

# MULTIPLE PIPELINE COLLAPSE IN BHARUCH DISTRICT IN AUG, 2013

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District Collector, Bharuch District



# Structure of Presentation

- Introduction – Bharuch District
- District Flood Vulnerability Profile, Floods -2013,
- Oil and Gas Pipelines – Aug, 2013 Floods
- Challenges & Policy Issues
- District-level Interventions
  - Automatic Weather Stations
  - DARMAT
  - Chemical and Industrial Disaster Management Application
  - DDMP updation

# 1. Introduction

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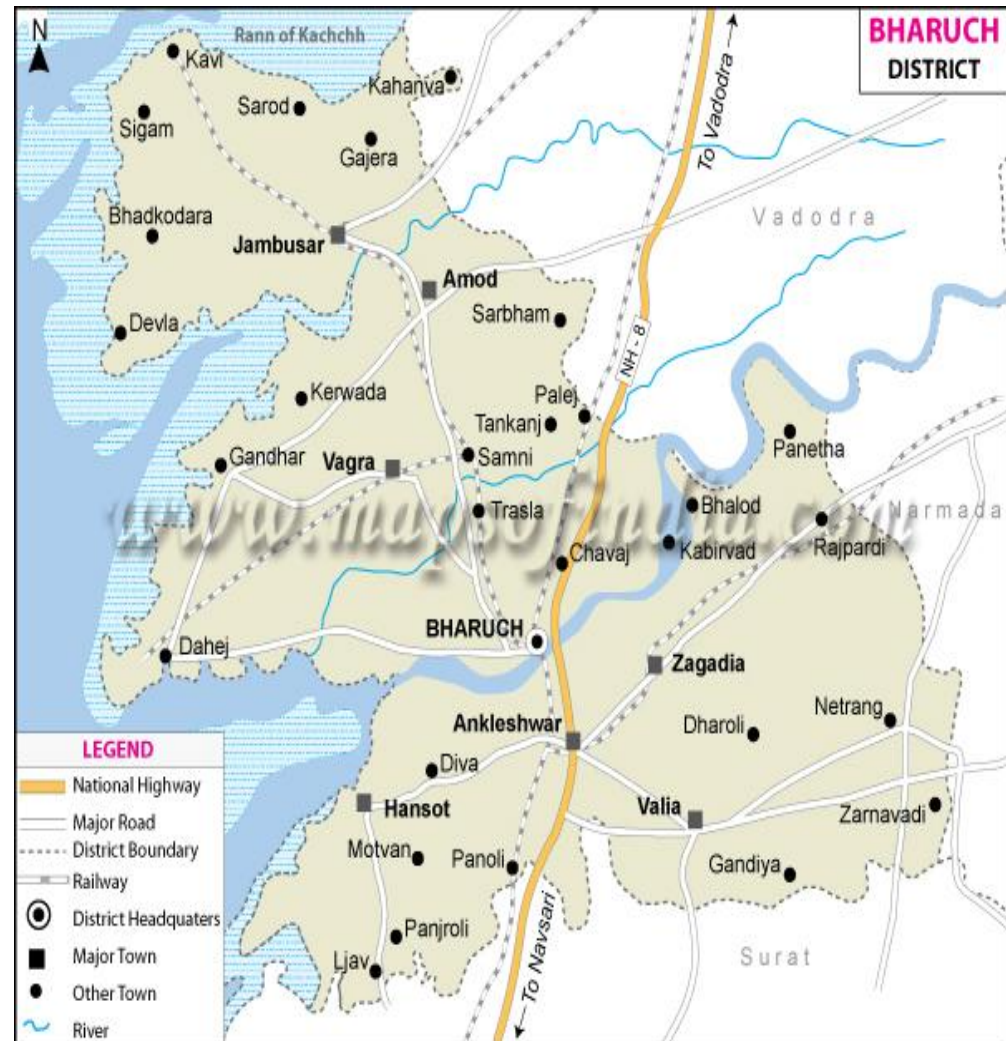
- Area: 5,253 sq. km
- Blocks : 9
- Villages : 662

## Demographic Details

- Population: 15,50,822 (2011 Census)
- Density: 238 persons per sq. km
- Sex Ratio: 924
- Literacy: 83.03%

## Location

- National Highway No 8 passes through the district, connecting it with Ahmadabad (182 km) and Mumbai (362 km), along with the DMIC
- Dahej Port, LNG Terminal



# Economic Profile

4

## ➤ Industry

- Bharuch is a major industrial base in sectors as diversified as chemicals & petrochemicals, textiles, drugs & pharmaceuticals and ports & ship building,
- PCPIR: Petroleum, Chemical & Petrochemical Investment Region
- 9 SEZs, 16 Industrial Estates, 11,900 Small & Medium Enterprises

## ➤ Minerals

- 52% of the State's lignite is found in Bharuch
- 92% of silica sand is produced in the district

## ➤ Agriculture

- Black Cotton Soil, Narmada Canal Irrigation, Cotton, Sugarcane, Bananna cultivation

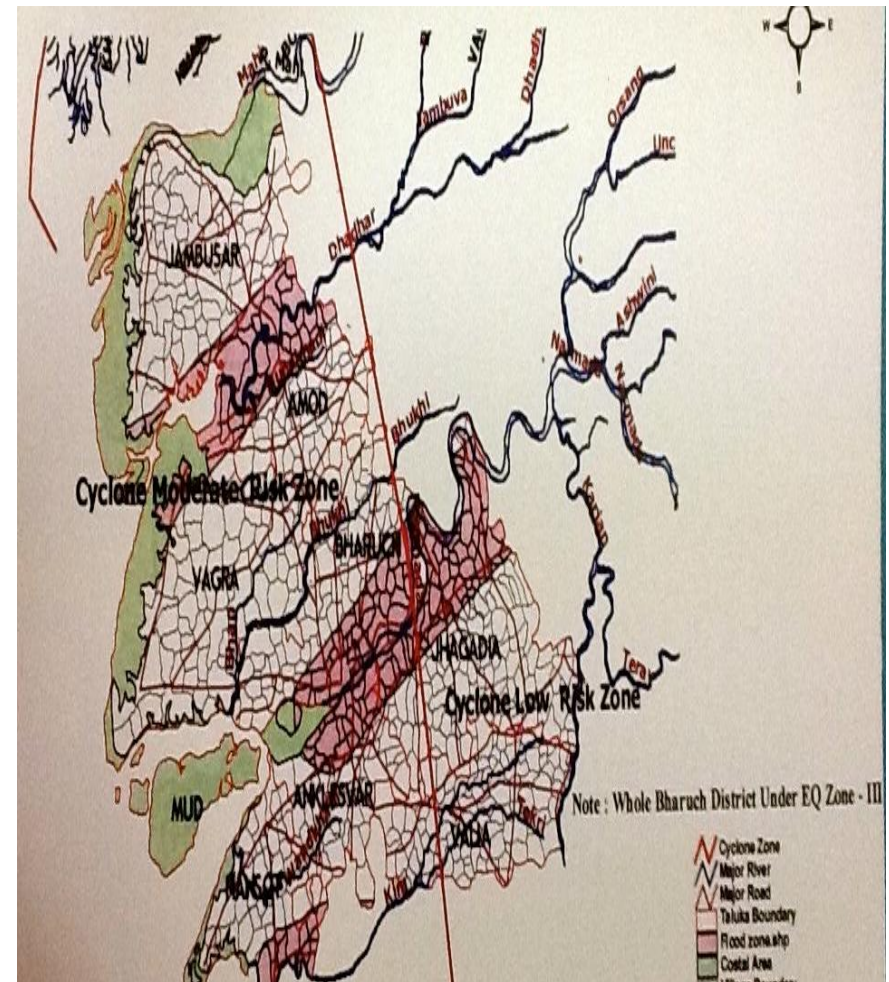
# Leading Companies in the PCPIR



# 2. Flood Vulnerability Profile

- Vulnerable Villages: 216
- Rivers Basins: Narmada, Dhadhar
- Natural Drain: Bhukhikhadi,
- Danger level : 24 ft at Golden Bridge, Narmada

Water Level (in feet)	No. of Years (out of 44)
32	10
30	17
28	23
26	26
24 (Danger level)	29



# 2. Experience of Floods - 2013

- 1<sup>st</sup> - 4<sup>th</sup> August, 2013
  - 32.24 ft on 3.8.13,
  - 4164 persons evacuated in 23 habitations.
  
- 22<sup>nd</sup> - 28<sup>th</sup> August, 2013
  - 35.75 ft on 25.8.13,
  - 17,134 persons evacuated in 46 habitations.

Year	Narmada Golden Bridge Water Level
1970	41.50
1973	37.07
1984	35.00
1990	37.01
1994	39.54
2013	35.75

# 2. Experience of Floods - 2013

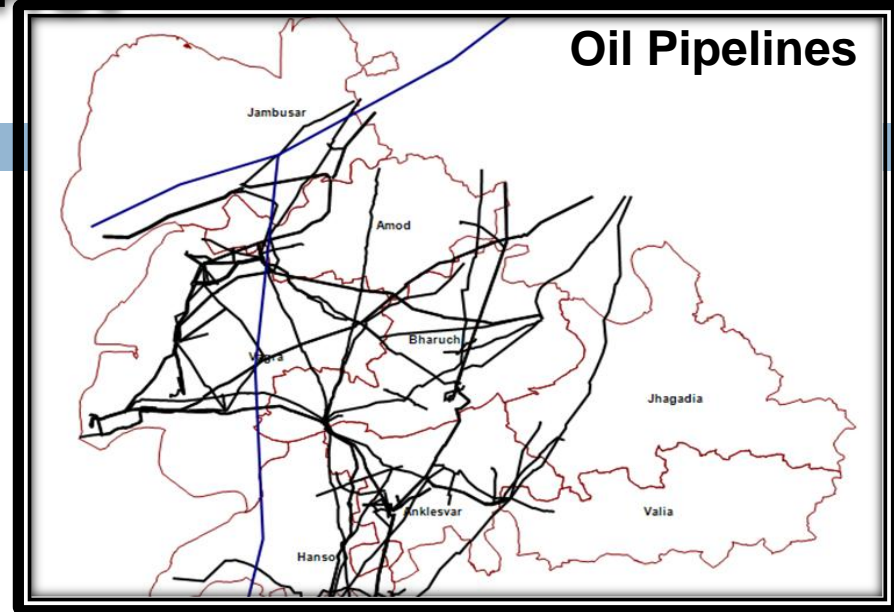
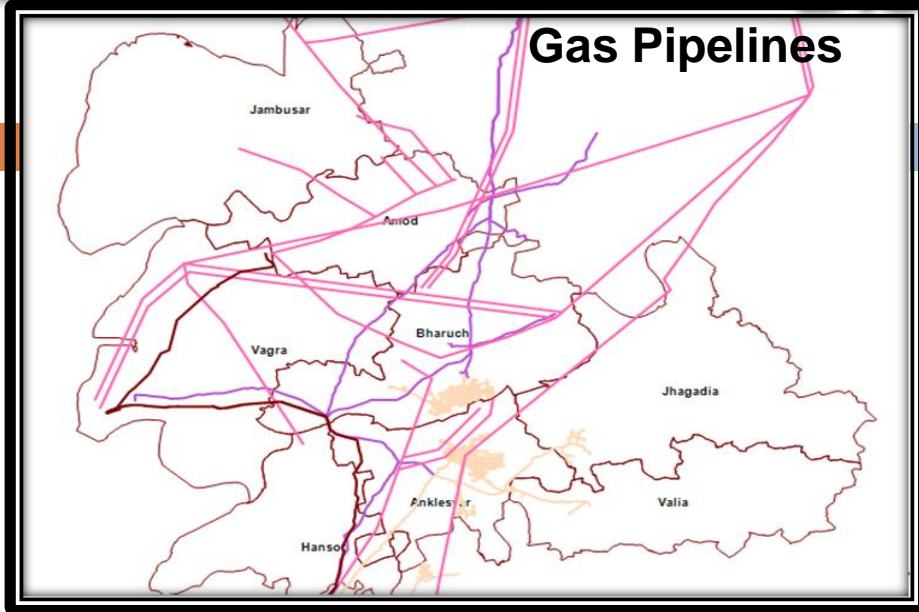
- 22<sup>nd</sup> – 25<sup>th</sup> Sept, 2013
  - 33.5 ft at Golden Bridge on 24.9.13,
  - 102.6 ft at Dhadhar River on 25.9.13,
  - Bhukhikhadi overflow – Dahej and industrial belt,
  - Heavy Rainfall (in mm)
- 35,139 persons evacuated in 102 habitations,
- 64,150 ha agricultural land affected,
- Inundation of 72 residential societies,
- 61 roads cutt off,
- 4 coys of NDRF, 1 coy Army

22/09/2013	23/09/2013	24/09/2013	25/09/2013	26/09/2013
118.25	113.75	124.75	102.00	103.06





# 3. Oil & Natural Gas pipelines – Bharuch District



Map Source: GSDMA Website

- Gujarat Gas Distribution
- GSPL
- GAIL North South
- Reliance

- INDIANOIL
- ONGC ANKLESHWAR

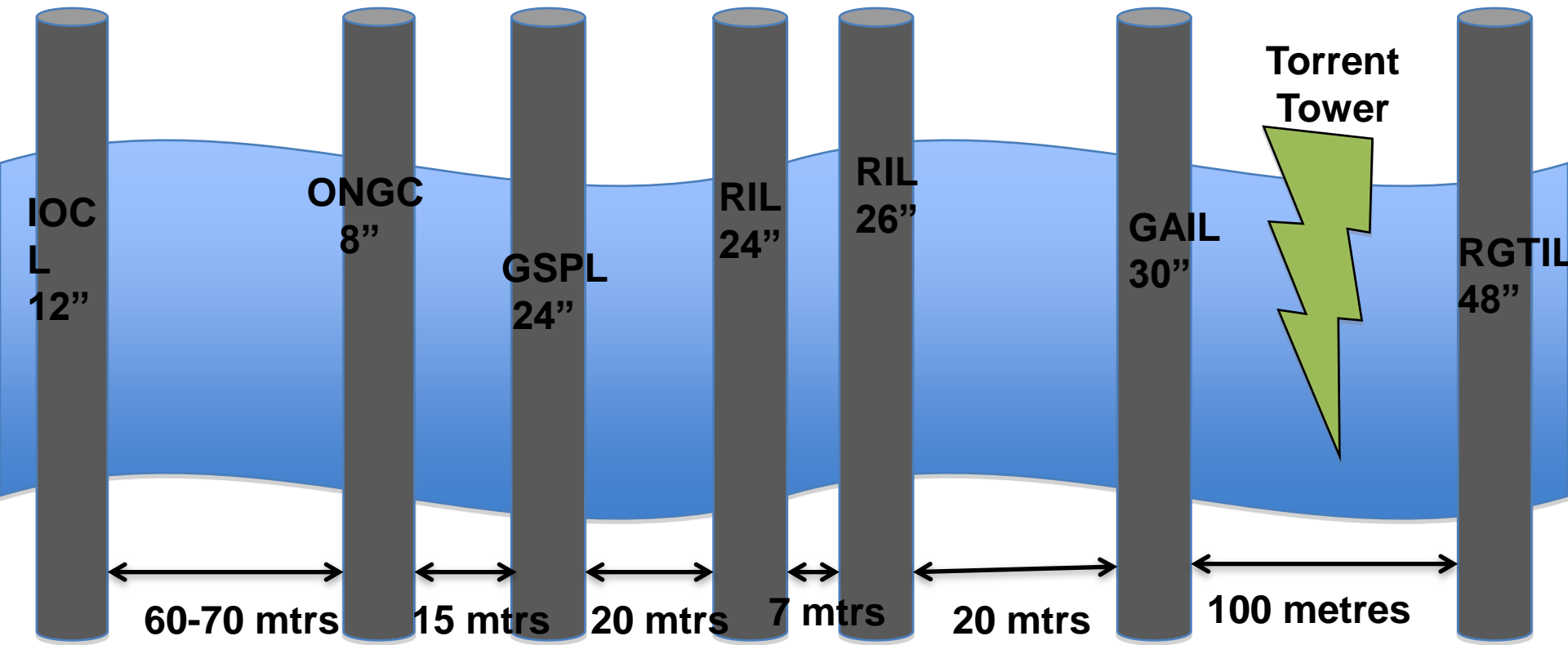
- There are total 7 pipeline operators in the district
- 2 of these operate Oil pipelines (IOCL and ONGC)
- 5 operate gas pipelines (RIL, RGTIL, GSPL, GAIL, Gujarat Gas) of which Gujarat Gas is a city gas distribution network.

# Route Details of Pipelines crossing river Narmada at Bhadbhut village

Sr.	Company	Pipeline Detail	Oil/Gas
1	GAIL	Dahej – Uran – 30”	Compressed Natural Gas
2	RIL Ind.	Hazira to Dahej 26”	Semi-Rich and Lean Natural Gas
		Hazira to Dahej 24”	
3	RIL Gas Transportation Ltd.	Kakinada(A.P.) to Bhadbhut 48”	Compressed Natural Gas
4	GSPL	Ankleswar to Dahej 24”	Compressed Natural Gas
5	ONGC	Ankleswar to Gandhar 8”	Crude Oil
6	IOCL	Amod to Hazira 12.75”	Oil Products

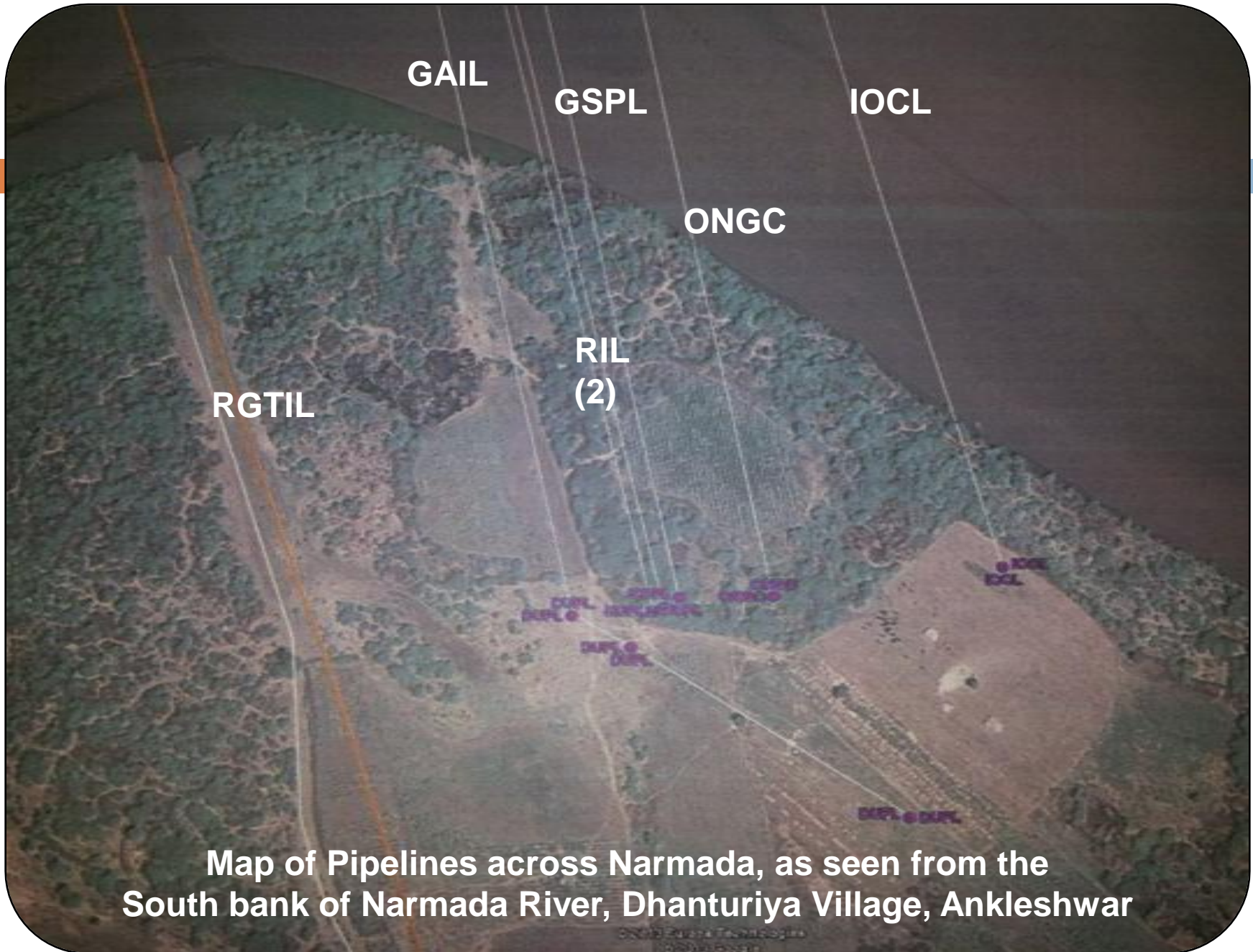
- GAIL - Hajira-Vijaypur-Jagdishpur – 36” Crossing through Janor
- ONGC (OPAL) proposed line for Naptha crossing through Bhadbhut from Hajira to Dahej 12”

# Position of Pipelines across the Narmada in Bhadbhut Sector, Approximate distance between them



Distance between pipelines: Approximately

**Bhadbhut Village (North Bank of River Narmada, Bharuch side)**



**Map of Pipelines across Narmada, as seen from the South bank of Narmada River, Dhanturiya Village, Ankleshwar**

**Incident: on 25<sup>th</sup> August 2013, there was explosion in the DUPL natural gas pipeline of GAIL and breakage in the 26” gas pipeline of RIL. This was followed by incident of oil leakage in the ONGC pipeline on 28<sup>th</sup> August 2013.**



**Torrent Transmission tower on the south bank of the Narmada River**



**Transmission tower on the south bank of the Narmada River: It was on land but now it is in 10 m depth of water due to erosion.**



# Sequence of Events: Pipeline Disaster, Bharuch

**25<sup>th</sup> August  
2013**

- Explosion/Leakage of natural gas in Dahej-Uran Pipeline of GAIL (India) Ltd.
- Breakage of 26" dia semi-rich gas pipeline of Reliance Industries Limited, Dahej
- District Administration issues order of immediate shutdown of all pipelines in Bharuch District.

**26<sup>th</sup> August  
2013**

- District Crisis Group (DCG) Meeting called; all pipeline operators asked to verify structural safety of their pipelines and submit safety undertakings.
- District Administration permitted resumption of operations of GAIL (HVJ Pipeline), RGTIL and GSPL, based on a joint report by GPCB and DISH, and subject to undertakings and fulfillment of safety preconditions, including a third-party technical inspection from among the approved panel of PNGRB.

**27<sup>th</sup> August  
2013**

- Letter sent to GSDMA requesting issuance of necessary instructions to PNGRB to conduct a third party technical inspection of all affected pipelines in the district and to verify the safety of the same.
- ONGC had submitted a written undertaking that all residual oil in their pipeline laid across the Narmada would be displaced by water by this date. It was subsequently realised that this was not done.



**28<sup>th</sup> August  
2013**

- Residual oil leakage occurred from ONGC pipeline near Bhadbhut village, by the Narmada river in Bharuch District.

**29<sup>th</sup> August  
2013**

- District Administration informed of above oil leakage by GPCB, who also wrote to the Coast Guard, Gandhinagar for immediate cleaning of oil spill.
- ONGC officials reached site; submitted a preliminary report acknowledging the presence of minor traces of crude oil. ONGC also arranged to procure Oil Spill Dispersant from Mumbai.
- IOCL submitted a written undertaking stating that their pipeline has been shutdown since 5<sup>th</sup> Januray 2013 and the river section of the pipeline is empty and that it is safe.
- All companies asked to re-evaluate safety preparations and submit undertakings.

**30<sup>th</sup> August  
2013**

- In post incident surveillance report by Coast Guard Gandhinagar, 'a thin silvery oil sheen' reported, extending 2-3 nautical miles towards the sea.
- Coast Guard recommends mechanical churning of oil by small mechanised boats instead of spraying OSD(Oil Spill Dispersant).
- Report by SDM Bharuch– immediate measures to plug oil leakage by ONGC not satisfactorily complied with.
- ONGC submitted report that their site visit revealed no oil leakage from their pipeline and that 'oily sheen' observed by Coast guard is likely to be condensate of other companies' ruptured pipelines.

31<sup>st</sup> August  
2013

- GPCB submitted report certifying presence of oil and grease far beyond normal levels from an oily waste sample, and that ONGC had not plugged the leakage till then.
- A show-cause notice was issued to ONGC by the District Administration for non-compliance of safety conditions and failing to give notice of incident.
- GPCB also issued notices to GAIL, RIL for failing to intimate the concerned authorities about the incident and lapses in safety procedures.

September  
2013

- 1<sup>st</sup> September 2013: Independent High-Level Technical team, i.e. M/S CEIL, Mumbai appointed by Energy & Petrochemical Department
- ONGC replied to show-cause notice issued by the District Administration
- ONGC conducted churning of oil in affected area by boats up to 13<sup>th</sup> Sept 2013 and Crude oil trapped in river section was displaced by ONGC.

October  
2013

- RIL-24" pipeline also fractured despite attempts at restoration, GSPL-24" pipeline, depressurized and isolated, afloat for 100 m
- For further recovery of residual oil under the riverbed, i.e. U-tube section portion, ONGC has engaged the services of expert agency M/S Sea Care Marine ,Mumbai. For this, conditional permission was granted by GPCB subject to clearance from the Gujarat Maritime Board.

21<sup>st</sup> November  
2013

- Review and policy meeting organized by GSDMA to discuss policy vacuum and multiplicity of laws and agencies granting ROU to pipeline operators.

# Vulnerable Villages



- Villages Immediately abutting pipelines:
  - *Bhadbhut (3835), Dhanturiya (4717).*
- Downstream Villages in case of oil Leakage:
  - ***Bharuch***: *Kasava (1336), Mahegam (1235),*
  - ***Vagra*** : *Kaladra (1663), Suva (1920), Ambetha (1552), Jageshwar (1571), Rahiad (1694), Lakhigam (4938).*
- **Total vulnerable population: 24,661.**

*(Population figures of villages stated in brackets)*

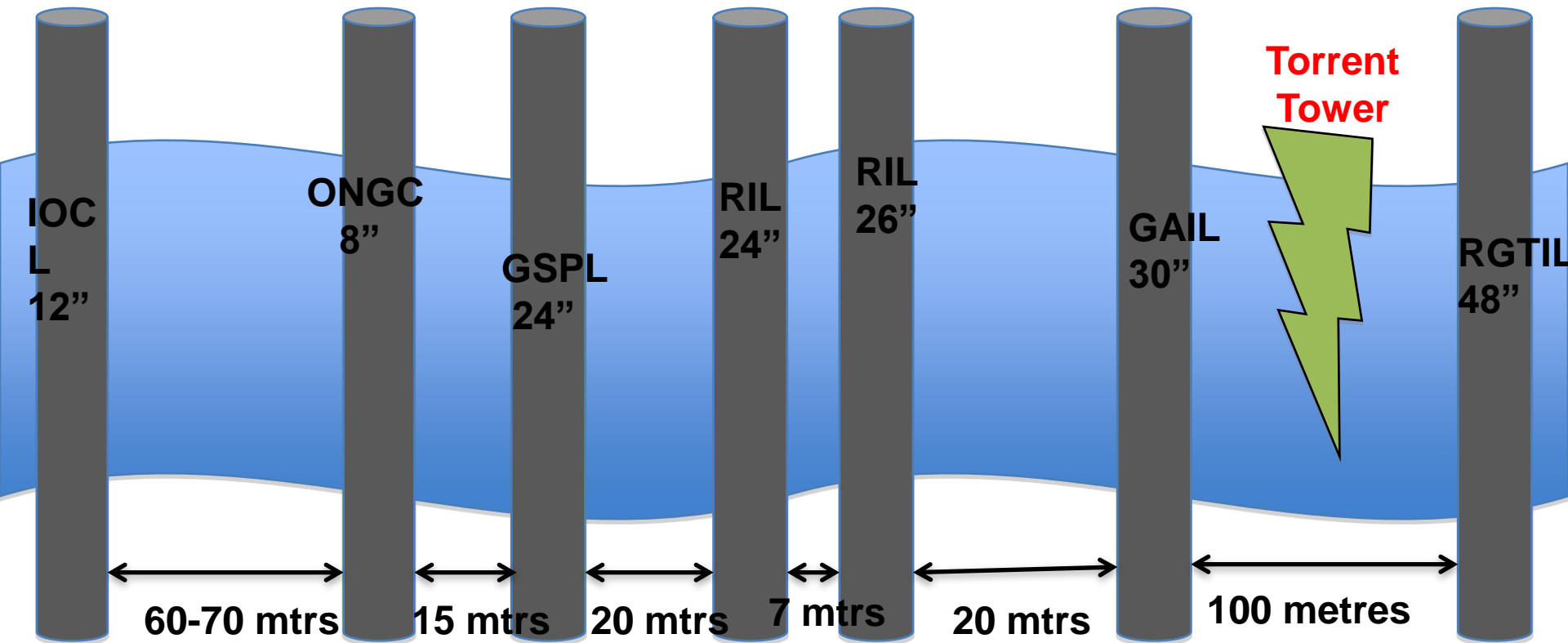
# 4. Policy Issues & Suggestions

- Safe Distance between Pipelines,
- Special Guidelines for High Density Pipeline Corridors,
- RoU permissions – Local consultation,
- Incident Reporting and Post-Incident Action.

# Policy Issue (1): *Safe Distance between pipelines*

- Pipelines in Bhadbhut sector are laid at varying distances from each other. Companies technically assess safe distances by themselves, and the final permission to lay pipelines is granted by Chief Controller of Explosives (PESO) or the PNGRB,
- PNGRB(Technical Standards and Specifications including Safety Standards for Natural Gas Pipelines) Regulations, 2009 mention safe distance between pipelines but no special provisions for high-density pipeline corridors especially laid through rivers or water bodies,
- Issue of safe distances vis-à-vis ***other critical installations***, especially in high-density pipeline corridors ( E.g. GAIL's pipeline is appx. 50 meters from Torrent power's Transmission Tower. )
- Need for clarity of procedures while granting ROUs to companies for different installations; granting a role to the District Administration for coordinating between different agencies granting approvals.

# Position of Pipelines across the Narmada in Bhadbhut Sector, Approximate distance between them



Distance between pipelines: Approximately

**Bhadbhut Village (North Bank of River Narmada, Bharuch side)**

# Policy Issue (2): *RoU Permissions*

## ROU & other permissions

Granted by the Ministry of Petroleum and Natural Gas, Government of India under the Petroleum and Minerals Pipelines (Acquisition of Right of User in Land) Act 1962 by way of publication in the Official Gazette of India.

Irrigation Department:  
Agreement with the State Irrigation Department to lay pipelines across the River bed.

## Technical Standards for Construction, Design & Safety

Technical safety of designs for Petroleum Pipelines are approved by Chief Controller of Explosives (PESO)

Technical safety of natural gas pipelines are covered under PNRGB(Technical Standards and Specifications including Safety Standards for Natural Gas Pipelines) Regulations, 2009.

Oil Industrial Safety Directorate (OISD) Standards.

Directorate General of Mines Safety under Section 6(1) of the Mines Act 1952.

# Details of ROU Permission taken by Pipeline Industries as follows

Sr.	Name of Industries	ROU permission Authority	Year
1	Gujarat State Petronet Ltd.(GSPL)	PMP Act 1962, Agreement with Irrigation Dept	2000
2	Indian Oil Corporation Ltd.(IOCL)	PMP Act 1962, Agreement with Irrigation Dept	2009
3	Reliance Industries Limited(RIL)	PMP Act 1962, Agreement with Irrigation Dept	2000
4	Reliance Gas Transportation Infra' Ltd'(RTGL)	PMP Act 1962, Agreement with Irrigation Dept	2008
5	GAIL (India) Limited (GAIL)	PMP Act 1962, Agreement with Irrigation Dept	2003, 2004
6	Oil & Natural Gas Corporation(ONGC)	PMP Act 1962, Agreement with Irrigation Dept	2009



# 3. Incident Reporting & Post Incident Action

## Notice of Accident:

**Section 27 of The Petroleum Act, 1927 and Rule 101 of The Petroleum Rules 2002, Section 9(1)(a) of Environment Protection Act 1986 and Section 5 of MSIHC Rules 1989, PNGRB (Codes of Practices for ERDMP) Regulations, 2009.**

## Remedial Measures:

**Section 9(2), 9(3) of the Environment Protection Act, 1986 and Section 29 (3) of the Gujarat State Disaster Management Act 2003**

**Pipeline operators laying their pipelines across river-beds should be made stakeholders in plans to protect riverbanks from erosion. Laying pipelines through an overhead corridor above the river can be considered where possible.**

**Possible Suggestions and Recommendations**

**(1)**

**Right of User permissions to Telecom and Power Towers are granted by the Central Govt. without local consultation. An NOC can be obtained from the concerned District Authority in these cases to ensure safe distances.**

**Technical safety standards should be specified statutorily for high-density pipeline corridors**

All oil pipeline operators must necessarily have the wherewithal to immediately deal with incidents of oil leakage (for cleaning and disposal) e.g. OSD sprays, boats to churn the oil, etc. and must adhere to OISD-GDN-200 (Guidelines for preparation of Oil Spill Response Contingency Plan) of OISD

**Possible Suggestions and Recommendations**

**(2)**

It must be made mandatory for all pipeline operators to inform both the District Administration and any other installations on either side of their pipeline when undertaking repair work or relaying pipelines.

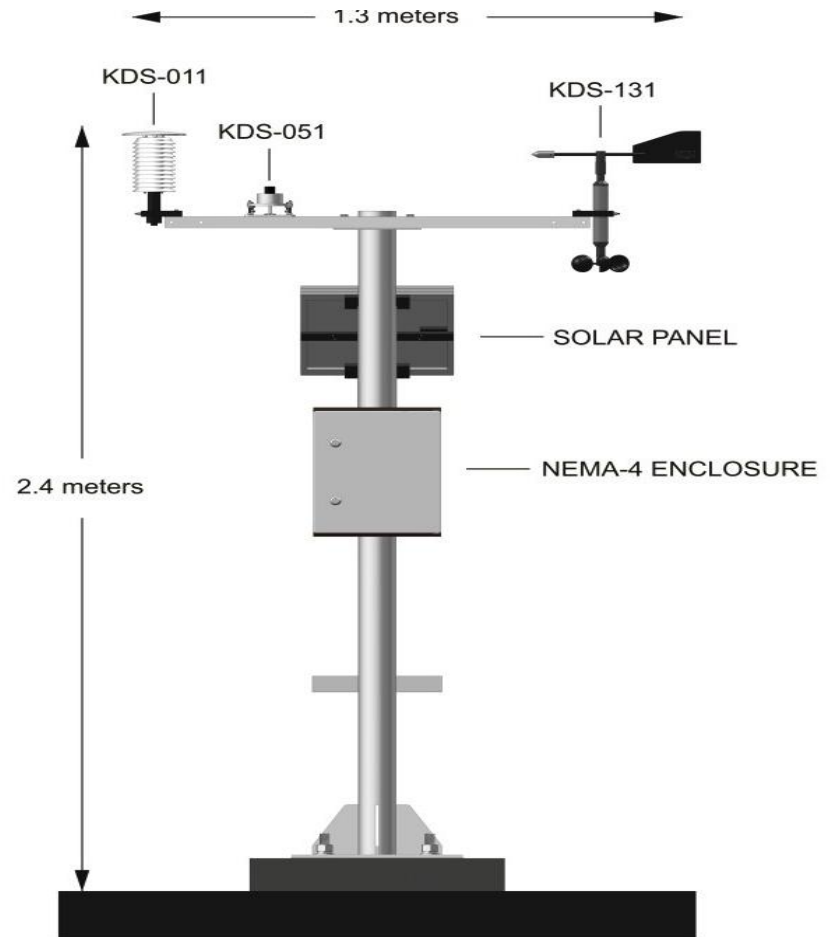
The exact location of laying pipelines across a riverbed must be approved carefully by the Irrigation Department after undertaking a hydrodynamic survey of the area and the erosion on riverbanks. This should be avoided in the narrowest part of the river where water pressure and flow during floods is maximum.

# 5. District Level Interventions

- Automatic Weather Stations,
- Disaster Alert and Resource Management by Application of Technology,
- Chemical and Disaster Management Application,
- DDMP updation.

# 1. Automatic Weather Stations

- Real-time Weather and Water Level Data transmitted through GSM/GPRS network,
  - Measures air temperature, wind speed, wind direction, rainfall and water level,
  - 12 AWSs proposed at all Taluka HQs, Golden Bridge, Dhadhar River, Bhukhikhadi
  - Budget: 26 lakhs,



## 2. DARMAT

- GIS-based application with mobile SMS alert provision,
- Multiple Disaster Planning and Response Management,
- Layers of data for infrastructure facilities, road, rail network, canals, vital installations, relief centres, schools, anganwadis, pipelines, hazardous industries, sub-stations etc.
- Digital Elevation Modelling.

# Disaster Alert and Resource Management by Application of Technology(Bharuch District)

GIS

- Dam Site
- Revenue Administrator

Username: Admin

Password: ●●●●●●●●

Login

Cancel

# On selecting dam site from dropdown list of Type you will get location of Dam.

Register Alert and Resource Management by Application of Technology

Type : **---Select---** Dam : **---Select---** Discharge: **--- Select ---**

Administrative Boundary > **Dam Site** > Vital Installation > Natural Resources > Amenities > Hazard > Affected Villages > Facility >

Identify  Pan

**Theme On/Off**

Dam Site

**Theme Selection**

Dam Site  
 Taluka

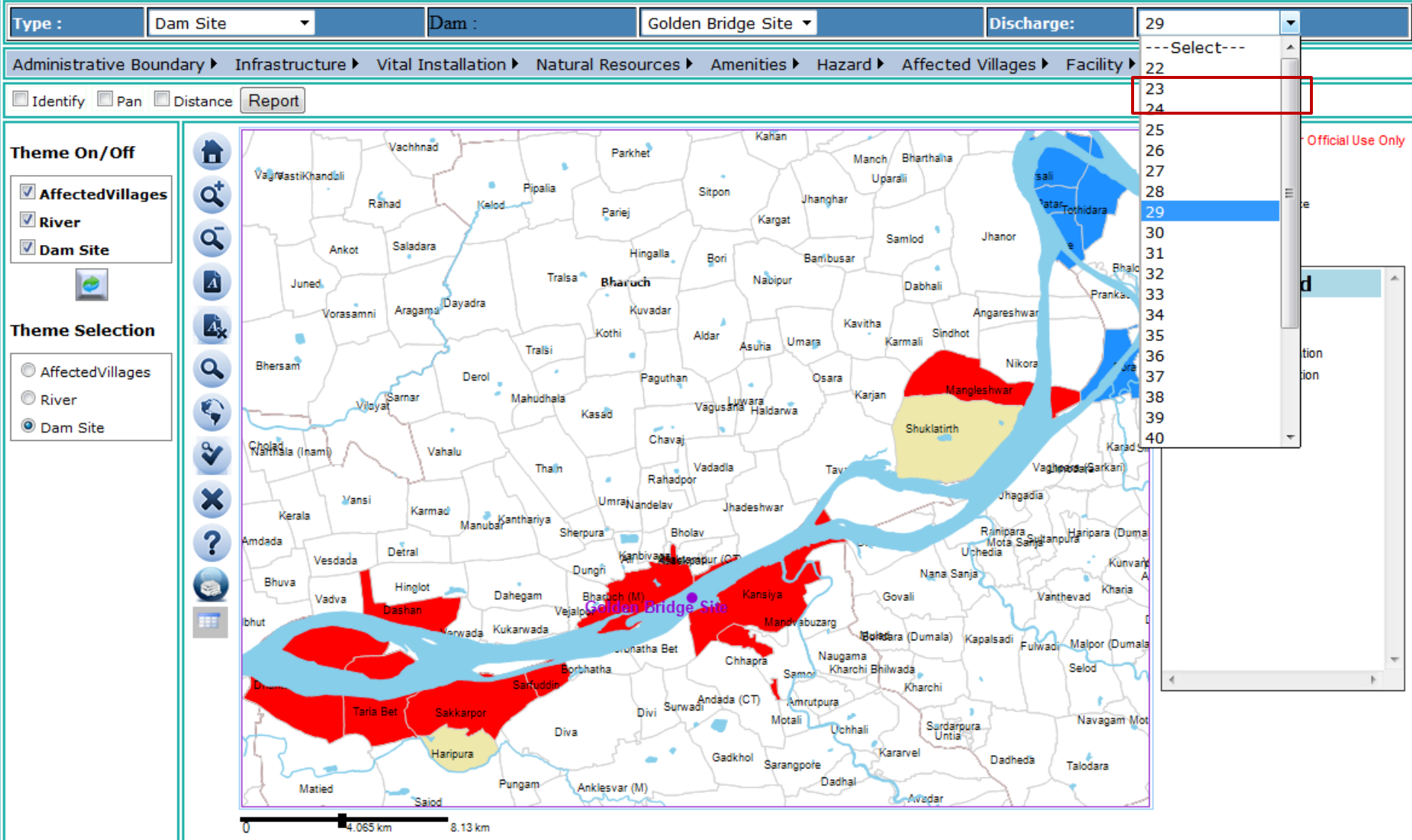
**Legend**

- Taluka
- Dam Site

The map displays the Bharuch district in Gujarat, India, divided into several talukas: Jambusar, Amod, Bharuch, Vagra, Hansot, Anklesvar, Valia, and Jhagadia. Several dam sites are marked with purple dots and labeled: Golden Bridge Site, Daria, Dholi, Dholekham, Baldeva, Koyali Mandvi, and Pigut. A scale bar at the bottom indicates distances of 0, 14.31 km, and 28.62 km. A north arrow and the text 'For Official Use Only' are present in the top right corner. The text 'District : Bharuch' is also visible.



On selecting river site level (i.e Golden Bridge) will get alert, ready for evacuation and immediate evacuation which are affected by floods.



# Disaster Alert and Resource Management by Application of Technology

[Logout](#)

Information - Mozilla Firefox

localhost:53445/Bharuch\_Flood/ward\_grid\_new.aspx

AffectedVillages

Date: 28-04-2014

District	Taluka	Village	Population	signal
Bharuch	Jhagadia	Tarsali	2691	Ready For Evacution
Bharuch	Jhagadia	Patar	56	Ready For Evacution
Bharuch	Jhagadia	Ore	626	Ready For Evacution
Bharuch	Jhagadia	Tothidara	510	Ready For Evacution
Bharuch	Bharuch	Mangleshwar	1938	Immidiata Evacution
Bharuch	Bharuch	Shuklatirth	7502	Alert
Bharuch	Bharuch	Dashan	963	Immidiata Evacution
Bharuch	Bharuch	Bharuch (M)	172339	Immidiata Evacution
Bharuch	Jhagadia	Pora	866	Ready For Evacution
Bharuch	Anklesvar	Dhanturiya Bet	4717	Immidiata Evacution
Bharuch	Anklesvar	Taria Bet	3474	Immidiata Evacution
Bharuch	Anklesvar	Haripura	1470	Alert
Bharuch	Anklesvar	Sakkarpur	2935	Immidiata Evacution
Bharuch	Anklesvar	Sarfuddin	416	Immidiata Evacution
Bharuch	Anklesvar	Chhapra	1335	Immidiata Evacution
Bharuch	Anklesvar	Kansiya	3686	Immidiata Evacution

Export to Excel

DRC

Official Use Only For Official Use Only

Bharuch

Ben Bridge Site

29

## Legend

a

Ready For Evacuation

Immidiata Evacuation

Site

# Disaster Alert and Resource Management by Application of Technology

Type :  Dam :  Discharge:

Administrative Boundary ▶ Infrastructure ▶ Vital Installation ▶ Natural Resources ▶ Amenities ▶ Hazard ▶ Affected Villages ▶ Facility ▶

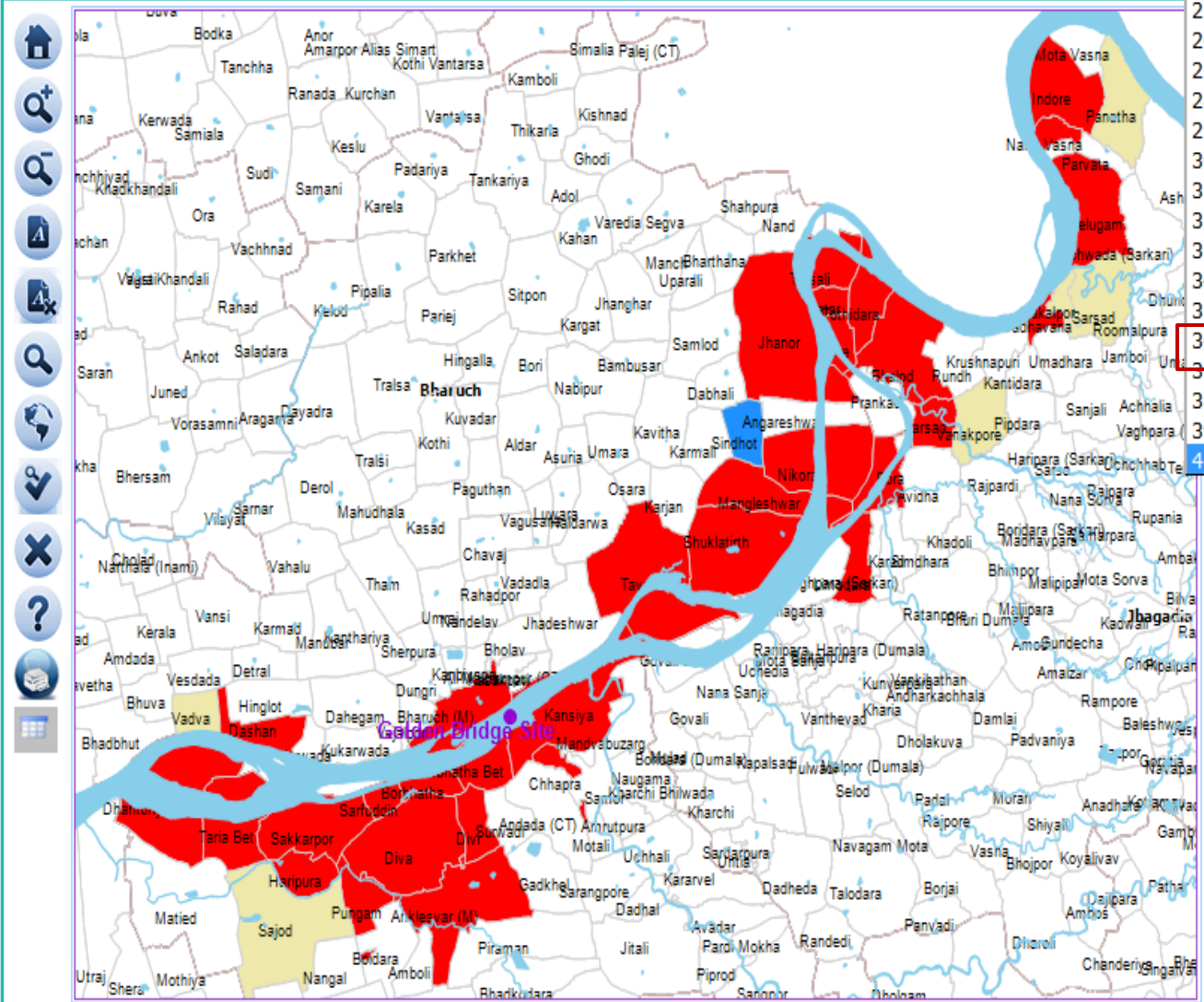
Identify  Pan  Distance

## Theme On/Off

- AffectedVillages
- River
- Dam Site

## Theme Selection

- AffectedVillages
- River
- Dam Site



---Select---

22

23

24

25

26

27

28

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32

33

34

35

36

37

38

39

40

Official Use Only

0 5.705 km 11.41 km

# Disaster Alert and Resource Management by Application of Technology

Type :  Dam :  Discharge:

- Administrative Boundary
- Infrastructure
- Vital Installation
- Natural Resources
- Amenities
- Hazard
- Affected Villages
- Facility

Identify  Pan  Distance

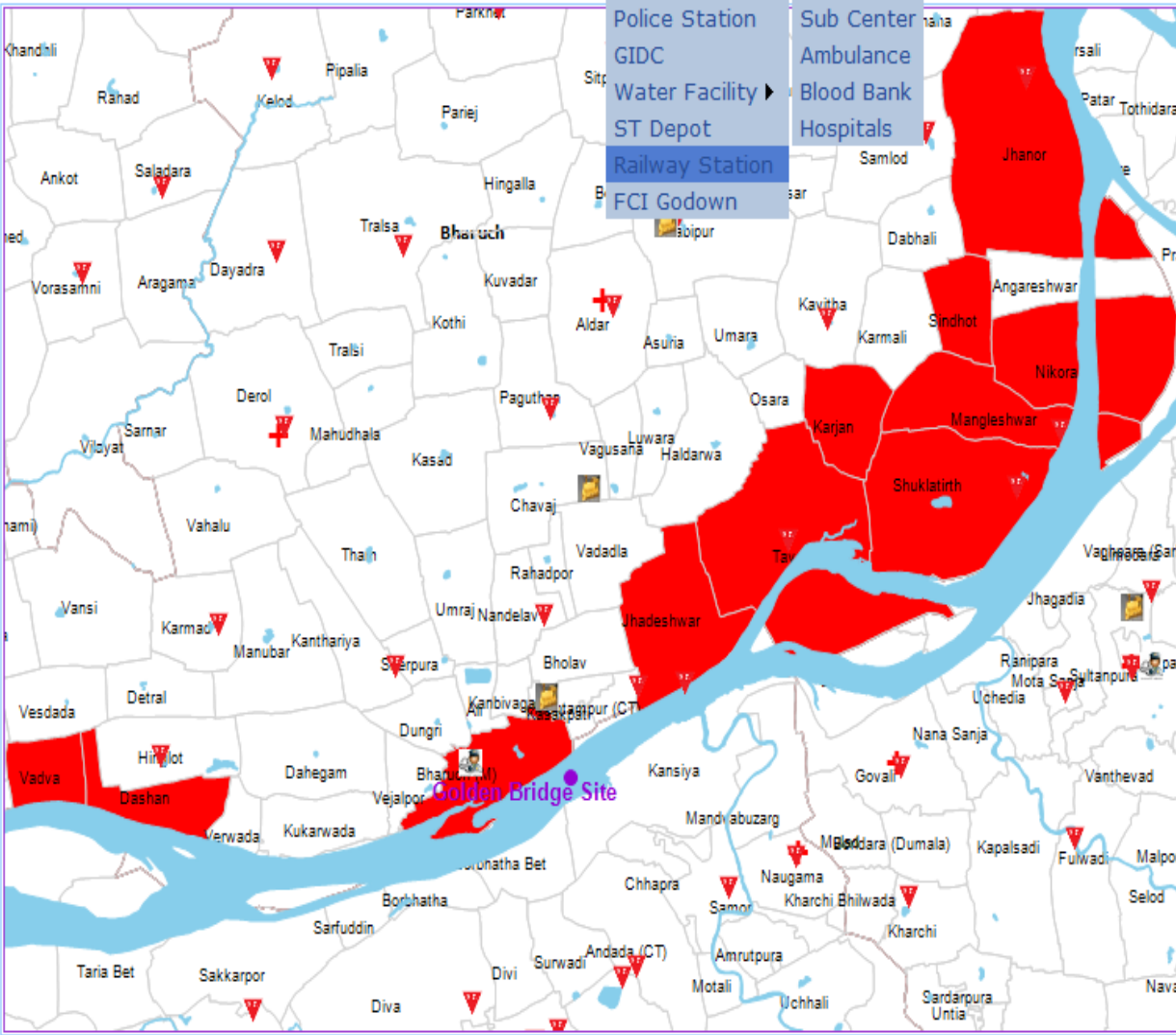
- Health
  - PHC
  - CHC
- School
- Police Station
- GIDC
- Water Facility
- ST Depot
- Railway Station
- FCI Godown

## Theme On/Off

- Affected Villages
- River
- Dam Site
- PHC
- CHC
- Sub Center
- Police Station
- Railway Station

## Theme Selection

- Affected Villages
- River
- Dam Site
- PHC
- CHC
- Sub Center
- Police Station
- Railway Station

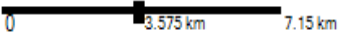


For Official Use Only

District : Bharuch  
Dam: Golden Bridge Site  
Discharge: 46

### Legend

- Taluka
- Alert
- Ready For Evacuation
- Immediate Evacuation
- River
- Dam Site
- PHC
- CHC
- Sub Center
- Police Station
- Railway Station



# Disaster Alert and Resource Management by Application of Technology

Type : Dam Site    Dam : Golden Bridge Site    Discharge: 46

Administrative Boundary ▶ Infrastructure ▶ Vital Installation ▶ Natural Resources ▶ Amenities ▶ Hazard ▶ Affected Villages ▶ Facility ▶

Identify    Pan    Distance

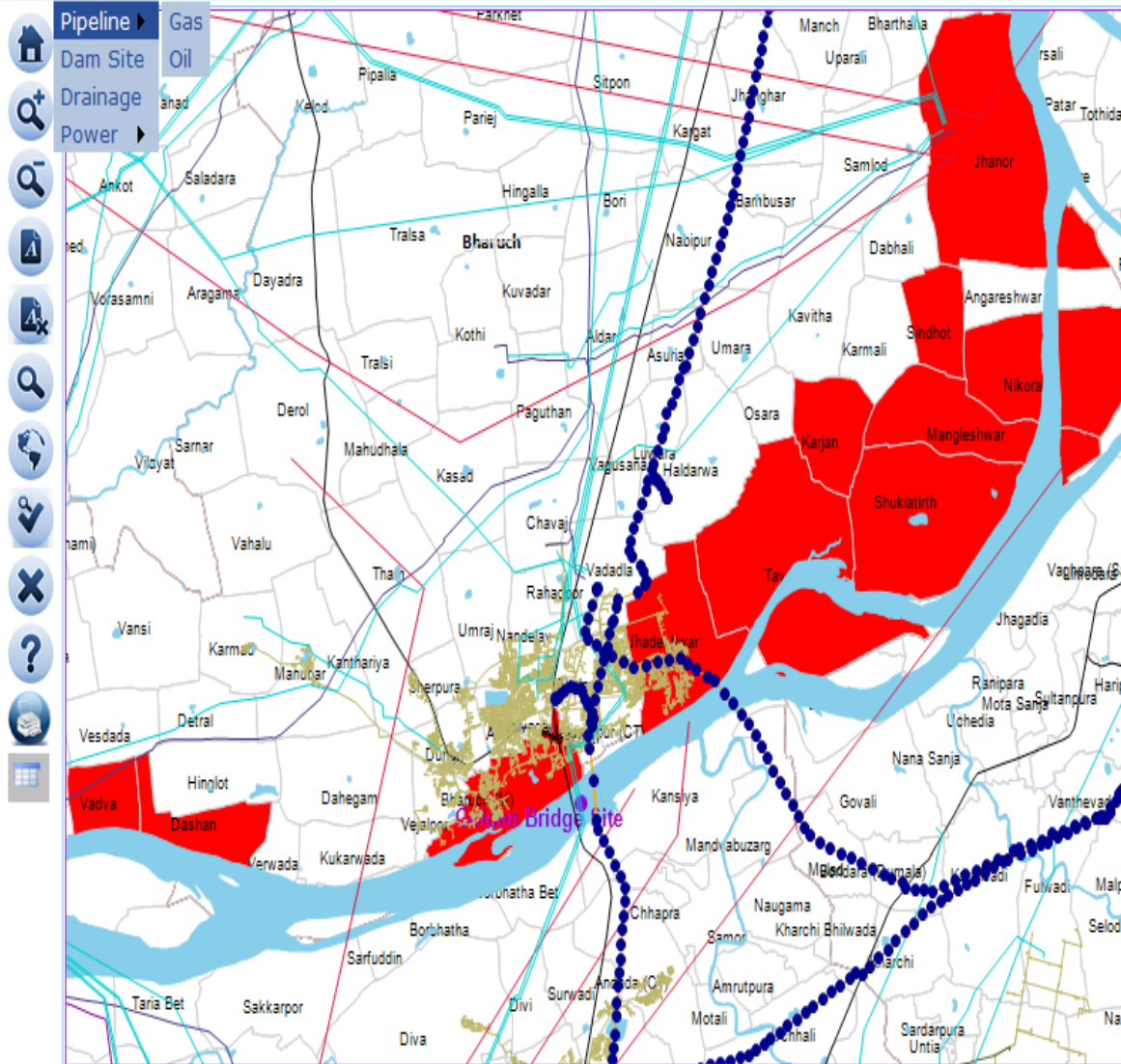
Railway  
Road  
Pipeline ▶  
Gas  
Oil  
Dam Site  
Drainage  
Power ▶

## Theme On/Off

- AffectedVillages
- River
- Dam Site
- Railway
- Road
- Gas Pipeline
- Oil Pipeline
- 132kVA Feeder
- 132kVA Tower

## Theme Selection

- AffectedVillages
- River
- Dam Site
- Railway
- Gas Pipeline
- Oil Pipeline
- 132kVA Feeder
- 132kVA Tower



District : Bharuch  
Dam:Golden Bridge Site  
Discharge:46

For Official Use Only

### Legend

- Taluka
- Alert
- Ready For Evacuation
- Immediate Evacuation
- River
- Dam Site
- Railway
- Gas Pipeline
  - GAIL\_N\_H
  - GSPL
  - GUJARATGAS\_DISTRIBUTI
  - GUJARATGAS\_TRANSMS
  - Reliance
- Oil Pipeline
  - INDIANOIL



# Disaster Alert and Resource Management by Application of Technology

Type :  Dam :  Discharge:

- Administrative Boundary ▶ Infrastructure ▶ **Vital Installation ▶** Natural Resources ▶ Amenities ▶ Hazard ▶ Affected Villages ▶ Facility ▶

Identify  Pan  Distance

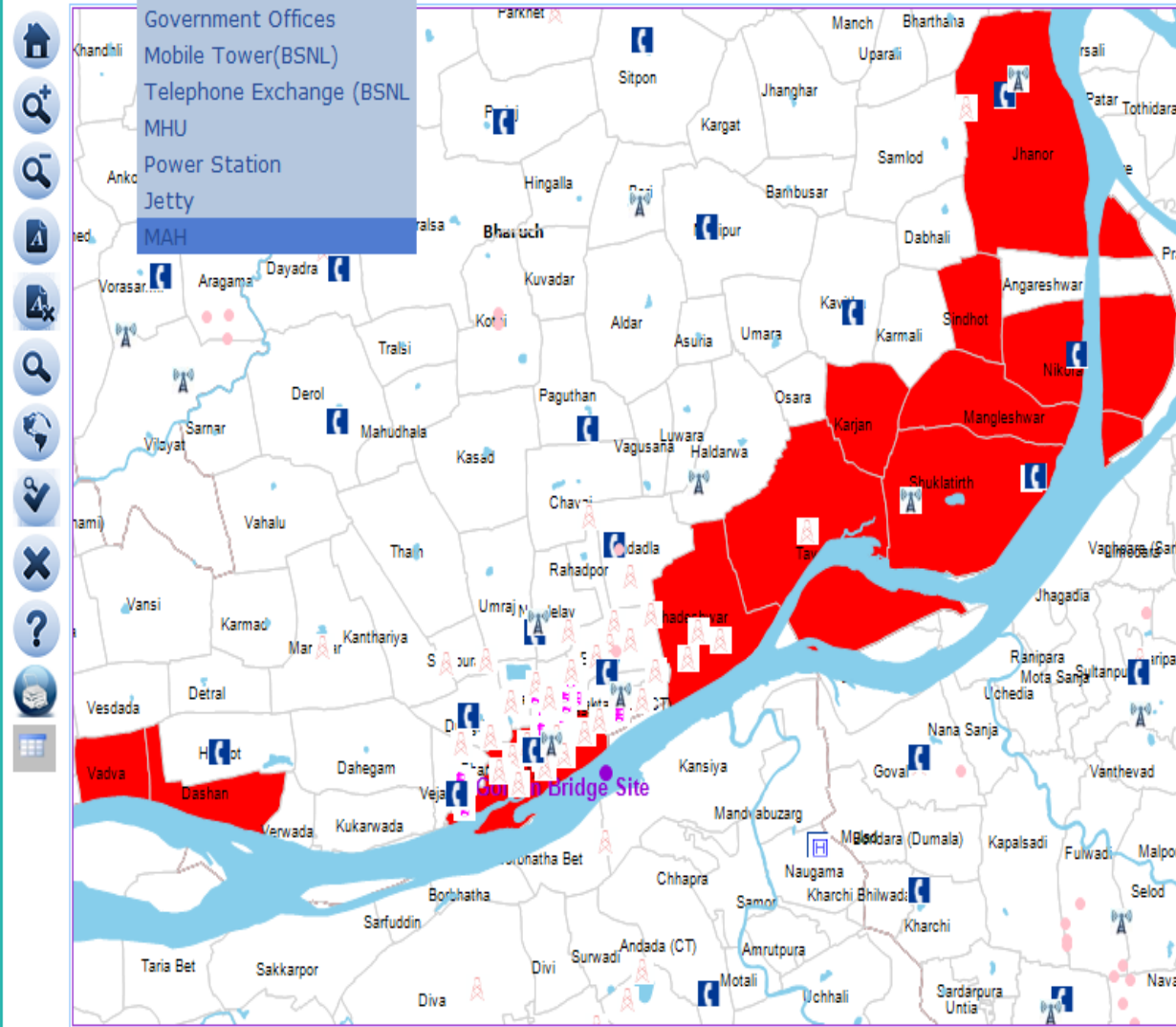
## Theme On/Off

- Affected Villages
- River
- Dam Site
- Government Offices
- Mobile Tower BSNL
- BSNL Telephone Exchange
- MHU
- Powerstation
- Jetty
- MAH

## Theme Selection

- Affected Villages
- River
- Dam Site
- Government Offices
- Mobile Tower BSNL
- BSNL Telephone Exchange
- MHU
- Powerstation
- Jetty
- MAH

- Airport
- Port
- Government Offices
- Mobile Tower(BSNL)
- Telephone Exchange (BSNL)
- MHU
- Power Station
- Jetty
- MAH**



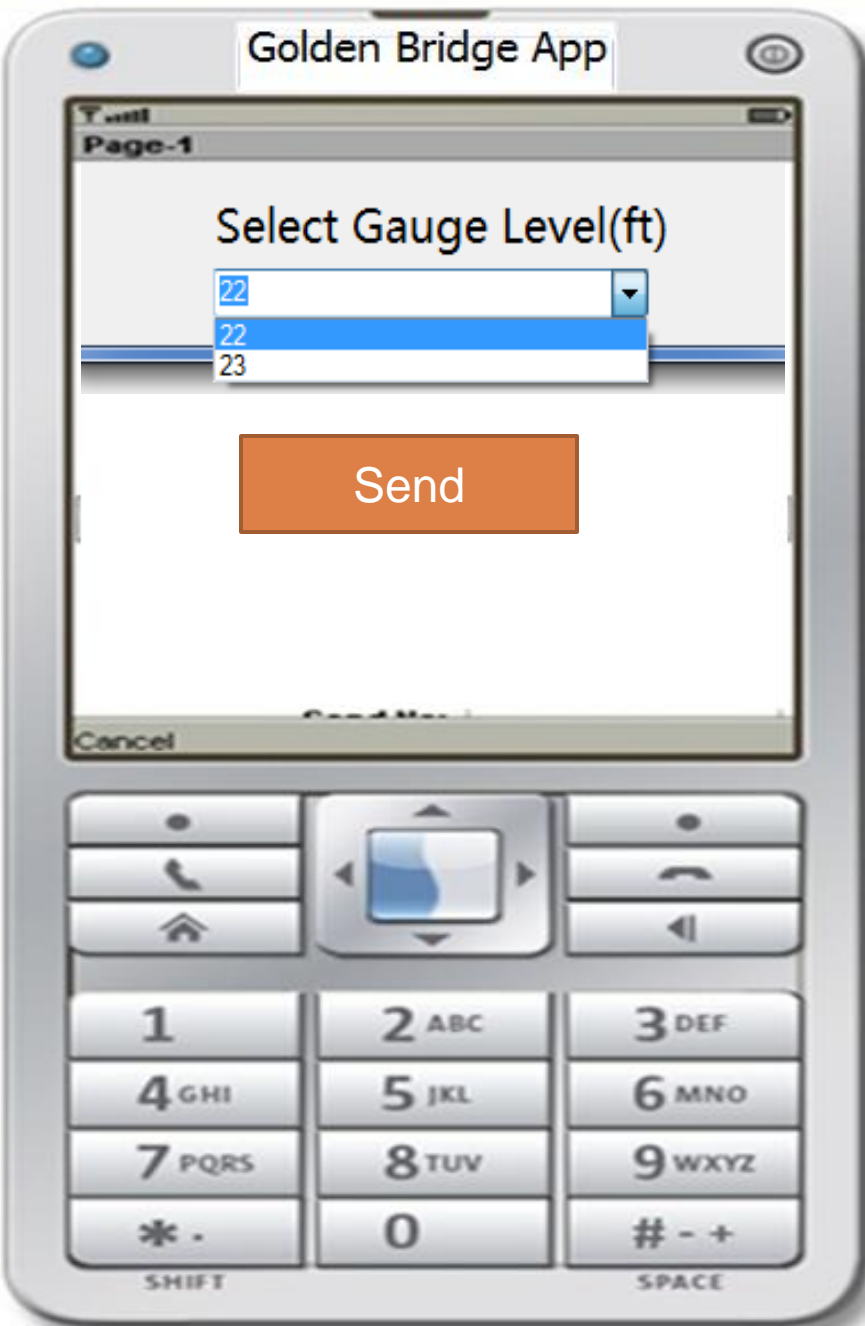
For Official Use Only

District : Bharuch  
Dam:Golden Bridge Site  
Discharge:46

### Legend

- Taluka
- Alert
- Ready For Evacuation
- Immediate Evacuation
- River
- Dam Site
- + Government Offices
- + Mobile Tower BSNL
- + BSNL Telephone Exchange
- + MHU
- + Powerstation
- Jetty
- MAH

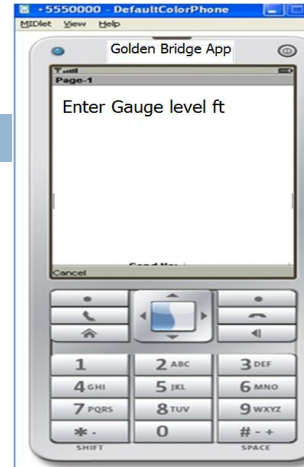
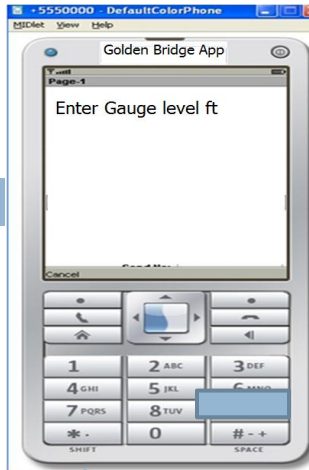




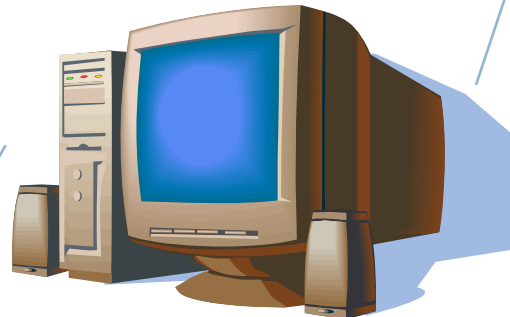


ApnaGam ma Puraavi  
sake tem che to  
salamatjagya par  
khasi java vinanti

Mobile  
Application



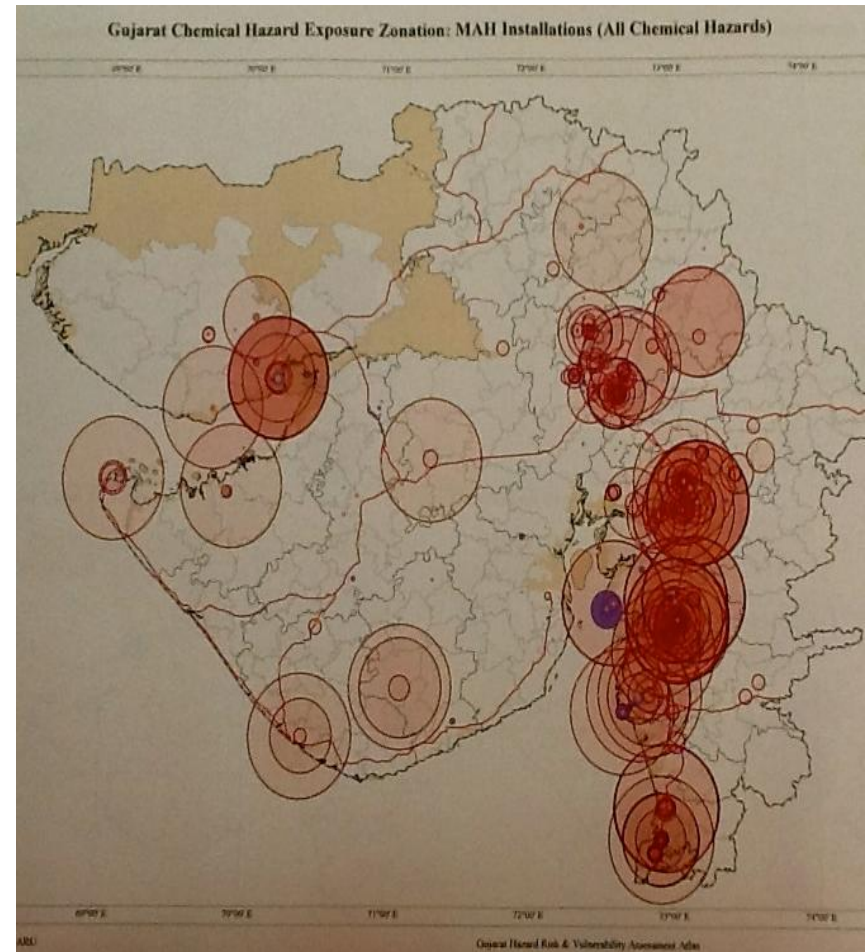
Auto  
Response  
by Server



Server

# 3. Industrial and Chemical Disaster Management Application

- Bharuch is one of two districts in Gujarat to lie in AA Category, i.e. Highly Hazardous,
- 88 MAH units,
- Bharuch has a large no. of stored toxic gases such as chlorine and ammonia, which have toxic endpoints of greater than 40 km,
- Ankleshwar has the 3<sup>rd</sup> largest incidence of storage of HAZCHEM in their MAH units in Gujarat.



### 3. Industrial and Chemical Disaster Management Application

- GIS-based application for computer-aided emergency response management for chemical and industrial disasters,
- Onsite Emergency Plans, Safe Route for Evacuation, Chemical Inventory etc. of all MAH units,
- DPMC, Ankleshwar and Directorate of Industrial Safety and Health to jointly manage the application.

# Dash Board

Wel Come to Chemical and Industrial Disaster Management Application, Bharuch District



Chemical Database

Dynamic Model

Static Model With GIS

Google



Collectorate Bharuch, Bharuch



# Select Chemical

## Chemical Information

View:  Pure Chemicals  
 Solutions

ALLYL CHLOROCARBONATE  
ALLYL FORMATE  
ALLYL GLYCIDYL ETHER  
ALLYL ISOTHIOCYANATE  
ALLYLTRICHLOROSILANE  
ALUMINUM TRIETHYL  
N-AMINOETHYLPIPERAZINE  
2-AMINO-2-METHYL-1-PROPANOL  
**AMMONIA**  
AMMONIUM SULFIDE  
AMPHETAMINE  
N-AMYL ACETATE  
SEC-AMYL ACETATE

Select

Cancel

Add

Modify

Delete

Help

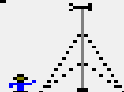
# Select Wind Direction and Wind Speed

## Atmospheric Options

Wind Speed is :   knots  mph  meters/sec

Wind is from :  Enter degrees true or text (e.g. ESE)

Measurement Height above ground is:



OR  enter value :



feet



meters

Ground Roughness is :

Open Country

Urban or Forest

OR

Input Roughness [ $Z_0$ ] :

Open Water

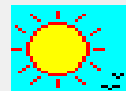
Select Cloud Cover :



complete  
cover



partly  
cloudy



clear

OR  enter value :   
(0 - 10)

OK

Cancel

## Atmospheric Options 2

Air Temperature is :  Degrees  F  C

Stability Class is :   A  B  C  D  E  F

Inversion Height Options are :

No Inversion  Inversion Present, Height is :   feet  
 meters

Select Humidity :



wet



medium



dry

OR  enter value :  %

(0 - 100)

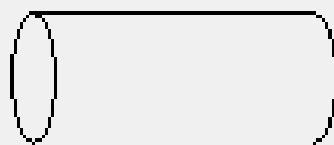
OK

Cancel



Select tank type and orientation:

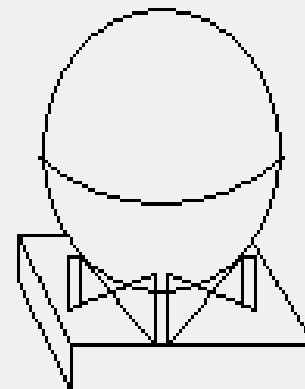
Horizontal cylinder



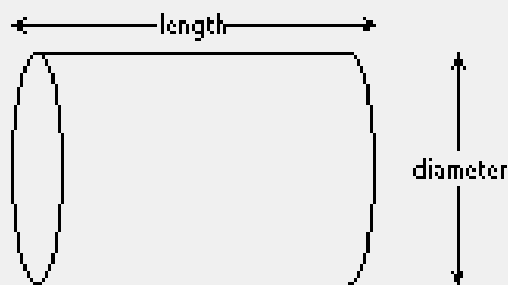
Vertical cylinder



Sphere



Enter two of three values:



diameter

length

volume

feet  meters

liters  cu meters

OK

Cancel

Help

Enter state of the chemical:

Help

- Tank contains liquid
- Tank contains gas only
- Unknown

---

Enter the temperature within the tank:

Help

- Chemical stored at ambient temperature
- Chemical stored at  degrees  F  C

OK

Cancel

## Mass or Pressure of Gas

Enter either tank pressure OR amount of gas

The tank pressure is :

mmHg

atm

psia

Pa

OR

The amount of gas is :

pounds

tons(2000 lbs)

kilograms

cu ft at STP

cu m at STP

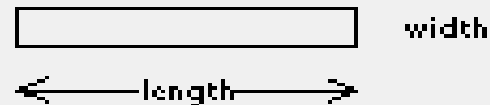
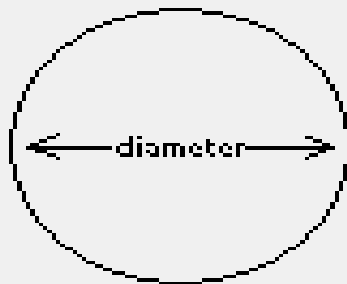
OK

Cancel

Help

## Area and Type of Leak

Select the shape that best represents the shape of the opening through which the pollutant is exiting



Circular opening

Rectangular opening

Opening diameter:

inches

feet

centimeters

meters

Is leak through a hole or short pipe/valve?

Hole

Short pipe/valve

OK

Cancel

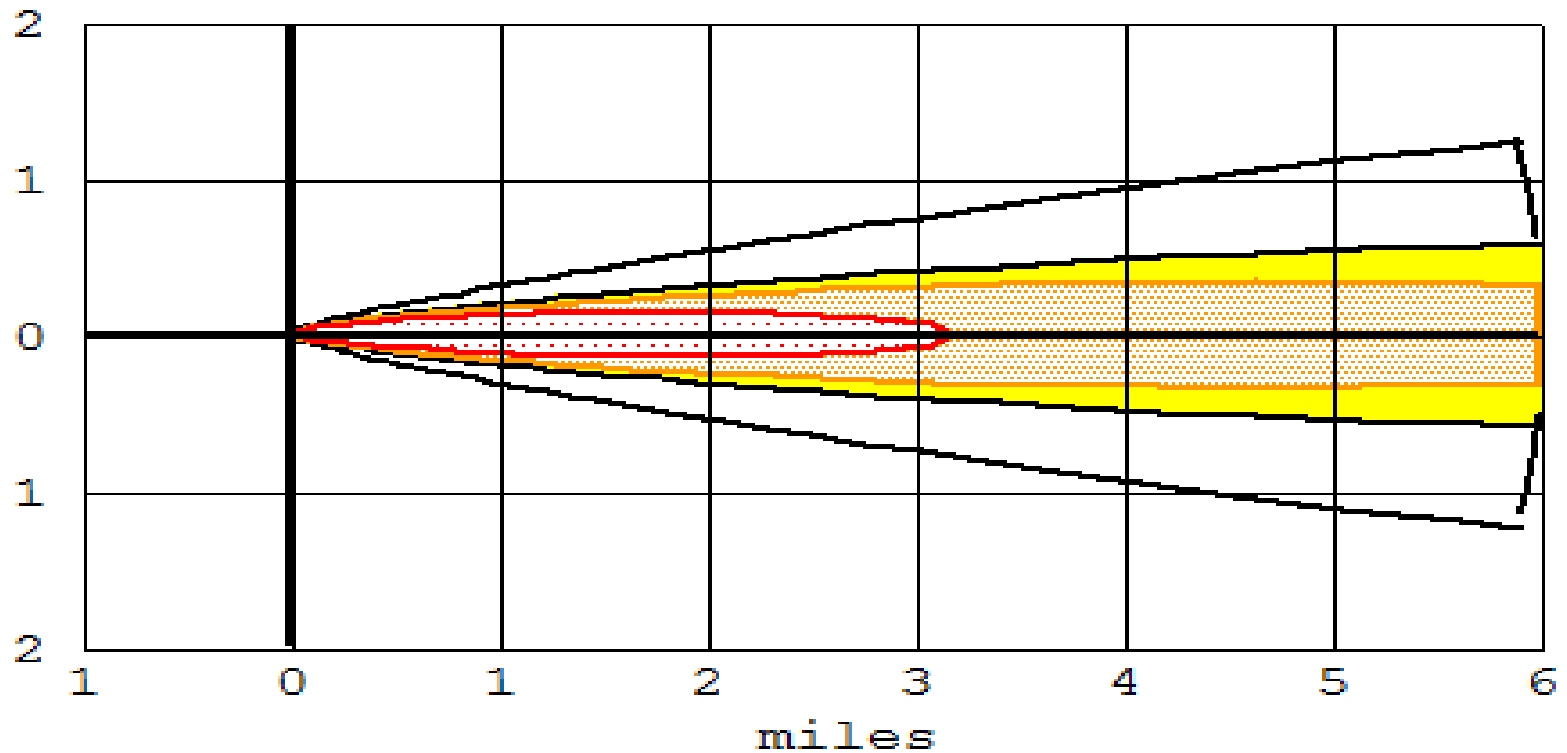
Help





# Threat Zone

Toxic Threat Zone



miles

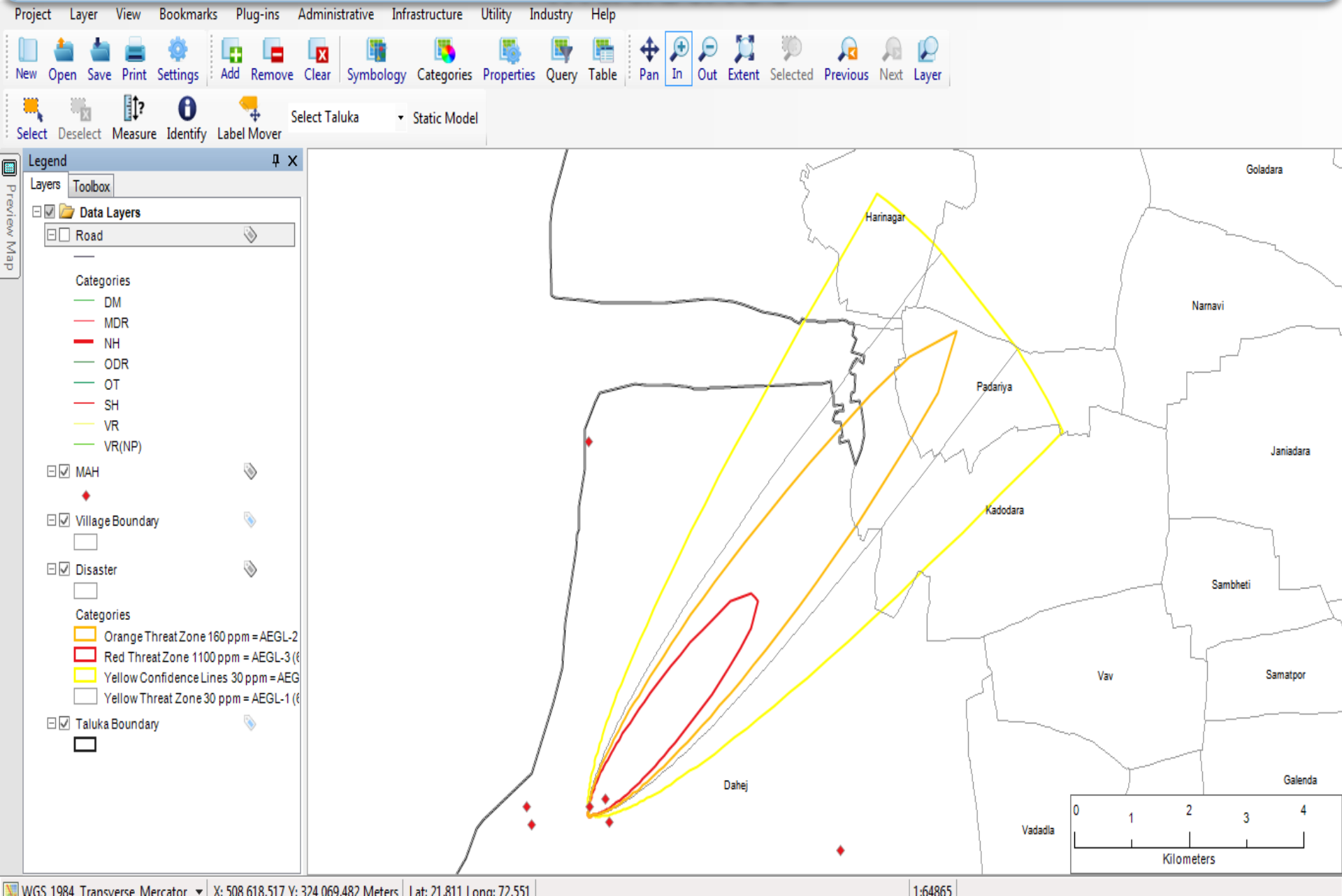


-  greater than 1100 ppm (AEGL-3 [60 min])
-  greater than 160 ppm (AEGL-2 [60 min])
-  greater than 30 ppm (AEGL-1 [60 min])
-  Confidence Lines

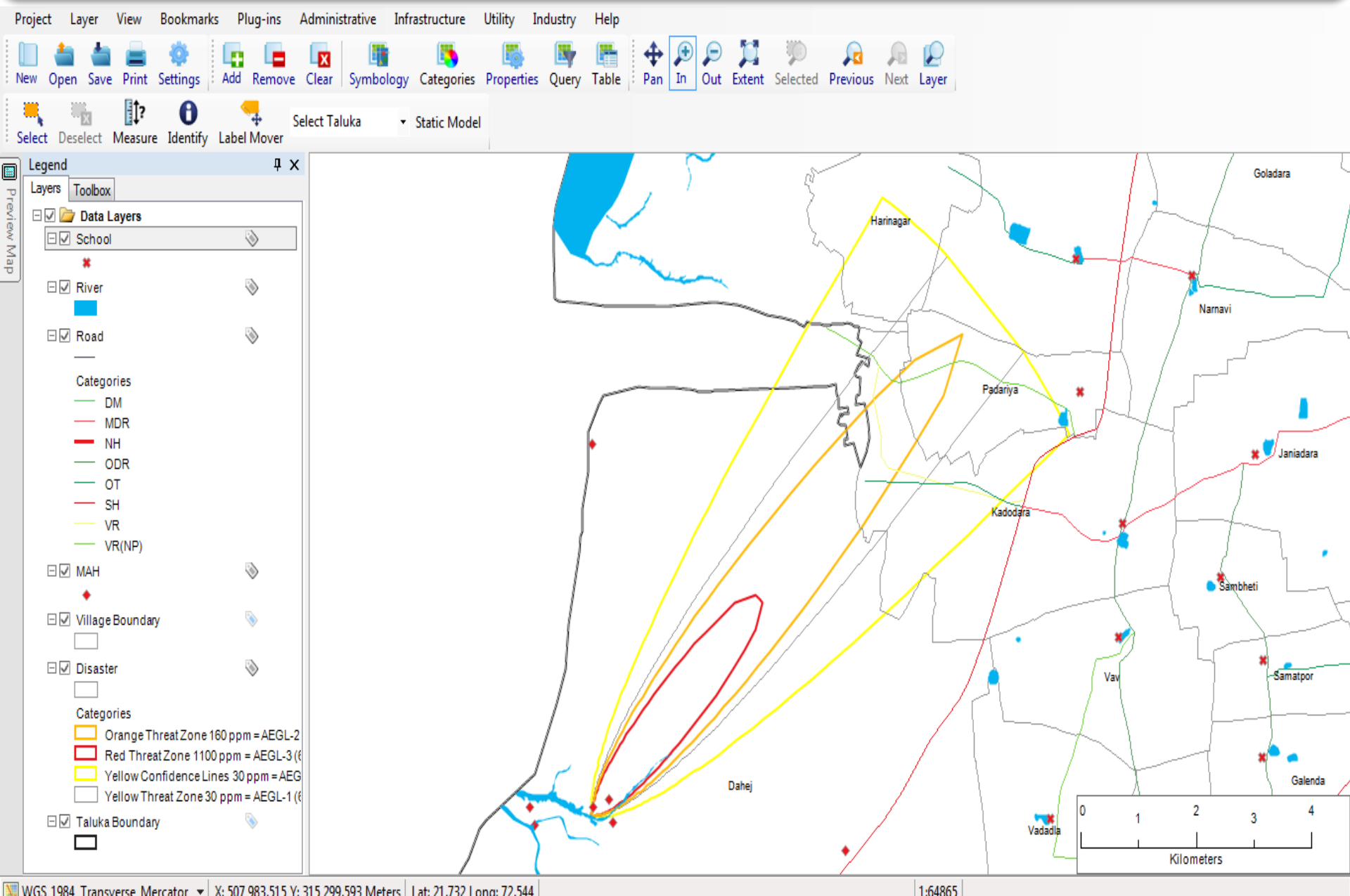
# Threat Zone on Google Map

The screenshot displays the Google Earth Pro interface with a satellite view of a region. A yellow-shaded threat zone is overlaid on the map, originating from a yellow pushpin labeled "ALOHA Source Point" near "Dahej". The zone extends northeastward, passing through "Padariya" and ending near "Kadodara". The zone is bounded by a yellow outline and contains a red-shaded inner area. The interface includes a search panel on the left with "Fly To" options and a "Places" list. The "Layers" panel shows "Primary Database" and "Borders and Labels" checked. The bottom of the map displays copyright information: "Data SIO, NOAA, U.S. Navy, NGA, GEBCO", "Image © 2014 TerraMetrics", "Image © 2014 DigitalGlobe", and "© 2014 Google". The Google logo is visible in the bottom right corner.

# Threat Zone with Village Boundary and MAH Industries



# Threat Zone with Infrastructure





# 4. Disaster Management Plan

- Vagra Taluka Disaster Management Plan adopted as Model TDMP in Gujarat State,
- Model Chemical and Industrial Disaster Management Plan prepared for Bharuch district,
- Multi-Hazard District Disaster Management Plan updated based on experience of 2013.



# Thanks

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