Assessment for Proposed Expansion of Thermal Power Plant (Phase III) at Wandh,Kachchh district.*

Box 3: **Too many channels and no clarity**

1. *Envirotech East Pvt. Ltd., 2010, EIA Study for Phase III (3*660 MW) Coal Based thermal power project at Tunda village, Kachchh, Gujarat.*
2. *Envirotech East Pvt. Ltd., 2010, EIA Study for Phase III (3*660 MW) Coal Based thermal*

power project at Tunda village, Kachchh, Gujarat.
3. National Institute of Oceanography,2009, *Marine Environmental Impact Assessment for Proposed Expansion of Thermal Power Plant (Phase III) at Wandh,Kachchh district.*
4. National Institute of Oceanography,2009, *Marine Environmental Impact Assessment for Proposed Expansion of Thermal Power Plant (Phase III) at Wandh,Kachchh district.*
5. National Institute of Oceanography,2009, *Marine Environmental Impact Assessment for Proposed Expansion of Thermal Power Plant (Phase III) at Wandh,Kachchh district.*
6. *Gujarat Coastal Zone Management Authority. December 21, 2009. Minutes of the 83rd Meeting*
7. National Institute of Oceanography,2006, *Rapid Marine Environmental Impact Assessment of Proposed Thermal Power Plant at Wandh, Kachchh district.*
8. National Institute of Oceanography,2009, *Marine Environmental Impact Assessment for Proposed Expansion of Thermal Power Plant (Phase III) at Wandh,Kachchh district.*
9. National Institute of Oceanography,2009, *Marine Environmental Impact Assessment for Proposed Expansion of Thermal Power Plant (Phase III) at Wandh,Kachchh district.*
10. National Institute of Oceanography,2009, *Marine Environmental Impact Assessment for Proposed Expansion of Thermal Power Plant (Phase III) at Wandh,Kachchh district.*
11. National Institute of Oceanography,2008, *Marine Environmental Impact Assessment for Water Front Development Plan (WFDP) of Mundra Port, Kachchh district.*

Box 4: **Where is Bhukhi?**

1. Centre for Earth Science Studies, 2011, CRZ Report for Mundra Port SEZ-Phase 2
2. Centre for Earth Science Studies, 2011, CRZ Report for Mundra Port SEZ-Phase 2
3. Letter from Expert Committee to Centre for Earth Science Studies. March 22, 2013
4. Centre for Earth Science Studies, March 26, 2013, Electronic mail response
5. Centre for Earth Science Studies, March 26, 2013, Electronic mail response

6. Critical Issues not in ToR

79. Adani Port and Special Economic Zone Ltd. March 2013.Progress report

ANNEXURE 1

11-47/2008-IA.III
Government of India
Ministry of Environment & Forests
(IA Division)

Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi – 110 003,

Dated: 14th September, 2012

Office Memorandum

Subject: Constitution of Committee for inspection of M/s Adani Port and SEZ Ltd, Mundra, Gujarat. – Reg.

Ministry had granted Environment and CRZ clearance on 12.01.2009 to M/s Adani Port and SEZ Limited (Formerly Mundra Port and SEZ Limited) for the development of Port facilities at Mundra, District Kutch, Gujarat.

2. On representation from Shri Bharat Patel, General Secretary, Machchhi Mar Adhikar Sangarsh Sangathan, Ministry conducted a site inspection on 06-07th December, 2010. The Site inspection revealed certain violations related to construction of airport, township, and hospital without prior EC/CRZ clearance and destruction of mangroves. On 15.12.2010, a show cause notice was issued to the project authorities. Further, the Ministry issued directions on 23rd February, 2011 to project authorities not to undertake any reclamation activity and not to initiate any new construction work in the CRZ area.

3. Meantime, Kheti Vikas Sewa Trust have filed a PIL 12 of 2011 in the High Court of Gujarat alleging violation of Environmental Clearance by M/s Adani Port and SEZ Limited. The High Court passed an order directing inquiry into the allegation of destruction of mangroves by project authority and imposed stay on development works. The inquiry was conducted by Member Secretary, Gujarat Coastal Zone Management Authority (GCZMA) and PCCF. Based on the report of the committee, the High Court passed an interim order according to which project authority can carry out development in certain portions. The areas in which work can be carried out and the areas in which prohibition will remain were marked on a map, mentioned in the High Court order.

In the affidavit filed by the Ministry in the Hon'ble court of Gujarat, it was stated that 'the issues related to mangroves destruction, shore-line change due to reclamation, seismic/tsunami events, socio-economic implications etc. need to be examined by a multi – disciplinary committee of experts /relevant institutions.

4. Complaints have been received from Kheti Vikas Sewa Trust regarding severe impact upon environment safety and integrity in Mundra Port and SEZ Limited in Mundra, Kutch committed by M/s Adani Port and SEZ Ltd.

5. In view of the severity of the issues involved in the matter, it has been decided to constitute the following committee and make site visit to conduct inspection based on Terms of Reference (TOR) as mentioned in para 6 and submit the report to MoEF.

1.	Ms. Sunita Narain,	-	Chairperson
2.	Shri Anthony Gnanamuthu	-	Member
3.	Prof. R. Ramesh, Director, NCSCM & Member,NCZMA	-	Member
4.	Dr. A.Mehrotra, Director. Regional Office, Bhopal	-	Member
5.	Shri Lalit Kapur, Director, IA-III, MoEF, New Delhi	-	Member

6. The broad terms of reference of the committee for inspection of M/s Adani Ports and Special Economic Zone Ltd are to examine:

(i) the allegations regarding bunding /diversion/blocking of creeks and reclamation etc. and thereby distortion of original HTL.

(ii) the HTL submitted by the Proponent and HTL of approved Coastal Zone Management Plan .

(iii) whether construction of Mundra port, roads, railway was taken up prior to grant of Forest / Environmental Clearance ,

(iv) the development of port with respect to the approved components

(v) compliance to the conditions of the Environmental and CRZ clearance granted for the port development

(vi) the destruction of mangroves and levelling of sand dunes

(vii) the development of Power Plant with respect to the approved components

(viii) compliance to the conditions of the Environmental clearance granted for the Power plant

(ix) the likely impacts on agriculture due to ingress of salinity due to creation of huge water body of sea water for Adani Power Plant at Mundra Taluka.

(x) the issues related to handling of fly ash by Adani Power Limited and particularly with reference to the Notification on utilisation of fly ash.

(xi) the issues related to earthquake /Tsunami/ other natural calamities and soil liquefaction which may be impacted adversely by the project.

7. The TA/DA of the non-official members of the Committee will be borne by Ministry of Environment and Forests, as per the prevailing Government of India rules on the subject.

8. The Committee shall submit its report within three months from the date of constitution.

This issues with the approval of Competent Authority.

(E.Thirunavukkarasu)
Dy. Director (IA-III)
Telefax: 011-24360806

To

1. Ms. Sunita Narain, Centre for Science and Environment 41, Tughlakabad Institutional Area New Delhi-110062 (Fax No. 29955879)
2. Dr. Anthony Gnanamuthu, Old No. 53 and New No. 103 Padmanabha Nagar Adyar, Chennai, Tamil Nadu (Fax No.
3. Dr A.Mehrotra, Director. Regional Office, Ministry of Environment and Forests, Kendriya Paryavaran Bhavan, Link Road No.3, Bhopal-462016 (Fax No. 0755-2463102)
4. Prof. Ramchandran Ramesh Institute of Ocean Management, Anna University, Chennai (044-22300108)
5. Shri Lalit Kapur, Director(IA-III), MoEF, New Delhi.