No. IENG/Env.Cell/EC/Half.Comp/2024
Date: 23.12.2024

To,
The Integrated Regional Officer,
Ministry of Environment, Forest & Climate Change,
Integrated Regional Office, Green House,
Goplareddy Road,
VIJAYAWADA – 520010

Sir,

Sub: Environmental Clearance for various projects of Visakhapatnam Port Authority, Visakhapatnam – Submission of 2nd Half Yearly Compliance Reports – Reg.

Ref: 1. EC&CRZ Clearances from MoEF&CC for various VPA Projects(12 no.s)
2. VPA Lr. No. IENG/Env.Cell/MoEF/EC/Pt.I dated 15.07.2024 submission of 1st Half Yearly EC Compliance Report.

Please find herewith the attachment of 2nd Half Yearly EC compliance report for on EC & CRZ Clearances from MoEF&CC, New Delhi obtained by the VPA.

Submitted for kind information and perusal please.

Encl: As above

Yours Sincerely,

CHIEF ENGINEER

EC&CRZ CLEARANACE OBTAINED from MoEF & CC FOR VARIOUS PROJECTS OF VPA

S. No	Name of the Project	Environment Clearance Reference	Annexure No.
1	Development of Cruise-Cum-Coastal Cargo Terminal at Visakhapatnam Port by M/s. Visakhapatnam Port Trust, Visakhapatnam District, Andhra Pradesh.	Environmental Clearance Order No. SEIAA / AP / VSP / IND / 06 / 2019 / 1027167.74 & 164.65 dated 26.10.2021.	Annexure - A
2	Improving the capacity utilization of OR-I & OR-II berths at Visakhapatnam Port Trust (VPT), Andhra Pradesh by M/s Visakhapatnam Port Trust.	Environmental & CRZ Clearance Order F.No:10-62 / 2016-1A.III dated 07.03.2019.	Annexure - B
3	Development of Multipurpose Terminal by replacement of existing EQ-2 to EQ-5 berths to cater to 14.00 M draft vessels in Inner Harbor of Visakhapatnam Port Trust on DBFOT basis by M/s Visakhapatnam Port Trust.	Environmental & CRZ Clearance Order F.No.11-19 / 2015-1A.III dated 07.03.2019.	Annexure - C
4	Modernization of existing facility and addition of new facilities entailing capacity at Visakhapatnam port by M/s. Visakhapatnam Port Trust.	Environmental & CRZ Clearance Order F.No:11-93/2012-IA.III dated 25.05.2016.	Annexure - D
5	1. Development of East quay -1 (EQ-l) by replacing the existing EQ-l berth and part of EQ-2 berth at Visakhapatnam Port. 2. Development of East quay -1A (EQ-lA) on south of EQ1 at Visakhapatnam Port.	Environmental & CRZ Clearance Order F. No. 11-33 / 2010-IA.III dated 06.06.2011.	Annexure - E
6	Installation of Mechanized Handling Facilities at General-Cum-Bulk Cargo Berth in the outer Harbour of Visakhapatnam Port Trust, Andhra Pradesh	Environmental & CRZ Clearance Order File No.10-9/2009-IA.III, dated 01.09.2009.	Annexure - F
7	Construction of 3 berths WQ6, WQ 8 and EQ 10 in the northern arm of inner harbor of Visakhapatnam Port.	Environmental and CRZ Clearance Order F.No.11-7 / 2009-IA.III dated 31.08.2009.	Annexure - G
8	Up-gradation of Iron ore handling facilities at outer harbor of Visakhapatnam Port.	Environmental and CRZ Clearance Order F.No10-11 / 2006-IA-III dated 29.11.2006.	Annexure - H
9	Construction of 4 multipurpose berths in extended arm of internal harbor at VPT.	Environmental and CRZ Clearance Order No. PD/26017/1/98-CRZ-VPT dated 19th May 1998.	Annexure - I
10	1. Construction of LPG handling jetty in the outer harbor by Visakhapatnam Port Trust 2. Construction of multi-purpose berth in the outer harbor by Visakhapatnam Port Trust.	Environmental and CRZ Clearance Order F.No. J-16011/15,16/92-IA.III dated 02.02.1993.	Annexure - J
11	Construction of a Multipurpose Berth in the Inner Harbour at Visakhapatnam Port.	Environment and CRZ Clearance F.No. J-16011/11/91-IA.III dated 09.09.1991.	Annexure - K
12	Conversion of Old jetties WJ-2 and WJ-3 in the inner harbor into a regular berth at Visakhapatnam Port.	Environmental and CRZ Clearance Order F.No No.J-16011/4/8IA IA.III dated 12.07.1988.	Annexure - L

Annexure - A

Environmental and CRZ Clearance

For

Development of **Cruise-Cum-Coastal Cargo Terminal** at Visakhapatnam port vide letter dated **26.10.2021 bearing Order No. SEIAA/AP /VSP/IND/06 /2019/1027167.74 & 164.65**

Compliance on Conditions of Environmental Clearance for Cruise-cum-Coastal Cargo Terminal at Visakhapatnam Port.

ENVIRONMENT CLEARANCE CONDITIONS		
S. No	**Special Conditions**	**Compliance Status for the period of Apr'24 – Sep'24**
i.	The proposal shall not attract the following Acts & Rules: a. Forest Act 1980, b. Wild life (Protection) Act,1972; c. CRZ Notification, 2011; d. The Eco sensitive areas as notified under Environment (Protection) Act,1986; e. Critically polluted areas as notified by CPCB and also shall not harm live stocks and human beings and disturb their activities.	**Complied.** VPA is strictly followed MoEF&CC CRZ and PCB Rules and Regulations. Visakhapatnam Port is not notified under Eco Sensitive and critically polluted area by CPCB.
ii.	The proponent shall obtain NOC from the National Board for Wildlife (NBWL) as per MoEF&CC Office Memorandum dated 02.12.2009.	**Complied.** Copy of NOC for NBWL is enclosed as **Annexure - 1**.
	Part – A SPECIFIC CONDITIONS	**Compliance Status for the period of Apr'24 – Sep'24**
i.	The project proponent shall implement the on-site and off-site emergency action plans.	**Complied.** VPA having Disaster Management Plan including Emergency Evacuation Plan. The copy of extracted pages from DMP is enclosed as **Annexure - 2**.
ii.	The project authorities shall strictly comply with the provisions made in Manufacture, storage and Import of Hazardous Chemicals Rules, 1989, as amended in 2000 and the Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 for handling of Hazardous chemicals. Necessary approvals from Chief Controller of Explosives as applicable must be obtained. Requisite On-site and Off- site Disaster Management Plans shall be prepared and implemented.	**Complied.** Copy of Approval from Chief Controller of Explosives is enclosed as **Annexure - 3**. VPA having Disaster Management Plan and it is updated regularly. Some of the extracted pages are enclosed as **Annexure - 2**.
iii.	Regular AAQM shall be carried out around the plant. The location of the monitoring stations shall be decided in consultation with the concerned State Pollution Control Board based on occurrence of maximum GLCs and down wind direction. Additional Stations shall be set up in wind ward and downwind directions along with those in other directions.	**Complied.** VPA having 3 Continuous Ambient Air Quality Monitoring Stations with the provision of meteorological data collection. VPA carried out Gravimetrical Ambient Air Quality Monitoring at 3 locations.
iv.	The clearance shall be only for the storage and distribution of chemicals and no processing of any kind shall be carried out at the site.	**Complied.** VPA not having any processing facility in the port area.
v.	The company shall install automatic leak detection system supported hooters or alarm system.	**Complied.** VPA installed automatic leak detection system with hooters and alarm. The photographs are enclosed as **Annexure – 4**.
vi.	Occupational health surveillance of workers shall be done on a regular basis and records maintained as per the Factories Act.	**Complied.** VPA having ISO 45001:2018, ISO 14001:2015 and ISO 9001:2015 Certified Port. As per ISO 45001:2018 and it is ISO complainant port. Due to which

		VPA regularly conducting workers health checkup. VPA having 80 Beds Golden Jubilee Hospital and Occupational Health Centers in Operational Area also.
vii.	Green belt shall be developed to mitigate the effect of fugitive emission all around the plant in minimum of 33% plant area in consultation with the DFO.	**Complied.** VPA developed green belt in an area of 1327 Acres including plantation developed through DFO, AP. (% covered is about 17.5%). VPA Proposed 1 million Plantation in Visakhapatnam District through distribution of plants by VPA (2024-27)
viii.	Ambient noise levels must be within the approved limits of 75 dB (A) during day time and 70 dB (A) during night time as per CPCB norms. The D.G. set of capacity 1 x 500 KVA for meeting requirement shall be provided with adequate stack heights as per norms.	**Complied.** VPA regularly monitor the Ambient Noise levels at in port area. The monitoring results are within the limits.
ix.	Regularly monitoring of VOC and HC in the Work Zone Area in the Plant shall be carried and data be submitted to Ministry's Regional Office at Bangalore, CPCB and APPCB. Quarterly monitoring of fugitive emissions shall be carried out as per the guidelines of CPCB.	**Complied.** VPA not having any processing facility in port area. VPA installed 3no.s of Ambient Air Quality is Monitoring Stations for monitoring of fugitive emissions like PM_{10}, $PM_{2.5}$, SO_2, NO_X and NH_3 parameters.
x.	It was reported that order for the proposed project 13.88 KLD, out of which Domestic (Cruise, (Nov –March) – 1.68 KLD, Terminal building Staff – 0.9 KLD, Cargo handling (April April-Oct) –0.3 KLD), L Landscaping – 3.0 KLD, Dust Suppression – 3.0 KLD & Others – 5.0 KLD. 2. 2.59 59 KLD of the waste water generated shall be treated in STP of capacity 15.0 KLD. The treated wastewater shall be used for effective dust suppression.	**Complied.** • Since the cruise terminal berth will be operated during the cruise season (three months). • Considering the non-operational scenario of Cruise terminal berth, a septic tank is proposed at the project site. • However, water utility will be 2.5KLD only, if any surface water generated exceeding septic tank capacity, it will be connected to GVMC 38MLD STP (One Town) or the sewage water will be transfer to VPA 10MLD sewage water treatment plant to treat the water. • As per the consent of APPCB, VPA developed 15 KLD capacity of Septic tank at the project site.
xi.	All the internal roads shall be of Asphalt to reduce fugitive dust due to the transportation of vehicles.	**Complied.** VPA developed Asphalt roads or CC Block pavements for all internal roads.
xii.	Requisite firefighting system conforming to OISD standards shall be installed. Adequate firewater retention system shall be provided to prevent firewater mixing into the surface water stream or underground water.	**Complied.** Fire-fighting system is arranged at site. VPA having own Fire Brigade with sufficient equipment and manpower port area.

xiii.	Training shall be imparted to all employees on safety and health aspects of Petroleum fuels and chemicals handling.	**Complied.** VPA Regularly giving trainings on fire-safety and general safety for all workers through internal and external trainers.
xiv.	Usage of PPEs by all employees / workers shall be ensured.	**Complied.** VPA provided PPE for workers like Helmet, Safety Shoe, Hand Gloves, Goggles, Ear Plugs and Nose Masks etc.
xv.	The company shall harvest surface as well as rainwater from the roof tops of the buildings and storm water drains to recharge the ground water and use the same water for the various activities of the project to conserve water. The company shall undertake all relevant measures for improving the Socio Socio-economic conditions of the surrounding area.	**Complied.** VPA implemented Rain Harvesting Pits.
	Part – B GENERAL CONDITIONS	**Compliance Status for the period of Apr'24 – Sep'24**
i.	**This order is valid for a period of 7 years.**	**Noted.**
ii.	"Consent for Establishment" shall be obtained from Andhra Pradesh Pollution Control Board under Air and Water Act before the start of any construction work at site.	**Complied.** VPA obtained CFE from APPCB for the project vide order No. 597/APPCB/CTE/RO/VSP/HO/2023 dated 24.04.2023.
iii.	The half-yearly compliance reports in respect of the terms and conditions stipulated in this order & monitoring reports shall be uploaded in the website of the project periodically. It shall simultaneously be submitted in hard and soft copies to the SEIAA, A.P., District Collector and Ministry's Regional office, Vijayawada on 11th June and 11th December of each calendar year.	**Complied.** VPA submitted the Half Yearly Compliance Report for the period of Oct'2023 to Mar'2024 on 15.07.2024. The letter copy is enclosed as **Annexure - 5**.
iv.	Officials from the Regional Office of MOEF&CC, Vijayawada / The SEIAA, Andhra Pradesh through the Regional Offices of Andhra Pradesh Pollution Control Board who would be monitoring the implementation of environmental safeguards should be given full co-operation, facilities and documents/data by the project proponents during their inspection. A complete set of all the documents shall be submitted to the CCF, Regional Office to MOEF&CC, Vijayawada.	**Noted and Complied.**
v.	In the case of any change (s) in the scope of the project, the project would require a fresh appraisal by this SEIAA. No further expansion or modifications in the project shall be carried out without prior approval of the SEIAA, AP.	**Noted for Complied.**
vi.	The project proponent shall submit the copies of the environmental clearance to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.	**Complied.**
vii.	All other statutory clearances shall be obtained, as applicable by project proponents from the competent authorities.	**Complied.**
viii.	The project propone proponent should advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language	**Complied.** Photo copies of advertisement published by VPA in newspaper are

	informing that the project has been accorded environmental clearance and copies of clearance letters are available with t the Andhra Pradesh Pollution Control Board. The advertisement should be made within 7 days from the day of issue of the clearance letter and a copy of the same should be forwarded to the Regional Office of this Ministry at Chennai.	enclosed at **Annexure - 6**.
ix.	The funds earmarked for environmental protection measures (Capital cost of Rs. 128 Lakhs & Recurring cost of Rs. 34 Lakhs/annum) should be kept in separate account and should not be diverted for other purpose. Year wise expenditure should be reported to the SEIAA and Ministry's Regional Office located at Vijayawada.	**Complied.**
x.	At least 2% of the total project cost shall be allocated for Corporate Environment Responsibility (CER) and item item-wise details along with time bound action plan shall be prepared in accordance to the MoEF & CC's office Memorandum No.F.No.22's 22-65/2017 2017- IA.III, dated.01.05.2018 and submit to the SEIAA, A.P and Ministry's Regional Office, Vijayawada.	**Complied.** The detailed report on item wise expenditure incurred for environment management plan for the year of 2024-25 is enclosed at **Annexure - 7**.
xi.	Any appeal against this Environmental Clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.	**Noted.**
xii.	The SEIAA may revoke or suspend the order, if implementation of any of the above conditions is not satisfactory. The SEIAA reserves the right to alter/modify the above conditions or stipulate any further condition in the interest of environment protection.	**Noted.**
xiii.	Concealing the factual data or failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action u under the provisions of Environment (Protection) Act, 1986 without any prior notice.	**Noted.**

ANNEXURE – 1

GOVERNMENT OF ANDHRA PRADESH
FOREST DEPARTMENT

From:
Sri K.S.Reddy, I.F.S.,
Prl.Chief Conservator of Forests (WL) &
Chief Wildlife Warden,
Aranya Bhavan,
Agathavarappadu,
Guntur.

To:
The Deputy Chairman,
Visakhapatnam Port Trust,
Administrative Building,
Visakhapatnam-530035.

Rc.No. 9781/2016/WL-I,Dt: 24.11.2016

Sir,

Sub: FD - WL - Modernization of Existing facility and additional new facilities entailing capacity at Visakhapatnam port - Environmental clearance (EC) - Wildlife Clearance / Forest Clearance - Requested - Reg.

Ref: Minutes of the 39th Standing Committee of National Board for Wildlife held on 23-08-2016.

***

This is to inform that the Standing Committee of National Board for Wildlife in its 39th meeting (copy enclosed) held on 23-08-2016 has agreed to recommend the above subject proposal along with the conditions prescribed by the State Chief Wildlife warden and the State Board for Wildlife.

The conditions prescribed by the Chief Wildlife Warden and State Board of Wildlife are as follows;

1. The User Agency has proposed development of Green Belt with an outlay of 7.2 Million as per the EIA report table 12-1.
2. The User Agency should plant broad leaved native species in place of eucalyptus and Casuarina.
3. The User Agency should have a plan for continuity of Green Belt development in and around Port Area.

Hence, the user Agency is requested to give an undertaking stating the they will comply the conditions prescribed by the Chief Wildlife Warden and State Board of Wildlife.

Encl: As above

Yours faithfully,

Sd/- K.S.Reddy
Prl. Chief Conservator of Forests (WL) &
Chief Wildlife Warden

// True Copy //

for Prl. Chief Conservator of Forests (WL) &
Chief Wildlife Warden

Copy to AE(EC) for info

ANNEXURE – 2

VISAKHAPATNAM PORT TRUST

MARINE DEPARTMENT
VISAKHAPATNAM – 530035
ANDHRA PRADESH

COMPREHENSIVE
DISASTER MANAGEMENT PLAN

JANUARY -2021

ENVIRONMENTAL TECHNICAL SERVICES PVT. LTD.
MOBILE NO. 0-9873552267, 0-9810830190
EMAIL – SS@ETSINFRA.COM, JPSHRI@GMAIL.COM

FOREWORD

This study has been carried out by M/s Environmental Technical Services Private Limited, New Delhi, Work Order No. IMAR/MSS (tenders)/2020/15/, Dated 05/05/2020 based on inputs received form Visakhapatnam Port Trust, Visakhapatnam. M/s Environmental Technical Services Private Limited, would like to take this opportunity to extend their thanks to the Visakhapatnam Port Trust, Visakhapatnam, management and officers who co-operated in supplying the data and information required, thus maximizing the effectiveness of the study. The study identified the hazards and analysed the consequences of potential accident scenarios. The above study results, conclusions and recommendations were based on the information made available to ETS Private Limited at the time of study. ETS Private Limited exercised all reasonable skill, care and diligence in carrying out the study. However, this report should not be deemed as any undertaking, warranty or certificate and cannot be challenged in any court of law of the country.

Environmental Technical Services Pvt. Ltd. New Delhi

Place : New Delhi
Date : 11.01.2021

Dr J. P. Shrivastava
Managing Director

VISAKHAPATNAM PORT TRUST

PART I

DISASTER MANAGEMENT PLAN

CONTENTS- PART I

The Visakhapatnam Port Trust in recognition of the importance of safety and security of port area as first priority set up a core group committee for preparation of Disaster plan as per the recommendation of the National Disaster Management Plan. Our scope of plan covers the area of port and all the emergencies as per the act.

1.4 VISION

To maintain Visakhapatnam Port safer and disaster resilient by a holistic, pro-active, technology driven approach that involves all stakeholders and port users so that a culture of prevention, preparedness and mitigation is imbibed.

Further, to assist local, state and national authorities, so that Visakhapatnam Port's response complements that of authorities in providing assistance to affected populations during natural disasters.

1.5 TIME FRAMES

EVENT SCENARIOS

Probability: Low-once in 10-50yrs; Moderate=once in 2-10yrs; High=once annually
Impact/Preparedness/Risk Threat: 0=Very Low / 1=Low / 2= Moderate / 3 = High

Event/Scenario Spectrum	**Early warning**	**Probability of occurrence**	**Duration Impact**	**Impact on property**	**Impact on People**	**Time to Restore Facilities**	**Risk Threat Probability**
Cyclone	96-12 Hrs.	Very Low	0	0	0	12- 24 hrs.	Moderate
Floods	4-2 hrs.	Very Low	1	1	2	12-36 hrs.	Very Low
Earthquake	nil	Very Low	1	1	2	12-36 hrs.	Very Low
Tsunami	6-1 h	Very Low	1	1	2	12-24 hrs.	Very Low
Marine Accident							
Collision	< 1min	Low	<1hr	2	0	4 h	Moderate
Grounding	<1 min	Low	1-48h	2	0	1-48 hrs.	Moderate
Fire/Explosion	< 1min	Low	0.5-12 h	2	1	1-96 hrs.	Moderate

Event/Scenario Spectrum	Early warning	Probability of occurrence	Duration Impact	Impact on property	Impact on People	Time to Restore Facilities	Risk Threat Probability
Oil Pollution	<5 mins	Low	1-72 h	1	1	1-30 d	Moderate
Transport Accident							
Road	< 1min	Low	< 5 min	0.1	0.1	< 2 h	Moderate
Rail	< 1min	Low	< 5 min	0.05	0.1	1-48 h	Low
Function Failure							
Elec sub station	< 1min	Mod	24 h	0	0	12-48 h	Low
Pipelines failure	< 1min	Mod	1-24 h	0	0	12-48 h	Low
Fire station failure	< 1min	Mod	1-24 h	0	0	12-48 h	Low
Water system	< 1min	Mod	1-24 h	0	0	12-48 h	Low
Communications	< 1min	Mod	1-24 h	0	0	12-48 h	Low
Medical facilities	< 1min	Mod	1-24 h	0	0	12-48 h	Low
Human related							
Labour Action/ Strike	24 h	Mod	< 24 h	0	0	12-48 h	Low
Civil disturbance	< 12 h	Mod	< 24 h	0	0	12-48 h	Low
Terrorism & War							
State of War	< 48 h	Low	1- 10 d	2	2	12-96 h	Mod
Bomb Threat	< 1 h	Mod	1-3 d	2	3	12-96 h	High
Hostage Threat	< 1 h	Mod	1 – 3 d	1	3	12-48 h	High
Terrorist attack	Nil	Mod	1- 3 d	1	3	> 48 h	High

2. HAZARD, RISK, VULNERABILITY & CAPACITY ANALYSIS

2.1 DISASTER RISKS, VULNERABILITIES AND CHALLENGES.

VISAKHAPATNAM PORT – AREA VULNERABILITY & THREAT MATRIX

X = Slightly Vulnerable, XX = Moderately Vulnerable, XXX = Highly Vulnerable

Threats	**Vessel Accidents Collision Grounding**	**Fire Explosion on board vessel/ashore**	**Fire & Explosion Manifold Pipeline, Tank farm**	**Oil & Chemical Pollution**	**Personnel injury: Accident Rail, Road, On board ship**
Respondent Agencies	D.C. Visakhapatnam Port Trust DG Shipping Min. of Shipping	Visakhapatnam Port Trust Fire Service Visakhapatnam Fire Brigade Mutual Aid Response Group Police, Min. of Shipping	Visakhapatnam Port Trust Fire Service Oil Companies Visakhapatnam Fire Brigade Mutual Aid Response Group Police Min. of Shipping	Visakhapatnam Port Trust (CFO) Control Room Oil Companies Coast Guard, Visakhapatnam Corporation Distt. Collector Min. of Shipping	C.M.O, Visakhapatnam Port Trust Police
Vulnerable Areas					
Vessel Movement	----	------	-----	------	-------
Channel	xxx	xx	----	xxx	x
At Berth	x	xx	xx	xxx	xx

Threats	Vessel Accidents Collision Grounding	Fire Explosion on board vessel/ashore	Fire & Explosion Manifold Pipeline, Tank farm	Oil & Chemical Pollution	Personnel injury: Accident Rail, Road, On board ship
Storage-	----	----	----	----	----
Transfer					
Oil Transfer	---	xx	xx	xx	x
Cargo Transfer	----	----	----	----	----
Trucks, Trains	----	---	----	x	xx
Crane- Shore/Ship	----	xx	----	x	xx
Services	----	----	---	---	----
Access Gates	----	x	x	x	x
Emergency Generators	----	x	---	---	x
Electric Substations	----	x	---	---	x
Train siding Locos, Wagons,	---	----	---	---	xx
Fire station	----	----	---	----	----
Port tugs, crafts,	x	x	---	x	x
Administration Building & Parking	---	---	---	---	---
Customs Area	---	----	---	---	x
Port Employees' Quarters	----	x	----	---	---

Threats	Terrorism Bomb, War, Arson	Technical Failures Power, Transport Communication Infrastructure	Occupational Accidents Strikes	Cyclone Floods	Tsunami Earth Quake
Respondent agencies	Visakhapatnam Port Trust CISF, Police, Coast Guard, Navy, Control Room Min. of Shipping	Visakhapatnam Port Trust	Visakhapatnam Port Trust, CISF Police, Min. of Shipping	Visakhapatnam Port Trust, Dist. Collector, Control Room, Min. of Shipping	Visakhapatnam Port Trust, Distt Collector, Control Room Min. of Shipping
Vulnerable Areas					
Vessel Movement					
Channel	xxx	--	--	xx	x
At Berth	xx	x	x	xx	x
Storage- Transfer					
Oil Transfer	xxx	x	x	xx	--
Cargo Transfer					
Trucks, Trains	xxx	x	xx	xx	--
Crane- Shore/Ship	x	x	xx	xx	--
Services					
Access Gates	xxx	xxx	xx	xx	--
Emergency Generators	xx	x	--	x	--
Electric Substations	xx	x	--	xx	--
Train siding Locos, Wagons,	x	x	x	x	--
Fire station	--	x	--	x	--
Port tugs, crafts,	x	x	x	xx	--

Threats	Terrorism Bomb, War, Arson	Technical Failures Power, Transport Communication Infrastructure	Occupational Accidents Strikes	Cyclone Floods	Tsunami Earth Quake
Administration Building & Parking	x	x	--	x	--
Customs Area & Weigh Bridge	--	x	--	x	--
Port Employees' Quarters	x	x	--	x	--

VISAKHAPATNAM PORT TRUST

PART II

EMERGENCY CONTINGENCY PLAN

CONTENTS- PART II

CENTRAL DISASTER MANAGEMENT GROUP- BASIC FUNCTIONS

Team Leader : Chairman / Dy Chairman
Members: Dy Chairman , Secretary, FA & CAO, Chief Engineer, CME , Traffic Manager, Materials Manager, Chief Medical Officer, Commandant-CISF, Commandant – Coast Guard.
Basic Functions
1-Monitor and analyze reports from the On Site Action team and identify the area/population at risk
2-Activate the Response Plan and arrange the Alert siren.
3-Support the Action Group with materials, equipment, information and human resources
4- Implement changes in the current mode of action if deemed necessary
5-Adjust the Disaster classification of the incident and actuate the Central Control Room
6- Coordinate with external organizations, State Govt. as deemed necessary
7- Make the necessary arrangements and funds for evacuation, transportation, food & supplies
8-Make media statements and reports to MOS.

ON SITE ACTION GROUP - BASIC RESPONSIBILITIES

Team Leader:- Harbour Master / Senior Pilot
Members:-Control room-Sr. pilot, Chief Fire Officer, Dy Comdt. CISF , Exec. Engineer (Electrical) Addl. TM, Dy Chief Med. Officer.
Basic Functions
1- Assess & classify Incident:-nature-location- severity-casualties-resource requirement – time to control
2- Activate elements of the disaster management plan, arrange alert signal in liaison with DC
3-Conduct search, rescue and evacuation operations. Provide medical Aid
4- Manage incident operations and terminate plan, Arrange for re-Entry and restoration

EMERGENCY CLASSIFICATION

Level 1. It is an Incident within the port and is of a minor nature with a low level of personnel injury, interruption to work, damage level and loss of capability. It can be handled by the Port Trust Staff involving Marine and other depts. The Emergency Management group leader is the Dept Head. E.g. Building/Shed Fire, Elec Supply disruption, labour accident, vessel accidents

Level 2;- It is an Incident within the port area and is of a limited and moderate level of personnel injury, possible death(s),interruption of work, damage to port ..Besides Port resources, outside assistance may be required. The Disaster Management group leader is the Chairman, VPT.

E.g. Gas Leaks, Chemical/Oil Spills, Terminal Fires/ Explosions

Level 3:- It is a disaster of a severe and critical nature and could have a high level of personnel injury (and deaths), interruption to work, damage to port and loss of capability. It affects the port and possibly adjacent areas. Besides Port resources, assistance from outside agencies is required. If incident affects VPT, group leader is chairman, VPT and if it affects outside PPT , then information will be given to District Collector depending on the intensity.

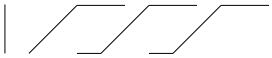
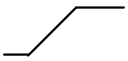
E.g. Gas Leaks, Chemical/Oil Spills, Fires/ Explosions & Cyclones

INCIDENT/REQUIREMENT SCENARIOS	LEVEL I – ACTION BY	LEVEL II & III –ACTION BY
Vessel–Grounding-Shifting-Evacuation	HM	HM + Salvage efforts + Navy + Coast Guard
Casualties	CMO	Port + District + State
Fire & Explosion on Vessel or Terminal	CFO	CFO + District (Fire wing) + CDMG
Fire & Explosion at Shed	CFO , TM	CFO + District (Fire wing) + CDMG
Oil or Chemical Spill	CFO	CFO +Central disaster Magmt. Group+ outside agencies
Toxic Gas Leakage	CFO	Central disaster Magmt. Group +District/ state assistance + outside agencies
Cyclone, tsunami, flood etc	Dy. Conservator	National disaster Management group + CDMG + District + state
Electric Supply breakdown	SE (Elect.)	CDMG + District + State

CENTRAL DISASTER MANAGEMENT GROUP - RESPONSIBILITIES

Position	Port Position	Alternative
Chief Emergency Controller	**Chairman**	**Dy. Chairman**
Monitors Disaster Management action Plan and a state of emergency preparedness is maintained at all times. Authorizes release of required funds. Leads Central Disaster Management group to direct operations from the emergency control center.		
For industrial disasters, confirms level of crisis, monitors the shutting down, evacuation and other operations as necessary. Directs activation of the Central Control room at emergency level 2 and 3		
Activates the off-site emergency plan if the disaster is spreading to/from outside Port boundary in liaison with Dy chairman, DC,TM and CFO		
Approves information to the media		
Liaises with the Secretary, Jt. Secy (Ports) of the MOS (Ministry of shipping)		
Confirms the termination of the emergency.		
Leads the Central Disaster Management Group, monitors the early restoration of facilities and port activities,		
Provides timely required status reports to the Secretary MOS		

Disaster Warning Alarm and Evacuation Signals

TSUNAMI - TYPE-HIGH PITCHED CONTINIOUS WAILING SIREN 5 Sec.  1 Sec.
FIRE /EXPLOSION/BOMB TYPE-LONG SIREN FOLLOWED BY SHORT SIREN 10 Sec. 3 Sec.
GENERAL EVACUATION ALARM FOR TOXIC/RADIATION LEAKAGES / NATURAL CALAMITIES TYPE-HIGH PITCHED RINGING ALARM AT SHORT INTERVALS 
C- ALL CLEAR SIGNAL TYPE:-LONG CONTINIOUS SIREN FOR 90 SECONDS 

Competent Agencies

List of agencies competent for issuing warning or alert is given below:

Competent agencies for issuing warnings

Disaster	**Agencies**
Earthquakes	IMD, MERI,BARC
Floods	Meteorology Department, Irrigation Department, Central Water Commission
Cyclones	Meteorology Department, Irrigation Department, IMD, INCOIS
Tsunami and Storm Surge	INCOIS
Epidemics	Public Health Department
Road Accidents	Police
Industrial and Chemical accidents	Industry, Police, MARG, DISH, BARC,AERB
Fires	Fire Brigade, Police

5.1 PORT RISK HAZARDOUS PRODUCTS STORAGE FACILITIES

COMPANY	LOCATION	NO OF TANKS	CAPACITY	PRODUCTS HANDLED
BPCL-VISAKHA	VIZAG	15	79,441 KL	ETHANOL, FO, LDO, HSD, BIO-DIESEL, MS
IOCL	VIZAG	28	1,40,797 KL	HFHSD, HSD, MS, LDO, LVFO, NFO-380, BFO-180, BFO-380, ATF, ETHANOL, JP-5, BIO-DIESEL
HPCL	STORAGE CAPACITIES	33	1,78,054.5 KL	HSD, NAPHTHA, MS, SKO, SOFT, ATF, ETHANOL, MTO, DIESEL, BIODIESEL, SLOP
CIL	VIZAG	3	27,500 KL	MOLTEN SULPHUR, SULPHURIC ACID, PHOSPHORIC ACID
IMC		1	10,000 KL	SULPHURIC ACID
IMC LIMITED	VISAKHAPATNAM	6	12,555.084 KL	S/ACID
HPCL	VISAKH	12	96,381 KL	HSD, HFHSD, CLO, LDO, LSHS, FO180, VLSFO, SLOP TANK, BITUMEN-VG40, BITUMEN-VG30, BITUMEN-VG10, JBO, LUBE OIL
HPCL REFINERY	ATF AREA	33	12,78,099.7 KL	CRUDE, NAPHTHA, E III MS, E IV MS, DRY SLOP, WET SLOP, E IV HSD, SKO, ATF
HPCL REFINERY	REFINERY AREA	77	8.88,870.6 KL	CRUDE, NAPHTHA, ISOMERATE, MS, HWO, DRY. SLOP, WET SLOP, MTO, HSD, LS HFHSD, LDO, JBO, CUTTER, FO, LSHS, IFO, BITUMEN, VGO, HSSR
NALCO		1	GROSS 7368M^3 NET 6896M^3	CAUSTIC SODA

5.2 VISAKHAPATNAM PORT TRUST – AREA VULNERABILITY & THREAT MATRIX

X=slightly vulnerable: xx=moderately vulnerable: xxx=highly vulnerable

Threats Vulnerable Areas	Vessel Accidents Collision Grounding Fire Explosion	Land Transport Personnel; Accident Rail Road	Fire & Explosion Manifold Pipeline	Toxic Gas Leakage Pipeline Manifold	Pollution Oil Chemical	Terrorism Bomb War Arson Cyber	Technical Failures Power, Transport Communication Infrastructure	Occupational Accidents Strikes	Cyclone - Floods	Tsunami Earth Quake
Vessel Movement										
Approach Channel	xx				x	x	x	x		X
Coal Berths	x	x	x	x	x	x	x	x	x	x
Oil Tanker Berth	x	x	xx	x	x	x	x	x	x	x
LNG Berth	x	x	xxx	xx	x	xx	x	x	x	x
Fertilizer Berth	x	x	x	x	x	x	x	x	x	x
Boat Train Pier	x	x	x		x	x	x	x	x	x
Gen Cargo Berths	x	x	x		x	x	x	x	x	x
Cargo Transfer										
Oil pipe lines			xx		xx	xx	xx	x	x	x
Ammonia/ph.acid			xx	xx	xx	xx	xx	x	x	x
pipeline										
Trucks/Mobile eqmt			x		x	x	x	x	x	x
Train tracks-Roads						x			x	x
Cranes & Ship Loaders						x	x	x	x	x
Bulk cargo conveyor system						x	x	x	x	x

Threats Vulnerable Areas	Vessel Accidents Collision Grounding Fire Explosion	Land Transport Personnel; Accident Rail Road	Fire & Explosion Manifold Pipeline	Toxic Gas Leakage Pipeline Manifold	Pollution Oil Chemical	Terrorism Bomb War Arson Cyber	Technical Failures Power, Transport Communication Infrastructure	Occupational Accidents Strikes	Cyclone - Floods	Tsunami Earth Quake
SERVICES	------	----	------	-----	------	------	------	------	-----	----
Control gates			x			xx		x	x	x
Emergency Generators			x			x	x	x	x	x
Electric Substations			x			x	x	x	x	x
Train siding Locos, Wagons,			x			x	x	x	x	x
Signal station-electronic means commn			x			x	x	x	x	x
Fire station 1 & 2			x			x	x	x	x	x
Port tugs, crafts, dredger	x	x	x		x	x	x	x	x	x
ADMINISTRATION	------	----	------	-----	------	------	------	------	-----	----
Administration Building & Parking			x	x		x	x	x	x	x
Customs Area & Weigh Bridge			x	x		x	x	x	x	x
Port officers & CISF Quarters			x	x		x			x	x

EVENT SCENARIOS -VISAKHAPATNAM PORT TRUST

Probability-Low-once every 10-50yrs:: moderate=once every 2-10yrs; High=once annually
Impact/Preparedness/Risk Threat 0=Very Low 1=Low 2=moderate 3=High

EVENT/ SCENARIO SPECTRUM	Early warning	Probability of Occurrence	Duration Impact	Impact on property	Impact on people	Time to Restore Facilities	RISK THREAT
Cyclone	96h-12h	Low	N/A	1	**1**	N/A	Moderate
Floods	96h-12h	Low	N/A	**1**	**1**	N/A	Low
Earthquake/Tsunami	5-8h	**low**	**N/A**	**1**	**1**	N/A	Low
V/L Accident							
Collision	< 1min	Low	<1hr	0	0	4 h	Low
Grounding	< 1min	Low	2-4hr	0	0	4 h	Low
Fire/Explosion	< 1min	Low	0.5-12h	1-2	1-2	12-96h	Moderate
Transport Accident							
Rail	< 1min	Mod	< 1min	0	1	6-48h	Low
Road Accident	< 1min	Mod	< 1min	0	1	<1h	Low
Pollution-							
Gas Release-Ammonia	< 1min	Low	1-24h	0.1	2	2-30d	Low
Phos /sulph acid spill	< 1min	Low	1-12h	0.1	1	2-4d	Low
Oil Spill	< 30min	Low	1-12h	1	1	1-2d	Low
Fire-Admin Building	< 10min	Low	1-72 h	1	1	12-96h	Low
Parking/Gates	< 1min	Low	1-12h	0	1	12-96h	Low
Function Failure							
Elec sub station	< 1min	Low	1-24h	0	0	12-48h	Low
Emergency Generator	< 1min	Low	1-24h	0	0	12-48h	Low
Pipelines failure	< 1min	Low	1-24h	0	0	12-48h	Low
Evacuation routes	< 1min	Low	1-24h	0	0.2	12-48h	Low
Fire Alarm failure	< 1min	Low	1-24h	0	0	12-48h	Low
Fire station failure	< 1h	Low	1-24h	0	0	12-48h	Low
Water system	< 1h	Low	1-24h	0	0	12-48h	Low

List of Local Industries – Phone Numbers

S. No.	Name	Office Phone
1	M/s. Hindustan Shipyard Limited	0891- 2577437
2	M/s. Hindustan Petroleum Corp. Ltd.	0891- 2895000/2895100
3	M/s. Coromandel Fertilizers Ltd.	0891- 2578400
4	Visakhapatnam Steel Plant	0891- 2518431
5	M/s. BHPV Limited	0891- 2517381
6	M/s. NALCO	0891- 2561432/35
7	M/s. East India Petroleum Ltd.	0891- 2578168
8	M/s. Andhra Petro Chemicals Ltd.	0891- 2578342
9	M/s. R.C.L.	0891- 2740500
10	M/s B.P.C.L.	0891- 2577528
11	M/s. I.O.C. Ltd.	0891- 2578300/302
12	M/s. I.M.C. Ltd.	0891- 2751250/2755612
13	M/s. ESSAR Steel Ltd.	0891- 2876300/2523213
14	M/s. Visakha Container Terminal Ltd.	0891- 2502164/40
15	M/s. SAIL	0891- 2704074/2563611
16	M/s. ONGC	0891- 2567833
17	M/s. NTPC	089247274
18	M/s. NMDC	0891- 25623943/262945
19	M/s. SALPG	0891- 2748928/29

CONTACT DETAILS OF NDRF OFFICERS

Force Head Quarters

Name	Designation	Address	Telephone No.	Fax No.	E-Mail
Shri S N Pradhan (IPS)	Director General	Directorate General, NDRF, 6th Floor, NDCC-II Building, Jai Singh Road, New Delhi - 110001	011-23438020, 011-23438119	011-23438091	dg.ndrf@nic.in
Shri Amrendra Kumar Sengar (IPS)	Inspector General	-- Do --	011-23438021	011-23438091	ig.ndrf@nic.in
Ms Nishtha Upadhyay	Financial Advisor	-- Do --	011-24368148	011-23438091	--
Mr. Mohsen Shahedi	Deputy Inspector General (Proc/Prov)	-- Do --	011-23438022	011-23438091	digprov-ndrf@nic.in
Shri Manoj Kumar Yadav	Deputy Inspector General (Trg/Pro /Academy/NCDC/East & North East Sector)	--Do--	011-23438140	011-23438091	dig.es.ndrf@nic.in
Shri Randeep Kumar Rana	Deputy Inspector General (Estt/ Ops / North-West Sector)	--Do--	011-23438023	011-23438091	dig.ns.ndrf@nic.in
Shri K K Singh	Deputy Inspector General (Adm/Works/South Sector)	-- Do --	011-23438185	011-23438091	dig.ss.ndrf@nic.in
Shri V V N Prasanna Kumar	Commandant (PROC/PROV/NDRR)	-- Do --	011-23438183	011-23438091	--
Dr. Amit Murari	CMO (SG)	-- Do --	011-23438091	011-23438091	cmo-ndrf@gov.in
Shri Muneesh Kumar	Second-in-Command (Works & Proc)	--Do--	--	011-23438091	--

Shri Daulat Ram Chaudhary	Second-in-Command (ADM)	--Do--	--	011-23438091	hq.ndrf@nic.in
Shri Pranshu Srivastava	Deputy Commandant (Trg)	--Do--	011-23438138	011-23438091	hq.ndrf@nic.in
Shri Rakesh Ranjan	Deputy Commandant (OPS)	--Do--	011-23438024	011-23438091	hq.ndrf@nic.in
Shri Surendar Kumar	Deputy Commandant (Engineer)	--Do--	--	011-23438091	--
Shri Krishan Kumar	AC (IT/COMN/PRO)	--Do--	011-23438024	011-23438091	krishan.0405@gov.in
Shri Bhawani Singh	AC(ADM & SO to DG)	--Do--	011-23438118	011-23438091	dc.adm.ndrf@nic.in
Shri S Raghavindra	AC/MIN	--Do--	011-23438091	011-23438091	hq.ndrf@nic.in
Control Room	--	--Do--	011-23438091, 011-23438136	011-23438091	hq.ndrf@nic.in

NDRF
Units

Name	Designation	Address	Telephone No.	Fax No.	Mobile No.	Unit Control Room No.	E-Mail
Sh. R S Gill	Officiating Commandant	1st BN NDRF, Patgaon PO - Azara,Distt. Kamrup Metro, Guwahati-781017	0361-2840027	0361-2849080	--	0361-2840284 09401048790 09435117246	assam01-ndrf[at]nic[dot]in
Sh. Nishit Upadhyay	Commandant	2nd BN NDRF, Near RRI Camp. Haringhata, Mohanpur, Nadia, (West Bengal) Pin - 741246	033-25875032	033-25875032	-	033-25875032 09474061104 09474116775	wb02-ndrf[at]nic[dot]in
Sh. Jacob Kispotta	Commandant	3rd BN NDRF, PO-Mundali, Cuttack - Odisha Pin - 754013	0671-2879710	0671-2879711	--	0671-2879711 09437581614	ori03-ndrf[at]nic[dot]in
Ms. Rekha Nambiyar	Commandant	4th Bn NDRF, PO - Suraksha Campus , Arrakonam , Distt. Vellore Tamilnadu-631152	04177-246269	04177-246594	--	04177-246594 09442140269	tn04-ndrf[at]nic[dot]in
Sh. Anupam Srivastava	Commandant	5th Bn NDRF, Sudumbare Taluka, Distt - Maval Pune (Maharashtra) Pin - 412109	02114-247010	02114-247008	--	02114-247000 09422315628	mah05-ndrf[at]nic[dot]in
Sh. A. K. Tiwari	Commandant	6th Bn NDRF, Jarod Camp,Teh-Wagodia, Vadodara, Pin - 391510	02668-274470	02668-274245	--	02668-274245 09723632166	guj06-ndrf[at]nic[dot]in
Sh. Ravi Kumar Pandita	Commandant	7th Bn NDRF, Bibiwala Road, Bhatinda (Punjab) Pin 151001	0164-2246193	0164 - 2246570	--	0164-2246193 0164-2246570	pun07-ndrf[at]nic[dot]in

Sh. P.K.Srivastava	Commandant	8th Bn NDRF, Kamla Nehru Nagar, Ghaziabad (UP) Pin - 201002	0120-2766013	0120 - 27666012	--	0120-2766618 09412221035	up08-ndrf[at]nic[dot]in
Sh. Vijay Sinha	Commandant	9th Bn NDRF, Bihata Patna, Bihar Pin - 801103	06115-253942	06115-253939	--	06115-253939 08544415050 09525752125	patna-ndrf[at]nic[dot]in
Mr. Zahid Khan	Commandant	10th Bn NDRF, ANU Campus, Nagarjuna Nagar, Guntur (AP) Pin - 522510	0863-2293178	0863-2293050	--	0863-2293050 08333068559	ap10-ndrf[at]nic[dot]in
Sh. A.K.Singh	Commandant	11 th Bn NDRF, Sanskritik Sankul, Maqbool Alam Road, Varanasi, UP - 221002	0542-2501201	0542 - 2501101	--	0542-2501101 08004931410	up-11ndrf[at]gov[dot]in
Sh. Rajesh Thakur	Commandant	12 th Bn NDRF, Itanagar, Arunachal Pardesh791112	0360-2277109	0360-2277106	--	0360-2277104 09485235464	bn12[dot]ndrf[at]gov[dot]in

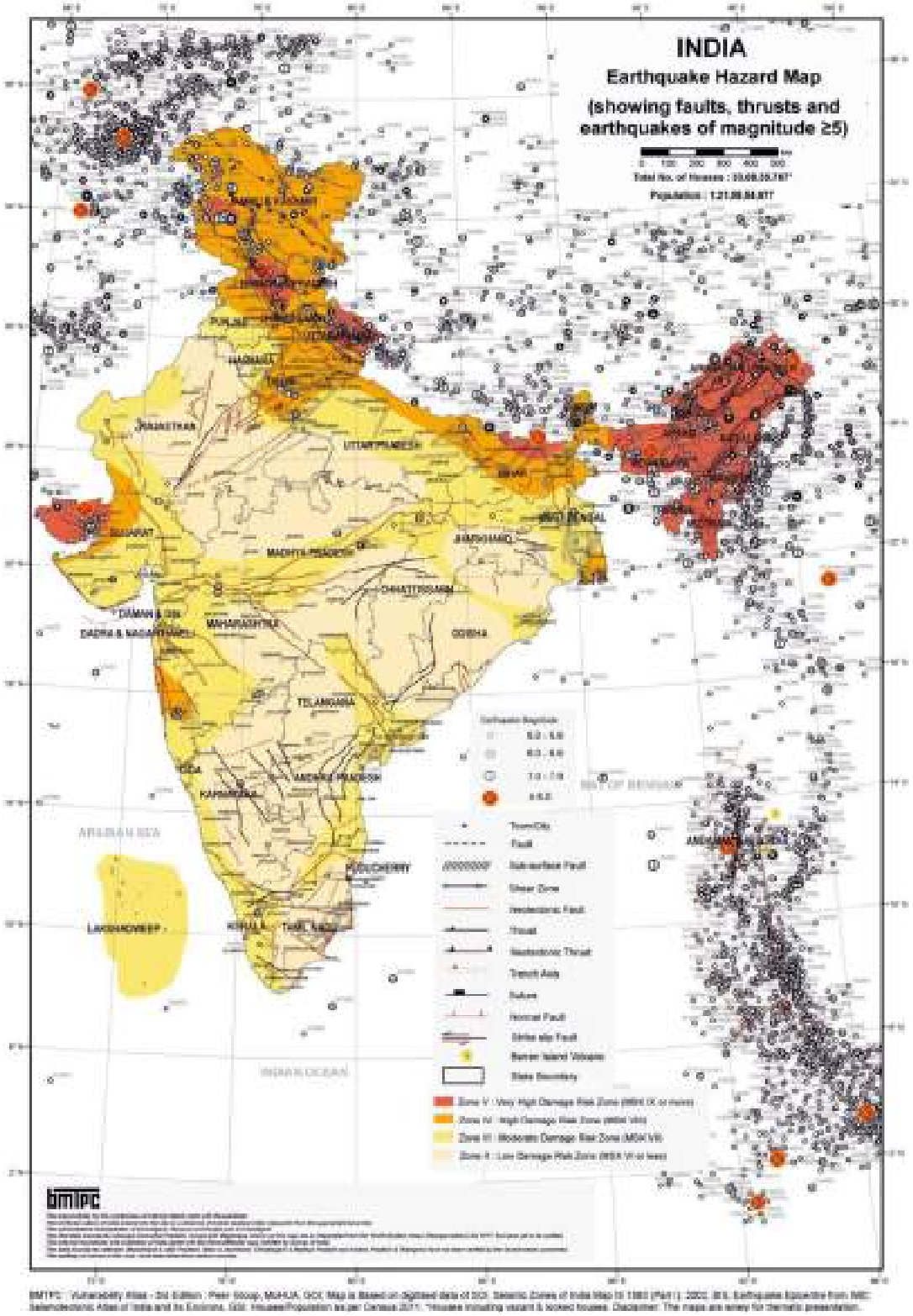
NDRF
RRCs

Name of RRC	Landline Number	Mobile Number
NDRF RRC, Port Blair, Andaman	03192289174	09442112269
NDRF RRC, Adayar, Chennai	04424420269	09442112269
NDRF RRC, Vizag Steel Plant, Vishakhapatnam, Andhra Pradesh	--	08333068565 08333068560
NDRF RRC, Fire Station Mahadevapura, Bengluru, Karnatka	--	09482978719 09482978715
NDRF RRC, Shaikpet Sport Complex, Hyderabad, Telangana	04023565666	08333068536 08333068547

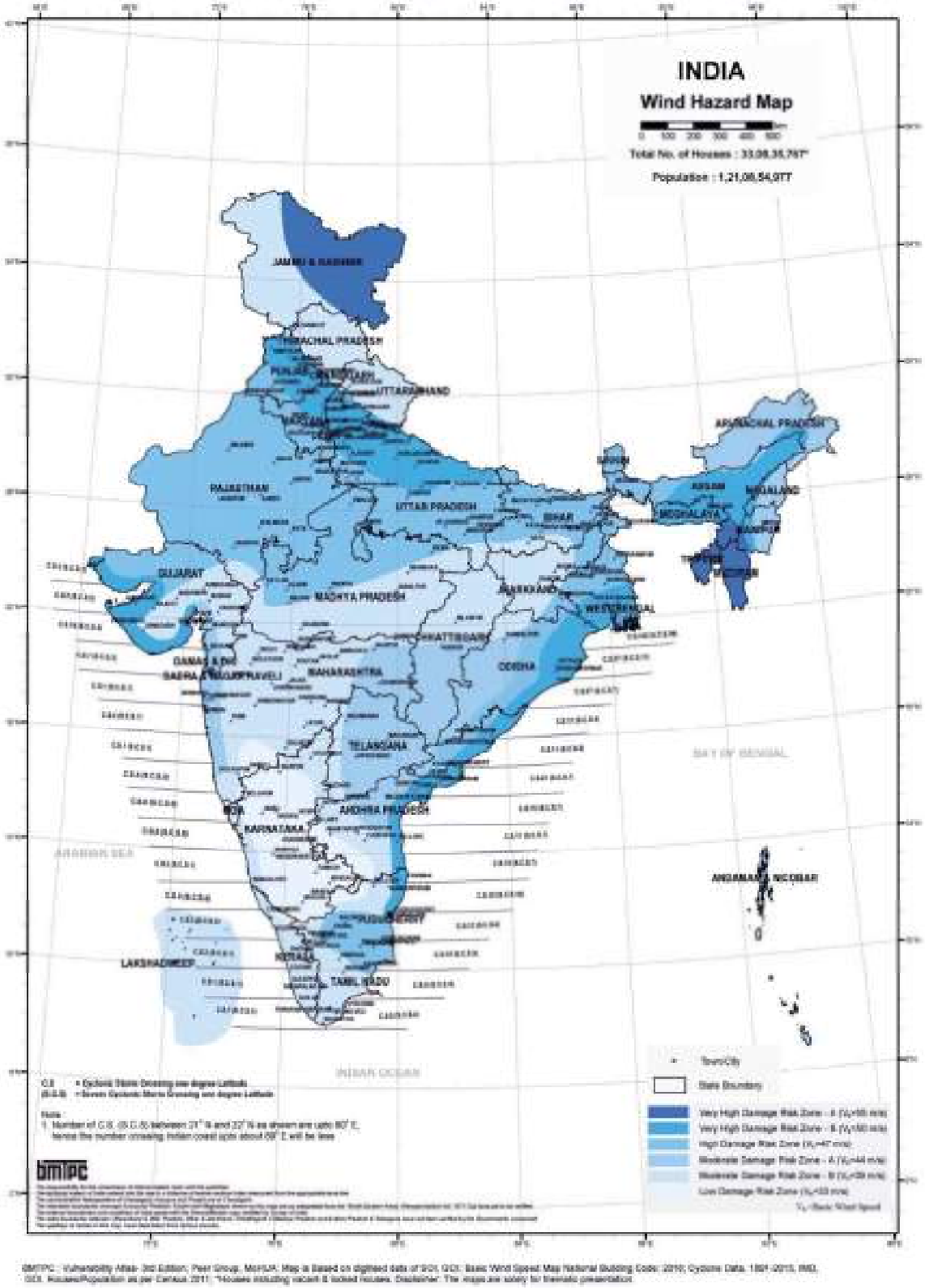
ANDHRA PRADESH STATE DISASTER RESPONSE FORCE (APSDRF)

Name of the Officer	Designation	Phone	Email ID
Sri. K. Kanna Babu, I.A.S	Special Commissioner (Disaster Management) & Ex-Officio Additional Secretary to Government, Revenue (DM) Department, Managing Director (FAC), APSDMA	0863-2377099	commr_relief_rev@ap.gov.in
Sri. Dr. C. Nagaraju	Executive Director	+91-9676957788, 0863-2377105	ed-apsdma@ap.gov.in
Smt. P. Seshasri	Administrative Officer	+91-8333905039	seshasrip-plg@ap.gov.in
Sri. Ch. Santhi Swarup	SEOC Incharge	+91-8333905033	seoc-apsdma@ap.gov.in

APPENDIX C
IMPORTANT MAPS

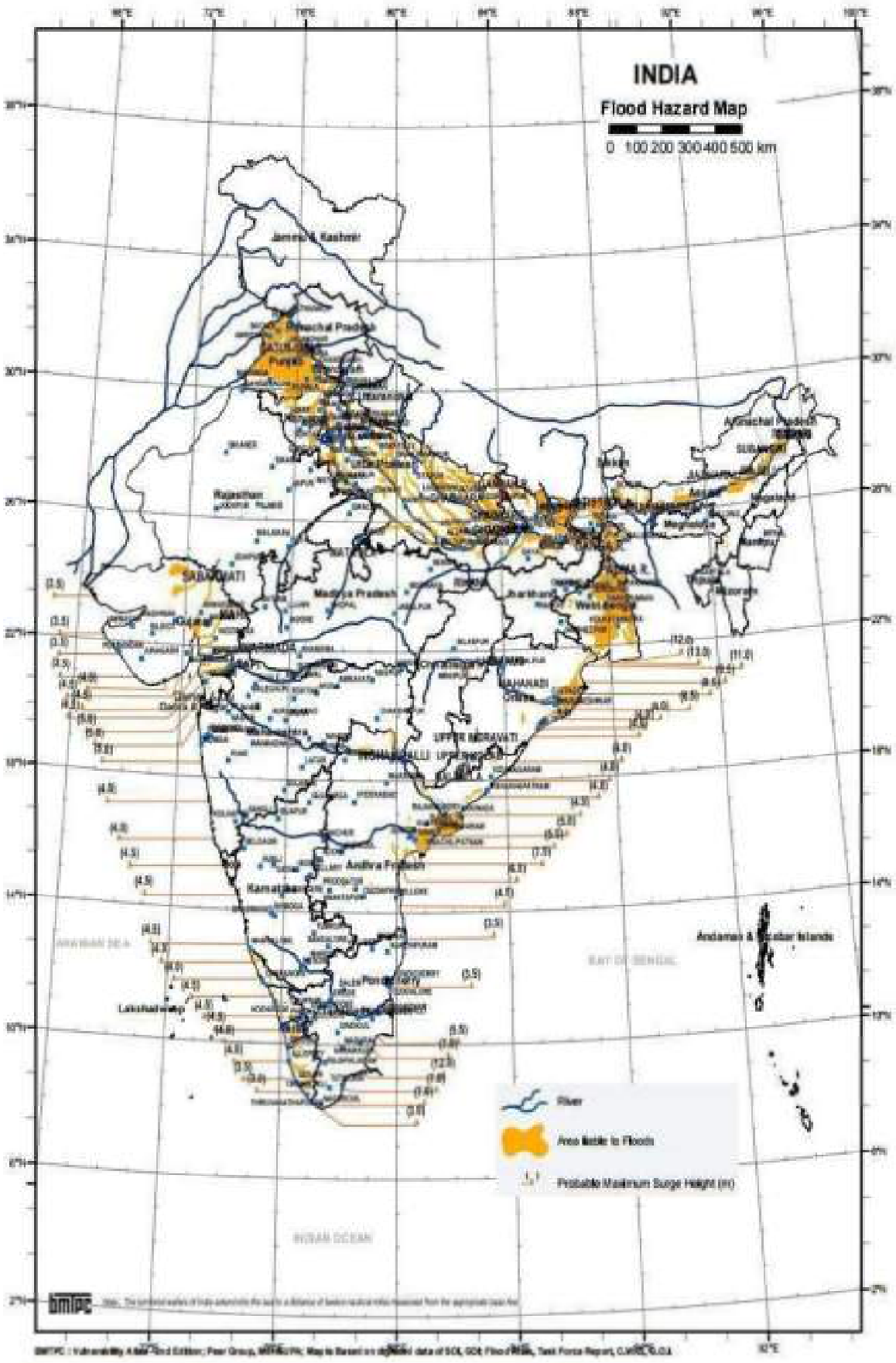


EARTHQUAKE HAZARD MAP



BMTPC , Vulnerability Atlas- 3rd Edition; Peer Group, MoHUA; Map is based on digitised data of SOI, GSI; Basic Wind Speed Map National Building Code- 2016; Cyclone Data- 1891-2015, IMD; GSI, Houses/Population as per Census 2011; *Houses including vacant & locked houses. Disclaimer: The maps are solely for thematic presentation.

WIND HAZARD MAP



FLOOD HAZARD MAP

ANNEXURE –3
(NOC for Explosives)

(10)

भारत सरकार
Government of India
वाणिज्य और उद्योग मंत्रालय
Ministry of Commerce & Industry
पेट्रोलियम तथा विस्फोटक सुरक्षा संगठन (पैसो)
Petroleum & Explosives Safety Organisation (PESO)
डोर न. 7-20-13, किरलामपुडी लेआउट
विशाखापट्टनम- 530017
Door No. 7-20-13, Kirlampudi Layout,
Visakhapatanam - 530017

E-mail : dyccevizag@explosives.gov.in
Phone/Fax No : 0891-2722257

दिनांक /Dated : 28/12/2022

सं /No : P/SC/AP/14/1437 (P34431)

से /To

visakhapatnam portt rust,
VISAKHAPATNAM PORT,
AOB Building, Near Sea Horse Junction,
Visakhapatnam,
Visakhapatnam (Urban),
Taluka: Visakhapatnam (Urban),
District: VISAKHAPATNAM,
State: Andhra Pradesh
PIN: 530035

विषय /Sub : Plot No, NIL, VISAKHAPATNAM PORT TRUST, VISAKHAPATNAM, Visakhapatnam (Urban), Taluka: Visakhapatnam (Urban), District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 530035 मे स्थित विद्यमान पेट्रोलियम वर्ग A,B Retail Outlet की अनुज्ञप्ति संख्या P/SC/AP/14/1437 (P34431) - नवीकरण के संदर्भ में ।
Existing Petroleum Class A,B Retail Outlet at Plot No, NIL, VISAKHAPATNAM PORT TRUST, VISAKHAPATNAM, Visakhapatnam (Urban), Taluka: Visakhapatnam (Urban), District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 530035 - Licence No P/SC/AP/14/1437 (P34431) - Reg Renewal of Licence.

महोदय /Sir (s),

कृपया आपके उपर्युक्त विषय से संबंधित पत्र संख्या X दिनांक 15/12/2022 का संदर्भ ग्रहण करें ।

Please refer to your letter No. X dated 15/12/2022 on the subject.

अनुज्ञप्ति सं P/SC/AP/14/1437 (P34431) दिनांक 04/01/2002 दिनांक 31/12/2025 तक नवीनीकृत कर लौटाई जा रही है ।
Licence No. P/SC/AP/14/1437 (P34431) dated 04/01/2002 is returned herewith duly renewed upto 31/12/2025.

कृपया पेट्रोलियम नियम,2002 के अधीन बनाए गए नियम 148 में दी गई प्रक्रिया का कड़ाई से पालन करें । अनुज्ञप्ति के नवीकरण हेतु समस्त दस्तावेजों को दिनांक 31/12/2025 या उससे पहले इस कार्यालय में प्रस्तुत करें ।
Please follow the procedure strictly as laid down in rule 148 of the Petroleum Rules, 2002 and submit complete documents for the Renewal of the licence so as to reach this office on or before 31/12/2025.

कृपया पावती दें । Please acknowledge the receipt.

भवदीय /Yours faithfully,

((जे.सरकार)
(J. Sarkar))
उप मुख्य विस्फोटक नियंत्रक
Dy. Chief Controller of Explosives
विशाखापट्टनम/Visakhapatanam

(अधिक जानकारी जैसे आवेदन की स्थिति, शुल्क तथा अन्य विवरण के लिए हमारी वेबसाइट : http://peso.gov.in देखें)
(For more information regarding status,fees and other details please visit our website: http://peso.gov.in)

(1)

भारत सरकार
Government of India
वाणिज्य और उद्योग मंत्रालय
Ministry of Commerce & Industry
पेट्रोलियम तथा विस्फोटक सुरक्षा संगठन (पेसो)
Petroleum & Explosives Safety Organisation (PESO)
डोर न. 7-20-13, किरलामपुडी लेआउट
विशाखापट्टनम- 530017
Door No. 7-20-13,
Kirlampudi Layout,
Visakhapatanam - 530017

E-mail : dyccevizag@explosives.gov.in
Phone/Fax No : 0891-2722257

संख्या /No. P/SC/AP/14/2145 (P209114)

दिनांक /Dated : 28/12/2023

सेवा में
/To,

The Board of Trustee,
Visakhapatnam Port Authority,
Port Area, Visakhapatnam.,
VISAKHAPATNAM,
Visakhapatnam (Urban),
Taluka: Visakhapatnam (Urban),
District: VISAKHAPATNAM,
State: Andhra Pradesh
PIN: 530035

विषय /Sub : Plot No, NA, Visakhapatnam Port Trust, Premists North Cabin, Visakhapatnam, Visakhapatnam (Urban), Taluka: Visakhapatnam (Urban), District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 530035 में स्थित विद्यमान पेट्रोलियम वर्ग A,B Retail Outlet की अनुज्ञप्ति संख्या P/SC/AP/14/2145 (P209114) - नवीकरण के संदर्भ में ।
Existing Petroleum Class A,B Retail Outlet at Plot No, NA, Visakhapatnam Port Trust, Premists North Cabin, Visakhapatnam, Visakhapatnam (Urban), Taluka: Visakhapatnam (Urban), District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 530035 - Licence No. P/SC/AP/14/2145 (P209114) - Reg Renewal of Licence.

महोदय /Sir(s),

कृपया आपके उपर्युक्त विषय से संबंधित पत्र संख्या OIN1557357 दिनांक 26/12/2023 का संदर्भ ग्रहण करें ।
Please refer to your letter No. OIN1557357 dated 26/12/2023 on the subject.

अनुज्ञप्ति सं P/SC/AP/14/2145 (P209114) दिनांक 09/10/1978 दिनांक 31/12/2026 तक नवीनीकृत कर लौटाई जा रही है ।
Licence No. P/SC/AP/14/2145 (P209114) dated 09/10/1978 is returned herewith duly renewed upto 31/12/2026.

कृपया पेट्रोलियम नियम,2002 के अधीन बनाए गए नियम 148 में दी गई प्रक्रिया का कडाई से पालन करें । अनुज्ञप्ति के नवीकरण हेतु समस्त दस्तावेजों को दिनांक 31/12/2026 या उससे पहले इस कार्यालय में प्रस्तुत करें ।
Please follow the procedure strictly as laid down in rule 148 of the Petroleum Rules, 2002 and submit complete documents for the Renewal of the licence so as to reach this office on or before 31/12/2026.

कृपया पावती दें । Please acknowledge the receipt.

भवदीय /Yours faithfully,

((एस. के. भोले))
(S. K. Bhole))
विस्फोटक नियंत्रक
Controller of Explosives
कृते उप मुख्य विस्फोटक नियंत्रक
For Dy. Chief Controller of Explosives
विशाखापट्टनम/Visakhapatanam

(अधिक जानकारी जैसे आवेदन की स्थिति, शुल्क तथा अन्य विवरण के लिए हमारी वेबसाइट . http://peso.gov.in देखें)
(For more information regarding status,fees and other details please visit our website: http://peso.gov.in)
Note:-This is system generated document does not require signature.

Website : http://peso.gov.in
Email: explosives@explosives.gov.in
दूरभाष/ Telephone : 0712-2510248
फैक्स/ FAX 0712-2510577
कार्यालयीन उद्देश्य के सभी पत्रादि "मुख्य विस्फोटक नियंत्रक" के पदनाम से भेजे जाए उनके व्यक्तिगत नाम से नहीं

All communications intended for this Office should be addressed to the 'Chief Controller of Explosives' and NOT to him by name.

भारत सरकार
GOVERNMENT OF INDIA
वाणिज्य और उद्योग मंत्रालय
Ministry of Commerce & Industry
पेट्रोलियम तथा विस्फोटक सुरक्षा संगठन
Petroleum and Explosives Safety Organisation
(पूर्व नाम – विस्फोटक विभाग)
(Formerly- Department of Explosives)
'ए'-ब्लाक, पाँचवा तल, केन्द्रीय कार्यालय परिसर,
"A" Block, 5th Floor, CGO Complex,
सेमिनरी हिल्स, नागपुर - 440 006 (महा)
Seminary Hills, Nagpur- 440006

37/P

पत्रांक / No. G-22(47)118/VII दिनांक / Dated : 09/03/2022

To,

The Chief Engineer,
Engineering Department,
M/s. Visakhapatnam Port Trust,
Visakhapatnam – 530 035.

Sub: Approval for Rehabilitation of Breasting and Mooring Dolphin at OSTT Jetty, Visakhapatnam Port Trust under Petroleum Rules, 2002 - Regarding.

Dear Sirs,

Please refer to your letter No. IM&EE/MOF/MII/8585 dated 17/02/2022 & inspection of the subject facilities by officer of O/o Dy. Chief Controller of Explosives, Visakhapatnam on 29/01/2021. Subsequently, M/s. Visakhapatnam Port Trust has submitted compliance report dated 15/02/20212 to the O/o Dy. Chief Controller of Explosives, Visakhapatnam. The inspection report along with recommendations of Dy. Chief Controller of Explosives, Visakhapatnam dated 17/02/2021 on the subject matter.

O/o Dy. Chief Controller of Explosives, Visakhapatnam has reported that M/s. Visakhapatnam Port Trust has conformed the avability of 2 Nos. of Class – III fire floats and 3 Nos.of tug boats as a Portable arrangement made for firefighting as per OISD 156, and recommended for handling the ships at the subject jetty restricted upto 1,00,000 DWT only.

In view of above the approval is accorded for the handling of vessels upto 1,00,000 DWT with following conditions :

1) A detailed clause wise compliane to OISD 156 shall be ensured.
2) SOP shall be strictly followed and regular safety audit to be carried out.
3) All activities shall be supervised by your technical competent persons.
4) Flame proof equipments with CCE approval details shall be maintained.
5) Details of hoses/unloading arms shall be regularly tested.
6) HC/Fire detectors at strategic locations to be maintained.
7) Automatic shutdown initiation due to HC/Fire detection to be incorporated suitably.
8) No other activities to be carried out within 100 Mtrs. Radius from the unloading Arm/manifold.
9) All due safety precautions shall be taken to prevent accidents.

This is issues with the concurrence of the Chief Controller of Explosives.

379
15/3/22

Yours faithfully,

(S.D. Mishra)
Controller of Explosives
for Chief Controller of Explosives

P.T.O.

ANNEXURE – 4

VISAKHAPATNAM PORT AUTHORITY

Leakage Detection System at Various locations.

ANNEXURE – 5

ISO 9001, ISO 14001
ISO 45001
ISPS COMPLIANCE PORT

SAGARMALA
PORT LED PROSPERITY

विशाखपट्टणम पोर्ट प्राधिकरण
(पत्तन, पोत परिवहन एवं जलमार्ग मंत्रालय)
VISAKHAPATNAM PORT AUTHORITY
(Ministry of Ports, Shipping & Waterways, Govt. of India)
విశాఖపట్నం పోర్ట్ అథారిటీ

No. IENG/ Env.Cell/ MoEF /EC/Pt.I
Date: 15.07.2024.

To
The Member Secretary,
Ministry of Environment, Forests and Climate Change,
Integrated Regional Office, Green House,
Gopalareddy Road,
Vijayawada,
Andhra Pradesh - 520010

Sir,

Sub: Environment Clearance for various projects of Visakhapatnam Port Authority, Visakhapatnam -Submission of the Half-yearly Compliance reports - Reg.

Ref: 1. VPA -EC &CRZ clearances obtained from MOEF&CC for various projects.
2. This Office Previous Lr. No. IENG/Env.Cell/MoEF/EC/Pt.I dated 29.12.2023

***

Please find herewith the attachment of half yearly compliance report on EC's obtained by the VPA for kind perusal and information please.

Encl: As above.

DESPATCHED 17/7/24 4.30pm

Yours faithfully,

15/7/24
CHIEF ENGINEER (I/c)
मुख्य अभियंता
CHIEF ENGINEER
विशाखपट्टणम पोर्ट ट्रस्ट
Visakhapatnam Port Trust

Visakhapatnam Port Authority, Visakhapatnam - 530 035, Phone : (91) + 891-2562758, Fax : (91) + 891-2565023
विशाखपट्टणम पोर्ट प्राधिकरण, विशाखपट्टणम - 530 035, फोन : (91) + 891-2562758 फैक्स : (91) + 891-2565023
E-mail : chairman.vpt@gov.in

ANNEXURE – 6

...రాపోటీ!

• దూసుకుపోతున్న ప్రధాన పార్టీల అభ్యర్థులు • సిట్టింగ్ ఎమ్మెల్యే పతివాడకే మరో ఛాన్స్ ఇచ్చిన టీడీపీ • త్రిముఖ పోటీ అనివార్యమంటున్న విశ్లేషకులు

దానికి 20 రోజులు ముందునుంచే ప్రచార పర్వాన్ని ప్రారంభించిన నాగ మాధవి టిక్కెట్ ఖరారైన తర్వాత మరింత వేగం పెంచి జనాల హృదయాల్లో గ్రాను గు ర్తు గా ప్పిం చేందుకు గట్టిగా ప్రయత్నం చేస్తున్నారు. జాతీయ పార్టీల విషయానికి వస్తే, బీజేపీ తరపున పతివాడ రమణకు ఆ పార్టీ అధిష్ఠానం టిక్కెట్ ప్రకటించడంతో ఆయన కూడా పెద్ద ఎత్తున ప్రచారానికి శ్రీకారం చుట్టి ముందుకు సాగుతున్నారు. గతంలో పట్టభద్రుల ఎమ్మెల్సీగా కూడా పతివాడ రమణ ఎన్నికల బరిలో నిలిచిన నైవం తెలుసుకునే మరో జాతీయ పార్టీ కాంగ్రెస్ విషయానికి వస్తే ... టికెట్ ఖరారయింది. ఆయన కూడా ప్రచారానికి శ్రీకారం చుట్టారు.

కోటి రూపాయల నగదు పట్టివేత

(విజయనగరం), ప్రభ న్యూస్: విశాఖ జిల్లా నర్సీపట్నంలో కారులో తరలిస్తున్న కోటి రూపాయలు పట్టుకున్నారు. దీనికి సంబంధించిన వివరాలు ఇలా ఉన్నాయి. ఎన్నికల నేపథ్యంలో ... వద్ద చెక్ పోస్టు ఏర్పాటు చేసి వాహన తనిఖీలు నిర్వహిస్తుండగా ఒక ... రూపాయల నగదును గుర్తించారు. వాహనంలో ఉన్నవారిని ప్రశ్నించగా, తాము ... నగదు విశాఖలోని ... ఎస్‌బీఐ నుండి పాడేరు బ్యాంకుకు ... తరలిస్తున్నామని ... నగదు సంబంధించిన సరైన ధ్రువపత్రాలు ... ఇన్‌కమ్ ట్యాక్స్ అధికారులకు అప్పగించారు. ఎస్.ఎస్.టి. ... రావు, నర్సీపట్నం సీఐ, ఎం. శ్రీనివాసరావు, ఎస్సై ... ఈ దాడిలో ... నగదును ... అప్పగిస్తున్నట్టు తెలిపారు.

జైల్లో ఉన్నాను!

• జగన్‌పై టీడీపీ ఎమ్మెల్సీ బాబూ రాజేంద్రప్రసాద్ కామెంట్

అమరావతి, ఆంధ్రప్రభ: అవినీతికి బ్రాండ్ అంబాసిడర్ అయిన జగన్ నేను తిన్నాను...నేను ఉన్నాను... అని వైరాగ్యంగా చెబుతున్నారని, దీనికి బదులు నేను తిన్నాను...నేను జైల్లో ఉన్నాను.. అంటే బాగుంటుందని టీడీపీ ఎమ్మెల్సీ బాబూ రాజేంద్రప్రసాద్ వ్యాఖ్యానించారు. మంగళవారం ఉండవల్లి ప్రజావేదికలో మీడియాతో మాట్లాడుతూ ప్రతిపక్షనేత జగన్ ... అన్నీ అసత్యాలు మాట్లాడరని, టీడీపీ నాయకులు, కార్యకర్తలు ... జగన్ ... నిర్లక్ష్యమన్నారు. ... జగన్‌కే ఉన్నాయన్నారు. ... సంక్షేమ పథకాలు అందిస్తున్నామన్నారు. ... పోలవరం పూర్తి చేస్తానని జగన్ చెబుతున్నారని, పోలవరాన్ని చంద్రబాబు ... పనులు పూర్తిచేశారని, త్వరలో పూర్తి చేయడానికి సిద్ధంగా ఉందని, ... ప్రతిపక్షనేతగా జగన్ ... వేస్తున్నారు. ఇప్పటికైనా జగన్ వాస్తవాలు తెలుసుకుంటే మంచిదని హితవు పలికారు.

ఫిరాయింపులతో ఖూనీ!

• తెలంగాణ భూములు దోచిన జగన్‌కు కేసీఆర్ మద్దతు ఇస్తారా? : టీ టీడీపీ నేత రావుల

హైదరాబాద్, ఆంధ్రప్రభ: ముఖ్యమంత్రి చంద్రశేఖరరావు పార్టీ ఫిరాయింపులను ప్రోత్సహిస్తూ ప్రజాస్వామ్యాన్ని ఖూనీ చేస్తున్నారని తెలుగుదేశం పార్టీ పొలిట్‌బ్యూరో సభ్యుడు రావుల చంద్రశేఖర్‌రెడ్డి దుయ్యబట్టారు. ... ఫిరాయిస్తేనే నియోజకవర్గాల్లో అభివృద్ధి జరుగుతుందని ఎమ్మెల్యేలు చెప్పడం ప్రజలను మోసం చేయడమేనని మంగళవారం జరిగిన విలేకరుల సమావేశంలో ఆయన అన్నారు. తెలంగాణ భూములు కొల్లగొట్టి, అక్రమంగా దోచుకుని 16 నెలలు జైలులో కూర్చున్న వైకాపా అధ్యక్షుడు జగన్ గెలవాలని కేసీఆర్, కేటీఆర్‌లు ఎలా కోరుకుంటారని ఆయన ప్రశ్నించారు. ఫెడరల్ ఫ్రంట్ ఏర్పాటుచేసి ప్రకంపనలు సృష్టిస్తామని ప్రగల్భాలు పలికిన కేసీఆర్ ఇప్పుడు మాటమార్చి జాతీయ పార్టీ అంటూ కొత్త రాగం ఎత్తుకున్నారని రావుల ఎద్దేవా చేశారు.

TIMES

THE TIMES OF INDIA, VISAK

FINANCE MINISTER ARUN JAITLEY SLAMS OPPOSITION-RULED STATES FOR 'ROBBING FARMERS' OF PM-KISAN SCHEME BENEFI

Pulwama attack: CRPF will not celebrate Holi

Gurgaon: The CRPF will not officially celebrate Holi this year as a mark of respect to its 40 jawans killed last month in a suicide attack in Jammu and Kashmir, where the force eliminated 210 terrorists in 2018, the force's chief said on Tuesday.

During an event to the mark 80th raising day of the force at its group centre here, CRPF Director General (DG) R R Bhatnagar also said the influence of left-wing extremists or Naxals has reduced by 40 per cent and only a few areas in the country are now affected. Paying tributes to the slain personnel, the DG said the force is creating a mobile app in order to provide help to the families of jawans killed in action. "there will be no official celebrations in the force during the Holi festival on March 21 as a mark of respect to the 40 troops killed in the suicide attack in Pulwama on February 14," the DG said. en

BJP-led govt faces fl today, CM Sawant c

'Will Deal With People Like Parrikar Did'

Pramod Sawant was sworn in as CM during the early hours of Tuesda

Panaji: The new BJP-led government in Goa will face the floor test in the state Assembly on Wednesday to prove its majority just a day after Speaker Pramod Sawant was sworn in as chief minister with an unprecedented two deputies past midnight capping a frenetic day of political wrangling.

The government claims majority with the support of 21 MLAs —12 from the BJP, three each of allies Goa Forward Party (GFP) and Maharashtrawadi Gomantak Party (MGP) and three independents. The strength of the 40-member House has been reduced to 36 following the death of chief minister Manohar Parrikar and BJP MLA Francis D'Souza and resignations of two Congress MLAs Subhash Shirodkar and Dayanand Sopte.

The Congress, which is the single largest party with 14 MLAs, had also staked claim to form the government. There is also an NCP legislator in the House. Governor Mridula Sinha has convened a special session of the Assembly at 11.30 am Wednesday to enable the chief Minister to prove his majority in the House, an official said. After multiple postponements of the oath ceremony o Monday, Sawant, a two-tim MLA from Sankhalim i North Goa, was sworn in a the Raj Bhavan at 1.50 am. An ayurveda practitioner, Sawant is also a dedicated RSS worker.

Reflecting a generational shift in the BJP, Sawant, 45, was administered the oath of office and secrecy along with 11 other ministers including those from the MGP and the GFP. He succeeded Parrikar, who died on Sunday after

Woman naxal killed in C

Rajnandgaon: A woman Naxal, carrying a gunned down on Tuesday in an encounter garh's Rajnandgaon district, police said. Th muna alias Sagan Bai, 46, was allegedly inv minister in the erstwhile Madhya Pradesh dent of Police Kamlochan Kashyap said.

Jamuna was working as a secretary of s. The skirmish took place lice station area, when a Chhattisgarh and Madhy al operation along the int

SPYWARE SCANDAL

Pegasus may be shut down or its creator NSO sold

Tory unrest against Boris grows with Covid curbs vote

Tornado toll rises to 88 in five US states

Kids get sucked into raging storm

Afghans angry after US lets soldiers off the hook

ASIA MATTERS

EXPRESS READ

'Time running out on Iran Nuke deal'

Field day for Doge after Musk gives greenlight

సీమ, ఉత్తరాంధ్ర జిల్లాల కోసం

మూడు రాజధానులే ముద్దు

ఓటీఎస్‌తో సర్వ హక్కులు

మా బహిరంగ సభకు అనుమతివ్వండి

వేతనాలు... పెన్షన్లపై సీఎస్‌వి తప్పుడు లెక్కలు

ANDHRA PRABHA - DAILY

dt. 15.12.2021 (WEDNESDAY)

ఆర్డర్ నెం.ఎస్ఇఐఎఎ/ఎపి/విఎస్పి/ ఐఎన్‌డి/06/2019/1027167.74 & 164.65 - తేది: 26.10.2021 ప్రకారం విశాఖపట్నం పోర్ట్ ట్రస్ట్, విశాఖపట్నం వద్ద క్రూజ్-కం-కోస్టల్ కార్గో టెర్మినల్ యొక్క అభివృద్ధి ప్రాజెక్టు కొరకు ఇసి & సిఆర్‌జడ్ క్లియరెన్స్ "ఎంఓఇఎఫ్ & సిసి" కొత్త ఢిల్లీ వారిచే ఇవ్వబడినది. క్లియరెన్స్ లేఖల యొక్క ప్రతి ఎంఓఇఎఫ్ & సిసి యొక్క అధికారిక వెబ్‌సైట్ http://envfor.nic.in వద్ద అందుబాటులో కలదు.

ఆంధ్రప్రభ - దినపత్రిక B: 15.12.2021 (బుధవారము)

ANNEXURE – 7

Sub: STATEMENT SHOWING THE DETAILS OF CER (CORPORATE ENVIRONMENT RESPONSIBILITY) IN VPA FOR YEAR OF 2024 - 2025

Sl.No.	Description of work	Expenditure incurred (Rs. in Crores)	Remarks
1.	**2.**	**3.**	**4.**
1.	Operation and Maintenance of Continuous Online Ambient Air quality monitoring Stations (CAAQMS) at 3 identified areas of VPA	0.3092	Work is in Progress.
2.	Sampling and analysis of Marine Sediments at Visakhapatnam Port	0.0138	Work is in Progress.
3.	Harbour water quality monitoring at high and low tides.	0.1170	Work is in Progress.
4.	Sampling, Analysis & Testing of raw sewage treated water of 10 MLD STP of VPA	0.0782	Work is in Progress.
5.	Operation and Maintenance Sewage Treatment Plant to handle total hospital sewage of 25 KLD at Golden Jubilee Hospital, Vishakhapatnam Port Trust for a period of 5 years.	0.0338	Operation and Maintenance is in Progress.
6.	Operation and Maintenance Sewage Treatment Plant Sullage at AOB 20 KLD for a period of 18 months.	0.3673	Treatment of Sullage water from canteen.
7.	Monitoring of Ground water samples to assess the contamination due to run off and water stagnation in cargo stacking Yards in Port area.	0.0220	Monitoring of Ground / Leachate Water is in Progress
8.	Engagement of Environment Cell Chief Manager, Manager and 3no.s of Supervisors on contract basis for Environment Cell of VPA.	0.3120	Engaged for Environmental Cell Works
9.	Marine Ecology Study	0.0412	Work in progress
10.	Providing PLC based MDSS at different areas in port area.	4.0000	Work Completed. PLC Based MDSS work is completed
11.	Construction of 4 covered storage sheds at various locations in Port area.	116.0400	3 Covered Sheds Construction work is completed. Another Shed work is in Progress.
12.	Mechanical sweeping on Port roads	1.9000	3no.s of Mechanical Sweeping Machine is deployed
13.	Three Truck Mounted and 7 Trolley Mounted Fog Canons	3.0000	Controlling of dust at operational area.
14.	Providing plantation of 10,000 Nos Avenue & Fruit Bearing plants**.**	0.0900	Work is in progress.
15.	Removal of Floating material from Drains	0.6600	Work is in progress.
16.	Green Belt Development (Maintenance)	5.0000	Work is in progress.
17.	Water Sprinkling on roads by Water Tankers	1.9200	Work is in progress.
18.	Internal roads and drains cleaning by Manpower	0.761	Work is in progress.
19	Environmental Audit and Development of Action plan for effective monitoring of Environmental Performance Indicators baseline study by NPC	0.2360	Report submitted.
20	AAQ Monitoring by Gravimetric method through M/s. MSV Analytical Laboratory	0.1275	Work in Progress.
	Total	**135.029**	

Annexure - B

Environmental and CRZ Clearance

For

Improving the capacity utilization of **OR-I & OR-II berths** at Visakhapatnam Port vide letter dated **07.03.2019 bearing F.No:10-62/2016-1A-III.**

Compliance on Conditions of Environmental Clearance for Improving the capacity utilization of OR-I & OR-II berths at Visakhapatnam Port.

ENVIRONMENT CLEARANCE CONDITIONS		
S. No	**Specific Conditions**	**Compliance status for the period of Apr'24 – Sep'24**
i	Construction activity shall be carried out strictly according to the provisions of CRZ Notification, 2011. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation zone area.	**Complied.** VPA Strictly followed the CRZ and Environmental Clearance (EC) Conditions.
ii	All the recommendations and conditions specified by the Andhra Pradesh Coastal Zone Management Authority who has recommended the project vide letter No.64/APCZMA/2017.535 dated February, 2018 shall be Complied with.	**Noted and Complied.**
iii	Consent to Establish/Operate for the project shall be obtained from the State Pollution Control Board as required under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974.	**Complied.** CFO Obtained from APPCB Order No. APPCB/VSP/VSP/45/ CFO/HO/1933 dated 13.04.2022.
iv	Notification GSR 94(E) dated 25.01.2018 of MoEF & CC regarding Mandatory Implementation of Dust Mitigation Measures for Construction and Demolition Activities shall be complied with.	**Complied.** Construction work is completed.
v	Comprehensive certified compliance report against each condition with respect to the compliance of earlier Environmental & CRZ Clearances issued shall be submitted condition wise to the Ministry within 03 months from issue of EC&CRZ clearance.	**Complied.**
vi	The project proponent shall ensure that the project is in consonance with the new CZMP prepared by the State Government under the provisions of the CRZ Notification, 2011.	**Complied.** VPA followed CRZ Notification 2011.
vii	The Project proponent shall ensure that no creeks or rivers are blocked due to any activities at the project site and free flow of water is maintained.	**Noted for Compliance.** No blockages of any creeks or rivers due to any of the project activities and ensured by VPA.
viii	No solid, semi-solid cargos would be handled.	**Complied.** The berths are dedicated to handle oil and petroleum products only.
ix	Dredging shall not be carried out during the fish breeding season.	**Complied.** As per plan, the dredging activity is carried out.
x	Dredging etc. shall be carried out in the confined manner to reduce the impacts on marine environment including turbidity.	**Complied.** Dredging is carried out in a proper way to reduce the impacts on marine environment.
xi	Dredged material shall be disposed safely in the designated areas.	**Complied.** The Dredged material dumped as per CWPRS Report. The copy CWPRS report is enclosed as **Annexure - 1**.
xii	Shoreline should not be disturbed due to dumping. Periodical study on shoreline changes shall be conducted and mitigation carried out, if necessary. The details shall be submitted along with the six monthly monitoring reports.	**Complied.** • Periodical study on shore line changes is ensured by VPA on regular basis as directed. • Details of Shoreline study by APSAC (Andhra Pradesh Space Application Centre) are enclosed as **Annexure - 2**.

xiii	While carrying out dredging, an independent monitoring shall be carried out by Government Agency/Institute to check the impact and necessary measures Shall be taken on priority basis if any adverse impact is observed.	**Complied.** Monitoring of sediment samples twice in a year is being carried out through M/s. S.V. Enviro labs and Consultants, Visakhapatnam NABET accredited agency and Harbour water quality is being monitored once in 3 months of a year through Andhra University NAAC accredited by UGC.
xiv	The fresh water requirement (7.11 MLD) for the present project will be met from Greater Visakhapatnam Municipal Corporation (GVMC), and also drawn from VPT's own open wells & galleries located outside CRZ area. Rain water harvesting shall be followed as per local byelaw and harvested water shall be stored, treated and reused to reduce the additional water requirement since Chennai is a water deficient area, besides use of water efficient appliances.	**Complied.** VPA implemented Rain Harvesting Pits at identified areas as per ASCI, Hyderabad Report.
xv	The concerns expressed during the public hearing held by the Visakhapatnam Port Trust needs to be addressed during the project implementation. These would also cover socio-economic and ecological and environmental concerns, besides commitment by the management towards employment opportunities.	**Complied.** VPA spend the amount for socio-economic and environment concerns in and around the port area.
xvi	Marine ecological studies as carried out by Marine Biology Department, Andhra University and its mitigation measures for protection of phytoplankton, zooplanktons, Benthic Organisms, Macro benthos and Olive Ridley's Turtles etc as given in the EIA-EMP Report shall be complied with in letter and spirit.	**Complied.** VPA carried out marine ecology study through Andhra University. The copy is enclosed as **Annexure - 3**.
xvii	Protection shall be ensured to the existing mangrove area around Meghadri gedda Creek and other water bodies within the Port area. Plantation of mangroves in suitable new area and maintenance of existing ones to be prioritized to maintain the present status of ecology/biodiversity.	**Noted for Comply.** VPA proposing to plant the mangrove plants at suitable location with the help of AP Forest Department.
xviii	A copy of the Marine and riparian biodiversity management plan duly validated by the State Biodiversity Board shall be submitted before commencement of implementation.	**Complied.** Same as Specific Condition no. xvi.
ix	A continuous monitoring programme covering all the seasons on various aspects of the coastal environs need to be undertaken by a competent organization available in the State or by entrusting to the National Institutes / renowned Universities / accredited Consultant with rich experiences in marine science aspects. The monitoring should cover various physicochemical parameters coupled with biological indices such as phytoplankton, zooplanktons, Benthic Organisms, Macro benthos, Olive Ridley's Turtles and fishes on a periodic basis during construction and operation phase of the project. Any deviations in the parameters shall be given adequate care with suitable measures to conserve the marine environment and its resources.	**Complied.** • Same as Specific Condition no. xvi & xviii. • Sediment analysis carried out by MoEF authorized agency M/s. S.V. Enviro Labs, Visakhapatnam. • Harbour Water Quality Monitoring was carried out by Andhra University.
xx	Continuous online monitoring of for air and water covering the total area shall be carried out and the compliance report of the same shall be submitted along with the 6 monthly compliance report to the regional office of MOEF&CC.	**Complied.** VPA having 3 Continuous Ambient Air Quality Monitoring Stations at 3 different locations. In addition to the above The Ambient Air Quality Monitoring is carried out by Gravimetric method through approved agency.

xxi	Ambient air quality shall be maintained at prescribed levels. The existing ambient air quality stations shall have a system of reporting exceedances separately to the Pollution Control Board.	**Complied.** Same as Specific Condition no. xx.
xxii	The project configuration should integrate and dovetail with the State Plan and not implemented unless the state plan is prepared and dovetailing ratified.	**Complied.**
xxiii	Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components as a part of the management plan. Marine ecology shall be monitored regularly also in terms of all micro, macro and mega floral and faunal components of marine biodiversity.	**Complied.** VPA carried out marine ecology study through Andhra University at a frequency of every 6 months in a year. The study report copy is enclosed as **Annexure - 3**.
xxiv	Spillage of fuel / engine oil and lubricants from the construction site are a source of organic pollution which impacts marine life, particularly benthos. This shall be prevented by suitable precautions and also by providing Necessary mechanisms to trap the spillage.	**Complied.** VPA having Oil Spill Contingency Plan, Disaster Management Plan with well-equipped and trained personnel. The extracted pages of Oil Spill Contingency Plan are enclosed as **Annexure - 4** and Extracted pages of Disaster Management Plan are enclosed as **Annexure - 5**.
xxv	Necessary arrangements for the treatment of the effluents and solid wastes / facilitation of reception facilities under MARPOL must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986. The provisions of Solid Waste Management Rules, 2016. E-waste Management Rules, 2016, and Plastic Waste Management Rules, 2016 shall be followed.	**Complied.** • VPA implemented MARPOL regulations. VPA is a ISO 14000:2015 complainant port. • Bilge / Ballast water is being collected from ships and are being disposed through authorized agencies. • VPA is followed PCB Rules i.e Solid Waste, E-Waste and Plastic Waste Management as well as Environment Protection Act.
xxvi	Compliance to Energy Conservation Building (ECBC-2017) shall be ensured for all the building complexes. Solar/wind or other renewable energy shall be installed to meet energy demand of 1% equivalent.	**Complied.** • VPA Established 10MW Solar Power Plant and the energy are used for captive purpose. • Other 77OKW Solar Panels are arranged on roof top of port buildings.
xxvii	All the recommendations mentioned in the rapid risk assessment report, disaster management plan and safety guidelines shall be implemented	**Complied.** • VPA conducted Quantitative Risk Assessment by IRCLASS Systems and Solutions Pvt. Ltd., Mumbai. Extracted pages are enclosed as **Annexure - 6**. • VPA having Disaster Management Plant and it is updating regularly.
xxviii	Measures should be taken to contain, control and recover the accidental spills of fuel and cargo handle.	**Complied.** VPA having Oil Spill Contingency Plan, Disaster Management Plan with well-equipped and trained personnel. Extracted pages of Oil

		Spill Contingency Plan are enclosed as **Annexure – 4**.
xxix	Necessary arrangement for general safety and occupational health of people should be done in letter and spirit.	**Complied.** As per ISO 45001:2018 Complainant port, VPA regularly conducting workers health checkup.
xxx	All the mitigation measures submitted in the EIA report shall be prepared in a matrix format and the compliance for each mitigation plan shall be submitted to the Regional Office, MoEF&CC along with half yearly compliance report.	**Complied.** The EIA matrix format is enclosed as **Annexure - 7**.
xxxi	VPT will strengthen their Environmental Management Cell.	**Complied.** A Separate environment cell is established with qualified environmental personnel working under the supervision of the Chief Engineer.
xxxii	VPT Shall consider more employment opportunities to the local people	**Complied.**
xxxiii	As per the Ministry's Office Memorandum F. No. 22-65/2017-IA.III dated 1st May 2018, funds @0.75% of project Cost shall be earmarked under Corporate Environment Responsibility (CER) for the activities such as strengthening of environmental cell by new recruitments, development of green fields, environmental monitoring surveys, solid waste management, sanitation and sewage facilities, widening of culverts etc. The activities proposed under CER shall be restricted to the affected area around the project. The entire activities proposed under the CER shall be treated as project and shall be monitored. The monitoring report shall be submitted to the regional office as a part of Hal yearly compliance report, and to the District Collector. It should be posted on the website of the project proponent.	**Complied.** • The detailed report on item wise expenditure incurred for environment management plan for the year of 2024-25 is enclosed at **Annexure - 8**. • VPA is uploaded Environmental Monitoring Reports in VPA website.
	GENERAL CONDITIONS	**Compliance status for the period of Apr'24 – Sep'24**
i	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality.	**Complied.** Construction work is completed.
ii	Full support shall be extended to the officers of this Ministry/ Regional Office at Bangalore by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.	**Noted and Complied.**
iii	A six-monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Bangalore regarding the implementation of the stipulated conditions.	**Complied.** VPA submitted six-monthly monitoring report on 15.07.2024. The copy enclosed as **Annexure-9**.
iv	Ministry of Environment, Forest and Climate Change or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.	**Noted for Comply.**
v	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with the satisfaction of the Ministry.	**Noted.**
vi	In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment, Forest and Climate Change.	**Noted and Complied.**

vii	The project proponents shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work.	**Complied.**
viii	A copy of the clearance letter shall be marked to concerned Panchayat/local NGO, if any, from whom any suggestion representation has been made received while processing the proposal.	**Noted.**
ix	A copy of this clearance letter shall also be displayed on the website of the concerned State Pollution Control Board. The Clearance letter shall also be displayed at the Regional Office, District Industries centre and Collector's *Office* / Tehsildar's office for 30 days.	**Noted.**
7.	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.	**Complied.** The NOC copies are enclosed as **Annexure - 10**.
8.	The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental and CRZ Clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen on the website of the Ministry of Environment, Forest and Climate Change at http://www.envfor.nic.in. The advertisement should be made within Seven days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the ~ Regional office of this Ministry at Bangalore	**Complied.** The photo copies of advertisement published by VPA in newspaper are enclosed as **Annexure - 11**.
9.	This Clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project. The clearance letter shall also be put on the website of the company by the proponent.	**Noted and Complied.** VPA ensures for uploading of EC copies in the Website as per the directions. Screen shot is attached at **Annexure - 12**.
10.	Any appeal against this Clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.	**Noted.**
11.	Status of compliance to the various stipulated environmental conditions and environmental safeguards will be uploaded by the project proponent in its website.	**Complied.** VPA ensures for uploading of EC copies in the Website as per the directions. Screen shot is attached at **Annexure - 12**.
12.	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parisad / Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	**Complied.**
13.	The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF&CC, the respective Zonal Office of CPCB and the SPCB	**Complied.** Same as General Condition's no. 11 & 12.

14.	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF&CC, the respective Zonal Office of CPCB and the SPCB.	**Complied.** VPA submitted six - monthly monitoring report on 01.07.2023. The copy enclosed as **Annexure-9**.
15.	The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF&CC by e-mail.	**Complied**. • The Form-V submitted to Environment Engineer, RO APPCB, Visakhapatnam on Dt. 30.09.2024. Copy enclosed as **Annexure - 13**. • Same was uploaded in Visakhapatnam Port Website.
16.	The above stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification 1994, including the amendments and rules made thereafter.	**Noted and Complied.**
17.	This issues with the approval of Competent Authority	**Noted.**

ANNEXURE – 1

***Fax* No.0891-2565023**

Government of India
Ministry of Water Resources, River Development and Ganga Rejuvenation
Central Water & Power Research Station
Khadakwasla, Pune – 411 024

Tel : 020-24103421
Fax : 020-24381004
E-mail : kudale_md@cwprs.gov.in

No.101/13/72-PH II Dated: 10.03.2016

Chief Engineer,
Visakhapatnam Port Trust
Visakhapatnam 530 035.

(Attn: Shri. M.R. Rajanikanth, SE)

Sub: Sediment Transport Investigation at Visakhapatnam Port –Dumping Ground - Reg.
Ref: VPT fax letter. No. IENG/SE-V/AE-I/CWPRS/2016 dated 25 Feb. 2016

Sir,

With reference to your fax on the subject matter, this is to inform that based on the Radio-active studies conducted at Visakhapatnam, dumping ground is suitable for disposal of contemplated dumping activity. From the sounding chart (Fig.1 given in the Annexure) obtained from dumping ground survey conducted in the year 2015 and also in view of the fact that maintenance dredging of the port is reasonably low, it is opined that spoil ground of 2.6 Sq.km area is suitable for proposed dumping. The material to be disposed, 9.66 Lakh Cum, from the proposed capital dredging (Table.1) is not expected to come back towards the shipping channel. Radio-active Tracer studies conducted along with BARC indicated that disposed sediment predominantly moved towards South-West direction.

Maintenance dredging quantities during the period 2010 to 2015 (Table.2) indicates that annual maintenance dredging requirement would be of the order of 2.56 Lakh.cum. It is learnt that all the material being dredged from the sand trap area is being used for the beach nourishment of the down-drift northern coastline to tackle the littoral drift phenomenon and to maintain the dynamic equilibrium of the coastline and thus reducing the quantity of deep-sea dumping. Annual maintenance dredging carried out from other operational areas only, which is not that significant, is to be dumped in the deep-sea dumping ground besides the occasional capital dredging quantity.

Since the dumping ground is located in the deeper contours beyond -40m, with more offset distance of 1.45Km from the port approach channel, the chances of the dumped material finding its way back in to the port approach area are negligible with the expected dumping rates.

Radio-Active Tracer studies conducted by CWPRS along with BARC in the dumping ground area of Visakhapatnam Port during January to April 2010 indicated that the predominant spread of the dumped material is in NE-SW direction. Longitudinal distances covered by tracer towards north-east and south-west from injection point were about 300 meters and 880 meters respectively. Similarly, the spread in the north-west and south-east direction was about 170 meters on either side from injection point during the observed period (Fig.2).

Results drawn from a numerical model study, conducted to assess the spread of the disposed material in deep-sea dumping ground at a location in the vicinity of Visakhapatnam are useful to understand the bed thickness change and suspended sediment concentration for a typical disposal rate. Since the calibration of mathematical model is on the basis of radio-active tracer studies conducted at Visakhapatnam, inferences drawn are reliable if the similar disposal rates are contemplated. However, regular monitoring is suggested by conducting periodic bathymetric surveys in and around the dumping grounds.

It can be seen from figure.3 that maximum bed thickness change at the dumping location is of the order of 8.0cm at the end of two months dumping at the rate of six dumps a day by a dredge having 4500 cum hopper. With this rate of disposal, contemplated dredging of 9.66 lakh.cum would be completed in 36 days only. Bar graph showing the bed thickness change versus number of days of dumping is given in Figure.4. The dredge material has been dispersed over a large area giving a negligible increase of thickness in the surrounding areas. So it can be inferred that dumping of dredge spoil do not cause any appreciable changes on the morphology at the dumping locations and surrounding area.

A typical Suspended sediment concentration (SSC) map obtained from the numerical model on 13th day of dumping at the specified rate is given vide Fig.5. It may be noted that SSC in the central portion is 0.06 kg/cum with lesser values in the surrounding area. These insignificant SSC values spreading over a larger areal extent is desirable from environmental considerations. Above information indicate that change in the water column parameters and bed morphology as well, is expected to be less due to the impact of dumping. Alternate disposal at different sub domains within the dumping ground may be adopted to further reduce the impact of dumping. It is suggested to monitor and review the performance of the dumping ground area by conducting periodical bathymetric surveys immediately before and after the dumping.

Thanking you,

Yours faithfully,

10/3/16

(M. D. Kudale)
Additional Director

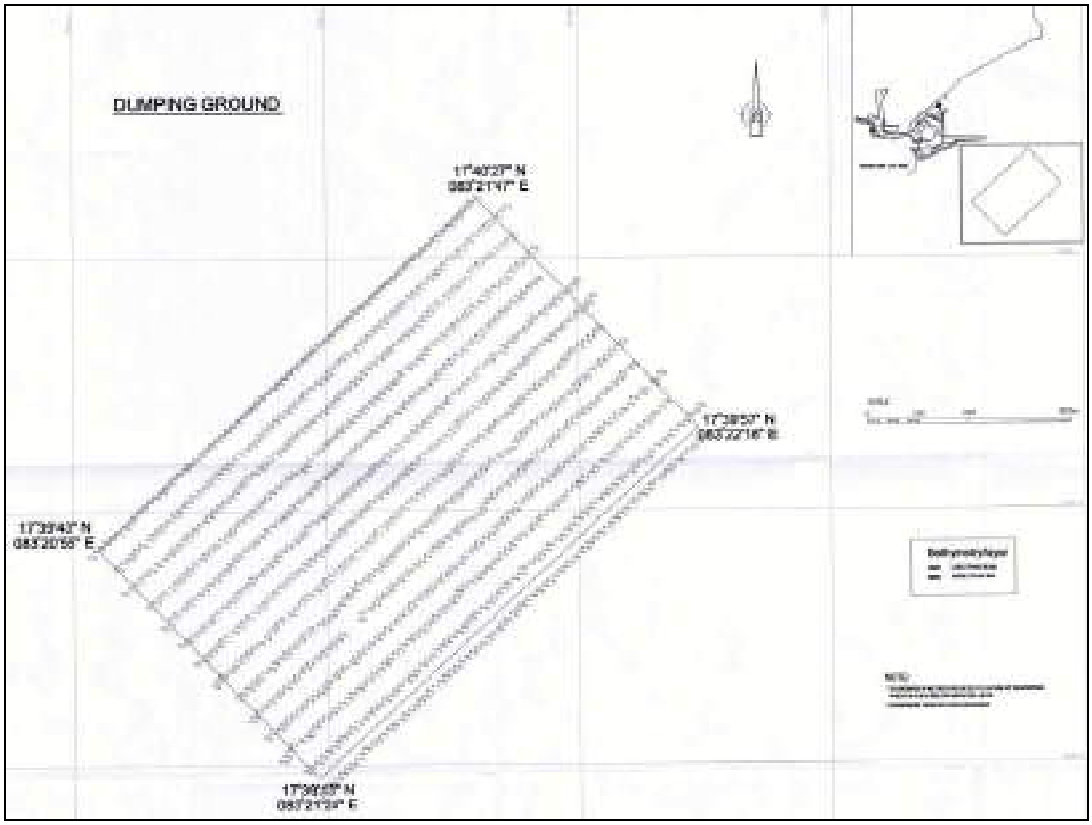


***Fig. 1**: Index map of Dumping ground at Visakhapatnam port showing the extent and Soundings*

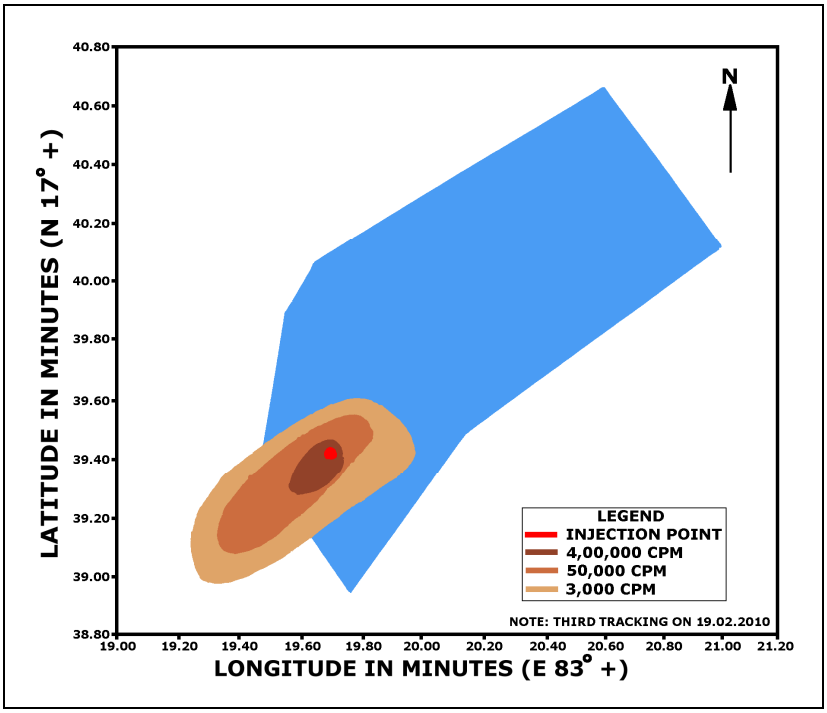


***Fig. 2**: Bed Transport / spreading pattern as per the Radio-Active Tracer study at Visakhapatnam port*

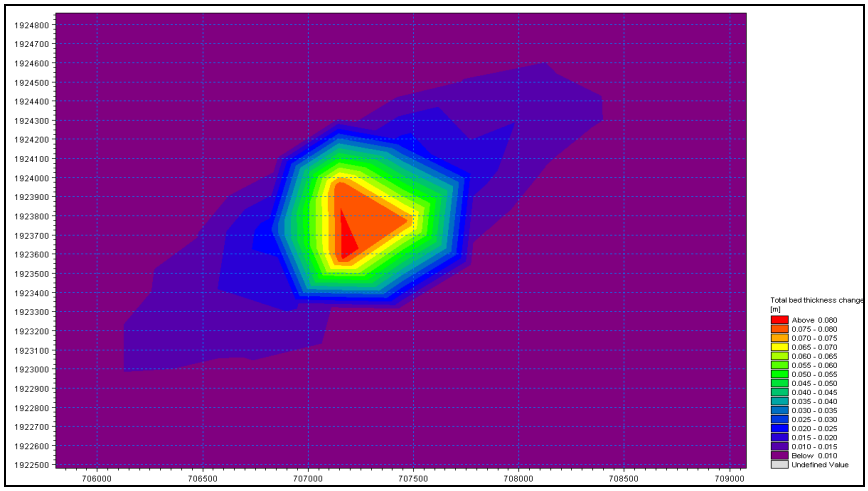


***Fig. 3**: Bed thickness change at the end of two months dumping period*

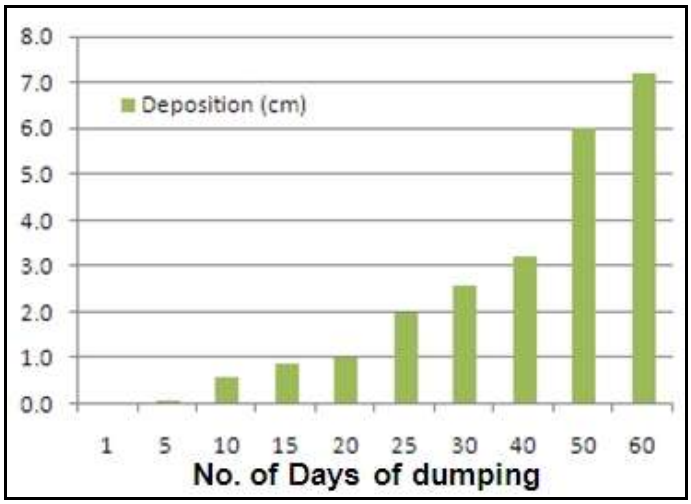


***Fig. 4**: Bed thickness change Vs No. of Dumping days*

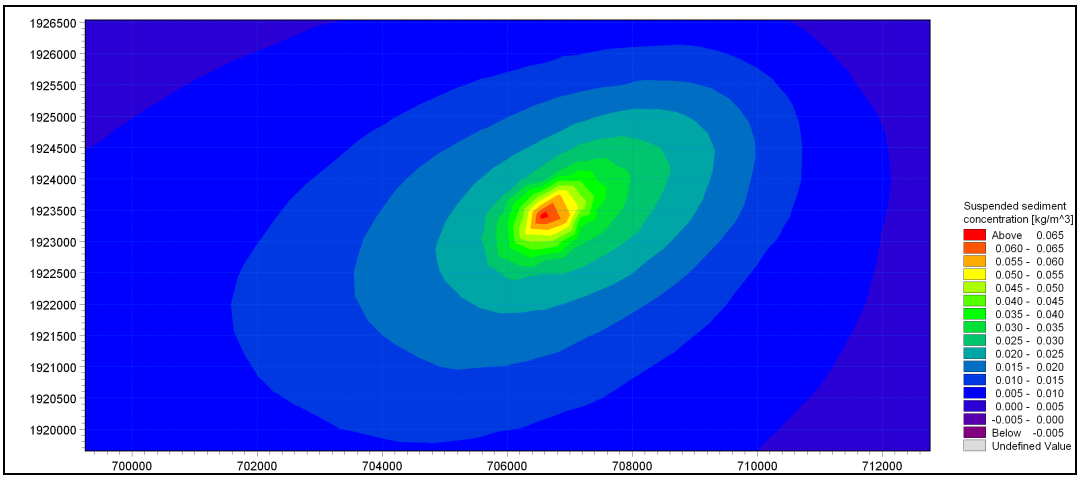


***Fig.5**: Suspended Sediment Concentration map during dumping*

ANNEXURE – 2

APSAC ANDHRA PRADESH SPACE APPLICATIONS CENTRE (APSAC)
ISO 9001:2015 ITE & C Department, Government of Andhra Pradesh

Dr. B.Sundar, IFS
Vice Chairman

Lr. no. SAC-12022/63/2022-DMSCS-APSAC – 1830 Dt. .10.2024

To
The District Collector,
Visakhapatnam - 530002

Dy Chairman
CE

Sub: Gride wise Shoreline Changes maps -Detailed shoreline hotspot report - Detailed maps- Visakhapatnam District – Reg.

***

EE(EC) 4/9/12
SE-II

Dear Sir/Madam,

1. The Andhra Pradesh Space Applications Center (APSAC) is carrying out Shoreline Changes mapping for the Andhra Pradesh coast. Shoreline geometry remains one of the key parameters in the detection of coastal erosion and deposition. Remote Sensing and Geographical Information Systems (GIS) are important tools for quantifying shoreline change on a temporal scale. The satellite images from 28th November 1990 and 6th March 2021 are the oldest and newest data sets used for the assessment of the coastal dynamics of the Visakhapatnam district.
2. The Digital Shoreline Analysis System (DSAS), a software application that works within the Environmental Systems Research Institute (ESRI)'s ArcGIS software, is employed in this study.
3. In the present study, the shoreline change rates are classified into seven classes based on the magnitude of changes. The erosion and accretion status during 1990-2021 for the Visakhapatnam district (**64.97 km**) with the lengths (km) is computed.
4. The analysis and shoreline change map are enclosed. In summary, the shoreline analysis indicates that 19.12 km (**29.43%**) of the Visakhapatnam coast is eroding, 24.42 km (**37.59%**) is under accretion, and 21.43 km (**32.98%**) is in a stable state. These lengths exclude the rocky coast, sea wall, and breakwaters. The eroding areas and areas under accretion require

CE

Address: # 40-17-3/1, M.G.Road, Labbipet, Vijayawada - 520 010
Phone: 0866-2973510, e-mail: apsac.itec@gmail.com, website:http://apsac.ap.gov.in

interventions, as both geological phenomena can affect microclimate and biogeochemical cycles.

5. Regional and detailed grid wise maps of the Visakhapatnam district are shared for carrying out ground truth verification by the field Engineers and technical officers associated with the protection of coastal resources. We request their feedback on the GIS analysis presented by APSAC for further processing.

Yours faithfully,

Vice Chairman

Encl: Shoreline Changes Map, Gridewise detailed map, Brief Description, Merits and Demerits of Accretion

Copy to

1. The Member Secretary, AP Coastal Zone Management Authority, Paryavaran Bhavan, Gurunanak Colony, Vijayawada- 520 007
2. The Commissioner, Greater Visakhapatnam Municipal Corporation (GVMC), Visakhapatnam
3. The Chairperson, Visakhapatnam Port Trust, Visakhapatnam

MONITORING AND SHORELINE CHANGE ANALYSIS STATUS REPORT FOR VISAKHAPATNAM DISTRICT USING REMOTESENSING AND GIS

Coastal shorelines or land-sea interfaces change in response to natural or anthropogenic interference. Natural factors may be morphological, climatological, or geological. Shoreline geometry remains one of the key parameters in detecting coastal erosion and deposition. Coastal features interact with waves, tides, rivers, storms, tectonic, and physical processes. Erosion (landward retreat) and deposition (advance and growth through accretion) can both present challenges to coastal communities and infrastructure. The vulnerability of coastal areas increases due to erosion, which can threaten human activities along the coasts. Changes (whether short-term or long-term) in the position and geometry of shorelines are crucial in understanding coastal dynamism and managing coastal areas. Remote sensing and GIS are considered important tools for quantifying shoreline change on a temporal scale.

The Digital Shoreline Analysis System (DSAS) is a software application that works within the Environmental Systems Research Institute (ESRI) Geographic Information System (ArcGIS) software. The US Geological Survey developed DSAS. The prime activity in the shoreline analysis workflow is the extraction of shoreline positions through digitization. DSAS computes rate-of-change statistics for a time series of shoreline vector data. A baseline is constructed to serve as the starting point for all transects cast by the DSAS application. DSAS generates transects perpendicular to the baseline at a user-specified spacing (100 m) alongshore. The transect shoreline intersections along this baseline are then used to calculate the rate-of-change statistics. The reported rates are expressed as meters of change along transects per year. The results obtained from the analysis of shoreline changes are in the form of numbers, i.e., ±m/yr, where + indicates accretion and - indicates erosion.

The satellite images from 28th November 1990 (LANDSAT - Thematic Mapper) and 6th March 2021 (LANDSAT 8 Operational Land Imager) are the oldest and newest datasets used. Other datasets include the Indian Remote Sensing Satellite (IRS) P3 Linear Imaging and Self Scanning (LISS) Sensor-III from 29th January 1999; IRS P6 LISS III from 14th February 2005 and 19th January 2010; and LANDSAT8–Operational Land Imager (OLI) from 22nd March 2015. The quantitative results are plotted in a GIS environment showing the magnitude of changes. The classification of shoreline changes is a subjective aspect. In this study, shoreline change rates are classified into seven classes. Considering the magnitude of changes, each of the erosion and accretion categories is divided into three sub-classes. A marginal change of ±0.5m/yr is considered as no change or stable coast.

The shoreline along the Visakhapatnam coast was analyzed for the period 1990-2021 to estimate shoreline changes (erosion, accretion, and stable areas). The shoreline length used in the analysis is the shore face length (excluding the interior parts of rivers/creeks) obtained from LANDSAT–Thematic Mapper and LANDSAT 8 - OLI satellite data. The erosion/accretion status during 1990-2021 for the Visakhapatnam district (64.97 km) with the lengths (km) is given in tabular form. Only four categories of shoreline are present in the district. A significant extent of the shoreline falls under the category of Stable Coast. The shoreline analysis indicates that about 29% of the coast is eroding, 38% is accreting, and 33% is in a stable state. These lengths exclude rocky coasts, sea walls, and breakwaters.

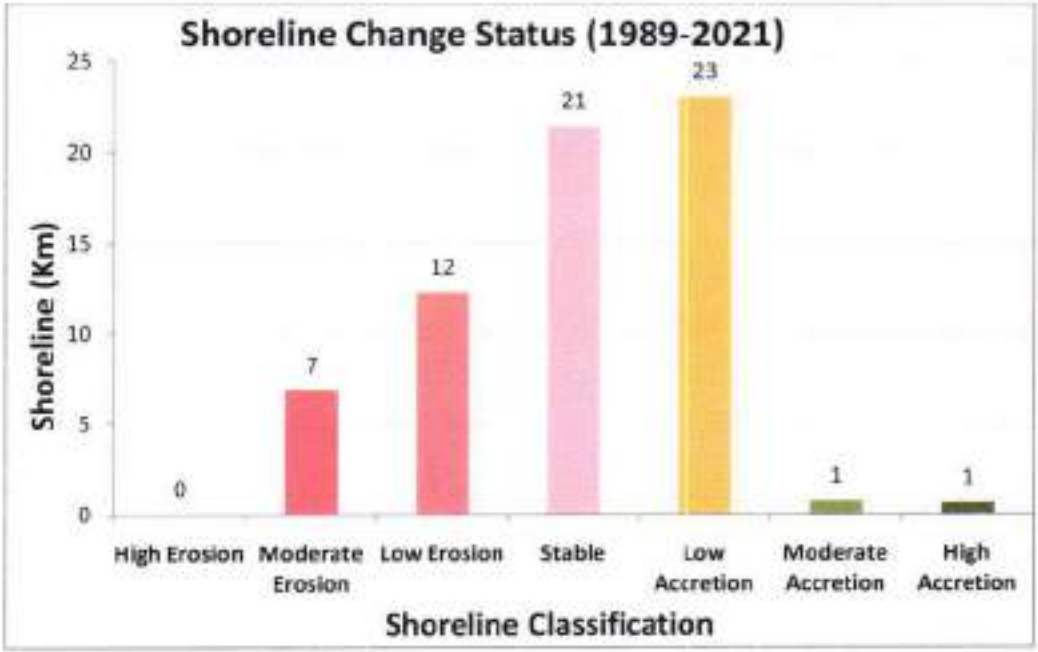
Table-1 Shoreline change Classification and Location Status.

Sl. No	Shoreline Classification (m/year)	Class length (Km)	Location (Nearest village/river/ creek)
1	High Erosion (> -5)	0.00	
2	Moderate Erosion (-5 to -2)	6.83	Beemunipatnam Northside area,Chepalupada area, North side Gostani river place.
3	Low Erosion (-2 to -0.5)	12.29	Annavaram places, Northside Gostani river area, Southside Beemunipatnam, Rushikonda area,
4	Stable Coast (-0.5 to +0.5)	21.43	Southside of Gostani River, Rushikonda area, Enadada, north and south side of port area,
5	Low Accretion (+0.5 to +2)	23.06	Appikonda area, Southside of Gangavaram port area, Southside of Visakhapatnam port places, near Rushikonda Place
6	Moderate Accretion (+2 to +5)	0.72	Near Gostani River mouth area, Southside of Visakhapatnam post area, Appikonda place,
7	High Accretion (>+5)	0.64	Near appikonda seawall area, Southside port places,
	Total	**64.97**	

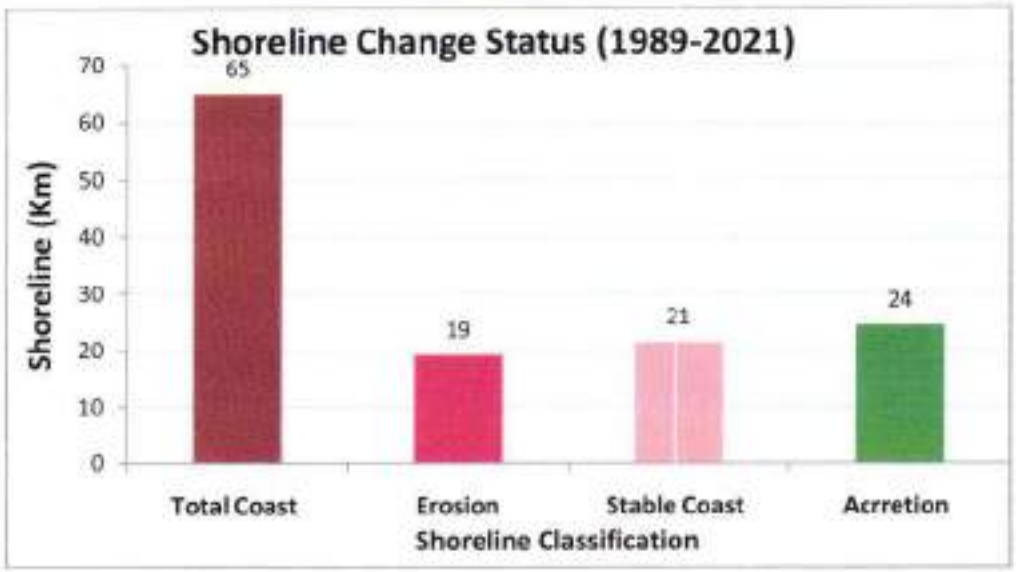
Table- 2 Classification of Shoreline Change in Visakhapatnam District

Classification of Coast	Length of the Coast (km)	Cumulative Length (km)	Percentage of Coast (%)	Cumulative (%)
Length of coastline	64.97			
High Erosion	0.00		0	
Moderate Erosion	6.83		10.51	
Low Erosion	12.29	19.12	18.92	29.43

Stable	21.43	21.43	32.98	32.98
Low Accretion	23.06		35.49	
Moderate Accretion	0.72		1.11	
High Accretion	0.64	24.42	0.99	37.59



Graph-1 Shoreline chage classification Status for Visakhapatnam district



Graph-2 Shoreline chage overall Status for Visakhapatnam district

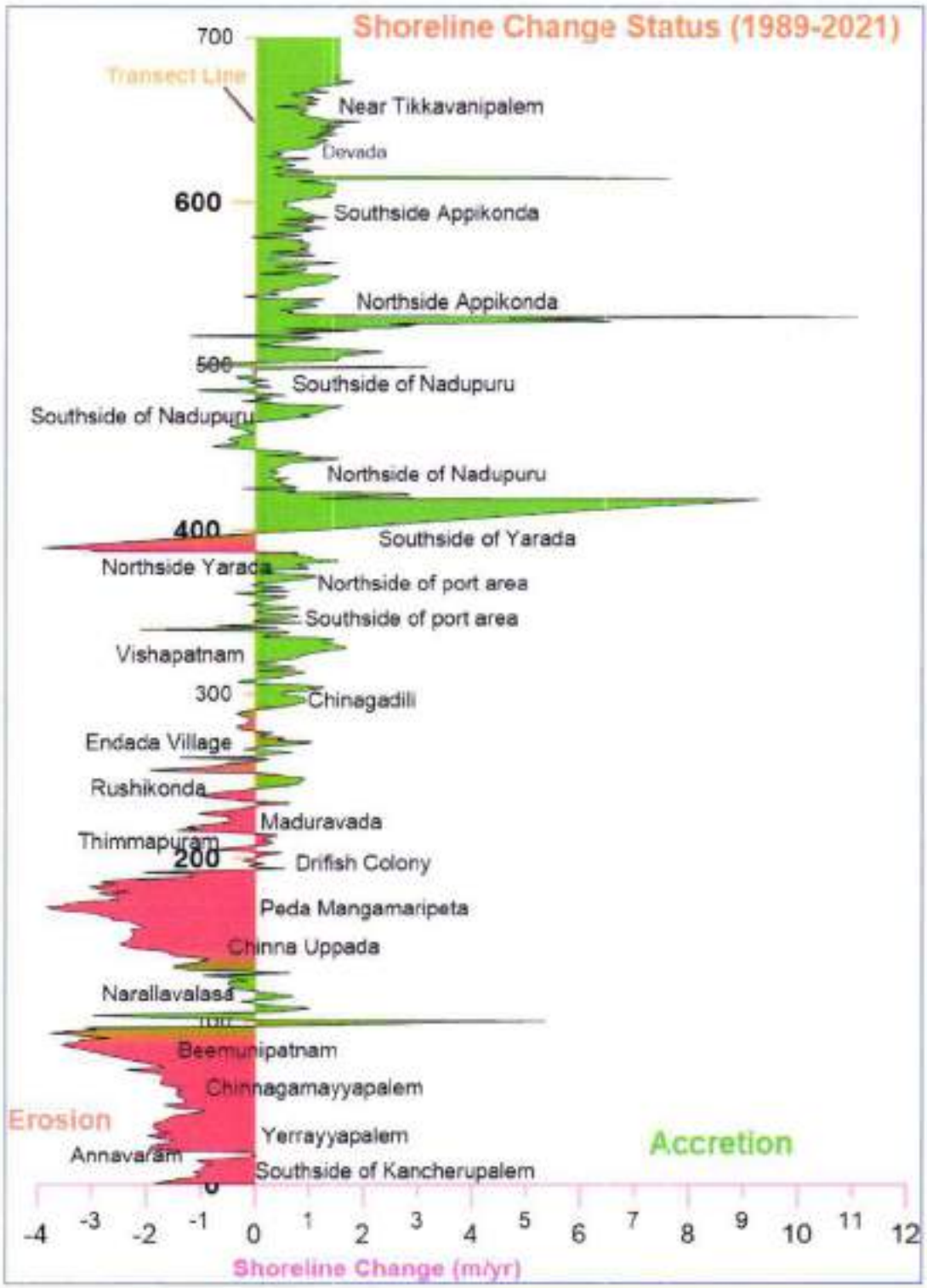
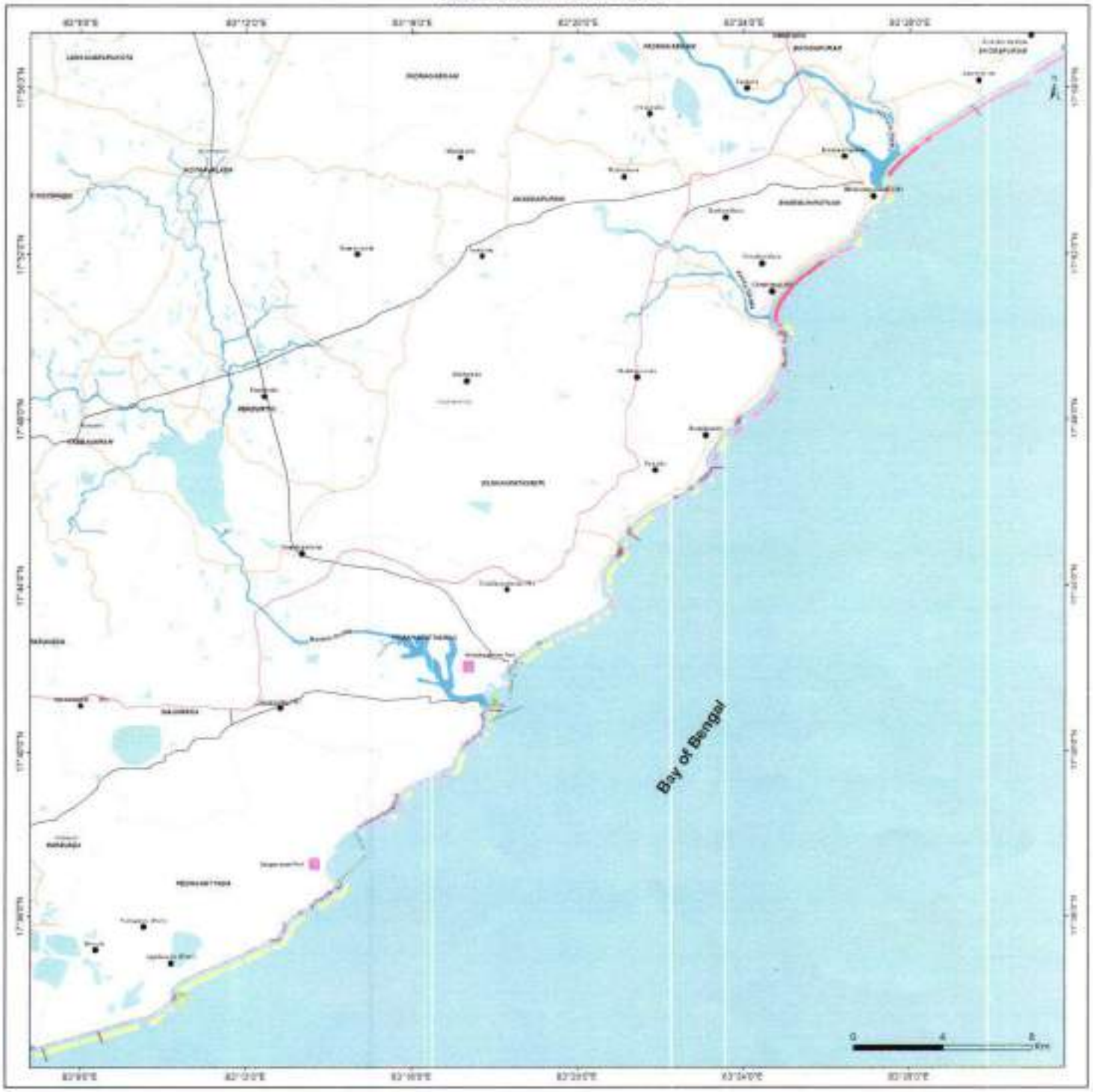


Figure- 1 Shoreline Change status along Visakhapatnam Coast

SHORELINE CHANGE MAP
ANDHRA PRADESH

VISAKHAPATNAM



Shoreline change Trend for Period 1988 - 2021

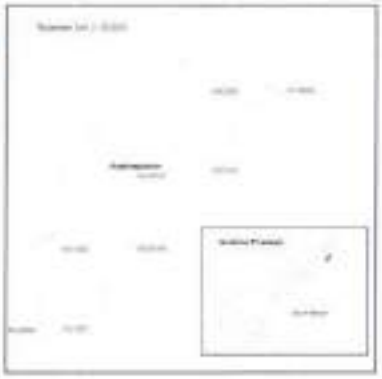
- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

Data Sources : Satellite Data	
Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3 -LISS- II	10/03/1999
IRS P6 -LISS- II	09/03/2006
IRS P6 -LISS- II	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

- National Highway
- State Highway
- District Road



- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Mandal Boundary
- Tank/Pond/Lake
- River/Creek

S No	Shoreline Classification (m/year)	length in Km
1	High Erosion (> -5)	0.00
2	Moderate Erosion (-5 to -2)	6.83
3	Low Erosion (-2 to -0.5)	12.29
4	Stable Coast (-0.5 to +0.5)	21.43
5	Low Accretion (+0.5 to +2)	23.06
6	Moderate Accretion (+2 to +5)	0.72
7	High Accretion (> +5)	0.64
	Total	**64.97**

A.P. SPACE APPLICATIONS CENTRE
ITE&C Department, Govt. of A.P

1988 - 2021

Official Use

SHORELINE CHANGE MAP
ANDHRA PRADESH

Visakhapatnam — **65O5NE**

Shoreline change Trend for Period 1988 - 2021

- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

Data Sources: Satellite Data

Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3-LISS- III	10/03/1999
IRS P6-LISS- III	09/02/2005
IRS P6-LISS- III	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

Administrative Boundaries

- District Boundary
- Mandal Boundary
- Village Boundary
- National Highway
- State Highway
- District Road

Km

0 — 2.25 — 4.5

- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Tank/Pond/Lake
- River/Creek

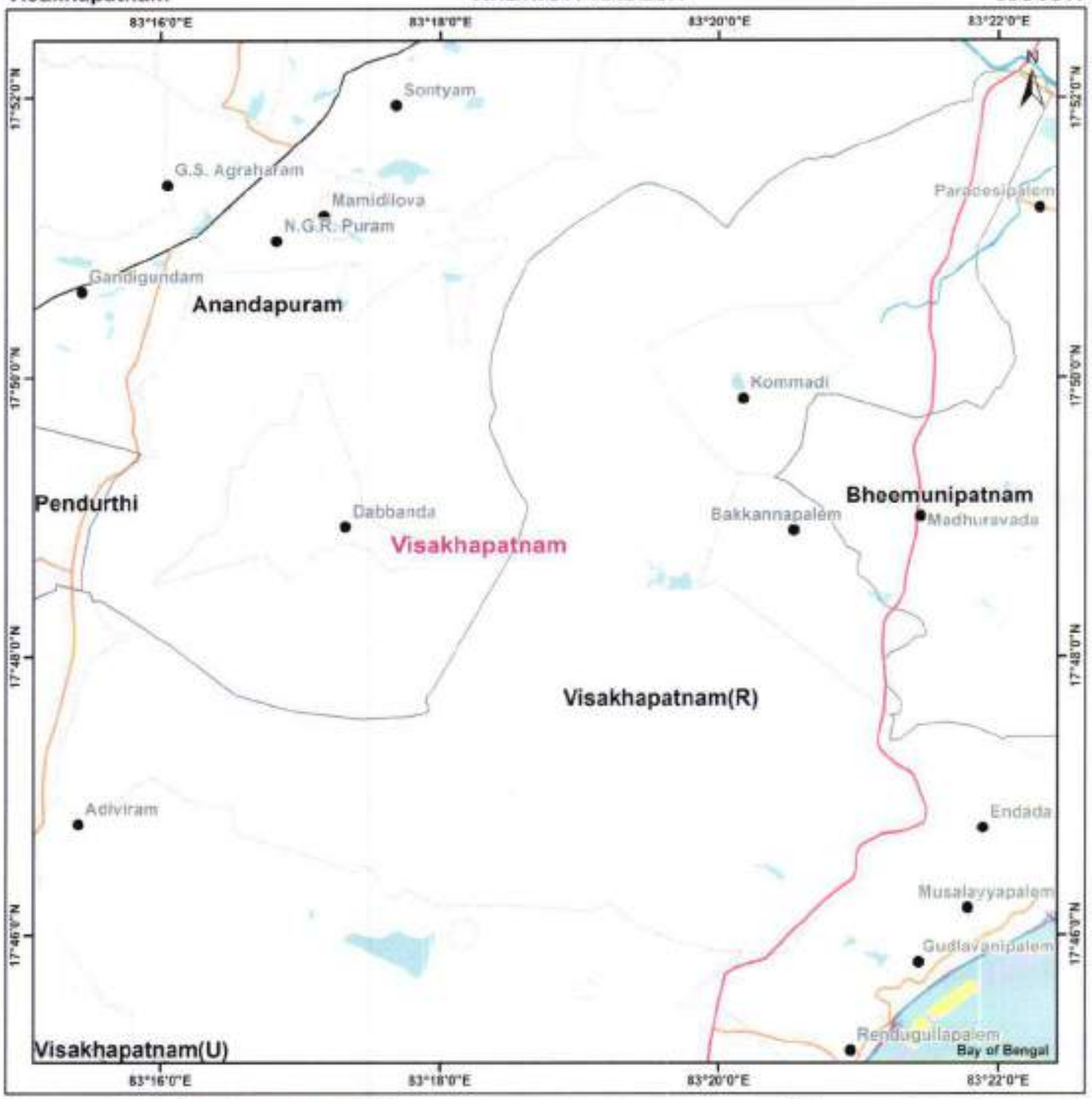
A.P. SPACE APPLICATIONS CENTRE
IT&C Department, Govt. of A.P
Vijayawada - 520010.

1988 - 2021

SHORELINE CHANGE MAP
ANDHRA PRADESH

Official Use

Visakhapatnam | **65O5SW**



Shoreline change Trend for Period 1988 - 2021

- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

Data Sources: Satellite Data

Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3-LISS- III	10/03/1999
IRS P6-LISS- III	09/02/2005
IRS P6-LISS- III	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

Administrative Boundaries

- District Boundary
- Mandal Boundary
- Village Boundary
- National Highway
- State Highway
- District Road

Km
0 2.25 4.5

- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Tank/Pond/Lake
- River/Creek

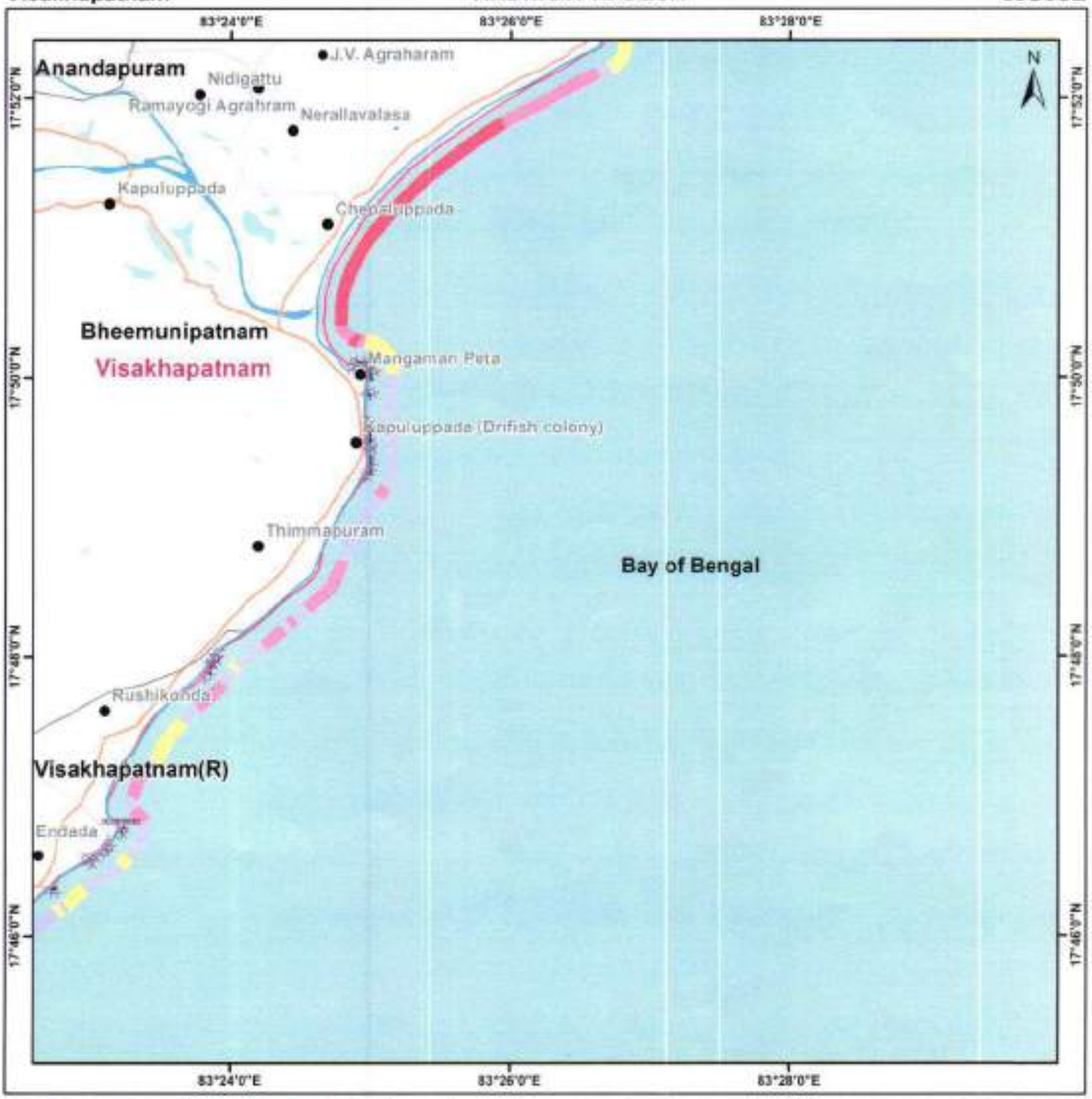
A.P. SPACE APPLICATIONS CENTRE
ITE&C Department, Govt. of A.P

1988 - 2021

SHORELINE CHANGE MAP
ANDHRA PRADESH

Official Use

Visakhapatnam **65O5SE**



Shoreline change Trend for Period 1988 - 2021

- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

Data Sources- Satellite Data

Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3-LISS- III	10/03/1999
IRS P6-LISS- III	09/02/2005
IRS P6-LISS- III	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

Administrative Boundaries

- District Boundary
- Mandal Boundary
- Village Boundary
- National Highway
- State Highway
- District Road

Km
0 2.25 4.5

- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Tank/Pond/Lake
- River/Creek

A.P. SPACE APPLICATIONS CENTRE
ITE&C Department, Govt. of A.P
Vijayawada - 520010.

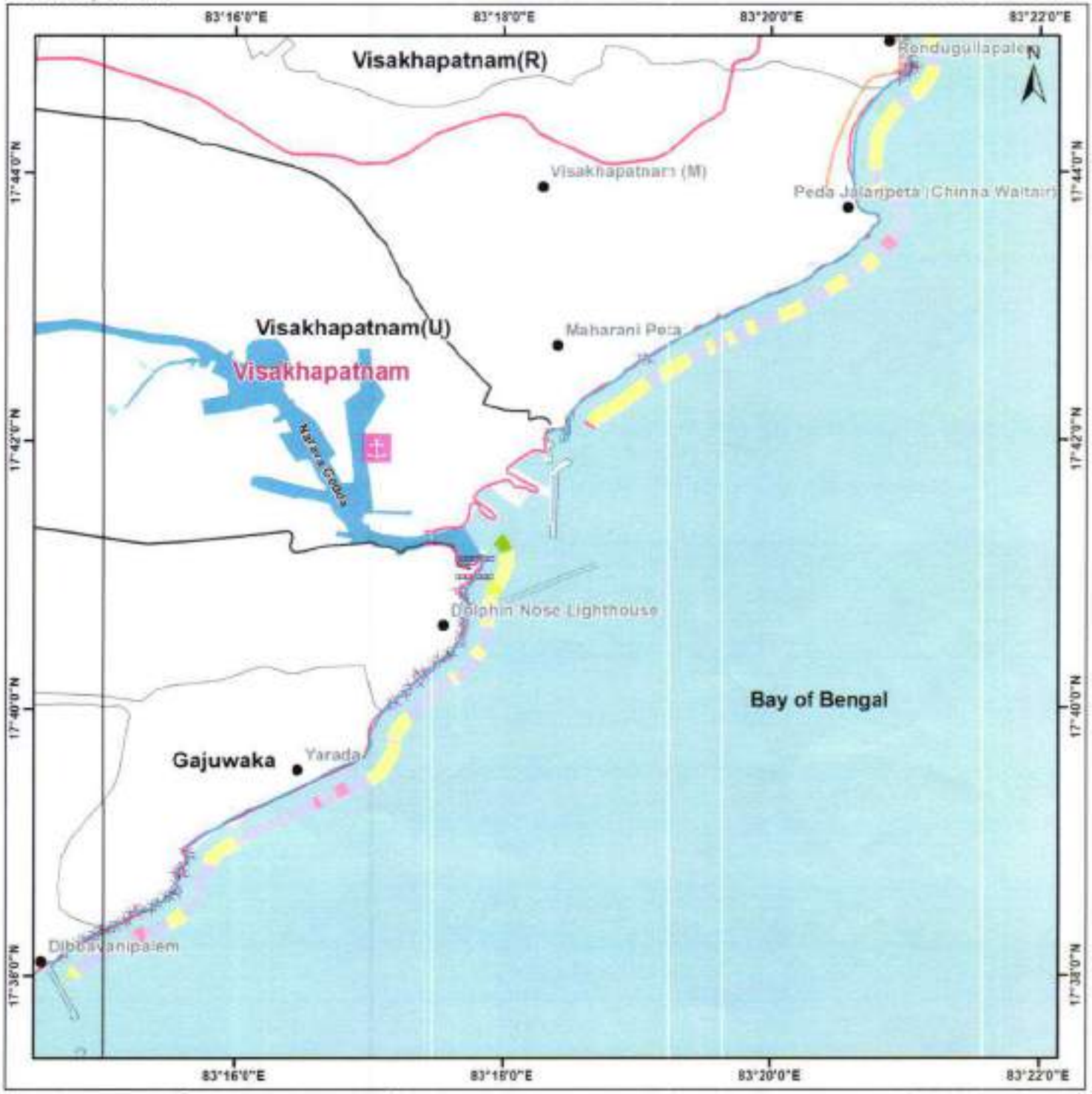
1988 - 2021

Official Use

SHORELINE CHANGE MAP
ANDHRA PRADESH

Visakhapatnam

65O6NW/ 65O2NE



Shoreline change Trend for Period 1988 - 2021

- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

Data Sources: Satellite Data

Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3-USS- III	10/03/1999
IRS P6-USS- III	09/02/2005
IRS P6-USS- III	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

Administrative Boundaries

- District Boundary
- Mandal Boundary
- Village Boundary
- National Highway
- State Highway
- District Road

0 2.5 5 Km

- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Tank/Pond/Lake
- River/Creek

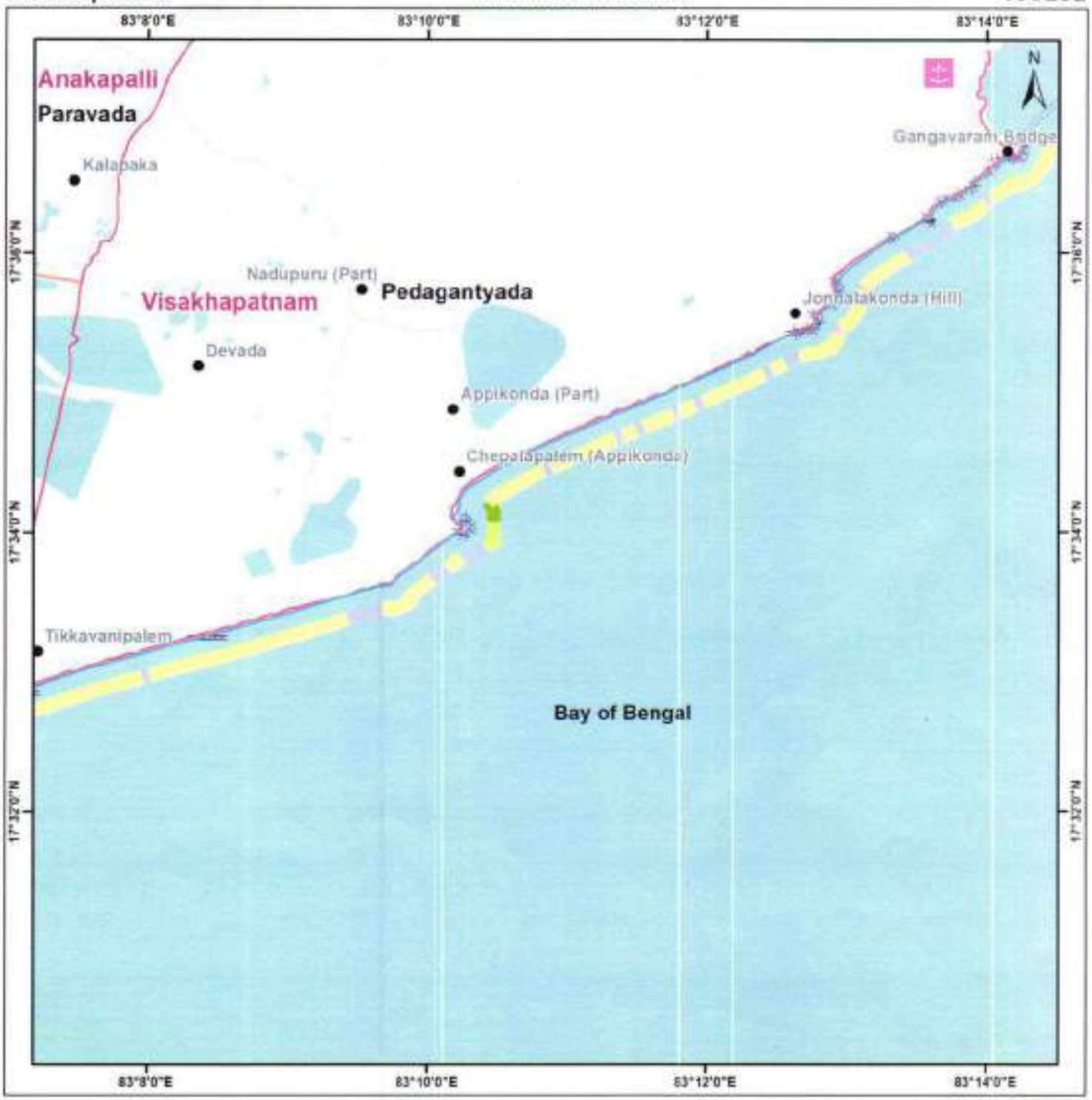
A.P SPACE APPLICATIONS CENTRE
IT&C Department, Govt. of A.P
Vijayawada - 520010.

1988 - 2021

SHORELINE CHANGE MAP
ANDHRA PRADESH

Official Use

Visakhapatnam — **65O2SE**



Shoreline change Trend for Period 1988 - 2021

- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

Data Sources: Satellite Data

Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3-LISS- III	10/03/1999
IRS P6-LISS- III	09/02/2005
IRS P6-LISS- III	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

Administrative Boundaries

- District Boundary
- Mandal Boundary
- Village Boundary
- National Highway
- State Highway
- District Road

Km
0 — 2.25 — 4.5

- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Tank/Pond/Lake
- River/Creek

A.P. SPACE APPLICATIONS CENTRE
ITE&C Department, Govt. of A.P
Vijayawada - 520010.

ANNEXURE – 3

1st half- yearly 2024 report

Marine Ecological Sensitivity assessment studies for preparing Biodiversity Monitoring and management plan in Visakhapatnam Port

Submitted to

Department of Civil Engineering
Visakhapatnam Port Authority
Visakhapatnam

Submitted
by

Department of Environmental Sciences
Andhra University
Visakhapatnam

1st half- yearly, 2024 report on

MARINE ECOLOGICAL SENSITIVITY ASSESSMENT STUDIES FOR PREPARING BIODIVERSITY MONITORING AND MANAGEMENT PLAN IN VISAKHAPATNAM PORT

Submitted to

DEPARTMENT Of CIVIL ENGINEERING

VISAKHAPATNAM PORT AUTHORITY

VISAKHAPATNAM

Submitted by

PROF. T. BYRAGI REDDY

DEPARTMENT OF ENVIRONMENTAL SCIENCES

ANDHRA UNIVERSITY

VISAKHAPATNAM - 530 003

List of Tables

List of Figures

Background of the study:

Coastal marine ecosystems provide a variety of ecosystem services for humans; however, these systems are susceptible to both terrestrial and marine factors because they are situated in the coastal ecotone (Ray and Hayden, 1992; Reizopoulou et al., 2014). Consequently, coastal marine ecosystems are very sensitive to environmental change and human activities (Halpern et al., 2004; Hoegh-Guldberg and Bruno, 2010; Perry et al., 2010). Marine ecosystem services are declining due to various problems, including marine pollution, eutrophication, habitat loss, and the degradation of biodiversity (Solan, 2004; Worm et al., 2006; Deegan et al., 2012; Johnston et al., 2015, Hewitt et al., 2016; Le Moal et al., 2019). However, ocean uses are still often located in sensitive biological and ecological areas without much consideration of their impact (Douvere and Ehler, 2009; Hu et al., 2019).

Life on earth is supported by the surrounding ecological conditions and the natural resources. Continents and oceans are the two major divisions comprising of all the ecosystems. The ocean serves as a source of food, energy, and minerals. About 75 % of the earth' surface is covered with oceanic waters which have a rich wealth of marine life. If we say that land is dominated by plant biomass, then we also have to accept that animal biomass dominates the oceanic waters.

Seas and oceans constitute the marine ecosystems. When compared to

land based terrestrial ecosystems, the marine ecosystems have certain unique features. They are:

1. The oceanic environment is very wide covering 75% of the earth's surface
2. The oceanic systems are very deep in which life extends to all depths
3. Sea is continuous
4. The water is in continuous movement both in vertical and horizontal dimensions
5. The water is salty with an average salt content of 35 g/litre
6. The concentration of dissolved nutrients is low. Ecology deals with organisms, populations, communities, ecosystems and the biosphere.

Marine ecology deals with the study of the environment and life in marine waters. It involves the study of a) Marine organisms and their habitat (physical support, light and transparency, nutrients, temperature, salinity and osmotic processes, gases, hydrostatic pressure, viscosity, circulation of water) b) Divisions of Marine environment (open sea-pelagic environment, epipelagic environment, mesopelagic zone, bathypelagic zone, abyssopelagic zone, and sea bottom- benthic environment) c) Distribution of marine life (planktons-floaters, Phytoplanktons, Zooplanktons, The nektons and the benthos).

Life on earth originated from oceanic waters. Creatures living on land need to deal with gravity, dehydration, great temperature variations, and

many other factors which are normally not encountered in oceans. But the marine organisms are affected by the factors like

A. Depth of oceanic water

B. Change in salinity

C. Change in temperature

D. Change in turbidity

E. And other environmental factors.

Marine Ecology involves the understanding of all these aspects.

A. Depth Zones in Oceans:

The continental margin forms the part of the sea bed that borders all the land frontiers. It consists of three zones as Continental shelf, continental slope and Deep Ocean basins. The continental shelf extends from the coast to a depth of 130 m. The width averages to about 75 kilometers. This shelf zone collects much of the sediments(deposits of sand and mud) that are carried by the rivers from land. The continental slope begins at the outer edge of the shelf. The slope is much steeper than the shelf and plunges to great depths of 3.6 kilometers. The width ranges from 20 to 100 kilometers. Submarine canyons extend into these slopes. The canyon heads may form some deep-sea fans and levees. The area between continental slope and deep ocean floor is known as continental rise. The deep ocean basin is called as the abyssal plain. Abyssal hills, gyots, sea mounts and deep-sea trenches are the physiographic features of the basin.

The deep ocean basins consist of deep-sea peaks, valleys, and plains which lie beyond the continental margin in the ocean basin. The mid-ocean ridges are the unique features of the ocean basins. Deep valleys also cut across the ridges in many places. Frequent volcanic activity is also expected in some valleys. The two chief sources of deep-sea sediment are the land itself and marine life. Marine life sediment consists mainly of tiny shells and the remains of dead organisms of the plankton. When such matter makes up a large part of sediment, they are called as oozes.

B. Salinity

Sea water contains much mineral salts to the extent of increasing its density. The oceans and seas put together contain about 5 x 10 16 tons of salts. One cubic foot of average sea water contains 2.2 pounds of salt. Salinity is generally reported in terms of ppt or parts per thousand (abbreviated o/oo), the number of pounds of salt per 1,000 pounds of water. It is affected by precipitation, evaporation and movement of water masses. It also varies from the surface zone to the deep ocean waters. Based on this factor, animals living in marine waters are classified into a) Stenohaline animals - restricted life with salinity b) Euryhaline animals – life that can be found at all levels of salinity. The marine communities are adapted to live in high saline waters. The osmotic properties of seawater are another problem of marine animals.

C. Temperature:

The Temperature fluctuation is minimum in oceanic waters. Arctic waters are colder. Tropical waters are warmer. The variation is seasonal and diurnal. Ocean animals show a varied response to the temperatures. There are two kinds of animals.

Stenothermal animals – the ones which live within 20°C 2. Eurythermal animals – the animals which can withstand the wide range of temperature variations. The cold-water forms also show an increase their in sizes. The surface temperature of the oceanic waters vary from about -2 °C near the North and South poles to about 30 °C near the equator. In the Polar Regions, the surface sea water freezes. The western tropical Pacific has the warmest surface water. Ocean currents affect the surface temperature.

D. Light and Photic Zones:

Light is very essential for the marine life. For photosynthesis, heating, radiations and vision are related to this factor. It determines the plant and animal life and depends on the angle of incidence. Perpendicular rays go deeper into the oceans.

E. Ocean Water Pressure

The difference in pressure (pgh) comes due to the thickness of water column(h), density of water (p) and the acceleration due to gravity (g). This has a great influence over the life and deposition, and solubility of $CaCO_3$ mechanisms. There are two classes: 1. Eurybathic -Animals live with great

vertical range (Eg. Natica) 2. Stenobathic -narrow range (Eg. Turris). Other factors: The other abiotic factors which have much impact on marine ecosystems are tides, currents and waves.

F. Marine Life

Marine life ranges in size from microscopic one-celled organisms to the blue whale, which may measure up to 30 meters long. Ocean plants and plantlike organisms use sunlight and the minerals in the water to grow. Sea animals eat these organisms and one another. Based on the variations in physical condition and the presence of certain specific kinds of animals and plants, the Marine environment is broadly classified into a) pelagic zone - open sea -entire sea water above ocean floor - encompasses a neritic zone and an oceanic zone. b) Benthic zone - ocean (bottom)- encompasses the littoral and deep-sea zones. All ocean life can be divided into three groups. These groups are: (1) the plankton, (2) the nekton, and (3) the benthos.

Description of Marine Ecology: The area of the port is located in a fjord estuary and the surrounding areas also could be crucial for the thriving of marine ecosystems directly and indirectly. Zooplankton is algal forms and juveniles of many shrimps, crabs and fishes and indicates the productivity and abundance in the area. Many important marine ecosystems such as intertidal ecosystems, estuaries, shallow water areas etc are present in the study site.

Scope of Work:

The assess the existing status of marine ecology in and around the project site and to prepare a suitable bio diversity monitoring and management plan for Visakhapatnam Port, the following attributes were studied by using the appropriate methods of marine/coastal sampling as per standard guidelines and understand the intertidal area through sample collection and analysis were carried out by Department of Environmental Sciences, Centre for Industrial and Scientific Consultancy (CISC), Andhra University, Visakhapatnam. Water analysis done to understand the pollution and effects in the area.

Primary Productivity

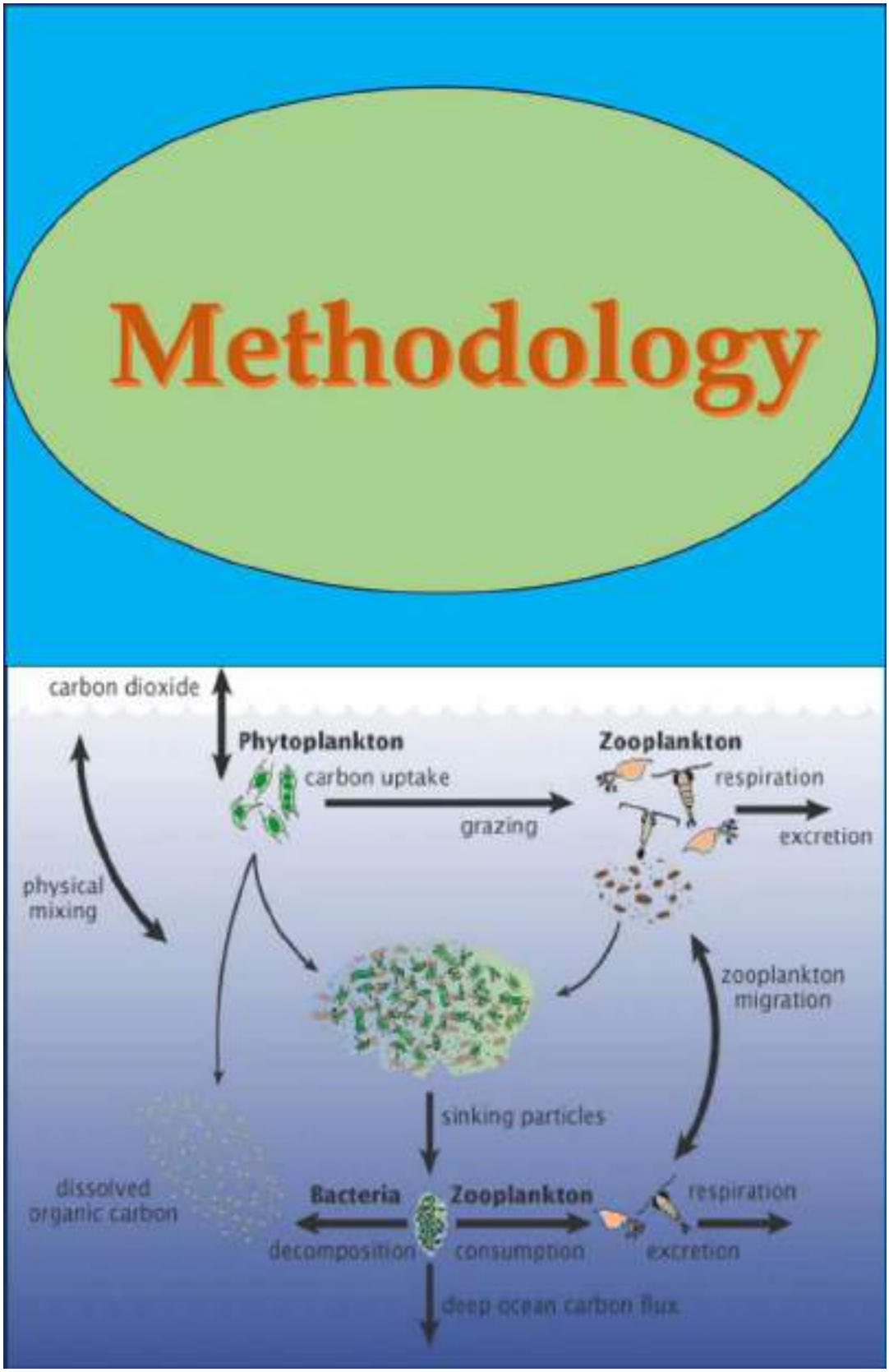
Phytoplankton

Zooplankton, Benthic fauna

Nekton, Beach ecology (Intertidal survey & costal survey)

Bio-accumulation of heavy metals

The project report was prepared and submitted for the Visakhapatnam Port Authority (VPA) for its project activities Viz, Strengthening, Deepening and Modification by the Department of Environmental Sciences, Centre for Industrial and Scientific Consultancy (CISC), Andhra University, Visakhapatnam.


Methodology
carbon dioxide
Phytoplankton
carbon uptake
grazing
Zooplankton
respiration
excretion
physical mixing
zooplankton migration
sinking particles
dissolved organic carbon
Bacteria
Zooplankton
respiration
decomposition
consumption
excretion
deep ocean carbon flux

Methodology

Centre for industrial and Scientific consultancy (CISC), Andhra University, Department of Environmental Sciences to undertaken a Marine Ecological Sensitivity Assessment study in and around for the harbour of Visakhapatnam Port Authority (Lat. 17041'40" N and Long. 83016'52" E) and coastal waters (~35m) as a part of their commitment to harbour expansion needs in that area. Taking into account the available expertise and the Department's acquaintance with Marine Biological Investigations of Visakhapatnam coastal waters, it was agreed that the study be held as per request from Department of Environmental Sciences, Andhra University. The scope of the Investigation related to monitoring physico-chemical variables and marine biology at 7 pre-determined locations (4 in the main Harbour; 1 Fishing harbour and 2 Sea) representing conditions in the inner harbour (stations 1-4), fishing harbour (st.5) and two locations (sts. 6 & 7) in the open sea as reference points being away from the Harbour (Fig.1).

It was also agreed that water quality and sediment characteristics be studied (as one time observation). For evaluation of water quality, the proposed variables included sea temperature, pH, dissolved oxygen, salinity, turbidity (in place of suspended particulate matter), nitrogen as ammonia, nitrite and nitrate, reactive silicate and phosphate. In addition, total nitrogen and phosphorus were also proposed to differentiate between inorganic and organic fractions. Sediment parameters consisted of organic carbon and its texture.

Marine Biological investigations included taxonomic enumeration (including species diversity) and quantification of phytoplankton, zooplankton and benthos at the above 7 locations. It was decided to lay emphasis on seabed life (macrobenthos) since they are the most vulnerable to any environmental disturbance. It was also proposed to estimate phytoplankton chlorophyll at all locations and primary productivity limited to two/three sites in the harbour and close to the coast. Experimental trawling was also proposed (~35m) to find out the fishery component of this area.

Study Area:

Visakhapatnam port is located in the ford estuary of the Meghadri River and is one of the significant ports of Andhra Pradesh. The location of the port is very ideal in the sense that it affords protection from cyclones which strike the east coast regularly, by a high promontory into the sea, known as Dolphin's Nose Hill which is to the north of the entrance channel. The low tidal range of a maximum of 1.82 meters is also advantageous for the location of the port.

Till the end of the 19th century, major commercial activity in Visakhapatnam was centred on the deep-water port with ships anchored off the sheltered coast. Post world war-I, the Bengal-Nagpur Railways constructed the Inner Harbor and the actual development of Visakhapatnam took place during 1927-33 that resulted in Vizag gaining importance as a hub of maritime/industrial activity.

The estuarine area serves as both a commercial and defence area and is very important for the development of the state and defence. Out of 13 major ports Visakhapatnam Port is one among situated on East coast of India. The first South East Asian port which got ISO certifications for Quality (ISO, 9001), Environment (ISO, 14001) and Safety (OHSAS, 18001). The Port is existing from 1933 till date taking an amazing role in building the nation duly serving industrial, commercial and Agricultural Sectors.

One more multi commodity berth EQ.4 was added to it in 1955. To meet the requirement of Oil Companies facilitating the discharge of crude and petroleum products two berths OR.1 & OR.2 were developed in the year 1957. Subsequently 4 more berths were added in the Inner Harbor between years 1965 to 1968. During the year 1976 Outer Harbor has been developed. The outer harbor is having Ore Berth (OB-I & OB-II), General cargo berth (GCB), LPG berth, OSTT, Container terminal and dredger berth.

The Visakhapatnam port is presently handling coal at west quay of Inner harbour. However, due to depth constraints in the inner harbour the larger size vessels of coal are lightened/handled at outer harbour due to availability of deeper dredge depths in the outer harbour.

The coal at GCB is unloaded from the ships on the wharf using floating cranes and the unloaded cargo is loaded in to the trucks using loaders and stacked in the back up area of the berth and at East Yard until it is lifted to the concerned parties. Handling of COAL at GCB by conventional method and

transportation through trucks from the berth to the stack yard are observed to be the main sources of Air pollution. Therefore, to minimize the dust, coal handling is totally mechanized and is being operated by Vedanta on PPP (Public –Private Partnership) mode.

Iron ore is handled at ore berth in outer harbour. The ore received from wagons is unloaded at ore handling plant and stacked. The handling of ore is done through fully mechanized facility. The conveyor passing through city and having interface was covered. However small quantity of iron ore fines is handled at west quay of inner harbour.

Fertilizer is handled at east quay of inner harbour, which is away from the city. The Visakhapatnam port trust in the earlier years of inception used to handle very less cargo and habitations were very much scattered with less population. Subsequently, due to the establishment of major industries in Visakhapatnam and its surroundings public habitation around Port increased abnormally while the port activities had increased steadily over a period of time.

The Port of Visakhapatnam, right from its inception, handles maximum cargo compared to other major ports for the past 7 years and thus is classified as a premier Port of India has been handling dry bulk cargo and the share of dusty cargo is about 50% of the total cargo. More or less the same level is being maintained for the past two decades. Handling of dusty cargo is neither unique to port of Visakhapatnam nor to other Indian seaports. It is a global practice

that has existed for over few decades. Sea Ports that act as gate ways to sea borne domestic and international trade are required to handle variety of cargoes required by the industries and Port of Visakhapatnam handling large volumes of coal, iron ore, fertilizer is no exception. With volumes of cargo going up the dust levels have also increased correspondingly and VPA is making all efforts to mitigate the same by taking certain environment protection measures such as dust suppression systems by water sprinkling.

Therefore, VPT committed to convert the present semi mechanized system into a fully mechanized system within built dust suppression system to minimize the emission of dust into the surrounding environment as it was found out through a scientific study carried out by an independent agency that the factors influencing the generation of dust pollution are mainly due to non-mechanized method of handling of dry bulk cargo such as coal, iron ore, fertilizer etc contributing for dust emissions during loading/unloading and transportation through trucks. Hence, loading and unloading of domestic, agricultural and commercial goods may cause ecological and water quality degradation of surrounding area of marine water. The following report encompasses the biodiversity and water quality parameters of the area to assess how the environment is at the time of the data collection.

Sampling Locations earmarked on Map

The proposed project site is located on the shore of Bay of Bengal,

Visakhapatnam, Andhra Pradesh. The project location image captured from Google earth of the Visakhapatnam Port Authority is shown inFigure 1.

Table. 1: The Sub-tidal (offshore) locations with co-ordinates.

S. No.	Sampling Locations	Longitude Latitude
1	Inner Harbour between East Quay& West Quay	17^0 42′ 03.2″ N 83^0 16' 54.5" E
2	Turning Circle, Inner Harbour	17^0 41' 34.4" N $83^0$16' 52.3" E
3	Turning Circle, Outer Harbour	17^0 41'10.6" N $83^0$18' 10.3" E
4	—0.3km Off Ramakrishna Beach (North of Port)	17^0 42' 53.9" N $83^0$19' 52.7" E
5	—3.0 km off Ramakrishna Beach (North of Port)	17°42' 08. 6" N 83°20' 14.4" E
6	—0.3 km Off Yarada Beach (South of Port)	17°39' 33.4" N 83°17' 02.9" E
7	—3.0 km Off Yarada Beach (South of Port)	17°38' 50.6' N 83^0 I4 44.1"E

Table 2: Beach Ecology Transect locations with co-ordinates

Transect no.	Location		Longitude Latitude
i	R.K. Beach (Near Submarine Museum) I		N17°43.048' E83°19.822'
ii	Yerada Beach		N17°39.078' E83°15.812'
Coastal Survey			
A	Start	5-6 km southwest of the port	N 17'38'57.67" E 83°15'38.44"
	End		N 17°39'15,37" E 83°16'6.84"
B	Start	5-6 km northeast of the port	N 17°43'7.76" E 83°20'2.75"
	End		N 17°42'5331" E 83°19'31.94"

Fig. 1: The Google image depicting the present study area

Fig. 2: The Google image showing the sampling locations of the present study

Date of sampling: June, 15th to 30th 2024

Method of sampling:

Phytoplankton and zooplankton sampling:

Plankton nets of mesh sizes 100µm and 25 µm are used for sampling of zooplankton and phytoplankton respectively. The nets are suspended horizontally to a vessel to collect the sample. The speed of the vessel and the diameter of the net opening are taken into consideration to know how much water is filtered for the sampling of the given number of plankton. 3 iterations are taken in each field site to have a mean value of the samples.

Phytoplankton:

Samples were collected from the surface water by using Towing a plankton net (mouth diameter 0.35mm) made of bolting silk (30 mesh size 48µm) for half an hour. These samples were preserved in 5% neutralized formalin and used for quantitative analysis in the method of Sukhanovo (1978). Numerical plankton analysis was carried out using Utermohl's invented plankton microscope.

Identified by using Hustedt (1930-1966), Venkararaman (1939), Cupp (1943), Subramanian (1946), Prescott (1954), Desikachary (1959 & 1987), Hendey (1964), Steidinger and Williams (1970), Taylor (1976) and Anandet al (1986).

Chlorophyll-a:

Samples filtered through Whatman GF/C filter papers and Chlorophyll was extracted into 90% acetone. The resulting-colored acetone was measured in Spectrophotometer at deferent wavelengths and the same acetone extracts were acidified and measured for the phaeo-pigments as per APHA manual (1989).

Zooplankton:

Samples were collected from the surface water by horizontal towing of plankton net with mouth diameter of 0.35m made of bolting silk (70 mesh size 200µm) for half an hour. After collection, the samples were preserved in 5% neutralized formalin and used for quantitative analysis.

Identified by Dakin and Colefax (1940), Davis (1955), Kasthurirangan (1963), Wickstead (1965) Damodara Naidu (1981). For quantitative analysis of Zooplankton, known quantity of water (100 ltr) was filtered through a bag net (0.33 mm mesh size) and filtrate was made upto 1 ltr in a wide mouthed bottle and then enumerated using Utermohl's invented plankton microscope. The density is expressed as number of organisms/m^3.

Fig. 3: sampling Collection of sediment and Zooplankton

Benthic sampling:

A benthic grab is used to collect sediment of the ocean floor and associated organisms at all the given sites. 3 iterations are used in

each site to collect both macro and micro-benthos of the area.

Samples were collected using a Van veen grab which covered an area of 0.1m^2. The wet sediment was sieved with varying mesh sizes for segregating the organisms. The organisms retained in the sieved were fixed in 5-7% formalin and stained further with Rose Bengal solution for easy spotting at the time of sorting. After a day or two, the organisms were sorted into various groups. The number of organisms in each grab sample was expressed as number per meter square. According to size, benthic animals are divided into three groups.

(i) Macrobenthos, (ii) Meiobenthos , (iii) Microbenthos (Mare, 1942)

Identified by: Fauvel (1953), Day (1967) referred for Polychaetes, Branes (1980), Lyla et al., (1999) for Crustaceans, Subba Rao et.al (1991), Ramakrishna (2003) for Molluscs.

Fig. 4: Phytoplankton and Benthos Sampling

Nekton sampling: Nektonic organisms' data is collected through catch data from the nearest landing center.

Beach ecology: A team has gone into intertidal areas of the given areas during low tide and did a species identification and count in 20*20 quadrants in both sandy and rocky intertidal areas. Photos are taken of the organisms for identification.

Methodology for Preservation:

- The plankton are preserved in 20 per cent ethyl alcohol and saltwater.
- The other organisms are photographed immediately and notpreserved
- Methodology for Sampling and Analysis:

Methodology of Analysis:

Zooplankton and Phytoplankton Analysis:

1. **Microscopic examination**: Place the prepared slide under a compound microscope and examine it at low magnification (e.g.,10x or 20x) to locate and identify zooplankton organisms. Use identification keys or taxonomic guides specific to the region andtarget organisms to assist with identification.
2. **Counting and quantification**: Randomly select several fields of

view and switch to a higher magnification (e.g., 40x or 100x) for accurate counting and quantification. Count the number of individuals of each identified species within the chosen fields of view. If necessary, repeat the process for multiple subsamples toobtain statistically significant results.

3. **Data analysis**: Calculate the abundance and diversity indices based on the counted individuals. Common metrics include total abundance, species richness, Shannon-Weaver diversity index, and evenness. Use appropriate statistical methods to analyze and interpret the data.
4. **Data recording:** Record all relevant data, including sampling location, date, sampling depth, preservative used, and identification information for each zooplankton species. Maintain a standardized data sheet or database to ensure consistency and facilitate future comparisons or analyses.

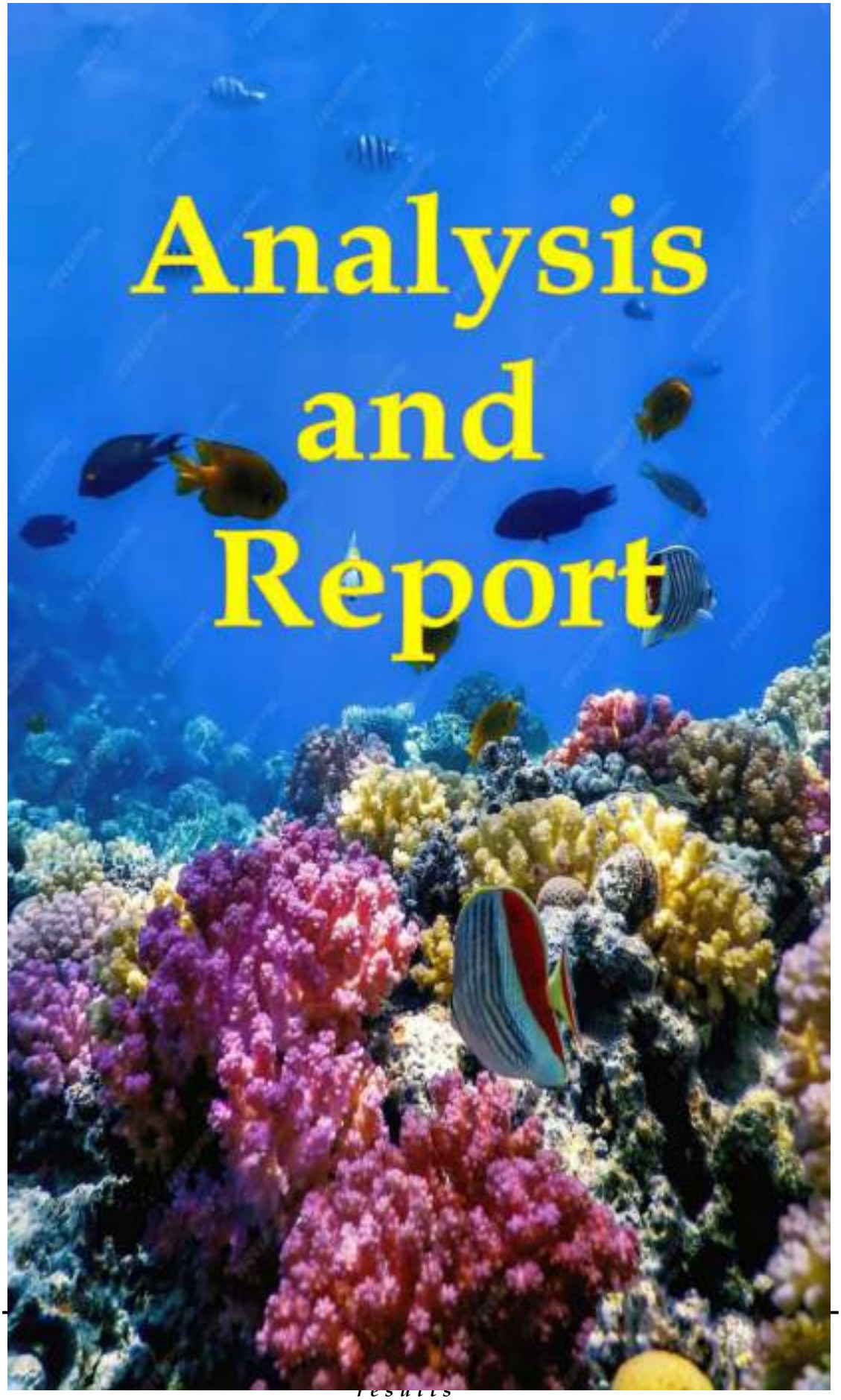
b. Benthic sampling analysis: Benthos are sieved and the organisms areidentified.

c. Nekton analysis: The samples are photographed and identified. The species and abundance count are taken into consideration.

Table. 3: Marine Ecological Studies of Visakhapatnam Port and its sampling methods & analysis of marine ecological sensitive studies

Parameter	Method	Instrument	Reference
Depth (m)	-	Sonar	-
S. D. Transp (m)	-	Secchi-disc	-
Sea Water Temp. (^{0}C)	Temp. Probe	Quanta Hydro Lab with appropriate sensors	-
Turbidity (NTU)	Turbidity Meter	Quanta Hydro Lab with appropriate sensors	-
Salinity (PSU)	Argentometric Method (Precipitation titration with $AgNO_3$)	Quanta Hydro Lab with appropriate sensors + Analytical estimation	Std. method for examination of water and waste water APHA 1989 – 17th Edition – 4500-CI-B, Page 4-68
pH	Electrometric	Quanta Hydro Lab with appropriate sensors	-
DO (mg/L^{-1})	Winklers (Titration with Hypo)	Quanta Hydro Lab with appropriate sensors	APHA 1989 – 17th Edition – 4500-CI-B, 4-152
Ammonia (N) (µmol.L^{-1})	Spectrophotometer	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
NO_2 – N (µmol.L^{-1})	Spectrophotometer (Azo-dye formation)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
NO_3– N (µmol.L^{-1})	Spectrophotometer (UV method)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
Phosphates-P (µmol.L^{-1})	Spectrophotometer (UV method)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
Silicate (µmol.L^{-1})	Spectrophotometer (UV method)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
Total Nitrogen (µmol.L^{-1})	Spectrophotometer (UV method)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
T. Phosphorous (µmol.L^{-1})	Spectrophotometer (UV method)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
Primary Productivity (MgC/m^3/hr)	Dark and light bottle	Estimating DO	Gaarder, T and Gran, H.H. (1927) Subba Rao, D.V. (2002)
Sediment Grain Size	Wet Sieving and pipette analysis	Gravimetric and particle size analysis	Krumbein W.C. and Pettijohn F.J. (1938)

Sand (%) Silt (%) Clay (%)		through conventional sieving	and Holme NA, Mclntyre AD (Eds. 1984)
Sediment Organic Matter (%)	Wet Oxidation	Initial digestion using a strong Oxidant followed by Fe Titration.	Walkley Black, later as modified Gaudette et.al.1974
Phytoplankton (nos. ml^{-1})	As numbers per ml using sedgwick counting chamber	Initial sedimentation of 1l volume of sample with Lugol's Iodine	UNESCO 1978
Zooplankton (no.s m^{-3})	Bongo net (twin sampler) Hydrobios Counting cell for enumeration	Digital flow meter used for volume of water filtered Stereozoom microscope for counting	UNESCO 1968, ICES 2000
Macrobenthos (no.s $haul^{-1}$)	Dredge and Grab Sampling	Initial sieving through 0.5mm mesh size, counter under magnification	Analysis according to Holme and Mclntyre (1984) Eleftheriou & Mclntyre 2005


Analysis
and
Report

ANALYSIS AND REPORT:

Hydrological Conditions:

Primary Productivity:

Most marine primary production is generated by a diverse collection of marine microorganisms called algae and cyanobacteria. Together these form the principal primary producers at the base of the ocean food chain and produce half of the world's oxygen. In the present work, marine water samples were from 7 different locations and transferred to 300ml Dissolved Oxygen (DO) bottles (one light and one dark bottle). The experiment was performed using dark and light bottle method. One bottle was fixed with Winkler reagent for initial oxygen. The other light bottle and dark bottle were kept in a bucket containing same water sample for 24 hours.

After 24 hours, both samples were fixed with Winkler A and B and the DO were analyzed. The increase in dissolved oxygen of water as a result of photosynthesis was measured in light bottle; simultaneously decrease in oxygen of dark bottle was measured to estimate the respiration in the same sample.

Water quality:

Water quality characteristics consisted of conventional variables (namely Depth, Secchi disc, Water Temperature, Conductivity, Turbidity, Total Suspended Matter, pH, Salinity, Dissolved Oxygen, Dissolved Oxygen

Saturation, Nitrite, Nitrate, Ammonia, Dissolved Inorganic Nitrogen, Phosphate, Silicate, Total Nitrogen, Total Phosphorous, Dissolved Organic Nitrogen, Dissolved Organic Phosphate) intended for Environment Impact Assessment. Both surface and bottom samples were collected in two phases during June 2024 for the above physicochemical characteristics. Altogether Seven GPS prefixed sampling locations were visited for monitoring the study area (Fig.3). The following tabulation shows minimum, maximum and, mean values and (SE±) in respect of overall water quality off Visakhapatnam Port and two locations in the open sea. Table. 2 shows water quality data at the selected locations.

Table. 4: Water quality characteristics at the selected location of Visakhapatnam Port, June 2024.

S. No.	Sample -1	Sample - 2	Sample - 3	Sample - 4	Sample - 5	Sample - 6	Sample - 7
Temp	33	33	33	31	29	31	29
Depth	12.7	20.2	16.7	25.2	4.9	33.6	40.3
Secchi Disc (m)	1.4	1.7	1.2	2.2	0.5	3.1	2.6
Conductivity (ms.cm-1)	53.7	54.9	54.7	57.3	55.9	56.2	56.6
Turbidity (NTU)	9.4	9.9	10.7	5.5	6.6	3.3	5.8
TSM	74	97	89	80	28	17	24
pH	8.14	7.63	7.96	8.19	8.36	8.36	8.37
NO_2	7.3	7.5	3.5	1.4	3.1	0.5	0.0

NO_3	13.4	9.7	11.4	8.1	10.3	2.5	5.8
NH_3	20.6	21.4	20.5	6.9	13.1	3.9	3.6
DIN	39.7	37.4	34.1	15.5	25.4	6.6	8.8
PO4	13.8	17.0	24.0	8.4	2.6	0.1	0.4
SiO4	166.9	170.2	177.4	80.6	39.1	29.8	90.2
DO	6.64	4.93	4.29	4.71	1.93	5.36	5.36
Salinity	33.89	34.70	34.57	36.45	35.77	35.77	35.91
TN	173.8	210.5	325.9	78.7	127.5	57.0	46.4
TP	13.9	17.1	24.6	8.7	2.8	0.2	0.4
DON	134.1	173.2	291.8	63.2	102.1	50.3	37.6
DOP	1.20	1.42	2.46	0.88	0.24	0.10	0.38

(**Note:** All parameter values expressed in mg/l except pH, depth, secchi-disc, temperature, conductivity and turbidity.)

In the present study, depth ranged from 4.9m to 40.3m and secchi-disc transparency 0.5m to 3.1m. Average seawater temperature was high (~29.5 0C) which reflects hot weather conditions. Salinity was high (35.91); dissolved oxygen was ranges from 1.93 to 6.64 mg/l, however very low DO levels (1.93mg/l) were observed sampling location - 5 in the surface waters which may be due to polluted conditions found in the inner harbour. Turbidity ranged from 3.3 NTU to 10.7 NTU; pH alkaline (≤8), TSM loads high (97mg/l), high total nitrogen (325.9mg/l), high phosphate (24.6mg/l), silicate (177.4mg/l), which together indicated impacting conditions from industrial wastage and domestic sewage.

Sediment Characteristics

In marine benthic ecology, sediment grain size or granulometry is considered an important variable that determines the composition and

characterization of benthos. The nature of biological community living in sediment is always related to sediment type (Gray, 1974). Sediment type could be defined in a number of different ways, one of which is the sediment particle size distribution. In marine benthic monitoring studies, biological communities are routinely compared to sediment particle size distribution.

Gray (1974) reported that diversity within shelf habitats is lowest in mud, higher in sand and highest in mixed mud and sands-sediment with a median particle diameter of about 200 µm. Any correlation between the benthic organisms and sediment nature (texture, structure and organic content) should therefore be taken as the key to benthic ecology. The nature of sediment is determined by the complex interaction of a large number of factors such as the source and supply of sedimentary material, its transportation, deposition and post-depositional changes, if any, of mainly biogenic origin (e.g. bio-deposition and bio-turbation) etc. In conjunction with more extensive benthic surveys, sufficient information can be derived from a measurement of the combined sand, silt and clay levels as well organic content of the sediment.

During the present study, detailed analysis of sand, silt, clay and organic carbon was carried out for 6 locations as per the requirement (st.M4 could not be sampled for technical reasons). Table 4 contains data on the sediment texture and %organic content in respect of these locations. The following tabulation shows summarized information (range, mean and SE) on sediment nature and organic content.

Table. 5: Summary of Sediment nature and characteristics

S. No.	Characteristics	Min	Max	Mean	SE
1	Silt (%)	25.21	86.21	57.36	10.18
2	Sand (%)	13.65	74.64	42.47	10.18
3	Clay (%)	0.10	0.33	0.16	0.03
4	Sediment organic carbon (%)	1.01	9.72	5.21	1.47

From the data presented above, organic carbon is high (mean 5.21%). Sand ranged from 13.65% (st. M3) to 74.64% (st. M6), Silt ranged from 25.21% (st. M6) to 86.21% (st. M3) and average clay was very low (mean 0.16 %). In sts. M3 and M5 very high organic carbon content was observed and also mud (Silt + Clay) is highest at the same locations. It is generally established that soft sediments contain more organic carbon than those with coarse particles. The predominant reason for the relatively high mud levels could be related to submarine drilling activity during the last few years at station M3 and fishing harbour effect at station M5.

Heavy metals:

In the present study, the gastropod sample was collected for Heavy metals analysis. The shows that the presence of heavy metal concentration is below detectable level and copper and other metals are absent in observed gastropod sample.

ZOOPLANKTON

Zooplankton numerical abundance (Ind./10m3), and diversity at the harbor and sea locations off Visakhapatnam was studied according to standard procedures before the onset of active monsoon. Altogether seven zooplankton samples were collected representing the seven stations. As mentioned before, the sampling locations and reference sites were selected in such a manner they adequately represented the ecological conditions in and around the Visakhapatnam harbour.

Zooplankton were identified to the group level since they were poorly poor represented inside the harbour. As a matter of fact, there were hardly any active zooplankton at the stations examined inside the harbour evidently due to poor seawater quality. The forms were identified with the help of a binocular stereomicroscope following standard taxonomic references (e.g., Nishida, 1985, ICES identification leaflets for plankton, 1939-2001; Kasturirangan, 1963 and Newell and Newell, 1977). All abundance data were converted to density (ind./10m3) using the volume of water filtered by the net.

Zooplankton count and species in the area:

Zooplankton was collected during pre-monsoon area and showed biomass between 38 and 43 ml/100 m3 in the study areas. The Total population per each sample ranged from 288912 to 392047. The biomass and population have been observed to be minimal in the inner harbour and highest in the Outer

harbour area. Copepods and Decapods are dominant in RK Beach and Yarada areas. While in average, Tintinnids, Copepods and decapods are Dominant groups in all areas. The dominant groups in Inner Harbour are bivalves.

Table. 6: Numerical abundance of zooplankton (ind./10m3).

Taxa	Sampling Locations							Total	%
	1	2	3	4	5	6	7		
Copepod	373	84	169	89	2757	13989	1894	19355	87.9
Bivalve Veliger	8	314	0	46	317	51	209	945	4.3
Mysis sp.	0	0	0	0	17	0	61	78	0.4
Cyclopoida	20	15	2	8	12	0	8	65	0.3
Lucifer sp.	0	5	0	0	31	27	218	281	1.3
Spirotricha	0	5	8	0	10	12	4	39	0.2
Saggita sp.	0	0	6	0	31	810	12	859	3.9
Protozoea	0	0	0	0	31	0	12	43	0.2
Zoea	0	0	0	0	17	0	21	38	0.2
Gastropod Veliger	0	0	0	0	0	15	12	27	0.1
Polychaete larva	0	0	0	0	0	15	40	55	0.2
Cladocera sp.	0	0	0	0	0	0	21	21	0.1
Megalopa	0	0	0	0	0	0	12	12	0.1
Nauplius	0	0	0	0	0	0	61	61	0.3
Amphipod	0	5	0	0	0	0	31	36	0.2
Foraminifera	2	0	4	6	1	11	10	34	0.2
Fish eggs	0	0	68	0	0	0	0	68	0.3
Others	0	0	0	0	4	0	10	14	0.1
	403	428	257	149	3228	14930	2636	22031	100.0

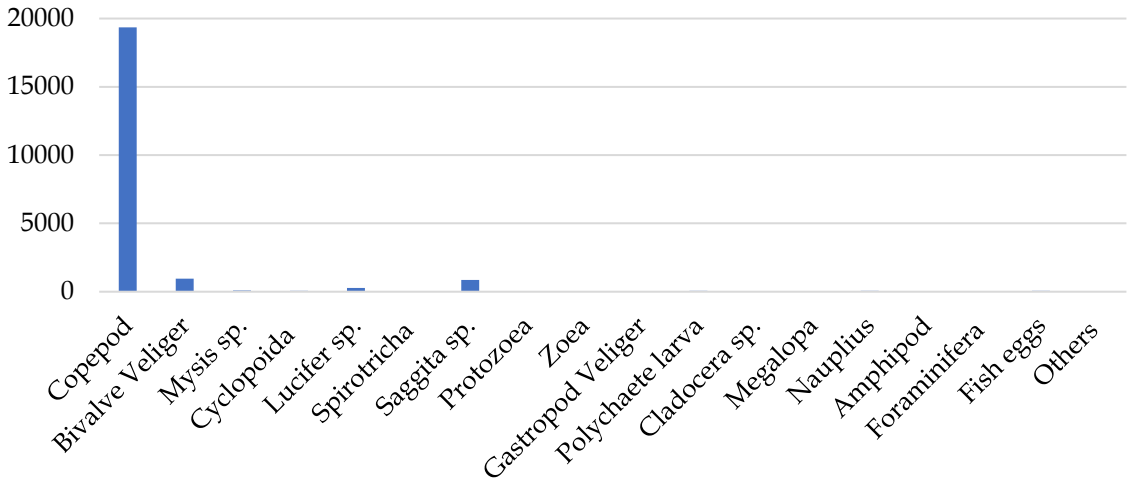


Fig. 5: Numerical Abundance of Zooplankton

Composition

During this study, copepods constituted the bulk (87.9%) of the population followed by the arrow work *Sagitta* (3.9%), larval forms (4.5%) and contribution by other groups (7.6%) (F). Table 8 shows numerical abundance of zooplankton at the selected stations. Based on the data, it is found that the order of maximum abundance of zooplankton relates to copepods (max 13969 ind./10m3) at st.6 in the open sea.

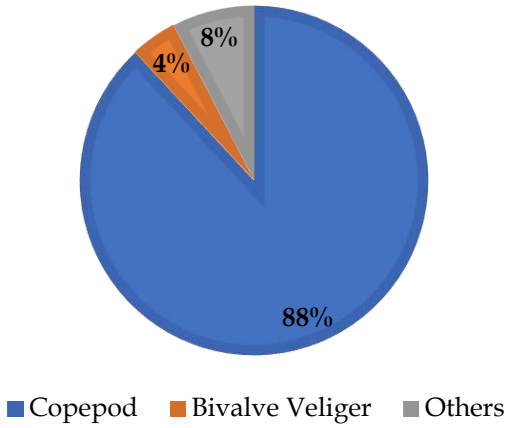


Fig. 6: Composition of Zooplankton

Minimum numbers (84-89 ind./10m3) within the polluted habitat in the harbour. Among the larval plankton, bivalve veligers outnumbered all others. It is noteworthy that there were most abundant (314 ind./10m3) at st.2 located in the north channel affected by sewage pollution.

Phytoplankton:

In the present study carried out during pre-monsoon and the observations on phytoplankton consisted of species composition and their numerical abundance at 7 selected locations. Surface samples consisted of net hauls (30µm mesh size) towed alongside boat (2-3knots) for about 5-10 minutes. All net hauls were fixed in buffered 5% formaldehyde and stored until analysis in the Laboratory. For taxonomic identification, a research microscope (Leica, DMLS) with x400 was utilized. All taxonomic identifications were carried out according to Subrahmanyam (1946), Santhanam et al. (1987) and Tomas (1997).

Phytoplankton biomass was observed between 60 and 80 ml/100 m3 in the study areas. The Total population per sample ranged from 10220983 to 15905782. The biomass and population have been observed to be minimal in the RK beach offshore area and highest in the Outer harbour area. The dominant groups, in general, are *T. pseudonana*, *Skeletonema, Thalassiosera, Asterionellopsis, Rgizocelenia and Asteromphalus* genii.

Table. 7: Numerical abundance of Phytoplankton (ind./10m3).

Name of the Species	Sampling locations							Total	%
	1	2	3	4	5	6	7		
T. pseudonana	356	152	165	0	0	0	0	673	24.9
Skeletonema costatum	13	20	10	36	347	30	10	466	17.2
T. coromandeliana	0	0	0	50	267	13	0	330	12.2
Protoperidinium granii	0	205	23	7	43	0	0	278	10.3
Thalassiosira subtilis	10	66	46	27	112	0	0	261	9.6
P. seriata	0	13	10	17	13	17	20	90	3.3
R. stolterfothii	0	0	3	7	40	13	10	73	2.7
Chaetoceros lorenzianus	0	0	0	10	7	13	20	50	1.8
Rhizosolenia setigera	3	7	7	0	10	13	7	47	1.7

Nitzschia sp.	0	7	0	13	26	0	0	46	1.7
Chaetoceros sp.	7	3	7	7	7	3	7	41	1.5
Navicula sp.	10	0	13	0	0	10	0	33	1.2
L.minimus	0	0	0	7	30	0	0	37	1.4
Nitzschia longissima	0	3	7	0	20	0	0	30	1.1
R. robusta	0	13	0	3	10	0	0	26	1.0
Gloeocapsa sp.	23	0	0	0	0	0	0	23	0.9
Monas socialis	13	0	10	0	0	0	0	23	0.9
Diplopsalis sp.	0	0	0	0	20	0	0	20	0.7
Oscillatoria princeps	3	7	10	0	0	0	0	20	0.7
Bacteriastrum hyalinum	0	0	0	0	0	10	7	17	0.6
R.styliformis	0	0	0	7	3	0	0	10	0.4
Lauderia annulata	0	0	10	0	0	0	0	10	0.4
Cylindrotheca closterium	0	0	0	0	10	0	0	10	0.4
P. angulatum	0	0	0	0	3	7	0	10	0.4
Cymbella sp.	10	0	0	0	0	0	0	10	0.4
Microcystis pulverea	10	0	0	0	0	0	0	10	0.4
Trichodesmium sp.	0	0	0	0	0	3	7	10	0.4
Hemiaulus sinensis	0	0	0	0	0	0	7	7	0.3
O.limosa	0	0	0	0	0	7	0	7	0.3
Melosira sp.	7	0	0	0	0	0	0	7	0.3
Amphiprora alata	3	3	0	0	0	0	0	6	0.2
O. sinensis	3	3	0	0	0	0	0	6	0.2
Cosmarium sp.	3	0	3	0	0	0	0	6	0.2
C. jonesianus	0	0	0	0	3	0	0	3	0.1
Lithodesmium undulatum	0	0	0	0	0	0	3	3	0.1
Eucampia cornuata	0	0	0	0	0	3	0	3	0.1
Thalassiothrix frauenfeldii	0	0	0	0	3	0	0	3	0.1
Total	**474**	**502**	**324**	**191**	**974**	**142**	**98**	**2705**	100.0

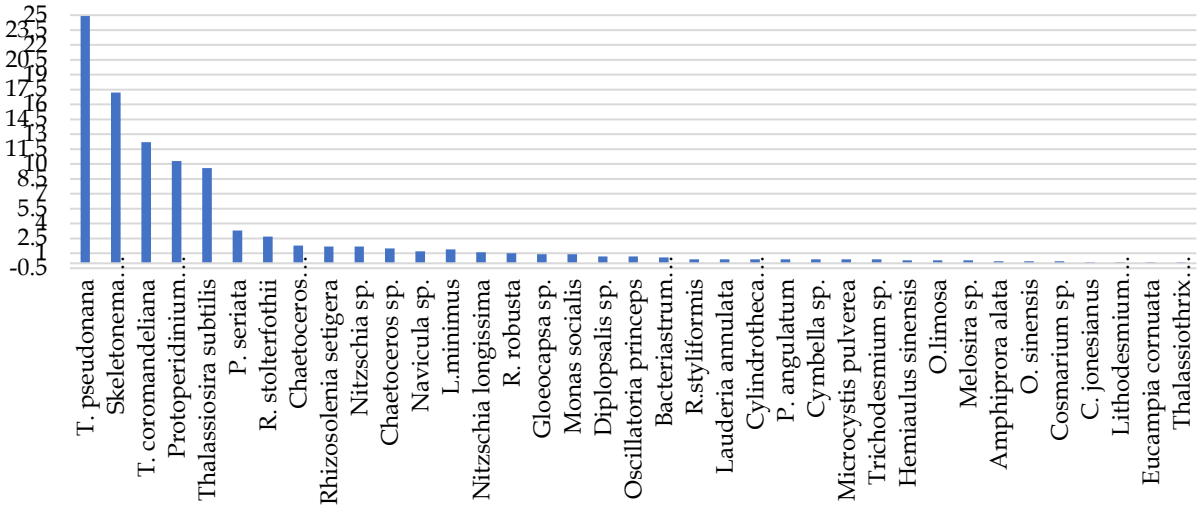
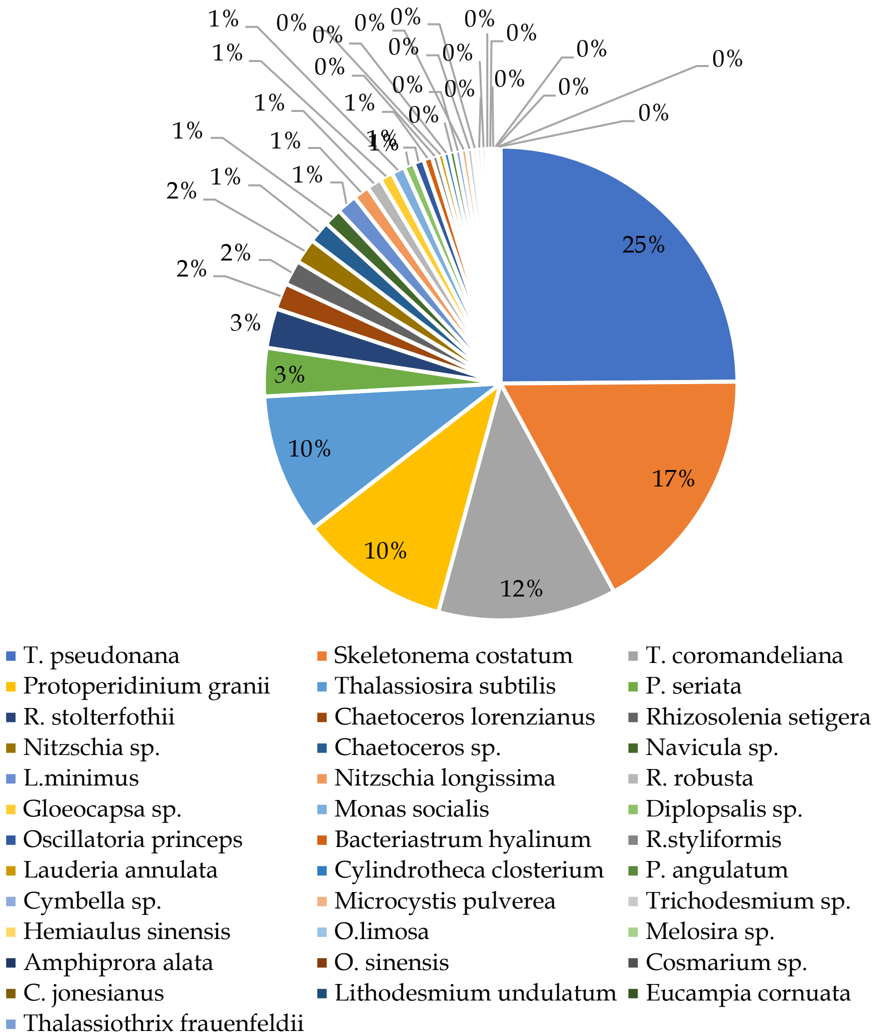


Fig. 7: Numerical Abundance of Phytoplankton

Fig. 8: Composition of phytoplankton



Select Species of Phytoplankton (Diatoms)

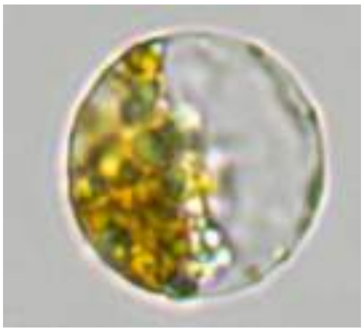


Fig. 9: ***T. pseudonana***


Fig. 10: Skeletonema costatum

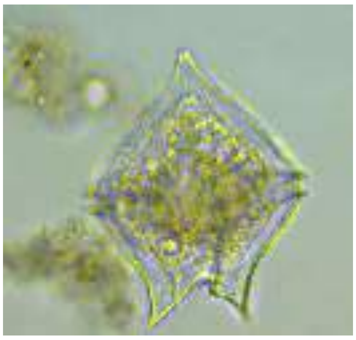


Fig.11: Protoperidinium granii

Fig. 12: Thalassiosira subtilis

Fig. 13: Chaetoceros lorenzianus

Fig. 14: Rhizosolenia setigera

Fig. 15: *Navicula* sp.

Fig. 16: *Gloeocapsa* sp.

Fig.17: Diplopsalis sp.

Fig. 18: *Oscillatoria princeps*

Fig. 19: Bacteriastrum hyalinum

Fig. 20: *Lauderia annulata*

Fig. 21: Cylindrotheca closterium

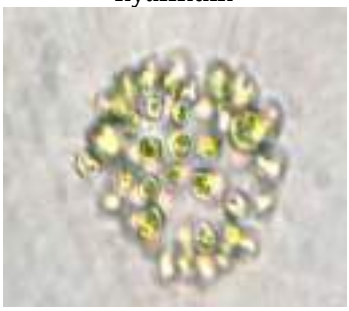


Fig. 22: Microcystis pulverea

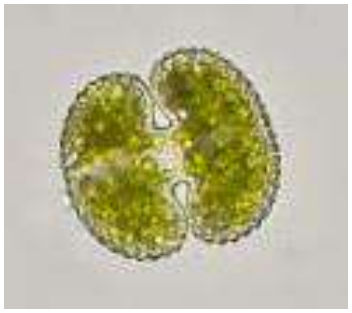


Fig. 23: Cosmarium sp.

Benthic sampling:

Collected Benthic samples showed varied dominant groups between Inner Harbour area and other areas. The Species count in general varied from 4 to 17. The Dominant groups in general are Tanaids, Neptys, Amphipods, and Cossurids.

Table. 8: List of species and dominant groups in the present study

Location	Number	Species count	Dominant groups
Outer harbour	1,245	17	Tanaids, Amphipods, Nephtys dibranchis Cossurids
Inner harbour	688	12	Cirratulus, Nephtys, Cossurids, Tanids
Between East quay and West quay	86	4	Cirratulus, Nephtys Cossurids, Tanids
RK beach - offshore	200	5	Tanaids, Amphipods, Nephtys dibranchis Cossurids
RK beach nearshore	345	10	Tanaids, Amphipods, Nephtys dibranchis Cossurids
Yarada offshore	260	7	Tanaids, Amphipods, Nephtys dibranchis Cossurids
Yarada nearshore	445	9	Tanaids, Amphipods, Nephtys dibranchis Cossurids

Nekton sampling:

The Nekton samples are from local catch and also from research trawl nets. The most common species seen are jellyfish, Sargent fishes, gobies, mullets and fewer numbers of elasmobranchs are also seen.

Table. 9: Species count and dominant groups in the study

Location	Number per hawl	Species count	Dominant groups
Outer harbour	180	4	Nemepteridae, Abudefduf, Mugilidae
Inner harbour	80	4	Mugilidae, Abudefduf, Gobidae Scyphozoa
Between East quay and West quay	76	3	Gobidae Scyphozoa Mugilidae
RK beach offshore	348	17	Rastrelliger kanagurta, Nemepteridae, Scyphozoa
RK beach nearshore	345	22	Abudefduf sp, Nemepteridae, Scyphozoa
Yarada offshore	420	23	Scyphozoa, Rastrelliger kanagurta, Nemepteridae,
Yarada nearshore	322	16	Rastrelliger kanagurta, Nemepteridae, Scyphozoa

Heavy metals:

In the present study, the gastropod sample was collected for Heavy metals analysis. The shows that the presence of heavy metal concentration is below detectable level and copper and other metals are absent in observed gastropod sample.

Beach Ecology:

Intertidal Biodiversity survey:

Intertidal Biodiversity survey was conducted in Yarada and RK Beach sandy shores and rocky shores. The following are the results of the same. The areas showed the abundance of diversity in both sandy and rocky shores.

Flora;

In flora, 4 trees, 2 shrubs, 10 herbs and 1 alga were observed during the study. Out of the 17 species observed, family Arecaceae was the most dominant family. *1pomeabiloba, Spinifex littoreus and Boerhavia diffusa* are the only three species of flora found in Transect B. *Ulvalactuca* was the only algal species which was found during the complete study. It was found only on a patch of rock present on the transect B. A mangrove patch present near the port was surveyed. It showed presence of three species viz. *Avecinia officinalis, Acanthus ilicifolius and Sessuvium portulachstrum.* The species richness of flora was more in Transect A. The distribution pattern of coastal flora shows *pomeabiloba* as the most frequent, dominant and abundant plant species present in the study area followed *by Spinifex littoreus.*

Table. 10: The list of flora observed during the present study

S. No.	Botanical Name	Habit	Family
1	*Acanthus ilicifolius*	Herb	Acanthaceae
2	*Avecinia officinalis*	Shrub	Acanthaceae
3	*Boerhavia diffusa*	Herb	Nyctaginaceae
4	*Borassus flabellifer*	Tree	Arecaceae
5	*Cocos nucifera*	Tree	Arecaceae
6	*Cyperus sp*	Herb	Cyperaceae
7	*Fimbristylis sp*	Herb	Cyperaceae
8	*Indigofera sp*	Herb	Fabaceae
9	*Ipomoea biloba*	Shrub	Convolvulaceae
10	*Launaeas armentosa*	Herb	Asteraceae
11	*Opuntiasp*	Herb	Cactaceae
12	*Phoenix sylvestris*	Tree	Arecaceae
13	*Prosopis juliflora*	Tree	Fabaceae
14	*Sessuvium portulachstrum*	Herb	Aizoaceae
15	*Spinifex littoreus*	Herb	Poaceae
16	*Typha angustata*	Herb	Typhaceae
17	*Ulvalactuca*	Algae	Ulvaceae

Fig. 24: *Cocos nucifera*

Fig. 25: *Sesuvium portulacastrum*

Fig. 26*: Borassus flabellifer*

Fig. 27: *Scaevola taccada*

Fauna:

The Transect A was more diverse area found during the study period. In fauna, 13 molluscs, 3 crustaceans, 2 butterflies and 3 bird species were observed during the study. Class Bivalvia of Mollusca was dominant. Species like *Papia textile and Sunetta effosa* were the species which were most common in the present study area.

The birds sighted during the study were also the most commonly sighted ones and are least concern according to IUCN. The birds sighted during the study were also the most commonly sighted ones and are least concern according to IUCN. In crab species, Fiddler crabs and Mottled Sally Lightfoot were the crabs which were seen only in transect A. The species richness of fauna is more on Transect A. No butterfly species was seen during the survey on transect B. Considering the distribution pattern of the fauna, molluscs were the most frequently, densely and abundantly distributed group followed by crustaceans, birds and butterflies

Figure. 11: list of Fauna observed at transect area during the study period

Location	Number (per square meter)	Species count in Average	Dominant groups
RK Beach shore	245	34	Caulerpaceae, Echinometridae, Ulvaceae, Gobidae Blennidae Portunidae Menippidae Astroidea
Yarada shore	320	42	Astroidea Emerita Ocepoda Ulvaceae Caulerpaceae

The different types of fauna were observed during the survey. The list of molluscs observed is given below in Table. 12.

Table. 12: List of Molluscs

S. No.	Scientific Name	Class	Family
1	*Anadara gubernaculum*	Bivalvia	Arcidae
2	*Babylonia spirata*	Gastropoda	Babyloniidae
3	*Olivafaba*	Gastropoda	Olividae
4	*Paphia textile*	Bivalvia	Veneridae
5	*Sunnetaeffosa*	Bivalvia	Veneridae
6	*Neritaoryzarum*	Gastropoda	Neritidae
7	*Mesocibotabistrigata*	Bivalvia	Arcidae
8	*Carditacalyculata*	Bivalvia	Carditidae
9	*Donaxscortum*	Bivalvia	Donacidae
10	*Sepia aculeate*	Cephalopoda	Sepiidae

11	*Gastranapolygona*	Bivalvia	Tellinidae
12	*Meritrixmeritrix*	Bivalvia	Veneridae
13	*Placuna placenta*	Bivalvia	Placunidae

During the present survey, the Arthropoda (Crustaceans and Insects (Butterfly)) observed during the survey are given below in the Table. 13.

Table. 13: List of Arthropoda- (Crustaceans and insects)

Arthropoda- Crustaceans			
S. No.	**Common Name**	**Scientific Name**	**Family**
1	Fiddler crab	*Uca spp.*	Ocypodidae
2	Mottled Sally Lightfoot	*Grapsus grapsus*	Grapsidae
3	Ghost Crab	*Ocypode spp.*	Ocypodidae
Arthropoda - Insecta (Butterflies)			
1	Common Lime Butterfly	*Papiliode moleus*	Papilionidae
2	Common Bottle blue	*Graphium sarpedon*	Papilionidae

Some of the Species observed during the present study:

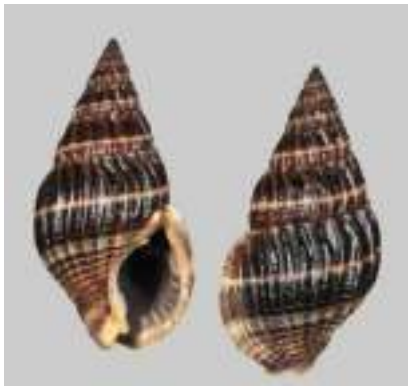


Fig. 28: *Nassarius olivaceus*

Fig. 29: *Ptychobela nodulosa*

Fig. 30: *Nassarius foveolatus*

Fig. 31: *Sphenopus arenaceus*

Fig. 32: Leucosia anatum

Fig. 33: Charybdis affinis

Fig. 34: *Charybdis* sp.

Fig. 35: Myra fugax

Fig. 36: Bursa rana

Fig. 37: *Papiliode moleus*

Fig. 38: *Graphium sarpedon*

The list of birds observed during the survey is given below in Table. 14.

Table. 14: List of Birds

S. No.	Common Name	Scientific Name	Family
1	Black Kite	*Milvus migrans*	Accipitridae
2	Common myna	*Acridother estristis*	Sturnidae
3	House crow	*Corvus splendens*	Corvidae

Fig. 39: ***Milvus migrans***

Fig. 40: ***Corvus splendens***

Fig. 41: ***Acridotheres Tristis***

The overall coastal diversity of flora and fauna is fair and any development activity inside the port premises would not have much effect on the coastal diversity.

Fisheries

Visakhapatnam is one of the important fish landing Centre's of Andhra Pradesh. Secondary fish data was procured from State Fishery Department, Fishery Survey of India & Department of Animal Husbandry Dairying & Fisheries. For supporting above data, local fish market and landing Centre data were studied.

The fish production data for the period 2016-17 to 2019-20 for nine major coastal States of India was procured from secondary source i.e., Department of Animal Husbandry Dairying & Fisheries. As per data, Andhra Pradesh has the highest fish production in India.

Visakhapatnam coastal marine fish and shrimp production data was procured from State Fishery Department. According to last five-year available data (Table. 15), there was a continuous increase in the production of marine fish and shrimp. As per data analysis, Indian Mackerel *(Rastrelliger kanagurta) and* Tuna (Tunnies) are the most dominant fishes at Visakhapatnam coast. Subsequently, very less quantity Bombay duck *(Harpodan nehereus)* and Hilsa (*Tenualosa ilisha*) catch was observed.

Table. 15: State wise maximum contribution to production of fish in India (In Lakh Tons)

Coastal States of India	2015-16	2016-17	2017-18	2018-19	2019-20
Andhra Pradesh	23.52	27.66	56.11	39.91	41.74
Goa	1.12	1.18	1.24	1.2	1.05
Gujarat	8.09	8.16	9.54	8.41	8.59
Karnataka	5.81	5.58	7.46	5.88	6.32
Kerala	7.28	5.92	7.81	8.01	6.8
Madhya Pradesh	1.15	1.39	2.82	1.73	2
Maharashtra	5.8	6.63	7.94	5.68	5.61

Odisha	5.22	6.08	11.42	7.59	8.18
Tamil Nadu	7.1	6.69	8.54	6.9	7.57
West Bengal	16.71	17.02	32.59	17.82	17.82
Puducherry	0.54	0.5	0.57	0.47	0.51
India	107.62	114.31	203.79	135.73	141.64

Table. 16: Total annual catch of marine fish & shrimp during 2011 to 2015 – Visakhapatnam.

SN	Name of the fishes	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
1	Shark	607	460.225	342.316	119.2	80.84
2	Skates	114	253	207.323	196.872	120.21
3	Rays	545	256.442	218.68	141.653	132.74
4	Oil Sardine	1008	3491	3484	3854	5290.82
5	Other Sardine	741	1344	1870	2248	2540
6	Hilsa Shad	19	34	184	99	102
7	Other Shads	437	303	498.8	312	350
8	Thrisocies	439	587	429	1139	1241
9	Anchovies	2289	2216	3159	4663	4521
10	Other Clupeids	516	876	1174	2988	3100
12	Chriocentrus	495	520	397	290	320
13	Polynemids	839	1149	777	339	410
14	Chorinemus	367	562	441	257	260
15	Trichuridae	2004	1637	3644	7830	6845
16	Carangids	3545	4241.41	1897	2964	2857
17	Indian mackeral	7873	11669.38	15774	14090	12345
18	Other mackerals	2502	5036.82	3462	4057	5621
19	S.commerson	1599	914	592	503	680
20	S.guttatus	749	676	439	311.8	350
21	S.Ieneoitus	408	419	141	117	120
22	Tunnies	6496	6142.251	4090.865	10037.638	10998.54
23	Mugil	951	497	148	83.72	110.24
24	Eels	700	214.626	194.985	123.986	154.21
25	Cat fish	692	547	659	481	598
26	Threadfin breams	638	934	1447	838	911
27	Pigface breams	416	435	332	293	302

28	Other perches	1151	1156	1294	1605	1826
29	Scianids	562	362	153	320	540.14
30	Leoignathus	742	491	2329	1147	1325.54
31	Black Pomfrets	985	409	3618.364	1921.76	1628.55
32	Silver Pomfrets	729	524.516	285.31	363.207	251.47
33	Sole (flat fish)	662	219	303	358	421
34	P.monodon	1148	497.93	453.674	612.776	750.36
35	P.indicus	967	677.904	538.616	419.564	520.41
36	Meta peneaus	3707	1817.85	1125.315	4230.376	4829.23
37	Non peneaid	1037	4188.081	7214.14	6120.457	5650.25
38	Mannecrustaceans	3341	1266.13	2299	2231.427	2310.84
39	Other crustaceans	14	34	49	56	46
40	Lobsters	410	220.748	17.911	5.056	11.95
41	Molluscans	471	380	41.81	96.4	100.82
42	Squids & cuttlefish	2468	688.07	2019.569	931.603	805.75
43	Mischallaneous	12202	16983.231	13496.576	11110.9	15986.19
	Total	**67712**	**75358.614**	**81241.254**	**89906.395**	**97365.1**

Visakhapatnam is well known as a hub of fishing activity. During fish market survey at Visakhapatnam fishing harbour a variety of fish were observed include yellow fin tuna, Prawns, Mackerel, King fish, Sardine, Ribbon fish, Sole fish, etc. As per local fishermen the Yellowfin tuna *(Thunnus albacares)* are the dominant species, it contributing 20% -30% to the total catch of the region.

Figure.42: The local, wholesale and fish market at Visakhapatnam Fishing Harbour

During local fish market survey some varieties of dry fishes are observed. The local women are engaged fulltime in procuring, drying, packing and marketing of dried fish at Visakhapatnam, these activities provide employment and economic security to local fisherman. Small shrimp such as acetes, ribbonfish, serfish, mackerel, sardines, flatfishes, and sciaenids are mainly used in the dried form.

Marine Turtle

In recent years, Visakhapatnam has become an increasingly popular destination for tourists. The degradation of the aquatic and coastal environments is mostly caused by infrastructural expansion, tourism, and increased pollution. Because of this, sea turtles find it challenging to nest here, and as a result, this beach is rarely used as a nesting site.

Reasons for the Loss of Nesting Beaches: water pollution, beach erosion, sea level rise, uncontrolled coastal development and other human activities. Uncontrolled fishing during nesting seasons, Non-use of turtle excluder device, increased marine traffic, offshore developmental activity, Threats from domestic dogs, wild boars & human being, Incidental catch in mechanized fisheries were treat to nesting for turtles.

Activities Supporting Conservation: Create a thorough action plan for the conservation of sea turtles in cooperation with all law enforcement agencies, businesses, and local communities. prohibiting the release of heavy metals, pesticides, heavy oils, heavy waters, and other toxic effluents into or close to beaches where turtles breed. prohibiting the throwing of waste into the water or on the beach, such as fishing nets, plastic bags, and other items that could kill sea turtles accidentally. coordinated beach and near-shore waterway cleanups by the local fisheries and forest departments and other government organizations. It is important to start this before sea turtles breed and to promote awareness about marine turtles.

CONCLUSION

The features of the water quality showed that the harbor waters are heavily contaminated due to the current circumstances (poor tidal exchange). The harbor waters have become extremely eutrophic, or nutrient built-up, due to the excessive enrichment of inorganic nitrogen and phosphorus caused by waste additives and ineffective mixing. This has resulted in the extinction of sensitive species and the proliferation of pollution-tolerant taxa like *Skeletonema costatum*, which is known to inhabit polluted marine water bodies frequently with exclusive dominance as in the present case.

When compared to similar aquatic bodies, zooplankton also showed a low diversity of life. Macrobenthos's life is completely destroyed. Nowhere in the harbor's bottom sediments was there any macroscopic life. The large concentrations of organic materials and sulfur-tainted hydrogen emissions attest to this. In fact, no life was found in the sediments even in 2008, when this laboratory conducted a similar investigation on the quality of harbor water and marine biodiversity. The conditions seem to have gotten worse over the years following, primarily due to an increase in the amount of waste being discharged into the harbor and an ineffective mixing system.

BIBLIOGRAPHY

Ray, G.C.; Hayden, B.P. Coastal zone ecotones. In Landscape Boundaries; Springer: New York, NY, USA, 1992; pp. 403–420.

Reizopoulou, S.; Simboura, N.; Barbone, E.; Aleffi, F.; Basset, A.; Nicolaidou, A. Biodiversity in transitional waters: Steeper ecotone, lower diversity. Mar. Ecol. 2014, 35, 78–84.

Halpern, B.S.; Walbridge, S.; Selkoe, K.A.; Kappel, C.V.; Micheli, F.; D'agrosa, C.; Bruno, J.F.; Casey, K.S.; Ebert, C.; Fox, H.E.; et al. A global map of human impact on marine ecosystems. Science 2008, 319, 948–952.

Hoegh-Guldberg, O.; Bruno, J.F. The impact of climate change on the world's marine ecosystems. Science 2010, 328, 1523–1528.

Perry, R.I.; Cury, P.; Brander, K.; Jennings, S.; Möllmann, C.; Planque, B. Sensitivity of marine systems to climate and fishing: Concepts, issues and management responses. J. Mar. Syst. 2010, 79, 427–435.

Solan, M.; Cardinale, B.J.; Downing, A.L.; Engelhardt, K.A.; Ruesink, J.L.; Srivastava, D.S. Extinction and ecosystem function in the marine benthos. Science 2004, 306, 1177–1180.

Worm, B.; Barbier, E.B.; Beaumont, N.; Duffy, J.E.; Folke, C.; Halpern, B.S.; Jackson, J.C.; Lotze, H.K.; Micheli, F.; Palumbi, S.R.; et al. Impacts of biodiversity loss on ocean ecosystem services. Science 2006, 314, 787–790.

Deegan, L.A.; Johnson, D.S.; Warren, R.S.; Peterson, B.J.; Fleeger, J.W.; Fagherazzi, S.; Wollheim, W.M. Coastal eutrophication as a driver of salt marsh loss. Nature 2012, 490, 388.

Johnston, E.L.; Mayer-Pinto, M.; Crowe, T.P. Chemical contaminant effects on marine ecosystem functioning. J. Appl. Ecol. 2015, 52, 140–149.

Hewitt, J.E.; Ellis, J.I.; Thrush, S.F. Multiple stressors, nonlinear effects and the implications of climate change impacts on marine coastal ecosystems. Glob. Chang. Biol. 2016, 22, 2665–2675.

Le Moal, M.; Gascuel-Odoux, C.; Ménesguen, A.; Souchon, Y.; étrillard, C.; Levain, A.; Moatar, F.; Pannard, A.; Souchu, P.; Lefebvre, A.; et al. Eutrophication: A new wine in an old bottle? Sci. Total Environ. 2019, 651, 1–

Douvere, F.; Ehler, C. Ecosystem-based marine spatial management: An evolving paradigm for the management of coastal and marine places. Ocean Yearb. Online 2009, 23, 1–26.

Hu W, Yu W, Ma Z, Ye G, Dang E, Huang H, Zhang D, Chen B. Assessing the Ecological Sensitivity of Coastal Marine Ecosystems: A Case Study in Xiamen Bay, China. *Sustainability*. 2019; 11(22):6372.

ANNEXURE – 4

2.3 Oil/ Chemical Spill

The Port has unique safety and environmental protection problems and the need for a well-integrated emergency plan for oil/chemical spill is absolutely essential. A number of accidents have occurred world over due to accidental discharge/leakage of Cargo. List of major oil spill in recent years world over is listed in **Table 2.18**. In India Arabian Sea at Mumbai it occurred twice in 2010 and 2011. The possible accidental leak/release scenarios of oil/chemical spill occurs due to collision, grounding, barging/ banking during handling of petroleum products, loading & discharge of liquid cargo, incorrect sequence of operations and during commencement/completion of cargo operations. If cargo tanks are ruptured during collision followed by heavy spark, causes fire due to ignition of oil. On the basis of hazard study, the following scenarios are considered for oil/chemical spill in Inner and at Outer harbour.

2.3.1 Scenario Development

The following scenario's which are possible due to failure while loading/discharge of the petroleum products that may result in leak/release at the OSTT, LPG Jetty, Oil Wharf, FB and at Northern arm (EQ6, EQ7,WQ1 & WQ1RE, WQ5). The cause of common failure is due to incorrect line up of ship/shore valves, Host failure, Gasket failure, Piping failure, over pressure in the line, damage to the hose by parting of mooring and striking of the tanker by passing vessel.

On the basis of hazard study, the following events are considered for consequence analysis of oil/chemical spill.

- Leak/release of crude at OSTT from vessel or transfer pipe line
- Leak/release of High Speed diesel at LPG jetty
- Leak/release of flammable liquids (IB & IC) and combustible liquids at OR1, OR2 from vessel/transfer pipeline
- Leak release of Bio diesel at OIL Wharf and Northern arm berths from vessel & pipeline
- Leak/release of styrene monomer at OR1 &OR 2 from vessel/transfer pipeline
- Leak of sulphuric acid at WQ1 & WQ1RE and phosphoric acid at EQ6/EQ7 of northern arm from vessel/ transfer pipeline
- Leak of caustic lye at EQ6/EQ7, WQ5 from vessel/transfer pipeline

- Spill over of Ammonia Nitrate at Northern arm berths (EQ & WQ) during handling
- Leak/release of molten Sulphur from vessel/transfer pipeline at FB
- Leakage of Alumina from vessel/transfer pipeline at WQ5 berth

The estimated quantity of hazard material release and spill over area in water and on land is reported in **Table 2.19**. However, the spread over area depends on absorbing and non-absorbing surface and its type and wind speed. Emergency management for Tier -1 level is considered as onsite crisis, whereas Tier-2 /Tier-3 level are considered as offsite crisis. Various response organizations for oil/chemical spill are involved as in case of fire-explosion. Depending on the level of responsibility, different groups will function for taking necessary action. Emergency (control) measures which are delineated for each hazard cargo as in **Table 2.19**.

The objective oil/chemical spill contingency plan:

- To develop appropriate and effective systems for the detection and reporting of oil spill.
- To ensure that appropriate response techniques are employed to prevent, control and combat pollution and dispose off recovered material in an environmentally acceptable manner.
- To ensure adequate protection to public health, welfare and the marine environment.
- To ensure that complete and accurate records are maintained for all expenditure to facilitate cost recovery

2.3.2 Response Plans

Chairman of VPT is the chief emergency controller in onsite/offsite emergency situations and Deputy Conservator of the Port will be emergency coordinating officer. A guideline or response plan is delineated as shown in **Table 2.20**. To combat oil/chemical pollution responsibility of organization has to be identified as in line with Fire-explosion, to deal with following components.

- Organisational structure of Emergency
- Port risk evaluation
- Area risk evaluation
- Notification and communication

- Emergency equipment & facilities

2.3.3 Action Plan

On the basis of direct information through incident controller, immediate response is to implement action plan to take preventive measures for spill on land as well as on water. In case of oil spill accidents within Port limits, the Master as representative of the owner of the vessel and the cargo owner will take immediate action to inform the Port authorities and also to alert the concerned oil company representative onboard ship and immediately inform the oil terminal manager of the concerned oil company. The responsibility of the Port/ user Agency / industry is to protect the Harbour water, fisheries and maintenance of the ecology of the Port area. Hence full cooperation between all the parties concerned is required expeditiously and that as far as possible division of responsibility is to be delineated in principle, and accepted by all the parties.

Communication system within Port organization for emergency coordination linkages is given in **Annexure XII**, which is needed for onsite crisis management. The communication linkages with State & Central Government in the case of major crisis will be the same as in the case of Fire-explosion.

2.3.3.1 Preventive Measures

Preventive measures are aimed at reducing the chance of error as far as possible and to ensure that only best materials are used and maintained. The entire accident prevention is constantly concerned with the elimination of mistakes, and although complete success is probably an unattainable target, the use of a check-list system goes a long way to minimize errors, and is particularly valuable when two different parties, the shore and ship personnel, are required to work together. Approved safety checklist as contained in the International Safety Guide for Oil Tankers and Terminals may be used (As per IMDG guide lines).

Prompt action in the event of accidental spillage is essential and it is advised strongly that throughout the period of loading and discharging, the following steps are to be followed:

- A responsible ship's officer should be on watch on board and an adequate crew should remain on board to deal with emergencies.

- A responsible member of the ship's crew should be stationed near the ships main oil cargo control valves.
- Responsible member of the shore personnel should stand by the shore control valves at the shore end of the flexible hoses.
- The telephonic or other recognised communication systems between berth and pump house(s) or other point should be in working condition.
- At the commencement of operations and at each change of watch or shift, the responsible ship's officer and the responsible member of the shore personnel should confirm with each other that the “stand by", start loading", "stop loading", "slow down", "start discharging", "stop discharging" and any other necessary signals are properly understood and agreed.

At each jetty there should be an arrangement for stopping the flow of oil immediately in the event of failure of a manifold or hose on the ship or jetty. If the loading pumps are located away from the jetty (say more than 90m (295ft) away) remote-control arrangements at the loading berth and at another location, at a safe distance from the berth should be provided to stop the pumps immediately. In recent years, considerable progress has been made towards handling jetty equipment, and in standardizing tanker manifold design to take full advantage of the improvement in hose-handling techniques and of the installation of all oil booms. These arrangements have many variations to suit local needs. But in brief, the joining of a ship's manifold flanges and the jetty pipeline can be achieved by the following basic methods.

- Flexible hoses, the handling of which may be assisted by simple derricks/cranes.
- Booms terminating in flexible hoses.
- All metal swivel-jointed loading arms.

Flexible hoses are made of reinforced oil-resisting rubber to the specification of BS 1435: 1975 [3] and as recommended by the Oil Companies International Marine Forum “Buoy mooring forum standard".

However, a boat has been hired for keeping channel water in the Port clean, which works under the direction of Deputy Conservator. Chief Officer (pollution) takes necessary action to ensure that the Port waters are to be kept clean and initiates action to spray chemical for oil dispersion. Oil booms are also being placed around tankers.

2.3.3.2 Containment Measures

The containment measures must be capable of capturing oil that may discharge from a primary storage system (i.e., tank or pipe) such that the oil will not escape to the environment before cleanup occurs. Compliance requires the use of dikes, berms, retaining walls, curbing, spill diversion or retention ponds, absorbent materials or other equivalent measures. Under different sections of the rule, a quick drainage system is required for tank car or tank truck loading/unloading racks and secondary containment is required for all bulk storage containers.

Bulk storage containers must be constructed with a secondary means of containment for the entire capacity of the largest single container and sufficient freeboard to contain precipitation. Secondary containment of bulk storage containers is typically accomplished by concrete or steel dikes, earth berms, double-wall tanks or remote impoundments. Examples of common appropriate containment measures for operational equipment include the following methods:

1. Absorbent material

In the case of indoor hydraulic reservoirs (e.g., elevators, vehicle hoists, dock levelers, machinery etc.) appropriate containment may be achieved by placing absorbent materials around equipment to prevent spilled oil from reaching a floor drain or other drainage inlet. Absorbent materials are readily available in a variety of shapes and sizes.

2. Concrete curbing

In the case of out door electrical equipment, appropriate containment may be achieved by constructing concrete curbing around the equipment to prevent the lateral migration of oil from reaching a drainage inlet before cleanup occurs. Curbing needs to be constructed around common outdoor pad.

3. Drainage inlet cover

These are placed over drainage inlet structures to prevent spilled oil from entering the drainage system and discharging into the environment. This option requires keeping the drainage inlet covered for all the time. The drainage inlet operations should be properly supervised and inspected in consistent with the rules. Drainage inlet covers are most effective when the surrounding surface is conducive to a tight seal and the area is free of debris (e.g. grit, snow, ice, sand, etc.)

Loading / Unloading Rack containment

According to loading/ unloading rack containment procedures "where loading / unloading area drainage does not flow into a catchment's basin or treatment facility designed to handle discharges, use a quick drainage system for tank car or truck loading and unloading areas. It is necessary to design any containment system to hold at least the maximum capacity of any single compartment of a tank car or truck loaded or unloaded at the facility". The requirement for loading/ unloading rack containment applies to all bulk storage facilities, whether they are above ground or completely underground containers. This requirement does not apply to operational equipment.

2.3.3.3 Combat Pollution – Equipment

Equipment needed to combat oil pollution are booms, skimmers, transfer pumps, vacuum trucks, absorbents and dispersants. Apart from fire fighting and protective equipments boats, small crafts are also needed along with supportive equipment. Available resources to combat oil spill with VPT and pollution control equipment along with equipment to be procured is listed in **Tables 2.21 & 2.22**.

2.3.4. Chemical Spill (contingency plan)

In VPT, apart from petroleum products, hazardous chemicals are also handled in Inner Harbour at FB and in Northern arm at EQ6, EQ7, and WQ1, WQ1RE & WQ5 berths by CIL, IMC, NALCO and EIPL. The identified hazardous substances are Ammonia, molten sulphur, caustic lye, alumina, Ammonium nitrate, phosphoric acid and sulphuric acid including styrene monomer. The spill over area along with response measures are delineated and reported in **Table 2.19**. Ammonia leak/release is considered as toxic gas dispersion whereas styrene monomer is toxic as well as flammable liquid. Fertilizer grade Ammonium nitrate (more than 0.2% of combustible material) is possibly explodable in certain conditions. In recent times, accident occurred due to explosion are reported of Ammonium nitrate (fertilizer grade) (**Annexure XIII**). Responsibility of first response team with coordinating action team, preventive methods (spill disposal methods) on the basis of its reactivity and its combustibility with other chemicals have to be considered, which are reported in **Table 2.23**.

2.3.4.1 Response Plan

First Responder Operations level

First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response at the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. The first responder should know how to select and use proper personal protective equipment provided to the first responder at operational level, perform basic control, containment and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit and implement basic decontamination procedures.

The following absorbents can be used successfully to control chemical spill.

- Universal spill absorbent-1:1:1 mixture of Flor-Dri (or unscented kitty litter), sodium bicarbonate, and sand. This all-purpose absorbent is good for most chemical spills including solvents, acids (not good for hydrofluoric acid), and bases.
- Acid spill neutralizer-Sodium bicarbonate, Sodium carbonate or calcium carbonate.
- Alkali (base) Neutralizer-sodium bisulfate.
- Alkali Metals-Dry sand or a Class “D” Fire Extinguisher.
- Solvents/organic liquid absorbent - Inert absorbents such as vermiculite, clay, sand, Flor-Dri, and Oil-Dri.
- Ammonium Nitrate – Early stages of fire use flooding amount of water.
- Alumina – Moisten first to prevent dusting and wash away with plenty of water.

Action Plan

Action plan involves preventive measures and use of personnel protective equipment

2.3.4.2 Personnel Protective Equipment (PPE)

The purpose of personnel protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biological hazards that may be encountered. Careful selection and use of adequate PPE is necessary to protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing. No single combination of protective equipment and clothing is capable of protecting against all hazards. Thus PPE should be used in conjunction with other protective methods. The use of PPE can itself create significant worker mobility, and communication. For any

given situation, equipment and clothing should be selected so it provides an adequate level of protection. Over protection as well as under-protection can be hazardous and should be avoided. Few common PPE are:

- Goggles and Face Shield.
- Heavy Neoprene Gloves.
- Disposable Lab Coat and Corrosive Apron.
- Plastic Vinyl Booties.
- Dust Mask/Respirator.

2.3.4.3 Chemical Protective Clothing

Chemical Protective Clothing (CPC) is available in a variety of materials that offer a range of protection against different chemicals. The most appropriate clothing material will depend on the chemicals present and the task to be accomplished. Ideally, the chosen material resists permeation, degradation, and penetration. Permeation is the process by which a chemical dissolves in and/or moves through a protective clothing material on a molecular level. Degradation is the loss or change in the fabric's chemical resistance or physical properties due to exposure to chemicals or ambient conditions (e.g., sunlight). Penetration is the movement of chemicals through zippers, stitched seams or imperfections (e.g., pinholes) in a protective clothing material.

Selection of chemical-protective clothing is a complex task and should be performed by personnel with training and experience. Under all conditions, clothing is selected by evaluating the performance characteristics of the clothing against the requirements and limitations of the site and task specific conditions. If possible, representative garments should be inspected before purchase and their use and performance discussed with someone who has experience with the clothing under consideration. In all cases, the employer is responsible for ensuring that the personal protective clothing (and all PPE) necessary to protect employees from injury or illness that may result from exposure to hazards at the work site is adequate and are of safe design and fabrication for the work to be performed.

2.3.4.4 Chemical Spill Response Procedures

In the event of chemical spill, response teams depend on risks involving the release of a type or quantity of a chemical, i.e., immediate risk to health and involve chemical contamination to the body:

- Notify the personnel in the neighbouring accident area.
- Alert people in immediate area of the spill.
- Determine the chemical nature of the spill and check the Met sheet.
- Isolate the area, and evacuate the people immediately(if necessary depends on risk)
- Keep away ignition sources and disconnect power.
- Use a fire extinguisher to extinguish any flames if applicable.
- Choose appropriate personal protective equipment (goggles, face shield, impervious gloves, lab coat, apron, etc.)
- Confine and contain spill. Cover with appropriate absorbent material. If the absorbent material is acid or base it should be neutralized prior to cleanup.

If you are asked to evacuate

- Do so immediately
- Stay tuned to a radio or television for information on evacuation, temporary shelters and procedures.
- Follow the routes recommended by the authorities shorten & safe
- If you have time minimize the contamination in the house by closing windows and all vents and turning of all fans
- Take core pre assembled disaster supplies supplier.

Table 2.18: List of Oil Spills

S.No.	Spill / Vessel	Location	Dates	Min Tonnes	Max Tonnes
1.	Erika	France, Bay of Biscay	12 December 1999	15,000	25,000
2.	2001 Shell Ogbodo oil spill	Nigeria	25 June 2001	9,500	Unknown
3.	Limburg (bombing)	Yemen, Gulf of Aden	6 October 2002	12,200	12,200
4.	Prestige oil spill	Spain, Galicia	13 November 2002	63,000	63,000
5.	Tasman Spirit	Pakistan, Karachi	28 July 2003	28,000	30,000
6.	Bass Enterprises (Hurricane Katrina)	United States, Cox Bay, Louisiana	30 August 2005	12,000	12,000
7.	Jiyeh power station oil spill	Lebanon	14 July 2006 – 15 July 2006	20,000	30,000
8.	2007 Korea oil spill	South Korea, Yellow Sea	7 December 2007	10,800	10,800
9.	Deepwater Horizon	United States, Gulf of Mexico	20 April 2010 – 15 July 2010	492,000	627,000
10.	Xingang Port oil spill	China, Yellow Sea	16 July 2010 – 21 July 2010	1,500	90,000

Table 2.19: Emergecy Response Measures for Oil Spills/Chemical Spills

S. No	Cargo	Max. Parcel size	Estimated Quantity of Spill (T)		Estimated area of Spill (Maximum) (ha)		Spill Control measures (On-land)	Spill Control measures (On-water)	Remarks
			Min.	Max.	On-land	On-water			
1	Ammonia	10,000	59	163	1.26	–	Gas detection for NH_3 --Leak detection --Leak sealing plug rugs / leak seal --Use of surfactant foams for suppression of vapors --Mechanical covers (PP or HDPE) --Flooding with water and neutralize with dilute HCL --Collection by drain or dykes into storage drums or tanks --Recovery / treatment of collected material --Final cleaning by water	Gas detection for NH_3 --Leak detection --Leak sealing plug rugs / leak seal --Use of surfactant foams for suppression of vapors --Isopropyl alcohol spray to prevent vapours --Mixing/ agitation of water media for further dilution	Ensure the clean up below 300 ppm level --Use water and neutralize with HCL --Induced air movement to dilute the vapours --Prevent people entry --Enforce respirators --Monitor by gas sensors --Prevent people and exposures

S. No	Cargo	Max. Parcel size	Estimated Quantity of Spill (T)		Estimated area of Spill (Maximum) (ha)		Spill Control measures (On-land)	Spill Control measures (On-water)	Remarks
			Min.	Max.	On-land	On-water			
2	Crude	1,40,372	738	2218	6.9	12.3	Control of ignition sources –Temporary plugging or patching –Stop oil collection by drains / dykes / pipeline and storage in drums / under ground tanks	Use of floating or mobile skimmers --Water jet application to divert the slick towards skimmer/dykes --Application of sorbents such as alkali saw dust / treated cellulose --Use of biodegradable bacteria / consortium	Incase of fire use CO_2 blanketing Use of clean up kits on land –Use of floating or mobile skimmers on water
3	Naptha	31476 6462	178 37	536 110	0.67	1.23	Use of vapor suppression foams Fluoro protein and surfactant –Floor clean up by adsorbents and incineration of wastes	Collection by mechanical booms or skimming / vacuum application Diversion of slick by water jets --Application of sorbents and skimmers	Prevent fires and control ignition sources –Control of oxidizing substances such as HNO_3 and perchlorates to prevent reactivity
4	MS ATF	30,724 30,094	275 269	823 807	0.43 ha	0.81 ha	Induced air movement by mechanical means to maintain vapors below LFL	Use of vapor supression foams Flouro protein and surfactant	Prevent fires and control ignition sources
5	Kerosene	30,000	226	682	0.82 ha	1.5 ha	Floor clean up by adsorbents and incineration of wastes	Diversion of slick by water jets	Use of floating or mobile or vacuum skimmers on water
6	Diesel	21,169	85	254	1.13	2.05	Stop oil collection by drains / dykes / pipeline and storage in drums / under ground tanks	Water jet application to move the slick towards skimmers / dykes	Foam blanketing for vapors

S. No	Cargo	Max. Parcel size	Estimated Quantity of Spill (T)		Estimated area of Spill (Maximum) (ha)		Spill Control measures (On-land)	Spill Control measures (On-water)	Remarks
			Min.	Max.	On-land	On-water			
7	Fuel oil	34,604	42	125	0.08	0.15 ha	Leak sealing –Flooding with water	Use adsorbents and nutrients (biological) enrichment	Incase of fire use CO_2 blanketing
8	Ethyl alcohol / Ethyl hexanol / N - Butanol	4,000	110	330	0.4	—	Containment by dykes and berms –Collection by drains and drums – Recovery by distillation / destruction of wastes by incineration	Use of vapor suppression foams such as alcohol resistant, Fluoro proteins and surfactant foams	Prevent strong oxidizers –Enforce personnel protection –Cordon off the clean up area
9	Styrene Monomer	8,446	125	376	1.5	2.77	Use of sand bags, inflatable berms for containment –Collection by drums and tankers and recovery by distillation	Use of proprietary foaming agent and mechanical covers --Use of mechanical booms, rubber blades, mobile / floating / vacuum skimmers	Control of all forms of heat sources for preventing polymerization –Use of redox emulsion polymerization procedure for clean up
10	Causic Lye	16,289	435	1303	1.5 ha	—	Dykes for containment –High dilution and neutralize with HCL –Collecton through drains and special pumps into rubber lined tanks or PVC drums –Prevent people and reaction with halides and metals –Flooding with cold water and collect the material for recovery	Use of barriers with selective membrane coating / coffer dams --Nutralize with HCL --Remove the contaminated water to PVC drums or rubber lined tankers --Low pressure cold water flooding	Control of reactions with halides and metals –Enforce personnel protective clothing –Physical barriers for the clean up necessary
11	Mono ethylene glycol	2,000 T	67	200	0.24 ha	0.45 ha	Use of mechanical covers –Control of ignition sources	Use of mechanical /sorbent booms, high pressure barriers	Use mobile / floating booms –Prevent strong oxidizers

S. No	Cargo	Max. Parcel size	Estimated Quantity of Spill (T)		Estimated area of Spill (Maximum) (ha)		Spill Control measures (On-land)	Spill Control measures (On-water)	Remarks
			Min.	Max.	On-land	On-water			
12	Alumina powder	36,600	384	1150	local	local	Dust control systems –Collection by suction and removel –Avoid use of water	Prevent dust falling on water --Enforce respirator use by personnel	In contact with water procedures H_2 gas and in turn cause fire
13	Methanol	9,072	303	907	0.4 ha	—	Containment by dykes and berms –Collection by drains and drums –Recovery by distillation / destruction of wastes by incineration	Use of vapor suppression foams such as alcohol resistant, Fluoro proteins and surfactant foams	Prevent strong oxidizers –Enforce personnel protection –Cordon off the clean up area
14	Sulpher (Molten)	10,000	83	250	local	local	Prevent people –Enforce respirator use by personnel and personnel protection clothing and gloves	Prevent spills on water --Control ignition sources and fires	Enforce personnel protection and respirators
15	Sulphuric acid	18,844	31	94	0.08	–	Dykes for contaminant, high dilution and neutralise with alkalies.And Dispose of netralised liquids down the drain. Keep unnecessary people away, isolate hazard area, self contained breathing apparatus and protective clothes for	Use of selective membrane coating/ copper dams. Neutralise with alkalis and remove contaminated water to PVC Drums.	Incompatible with alkali (Strong caustic) and metals. Viloent reaction with sodium tetra hydrochloride. For severe inhalation use proper respiratory protection and evacuate effected people.
16	phosphoric acid	10,000	17	50	0.1	–	-do-	-do-	-do-

Table 2.20: Oil Spill Response Plan

Plan Guidelines:

1. Introduction: I. Authorities & responsibilities Committee 2. Statutory requirement, relevant agreements. 3. Dimensions of plans 4 .Interfaces with other plans	6. Communication & Control I. Incident control room & facilities 2. Field communications and equipment 3. Reports, manuals, maps, charts and incident logs
2. Oil Spill Risks I. Identification of activities and risks 2. Types of oil likely to be spilled 3. Probable fate of spilled oil 4. Development of oil spill scenarios 5. Shoreline resources protection priorities 6. Shoreline sensitivity mapping 7. Special local considerations	7. Actions & operations - Initial procedure: I. Reporting incident preliminary estimate of emergency 2. Notifying key team members/authorities 3. Establishing and staffing control room 4. Collecting information - oil type, sea/wind forecasts, aerial. surveillance, beach report 5. Estimating fate of slice 24h-48h-72h 6. Identifying resources at risk inform parties immediately. . 7. Deciding whether to escalate response
3.Spill Response Strategies I. Philosophy and objectives 2. Limiting and adverse conditions 3. Strategy for sea zones 4. Strategy for coastal zones 5. Strategy for shoreline zones 6. Strategy for oil waste storage & disposal	8. Operations Planning & Mobilization I. Assembling full response team 2. Identifying immediate response priorities 3. Mobilising immediate response 4. Preparing initial press statement 5. Planning medium term operations-24h-28h-72h 6. Mobilising/ placing on standby resources 7.Establishing field command post and communications.
4. Equipment. Supplies & Service I. Primary oil spill equipment 2. Inspection maintenance arid testing 3. Auxiliary equipment, supplies and services. 4. Support equipment, supplies and service	9. Control Operations: 1. Establishing a managerial team with experts 2. Updating weather information as in 7.4 3. Reviewing and planning operations 4. Obtaining additional equipment, supplies and manpower 5. Preparing daily incident log & management report 6. Preparing operations accounts and financing reports 7. Preparing releases for public & press conferences 8. Brief local and Govt. officials
5.Manaeement-manpower &training I. Crisis manager & financial authorities 2. Incident organization chart 3. Manpower availability-on site/ on call 4. Availability of additional labour. 5. Advisors and consultants 6.Training,safety schedules and emergency exercises	10. Termination of operations 1. Deciding final and optimal levels of beach clean-up 2. Standing down equipment, cleaning, maintenance and replacement 3. Preparing formal detailed report 4 .Reviewing plans and procedures

Table 2.21: Available Resources for Combating Oil Spills

Organization	Equipment Type	Size	Location	Supply Delay	Cost	Contact Tel/Mob
Port Trust	Rigid Boom w/crew	450m	Oil wharf Marine com.	--	--	--
	Inflatable type					
Coast Guard	Boom	200m	Vizag	1 hr.		568875/79
Coast Guard	Skimmer					
Port Trust	Dispersant	1000 L	MF			
Coast Guard	Dispersant	800 L	Vizag	1 hr.		
Port Trust	Spray units					
Coast Guard	Spray units		Vizag			
Port Trust	Absorbent pads					
Coast Guard	Absorbent		Vizag			
Port Trust	Plastic bags					
Port Trust	Disposal truck	1x10t	FS			
Port Trust	VHF-Radio	2 units	FS			
Coast Guard	VHF-Radio	2 units	Vizag			
Port Trust	Tugs	1 No.	MF			
Port Trust	Launch/workboat	1	MF			
Port Trust	Protective clothing		FS			
Coast Guard	Survl aircraft	Donier	Chennai	2/3 hrs.		
	Aircraft fuel					
	Portable	1	Vizag	1 hr.		
	Floodlights					

Table 2.22: Pollution Control Equipment with VPT - Oil Pollution

S. No	Equipment	Quantity
1	Oil Recovery and Pollution Control Vessel	300m Pl boom
2	Dispersant chemicals	1000 Ltr
3	Rigid Type Oil Booms	500 m
4	Masonry Tank to store the oily water(cap 100 m^3)	1 No
5	Hired Launch for collecting Floating debris & Oil slicks	1 No
6	Absorbent Materials(waste Cotton Rags)	12 Bags
7	Buckets Non-sparking(15 ltrs capacity)	4 Nos
8	Scoops	8 Nos
9	Portable Sprayers	4 Nos
10	Moping/Oil absorb pads	48 Nos
11	Protective Clothing(Body Glove System/Rubberized Hand)	4 Sets
12	Saw Dust	6 Bags

Pollution Control Equipment under process of procurement

I. Port Proposes to procure additional equipment for Tier I spill as per MOU with Oil companies

Table 2.23: Chemical spill

Description	Sulphuric acid	Phosphoric acid	Caustic soda	Alumina	Ammonia	Ammonium Nitrate	Styrene monomer
Storage	Separated from combustible and reducing substances, strong oxidants, strong bases, food and feedstuffs incompatible materials. Store in stainless steel containers. Store in an area having corrosion resistant concrete floor	Separated from food and feedstuffs Dry. Well closed.	Separated from strong acids, metals food and feedstuffs Dry. Well closed. Store in an area having corrosion resistant concrete floor.	Separated from Class 5.1 : acids, alkalis, iron oxides. Keep as dry as reasonably possible from liquid halogenated hydrocarbons.	Fire proof. Separated from oxidants, acids, halogens. Cool. Keep in a well-ventilated room.	Provision to contain effluent from fire extinguishing. Separated from combustible and reducing substances.	Fireproof. Separated from incompatible materials. Cool. Keep in the dark. Store only if stabilized.
Spillage disposal	Consult an expert and evacuate danger area. Do not absorb in saw-dust or other combustible absorbents. Complete protective clothing including self-contained breathing apparatus. Do not let this chemical enter the environment.	Sweep spilled substance into covered containers. Carefully collect remainder, then remove to safe place. Chemical protection suit including self-contained breathing apparatus.	Sweep spilled substance into suitable containers. Wash away remainder with plenty of water. Complete protective clothing including self-contained breathing apparatus	Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water. P1 filter respirator for inert particles.	Evacuate danger area and consult an expert. Ventilation. Never direct water jet on liquid. Remove gas with fine water spray. Gas-tight chemical protection suit including self-contained breathing apparatus.	Evacuate danger area and consult an expert. Sweep spilled substance into non-combustible containers. Wash away remainder with plenty of water.	Ventilation. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do not wash away into sewer. Do not let this chemical enter the environment. Self-contained breathing apparatus.
Chemical Dangers	Strong oxidant and reacts violently with combustible and reducing materials. Strong acid, it reacts violently with bases and is	Violently polymerizes under the influence of azo compounds and epoxides. On combustion, forms toxic fumes phosphorous oxides. Decomposes on contact with alcohols,	Strong base, it reacts violently with acid and is corrosive in moist air to metals like zinc, aluminum, tin and lead forming a combustible/explosi ve gas (hydrogen).	It posses the property of evolving hydrogen gas when it contacting with sea water and reacts readily with acids and	Shock-sensitive compounds are formed with mercury, silver and gold oxides. The substance is a strong base, it reacts violently with acid and is	Heating may cause violent combustion or explosion. The substance decomposes on heating or producing toxic fumes nitrogen	The substance can form explosive peroxides. The substance may polymerize due to warming, under the influence of light and on contact with many compounds

Contd…

Description	Sulphuric acid	Phosphoric acid	Caustic soda	Alumina	Ammonia	Ammonium Nitrate	Styrene monomer
	corrosive to most common metals forming a flammable/explosive gas (hydrogen). Reacts violently with water and organic materials with evolution of heat. Upon heating, irritating or toxic fumes or gases (sulfur oxides) are formed.	aldehydes, cyanides, ketones, phenols, esters, sulfides, halogenated organics producing toxic fumes Attacks many metals forming flammable/explosive gas (hydrogen). Medium strong acid. Reacts violently with bases	Reacts with to produce ammonia causing fire hazard. Attacks some forms of plastics, rubber or coatings. Rapidly absorbs carbon dioxide and water from air. Contact with moisture or water may generate heat	caustic alkalies.	corrosive. Reacts violently with strong oxidants and halogens. Attacks copper, aluminum, zinc and their alloys. Dissolves in water evolving heat.	oxides The substance is a strong oxidant and reacts with combustible and reducing materials.	such as oxygen, oxidizing agents, peroxides and strong acids with fire or explosion hazard. The substance decomposes on burning producing toxic fumes, styrene oxide. Attacks copper and copper alloys.
Incompatibili-ties and reactivities	Organic materials, chlorates, carbides, fulminates, water, powdered metals [Note: Reacts violently with water with evolution of heat. Corrosive to metals.]	Strong caustics, most metals [Note: Readily reacts with metals to form flammable hydrogen gas. Do not mix with solutions containing bleach or ammonia.]	Water; acids; flammable liquids; organic halogens; metals such as aluminum, tin & zinc; nitromethane [Note: Corrosive to metals.]	Chlorine trifluoride, hot chlorinated rubber, acids, oxidizers [Note: Hydrogen gas may be formed when finely divided iron contacts moisture during crushing & milling]	Strong oxidizers, acids, halogens, salts of silver & zinc [Note: Corrosive to copper & galvanized surfaces.]	Incompatible with Class 4.1: Chlorides, bromides, fluorides, hypo chlorates, nitrites, perchlorates, permanganates and powdered metals	Oxidizers, catalysts for vinyl polymers, peroxides, strong acids, aluminum chloride [Note: May polymerize if contaminated or subjected to heat. Usually contains an inhibitor such as tert-butyl alcohol.
Personal protection & sanitation	Skin - Prevent skin contact; Eyes - Prevent eye contact; Wash skin - When contaminated; Remove - When wet or contaminated; Provide - Eyewash (>1%), Quick drench (>1%)	Skin - Prevent skin contact; Eyes - Prevent eye contact; Wash skin - When contaminated; Remove: When wet or contaminated; Change – Daily; Provide - Eyewash (>1.6%), Quick drench (>1.6%)	Skin - Prevent skin contact; Eyes - Prevent eye contact; Wash skin - When contaminated; Remove - When wet or contaminated; Change – Daily; Provide - Eyewash, Quick drench	Skin - Prevent skin contact; Eyes - Prevent eye contact; Wash skin - When contaminated; Remove - When wet or contaminated; Change – Daily; Provide - Eyewash, Quick drench	Skin - Prevent skin contact; Eyes - Prevent eye contact; Wash skin - When contaminated (solution); Remove - When wet or contaminated (solution); Provide - Eyewash (>10%), Quick drench (>10%)	Skin - Prevent skin contact; Eyes - Prevent eye contact; Wash skin - When contaminated; Remove - When wet or contaminated; Change – Daily; Provide - Eyewash, Quick drench	Skin - Prevent skin contact; Eyes - Prevent eye contact; Wash skin - When contaminated; Remove - When wet (flammable)

Contd…

Annexure - 5

VISAKHAPATNAM PORT TRUST

MARINE DEPARTMENT
VISAKHAPATNAM – 530035
ANDHRA PRADESH

COMPREHENSIVE
DISASTER MANAGEMENT PLAN

JANUARY -2021

ENVIRONMENTAL TECHNICAL SERVICES PVT. LTD.
MOBILE NO. 0-9873552267, 0-9810830190
EMAIL – SS@ETSINFRA.COM, JPSHRI@GMAIL.COM

FOREWORD

This study has been carried out by M/s Environmental Technical Services Private Limited, New Delhi, Work Order No. IMAR/MSS (tenders)/2020/15/, Dated 05/05/2020 based on inputs received form Visakhapatnam Port Trust, Visakhapatnam. M/s Environmental Technical Services Private Limited, would like to take this opportunity to extend their thanks to the Visakhapatnam Port Trust, Visakhapatnam, management and officers who co-operated in supplying the data and information required, thus maximizing the effectiveness of the study. The study identified the hazards and analysed the consequences of potential accident scenarios. The above study results, conclusions and recommendations were based on the information made available to ETS Private Limited at the time of study. ETS Private Limited exercised all reasonable skill, care and diligence in carrying out the study. However, this report should not be deemed as any undertaking, warranty or certificate and cannot be challenged in any court of law of the country.

Place : New Delhi
Date : 11.01.2021

Dr J. P. Shrivastava
Managing Director

VISAKHAPATNAM PORT TRUST

PART I

DISASTER MANAGEMENT PLAN

CONTENTS- PART I

The Visakhapatnam Port Trust in recognition of the importance of safety and security of port area as first priority set up a core group committee for preparation of Disaster plan as per the recommendation of the National Disaster Management Plan. Our scope of plan covers the area of port and all the emergencies as per the act.

1.4 VISION

To maintain Visakhapatnam Port safer and disaster resilient by a holistic, pro-active, technology driven approach that involves all stakeholders and port users so that a culture of prevention, preparedness and mitigation is imbibed.

Further, to assist local, state and national authorities, so that Visakhapatnam Port's response complements that of authorities in providing assistance to affected populations during natural disasters.

1.5 TIME FRAMES

EVENT SCENARIOS

Probability: Low-once in 10-50yrs; Moderate=once in 2-10yrs; High=once annually
Impact/Preparedness/Risk Threat: 0=Very Low / 1=Low / 2= Moderate / 3 = High

Event/Scenario Spectrum	**Early warning**	**Probability of occurrence**	**Duration Impact**	**Impact on property**	**Impact on People**	**Time to Restore Facilities**	**Risk Threat Probability**
Cyclone	96-12 Hrs.	Very Low	0	0	0	12- 24 hrs.	Moderate
Floods	4-2 hrs.	Very Low	1	1	2	12-36 hrs.	Very Low
Earthquake	nil	Very Low	1	1	2	12-36 hrs.	Very Low
Tsunami	6-1 h	Very Low	1	1	2	12-24 hrs.	Very Low
Marine Accident							
Collision	< 1min	Low	<1hr	2	0	4 h	Moderate
Grounding	<1 min	Low	1-48h	2	0	1-48 hrs.	Moderate
Fire/Explosion	< 1min	Low	0.5-12 h	2	1	1-96 hrs.	Moderate

Event/Scenario Spectrum	Early warning	Probability of occurrence	Duration Impact	Impact on property	Impact on People	Time to Restore Facilities	Risk Threat Probability
Oil Pollution	<5 mins	Low	1-72 h	1	1	1-30 d	Moderate
Transport Accident							
Road	< 1min	Low	< 5 min	0.1	0.1	< 2 h	Moderate
Rail	< 1min	Low	< 5 min	0.05	0.1	1-48 h	Low
Function Failure							
Elec sub station	< 1min	Mod	24 h	0	0	12-48 h	Low
Pipelines failure	< 1min	Mod	1-24 h	0	0	12-48 h	Low
Fire station failure	< 1min	Mod	1-24 h	0	0	12-48 h	Low
Water system	< 1min	Mod	1-24 h	0	0	12-48 h	Low
Communications	< 1min	Mod	1-24 h	0	0	12-48 h	Low
Medical facilities	< 1min	Mod	1-24 h	0	0	12-48 h	Low
Human related							
Labour Action/ Strike	24 h	Mod	< 24 h	0	0	12-48 h	Low
Civil disturbance	< 12 h	Mod	< 24 h	0	0	12-48 h	Low
Terrorism & War							
State of War	< 48 h	Low	1- 10 d	2	2	12-96 h	Mod
Bomb Threat	< 1 h	Mod	1-3 d	2	3	12-96 h	High
Hostage Threat	< 1 h	Mod	1 – 3 d	1	3	12-48 h	High
Terrorist attack	Nil	Mod	1- 3 d	1	3	> 48 h	High

2. HAZARD, RISK, VULNERABILITY & CAPACITY ANALYSIS

2.1 DISASTER RISKS, VULNERABILITIES AND CHALLENGES.

VISAKHAPATNAM PORT – AREA VULNERABILITY & THREAT MATRIX

X = Slightly Vulnerable, XX = Moderately Vulnerable, XXX = Highly Vulnerable

Threats	**Vessel Accidents Collision Grounding**	**Fire Explosion on board vessel/ashore**	**Fire & Explosion Manifold Pipeline, Tank farm**	**Oil & Chemical Pollution**	**Personnel injury: Accident Rail, Road, On board ship**
Respondent Agencies	D.C. Visakhapatnam Port Trust DG Shipping Min. of Shipping	Visakhapatnam Port Trust Fire Service Visakhapatnam Fire Brigade Mutual Aid Response Group Police, Min. of Shipping	Visakhapatnam Port Trust Fire Service Oil Companies Visakhapatnam Fire Brigade Mutual Aid Response Group Police Min. of Shipping	Visakhapatnam Port Trust (CFO) Control Room Oil Companies Coast Guard, Visakhapatnam Corporation Distt. Collector Min. of Shipping	C.M.O, Visakhapatnam Port Trust Police
Vulnerable Areas					
Vessel Movement	----	------	-----	------	-------
Channel	xxx	xx	----	xxx	x
At Berth	x	xx	xx	xxx	xx

Threats	Vessel Accidents Collision Grounding	Fire Explosion on board vessel/ashore	Fire & Explosion Manifold Pipeline, Tank farm	Oil & Chemical Pollution	Personnel injury: Accident Rail, Road, On board ship
Storage-	----	----	----	----	----
Transfer					
Oil Transfer	---	xx	xx	xx	x
Cargo Transfer	----	----	----	----	----
Trucks, Trains	----	---	----	x	xx
Crane- Shore/Ship	----	xx	----	x	xx
Services	----	----	---	---	----
Access Gates	----	x	x	x	x
Emergency Generators	----	x	---	---	x
Electric Substations	----	x	---	---	x
Train siding Locos, Wagons,	---	----	---	---	xx
Fire station	----	----	---	----	----
Port tugs, crafts,	x	x	---	x	x
Administration Building & Parking	---	---	---	---	---
Customs Area	---	----	---	---	x
Port Employees' Quarters	----	x	----	---	---

Threats	Terrorism Bomb, War, Arson	Technical Failures Power, Transport Communication Infrastructure	Occupational Accidents Strikes	Cyclone Floods	Tsunami Earth Quake
Respondent agencies	Visakhapatnam Port Trust CISF, Police, Coast Guard, Navy, Control Room Min. of Shipping	Visakhapatnam Port Trust	Visakhapatnam Port Trust, CISF Police, Min. of Shipping	Visakhapatnam Port Trust, Dist. Collector, Control Room, Min. of Shipping	Visakhapatnam Port Trust, Distt Collector, Control Room Min. of Shipping
Vulnerable Areas					
Vessel Movement					
Channel	xxx	--	--	xx	x
At Berth	xx	x	x	xx	x
Storage- Transfer					
Oil Transfer	xxx	x	x	xx	--
Cargo Transfer					
Trucks, Trains	xxx	x	xx	xx	--
Crane- Shore/Ship	x	x	xx	xx	--
Services					
Access Gates	xxx	xxx	xx	xx	--
Emergency Generators	xx	x	--	x	--
Electric Substations	xx	x	--	xx	--
Train siding Locos, Wagons,	x	x	x	x	--
Fire station	--	x	--	x	--
Port tugs, crafts,	x	x	x	xx	--

Threats	Terrorism Bomb, War, Arson	Technical Failures Power, Transport Communication Infrastructure	Occupational Accidents Strikes	Cyclone Floods	Tsunami Earth Quake
Administration Building & Parking	x	x	--	x	--
Customs Area & Weigh Bridge	--	x	--	x	--
Port Employees' Quarters	x	x	--	x	--

VISAKHAPATNAM PORT TRUST

PART II

EMERGENCY CONTINGENCY PLAN

CONTENTS- PART II

CENTRAL DISASTER MANAGEMENT GROUP- BASIC FUNCTIONS

Team Leader : Chairman / Dy Chairman
Members: Dy Chairman , Secretary, FA & CAO, Chief Engineer, CME , Traffic Manager, Materials Manager, Chief Medical Officer, Commandant-CISF, Commandant – Coast Guard.
Basic Functions
1-Monitor and analyze reports from the On Site Action team and identify the area/population at risk
2-Activate the Response Plan and arrange the Alert siren.
3-Support the Action Group with materials, equipment, information and human resources
4- Implement changes in the current mode of action if deemed necessary
5-Adjust the Disaster classification of the incident and actuate the Central Control Room
6- Coordinate with external organizations, State Govt. as deemed necessary
7- Make the necessary arrangements and funds for evacuation, transportation, food & supplies
8-Make media statements and reports to MOS.

ON SITE ACTION GROUP - BASIC RESPONSIBILITIES

Team Leader:- Harbour Master / Senior Pilot
Members:-Control room-Sr. pilot, Chief Fire Officer, Dy Comdt. CISF , Exec. Engineer (Electrical) Addl. TM, Dy Chief Med. Officer.
Basic Functions
1- Assess & classify Incident:-nature-location- severity-casualties-resource requirement – time to control
2- Activate elements of the disaster management plan, arrange alert signal in liaison with DC
3-Conduct search, rescue and evacuation operations. Provide medical Aid
4- Manage incident operations and terminate plan, Arrange for re-Entry and restoration

EMERGENCY CLASSIFICATION

Level 1. It is an Incident within the port and is of a minor nature with a low level of personnel injury, interruption to work, damage level and loss of capability. It can be handled by the Port Trust Staff involving Marine and other depts. The Emergency Management group leader is the Dept Head. E.g. Building/Shed Fire, Elec Supply disruption, labour accident, vessel accidents

Level 2;- It is an Incident within the port area and is of a limited and moderate level of personnel injury, possible death(s),interruption of work, damage to port ..Besides Port resources, outside assistance may be required. The Disaster Management group leader is the Chairman, VPT.

E.g. Gas Leaks, Chemical/Oil Spills, Terminal Fires/ Explosions

Level 3:- It is a disaster of a severe and critical nature and could have a high level of personnel injury (and deaths), interruption to work, damage to port and loss of capability. It affects the port and possibly adjacent areas. Besides Port resources, assistance from outside agencies is required. If incident affects VPT, group leader is chairman, VPT and if it affects outside PPT , then information will be given to District Collector depending on the intensity.

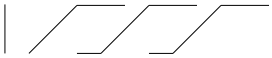
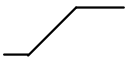
E.g. Gas Leaks, Chemical/Oil Spills, Fires/ Explosions & Cyclones

INCIDENT/REQUIREMENT SCENARIOS	LEVEL I – ACTION BY	LEVEL II & III –ACTION BY
Vessel–Grounding-Shifting-Evacuation	HM	HM + Salvage efforts + Navy + Coast Guard
Casualties	CMO	Port + District + State
Fire & Explosion on Vessel or Terminal	CFO	CFO + District (Fire wing) + CDMG
Fire & Explosion at Shed	CFO , TM	CFO + District (Fire wing) + CDMG
Oil or Chemical Spill	CFO	CFO +Central disaster Magmt. Group+ outside agencies
Toxic Gas Leakage	CFO	Central disaster Magmt. Group +District/ state assistance + outside agencies
Cyclone, tsunami, flood etc	Dy. Conservator	National disaster Management group + CDMG + District + state
Electric Supply breakdown	SE (Elect.)	CDMG + District + State

CENTRAL DISASTER MANAGEMENT GROUP - RESPONSIBILITIES

Position	Port Position	Alternative
Chief Emergency Controller	**Chairman**	**Dy. Chairman**
Monitors Disaster Management action Plan and a state of emergency preparedness is maintained at all times. Authorizes release of required funds. Leads Central Disaster Management group to direct operations from the emergency control center.		
For industrial disasters, confirms level of crisis, monitors the shutting down, evacuation and other operations as necessary. Directs activation of the Central Control room at emergency level 2 and 3		
Activates the off-site emergency plan if the disaster is spreading to/from outside Port boundary in liaison with Dy chairman, DC,TM and CFO		
Approves information to the media		
Liaises with the Secretary, Jt. Secy (Ports) of the MOS (Ministry of shipping)		
Confirms the termination of the emergency.		
Leads the Central Disaster Management Group, monitors the early restoration of facilities and port activities,		
Provides timely required status reports to the Secretary MOS		

Disaster Warning Alarm and Evacuation Signals

TSUNAMI - TYPE-HIGH PITCHED CONTINIOUS WAILING SIREN 5 Sec.  1 Sec.
FIRE /EXPLOSION/BOMB TYPE-LONG SIREN FOLLOWED BY SHORT SIREN 10 Sec. 3 Sec.
GENERAL EVACUATION ALARM FOR TOXIC/RADIATION LEAKAGES / NATURAL CALAMITIES TYPE-HIGH PITCHED RINGING ALARM AT SHORT INTERVALS 
C- ALL CLEAR SIGNAL TYPE:-LONG CONTINIOUS SIREN FOR 90 SECONDS 

Competent Agencies

List of agencies competent for issuing warning or alert is given below:

Competent agencies for issuing warnings

Disaster	**Agencies**
Earthquakes	IMD, MERI,BARC
Floods	Meteorology Department, Irrigation Department, Central Water Commission
Cyclones	Meteorology Department, Irrigation Department, IMD, INCOIS
Tsunami and Storm Surge	INCOIS
Epidemics	Public Health Department
Road Accidents	Police
Industrial and Chemical accidents	Industry, Police, MARG, DISH, BARC,AERB
Fires	Fire Brigade, Police

5.1 PORT RISK HAZARDOUS PRODUCTS STORAGE FACILITIES

COMPANY	LOCATION	NO OF TANKS	CAPACITY	PRODUCTS HANDLED
BPCL-VISAKHA	VIZAG	15	79,441 KL	ETHANOL, FO, LDO, HSD, BIO-DIESEL, MS
IOCL	VIZAG	28	1,40,797 KL	HFHSD, HSD, MS, LDO, LVFO, NFO-380, BFO-180, BFO-380, ATF, ETHANOL, JP-5, BIO-DIESEL
HPCL	STORAGE CAPACITIES	33	1,78,054.5 KL	HSD, NAPHTHA, MS, SKO, SOFT, ATF, ETHANOL, MTO, DIESEL, BIODIESEL, SLOP
CIL	VIZAG	3	27,500 KL	MOLTEN SULPHUR, SULPHURIC ACID, PHOSPHORIC ACID
IMC		1	10,000 KL	SULPHURIC ACID
IMC LIMITED	VISAKHAPATNAM	6	12,555.084 KL	S/ACID
HPCL	VISAKH	12	96,381 KL	HSD, HFHSD, CLO, LDO, LSHS, FO180, VLSFO, SLOP TANK, BITUMEN-VG40, BITUMEN-VG30, BITUMEN-VG10, JBO, LUBE OIL
HPCL REFINERY	ATF AREA	33	12,78,099.7 KL	CRUDE, NAPHTHA, E III MS, E IV MS, DRY SLOP, WET SLOP, E IV HSD, SKO, ATF
HPCL REFINERY	REFINERY AREA	77	8.88,870.6 KL	CRUDE, NAPHTHA, ISOMERATE, MS, HWO, DRY. SLOP, WET SLOP, MTO, HSD, LS HFHSD, LDO, JBO, CUTTER, FO, LSHS, IFO, BITUMEN, VGO, HSSR
NALCO		1	GROSS 7368M^3 NET 6896M^3	CAUSTIC SODA

5.2 VISAKHAPATNAM PORT TRUST – AREA VULNERABILITY & THREAT MATRIX

X=slightly vulnerable: xx=moderately vulnerable: xxx=highly vulnerable

Threats Vulnerable Areas	Vessel Accidents Collision Grounding Fire Explosion	Land Transport Personnel; Accident Rail Road	Fire & Explosion Manifold Pipeline	Toxic Gas Leakage Pipeline Manifold	Pollution Oil Chemical	Terrorism Bomb War Arson Cyber	Technical Failures Power, Transport Communication Infrastructure	Occupational Accidents Strikes	Cyclone - Floods	Tsunami Earth Quake
Vessel Movement										
Approach Channel	xx				x	x	x	x		X
Coal Berths	x	x	x	x	x	x	x	x	x	x
Oil Tanker Berth	x	x	xx	x	x	x	x	x	x	x
LNG Berth	x	x	xxx	xx	x	xx	x	x	x	x
Fertilizer Berth	x	x	x	x	x	x	x	x	x	x
Boat Train Pier	x	x	x		x	x	x	x	x	x
Gen Cargo Berths	x	x	x		x	x	x	x	x	x
Cargo Transfer										
Oil pipe lines			xx		xx	xx	xx	x	x	x
Ammonia/ph.acid			xx	xx	xx	xx	xx	x	x	x
pipeline										
Trucks/Mobile eqmt			x		x	x	x	x	x	x
Train tracks-Roads						x			x	x
Cranes & Ship Loaders						x	x	x	x	x
Bulk cargo conveyor system						x	x	x	x	x

Threats Vulnerable Areas	Vessel Accidents Collision Grounding Fire Explosion	Land Transport Personnel; Accident Rail Road	Fire & Explosion Manifold Pipeline	Toxic Gas Leakage Pipeline Manifold	Pollution Oil Chemical	Terrorism Bomb War Arson Cyber	Technical Failures Power, Transport Communication Infrastructure	Occupational Accidents Strikes	Cyclone - Floods	Tsunami Earth Quake
SERVICES	------	----	------	-----	------	------	------	------	-----	----
Control gates			x			xx		x	x	x
Emergency Generators			x			x	x	x	x	x
Electric Substations			x			x	x	x	x	x
Train siding Locos, Wagons,			x			x	x	x	x	x
Signal station-electronic means commn			x			x	x	x	x	x
Fire station 1 & 2			x			x	x	x	x	x
Port tugs, crafts, dredger	x	x	x		x	x	x	x	x	x
ADMINISTRATION	------	----	------	-----	------	------	------	------	-----	----
Administration Building & Parking			x	x		x	x	x	x	x
Customs Area & Weigh Bridge			x	x		x	x	x	x	x
Port officers & CISF Quarters			x	x		x			x	x

EVENT SCENARIOS -VISAKHAPATNAM PORT TRUST

Probability-Low-once every 10-50yrs:: moderate=once every 2-10yrs; High=once annually
Impact/Preparedness/Risk Threat 0=Very Low 1=Low 2=moderate 3=High

EVENT/ SCENARIO SPECTRUM	Early warning	Probability of Occurrence	Duration Impact	Impact on property	Impact on people	Time to Restore Facilities	RISK THREAT
Cyclone	96h-12h	Low	N/A	1	**1**	N/A	Moderate
Floods	96h-12h	Low	N/A	**1**	**1**	N/A	Low
Earthquake/Tsunami	5-8h	**low**	**N/A**	**1**	**1**	N/A	Low
V/L Accident							
Collision	< 1min	Low	<1hr	0	0	4 h	Low
Grounding	< 1min	Low	2-4hr	0	0	4 h	Low
Fire/Explosion	< 1min	Low	0.5-12h	1-2	1-2	12-96h	Moderate
Transport Accident							
Rail	< 1min	Mod	< 1min	0	1	6-48h	Low
Road Accident	< 1min	Mod	< 1min	0	1	<1h	Low
Pollution-							
Gas Release-Ammonia	< 1min	Low	1-24h	0.1	2	2-30d	Low
Phos /sulph acid spill	< 1min	Low	1-12h	0.1	1	2-4d	Low
Oil Spill	< 30min	Low	1-12h	1	1	1-2d	Low
Fire-Admin Building	< 10min	Low	1-72 h	1	1	12-96h	Low
Parking/Gates	< 1min	Low	1-12h	0	1	12-96h	Low
Function Failure							
Elec sub station	< 1min	Low	1-24h	0	0	12-48h	Low
Emergency Generator	< 1min	Low	1-24h	0	0	12-48h	Low
Pipelines failure	< 1min	Low	1-24h	0	0	12-48h	Low
Evacuation routes	< 1min	Low	1-24h	0	0.2	12-48h	Low
Fire Alarm failure	< 1min	Low	1-24h	0	0	12-48h	Low
Fire station failure	< 1h	Low	1-24h	0	0	12-48h	Low
Water system	< 1h	Low	1-24h	0	0	12-48h	Low

List of Local Industries – Phone Numbers

S. No.	Name	Office Phone
1	M/s. Hindustan Shipyard Limited	0891- 2577437
2	M/s. Hindustan Petroleum Corp. Ltd.	0891- 2895000/2895100
3	M/s. Coromandel Fertilizers Ltd.	0891- 2578400
4	Visakhapatnam Steel Plant	0891- 2518431
5	M/s. BHPV Limited	0891- 2517381
6	M/s. NALCO	0891- 2561432/35
7	M/s. East India Petroleum Ltd.	0891- 2578168
8	M/s. Andhra Petro Chemicals Ltd.	0891- 2578342
9	M/s. R.C.L.	0891- 2740500
10	M/s B.P.C.L.	0891- 2577528
11	M/s. I.O.C. Ltd.	0891- 2578300/302
12	M/s. I.M.C. Ltd.	0891- 2751250/2755612
13	M/s. ESSAR Steel Ltd.	0891- 2876300/2523213
14	M/s. Visakha Container Terminal Ltd.	0891- 2502164/40
15	M/s. SAIL	0891- 2704074/2563611
16	M/s. ONGC	0891- 2567833
17	M/s. NTPC	089247274
18	M/s. NMDC	0891- 25623943/262945
19	M/s. SALPG	0891- 2748928/29

CONTACT DETAILS OF NDRF OFFICERS

Force Head Quarters

Name	Designation	Address	Telephone No.	Fax No.	E-Mail
Shri S N Pradhan (IPS)	Director General	Directorate General, NDRF, 6th Floor, NDCC-II Building, Jai Singh Road, New Delhi - 110001	011-23438020, 011-23438119	011-23438091	dg.ndrf@nic.in
Shri Amrendra Kumar Sengar (IPS)	Inspector General	-- Do --	011-23438021	011-23438091	ig.ndrf@nic.in
Ms Nishtha Upadhyay	Financial Advisor	-- Do --	011-24368148	011-23438091	--
Mr. Mohsen Shahedi	Deputy Inspector General (Proc/Prov)	-- Do --	011-23438022	011-23438091	digprov-ndrf@nic.in
Shri Manoj Kumar Yadav	Deputy Inspector General (Trg/Pro /Academy/NCDC/East & North East Sector)	--Do--	011-23438140	011-23438091	dig.es.ndrf@nic.in
Shri Randeep Kumar Rana	Deputy Inspector General (Estt/ Ops / North-West Sector)	--Do--	011-23438023	011-23438091	dig.ns.ndrf@nic.in
Shri K K Singh	Deputy Inspector General (Adm/Works/South Sector)	-- Do --	011-23438185	011-23438091	dig.ss.ndrf@nic.in
Shri V V N Prasanna Kumar	Commandant (PROC/PROV/NDRR)	-- Do --	011-23438183	011-23438091	--
Dr. Amit Murari	CMO (SG)	-- Do --	011-23438091	011-23438091	cmo-ndrf@gov.in
Shri Muneesh Kumar	Second-in-Command (Works & Proc)	--Do--	--	011-23438091	--

Shri Daulat Ram Chaudhary	Second-in-Command (ADM)	--Do--	--	011-23438091	hq.ndrf@nic.in
Shri Pranshu Srivastava	Deputy Commandant (Trg)	--Do--	011-23438138	011-23438091	hq.ndrf@nic.in
Shri Rakesh Ranjan	Deputy Commandant (OPS)	--Do--	011-23438024	011-23438091	hq.ndrf@nic.in
Shri Surendar Kumar	Deputy Commandant (Engineer)	--Do--	--	011-23438091	--
Shri Krishan Kumar	AC (IT/COMN/PRO)	--Do--	011-23438024	011-23438091	krishan.0405@gov.in
Shri Bhawani Singh	AC(ADM & SO to DG)	--Do--	011-23438118	011-23438091	dc.adm.ndrf@nic.in
Shri S Raghavindra	AC/MIN	--Do--	011-23438091	011-23438091	hq.ndrf@nic.in
Control Room	--	--Do--	011-23438091, 011-23438136	011-23438091	hq.ndrf@nic.in

NDRF
Units

Name	Designation	Address	Telephone No.	Fax No.	Mobile No.	Unit Control Room No.	E-Mail
Sh. R S Gill	Officiating Commandant	1st BN NDRF, Patgaon PO - Azara,Distt. Kamrup Metro, Guwahati-781017	0361-2840027	0361-2849080	--	0361-2840284 09401048790 09435117246	assam01-ndrf[at]nic[dot]in
Sh. Nishit Upadhyay	Commandant	2nd BN NDRF, Near RRI Camp. Haringhata, Mohanpur, Nadia, (West Bengal) Pin - 741246	033-25875032	033-25875032	-	033-25875032 09474061104 09474116775	wb02-ndrf[at]nic[dot]in
Sh. Jacob Kispotta	Commandant	3rd BN NDRF, PO-Mundali, Cuttack - Odisha Pin - 754013	0671-2879710	0671-2879711	--	0671-2879711 09437581614	ori03-ndrf[at]nic[dot]in
Ms. Rekha Nambiyar	Commandant	4th Bn NDRF, PO - Suraksha Campus , Arrakonam , Distt. Vellore Tamilnadu-631152	04177-246269	04177-246594	--	04177-246594 09442140269	tn04-ndrf[at]nic[dot]in
Sh. Anupam Srivastava	Commandant	5th Bn NDRF, Sudumbare Taluka, Distt - Maval Pune (Maharashtra) Pin - 412109	02114-247010	02114-247008	--	02114-247000 09422315628	mah05-ndrf[at]nic[dot]in
Sh. A. K. Tiwari	Commandant	6th Bn NDRF, Jarod Camp,Teh-Wagodia, Vadodara, Pin - 391510	02668-274470	02668-274245	--	02668-274245 09723632166	guj06-ndrf[at]nic[dot]in
Sh. Ravi Kumar Pandita	Commandant	7th Bn NDRF, Bibiwala Road, Bhatinda (Punjab) Pin 151001	0164-2246193	0164 - 2246570	--	0164-2246193 0164-2246570	pun07-ndrf[at]nic[dot]in

Sh. P.K.Srivastava	Commandant	8th Bn NDRF, Kamla Nehru Nagar, Ghaziabad (UP) Pin - 201002	0120-2766013	0120 - 27666012	--	0120-2766618 09412221035	up08-ndrf[at]nic[dot]in
Sh. Vijay Sinha	Commandant	9th Bn NDRF, Bihata Patna, Bihar Pin - 801103	06115-253942	06115-253939	--	06115-253939 08544415050 09525752125	patna-ndrf[at]nic[dot]in
Mr. Zahid Khan	Commandant	10th Bn NDRF, ANU Campus, Nagarjuna Nagar, Guntur (AP) Pin - 522510	0863-2293178	0863-2293050	--	0863-2293050 08333068559	ap10-ndrf[at]nic[dot]in
Sh. A.K.Singh	Commandant	11 th Bn NDRF, Sanskritik Sankul, Maqbool Alam Road, Varanasi, UP - 221002	0542-2501201	0542 - 2501101	--	0542-2501101 08004931410	up-11ndrf[at]gov[dot]in
Sh. Rajesh Thakur	Commandant	12 th Bn NDRF, Itanagar, Arunachal Pardesh791112	0360-2277109	0360-2277106	--	0360-2277104 09485235464	bn12[dot]ndrf[at]gov[dot]in

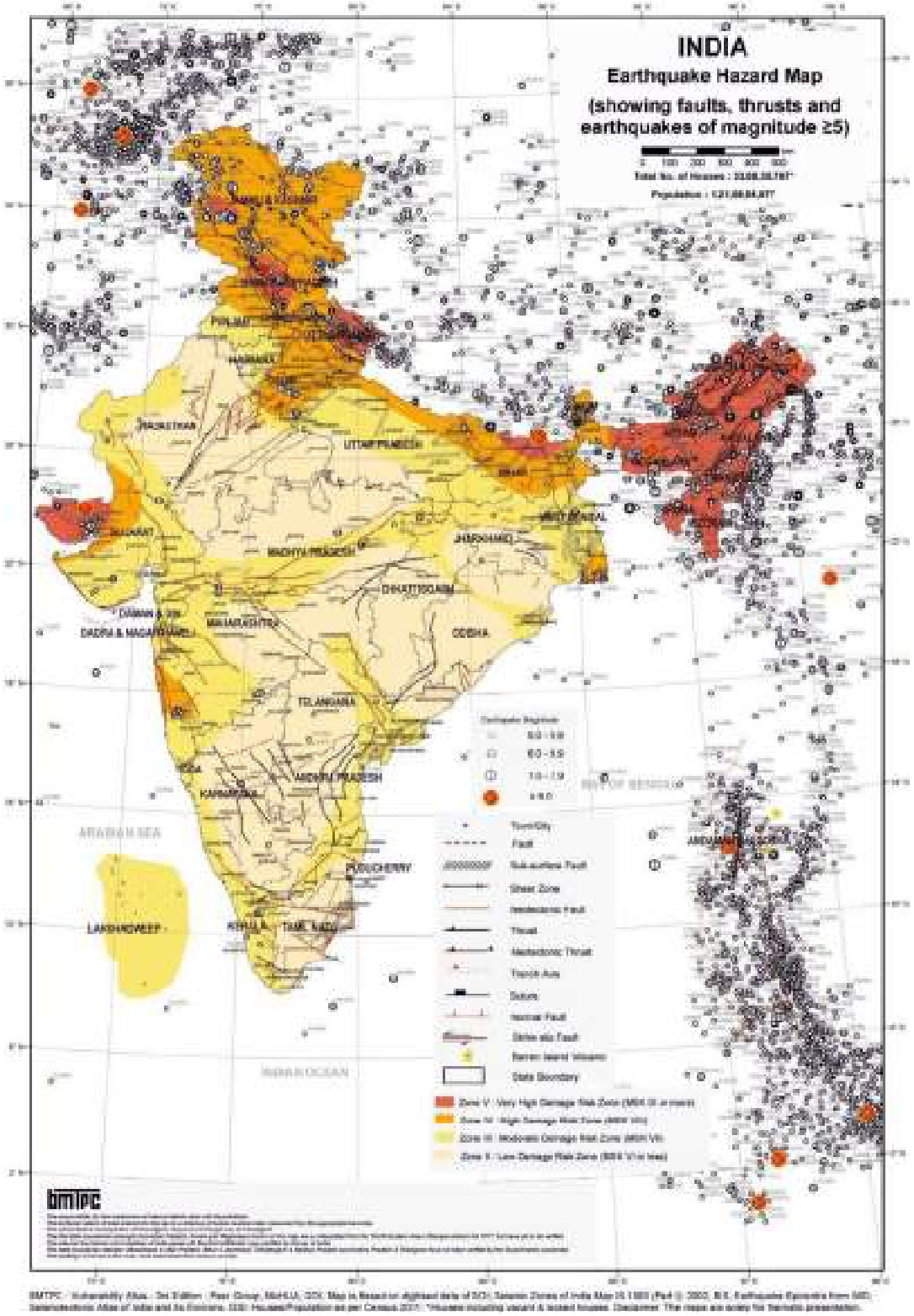
NDRF
RRCs

Name of RRC	Landline Number	Mobile Number
NDRF RRC, Port Blair, Andaman	03192289174	09442112269
NDRF RRC, Adayar, Chennai	04424420269	09442112269
NDRF RRC, Vizag Steel Plant, Vishakhapatnam, Andhra Pradesh	--	08333068565 08333068560
NDRF RRC, Fire Station Mahadevapura, Bengluru, Karnatka	--	09482978719 09482978715
NDRF RRC, Shaikpet Sport Complex, Hyderabad, Telangana	04023565666	08333068536 08333068547

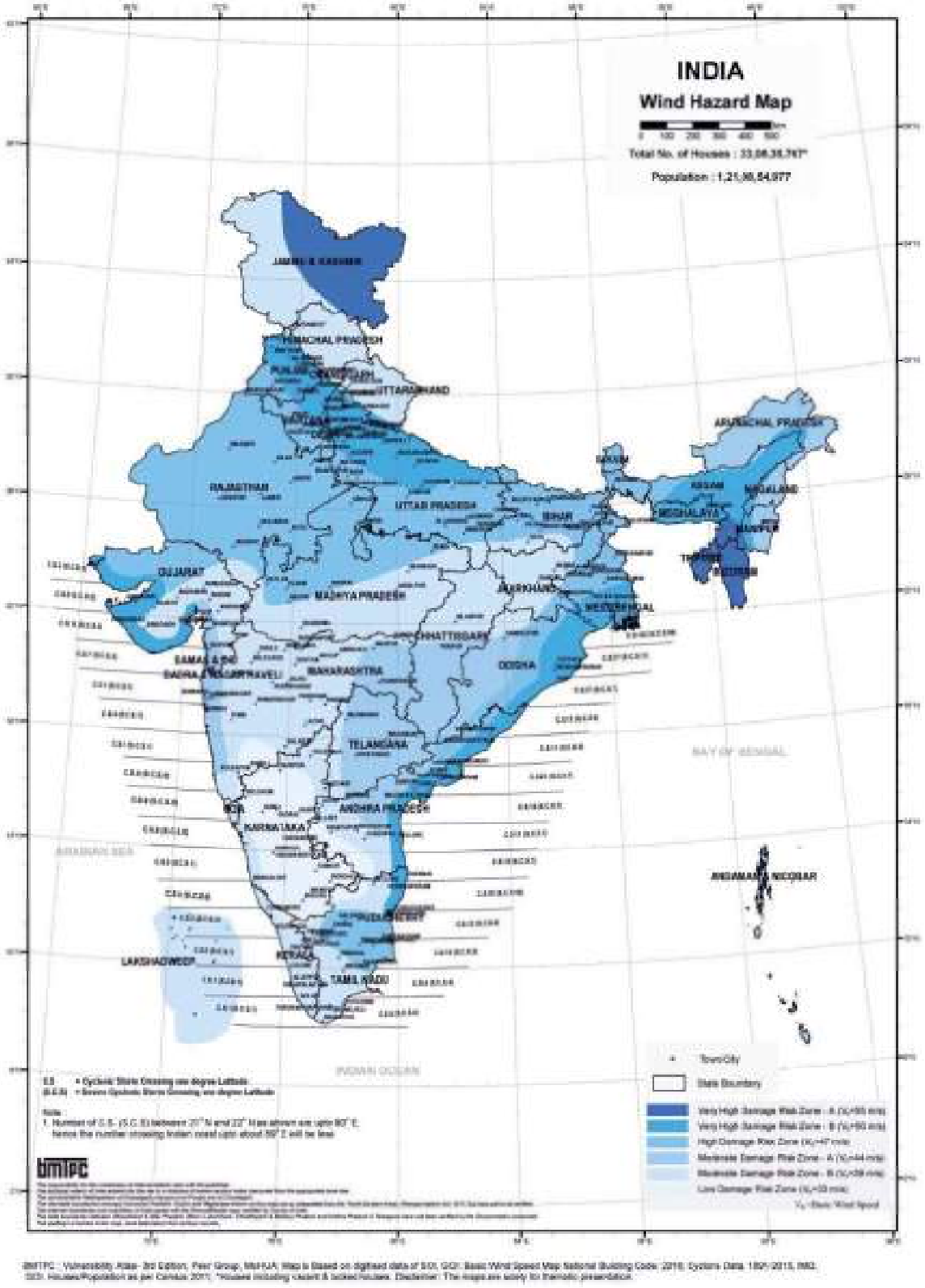
ANDHRA PRADESH STATE DISASTER RESPONSE FORCE (APSDRF)

Name of the Officer	Designation	Phone	Email ID
Sri. K. Kanna Babu, I.A.S	Special Commissioner (Disaster Management) & Ex-Officio Additional Secretary to Government, Revenue (DM) Department, Managing Director (FAC), APSDMA	0863-2377099	commr_relief_rev@ap.gov.in
Sri. Dr. C. Nagaraju	Executive Director	+91-9676957788, 0863-2377105	ed-apsdma@ap.gov.in
Smt. P. Seshasri	Administrative Officer	+91-8333905039	seshasrip-plg@ap.gov.in
Sri. Ch. Santhi Swarup	SEOC Incharge	+91-8333905033	seoc-apsdma@ap.gov.in

APPENDIX C
IMPORTANT MAPS

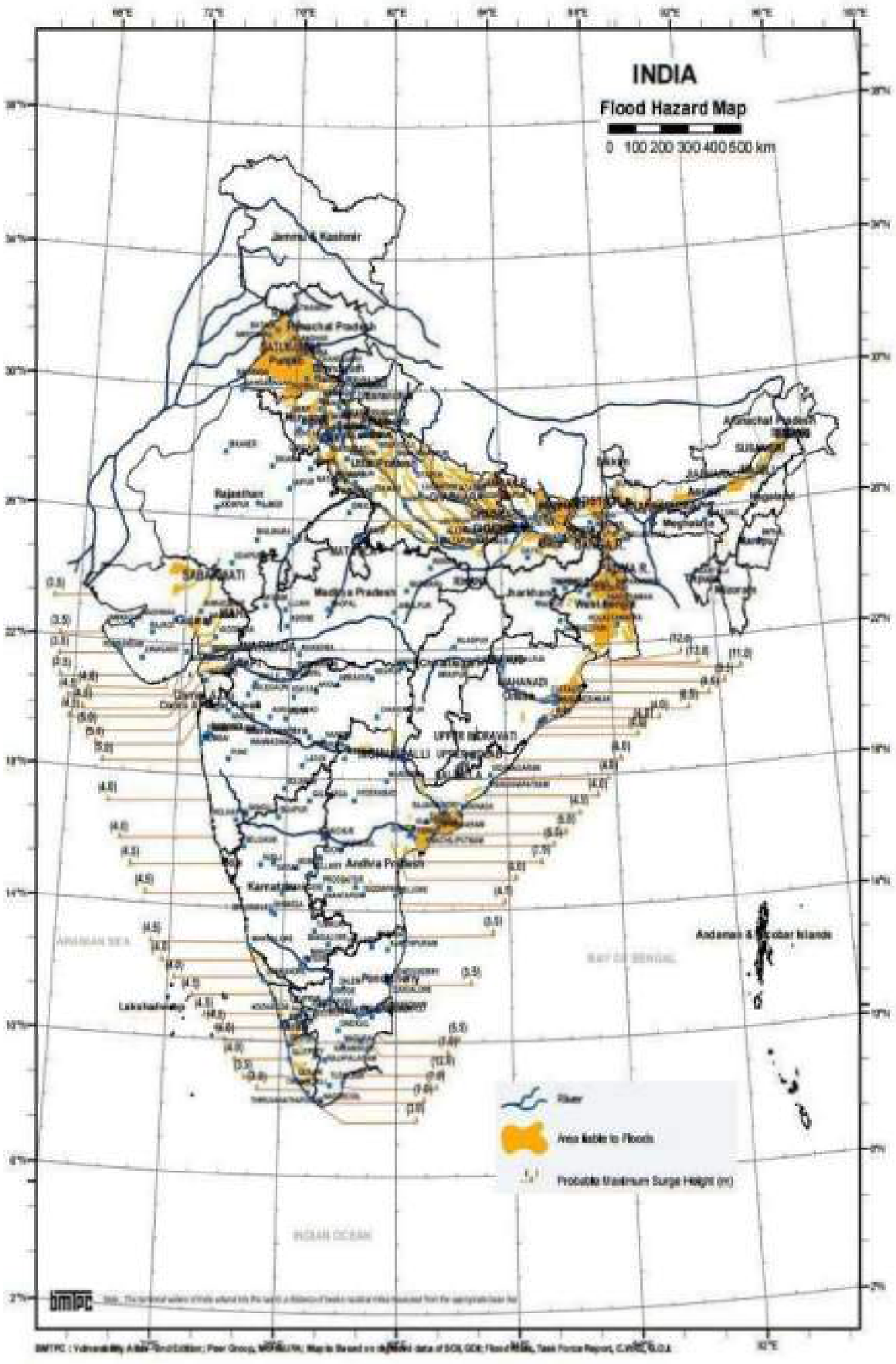


EARTHQUAKE HAZARD MAP



BMTPC - Vulnerability Atlas- 3rd Edition, Peer Group, MoHUA. Map is based on digitised data of SOI, GOI. Basic Wind Speed Map National Building Code, 2016; Cyclonic Data: IMD, 1891-2015, IMD; *2011 Houses/Population as per Census 2011; *Houses including vacant & locked houses. Disclaimer: The maps are solely for thematic presentation.

WIND HAZARD MAP



FLOOD HAZARD MAP

ANNEXURE – 6

Quantitative Risk Assessment (QRA) for Ammonium Nitrate Handling at VPA

VISAKHAPATNAM PORT AUTHORITY

Port Area, Visakhapatnam-530 035, Andhra Pradesh

Site Visit: 12th - 13th May 2023

IRCLASS SYSTEMS AND SOLUTIONS PVT. LTD.
52-A, Adi Shankaracharya Marg Opp Powai Lake, Powai, Mumbai – 400072
Email: industrial_services@irclass.org
Web: www.irclass.org / industrial
Tel: +91 22 3051 9400 / +91 22 7119 9400
WhatsApp: +91 88 7942 7273

Acknowledgement

We, IRCLASS Systems and Solutions Private Limited are obliged to the Management representative and Employees of Visakhapatnam Port Authority, Andhra Pradesh for their co-operation and support to the IRCLASS Systems and Solutions Private Limited Team during the Quantitative Risk Assessment (QRA).

SIGN-OFF SHEET			
Project Name	QRA STUDY FOR AMMONIUM NITRATE HANDLING AT VISAKHAPATNAM PORT AUTHORITY	**HAZOP Study Conducted by**	IRCLASS Systems and Solutions Pvt. Ltd., 52-A, Adi Shankaracharya Marg Opp Powai Lake, Powai, Mumbai – 400072
Document Title	QRA STUDY REPORT	**Issued By**	IRCLASS Systems and Solutions Pvt. Ltd.
Client	VISAKHAPATNAM PORT AUTHORITY		
Contact Person	FIRE & ASSISTANT SAFETY OFFICER	**Accepted By**	
Date of Issue	10.06.2023		
Report Number	ISSPL/R&S/VPA/QRA/2023		

10.06.2023	0	Issued as Final	DS/SD/PM	DH
29.05.2023	0	Issued as Draft	DS/SD/PM	DH
Date of Issue	**Revision**	**Description**	**Prepared**	**Reviewed**

Disclaimer:

This Report is issued upon the following terms and conditions:

Whilst IRCLASS Systems and Solutions Pvt. Ltd. (hereinafter referred to as ISSPL) and its committees use their best endeavors to ensure that the functions of ISSPL are properly carried out, in providing services, information or advice neither ISSPL nor any of its servants or agents warrants the accuracy of any information or advice supplied. Except as set out herein neither ISSPL nor any of its servants or agents (on behalf of each of whom ISSPL has agreed this clause) shall be liable for any loss damage or expense whatever sustained by any person due to any act or omission or error of whatsoever nature and however caused of ISSPL its servants or agents or due to any inaccuracy of whatsoever nature and howsoever caused in any information or advice given in any way whatsoever by or on behalf of ISSPL, even if held to amount to a breach of warranty. Nevertheless, if any person uses services of ISSPL, or relies on any information or advice given by or on behalf of ISSPL and suffers loss damage or expenses thereby which is proved to have been due to any negligent act omission or error of ISSPL its servants or agents or any negligent inaccuracy in information or advice given by or on behalf of ISSPL then ISSPL will pay compensation to such person for his proved loss up to but not exceeding the amount of the fee charged by ISSPL for that particular service, information or advice.

Any notice of claim for loss, damage or expense as referred to above shall be made in writing to ISSPL Head Office within six months of the date when the service information or advice was first provided, failing which all the rights to any such claim shall be forfeited and ISSPL shall be relieved and discharged from all liabilities.

Abbreviations:

AN	Ammonium Nitrate
QRA	Quantitative Risk Assessment
VPA	Visakhapatnam Port Authority
PHAST	Process Hazard Analysis Software
UDM	Unified Dispersion Model
HSE	Health Safety Executive, UK
TNT	Tri Nitrotoluene
Te	Tonnes Equivalent
ALARP	As Low As Reasonably Practicable
SOP	Standard Operating Procedure
NFPA	National Fire Protection Association

Table of Contents

Executive Summary

The report represents the QRA study carried out for Ammonium Nitrate Handling at EQ-3 and EQ-6 wharf of Visakhapatnam Port Authority (VPA), Andhra Pradesh. The study refers the layout drawing, Ammonium Nitrate Analysis report and other documents. The study team comprises Mr. Pradyut Mitra, experienced Process and safety professional having more than 30 years of experience and Mr. Dipak Sonawane & Mr. Sudarshan Daga, Risk & Safety Experts who has conducted analysis for the study.

A special gratitude goes to Visakhapatnam Port Authority, Andhra Pradesh for sharing the required information.

For the benefit of the implementers, the observations have been identified and highlighted as recommendations. The recommendations can also be designated as Opportunities for improvement and relate to best practices.

This study for the said facility has been carried out based on the data and information provided by the client.

The following accidental scenarios and consequences have been considered for the study:

- A fire on transport vehicle at jetty:
- An Explosion Risk
- Decomposition after the fire and toxic gases release in the environment (NH3, NO, NO2 and CO).

1. Introduction

Visakhapatnam Port Authority receive Ammonium Nitrate (AN) with Fertilizer Grade by ships. Ammonium Nitrate is unloaded on wharf and then transported to destination by the users. Generally, 1.2 tons of Ammonium nitrate in baggage form is unloaded at EQ-3 and EQ-6 wharf and 12-15 bags are packaged in a container at a time. Approx 20 Tons quantity of AN handling is considered for the analysis. The transportation by road will be by closed container or open truck and passing by the port limit to the consignee.

1.1 Objective

The objectives of the Risk Analysis study are to identify and quantify all potential failure modes that may lead to hazardous consequences and extent. Typical hazardous consequences include fire, explosion, and toxic releases.

This is achieved by the following:

- Identification of hazards that could be realized from hazardous material.
- Identify the potential failure scenarios that could occur within the facility.
- To asses, the potential risks associated with identified hazards to which the plant and its personnel and community outside may be subjected. Consequence analysis of various hazards is carried out to determine the vulnerable zones for each probable accident scenario.
- Evaluate the process hazards emanating from the identified potential accident scenarios.
- Analyse the damage effects to the surroundings due to such accidents.
- Conclusion and Recommendations in order to mitigate the hazard.

1.2 Scope

- The study addresses the hazards that can be realized due to Ammonium Nitrate handling and transport operations at EQ-3 and EQ-6 wharf of Visakhapatnam Port Authority (VPA).

2. Site Condition

2.1 Site Location and vicinity

The layout of EQ-3 and EQ-6 wharf of Visakhapatnam Port Authority (VPA):

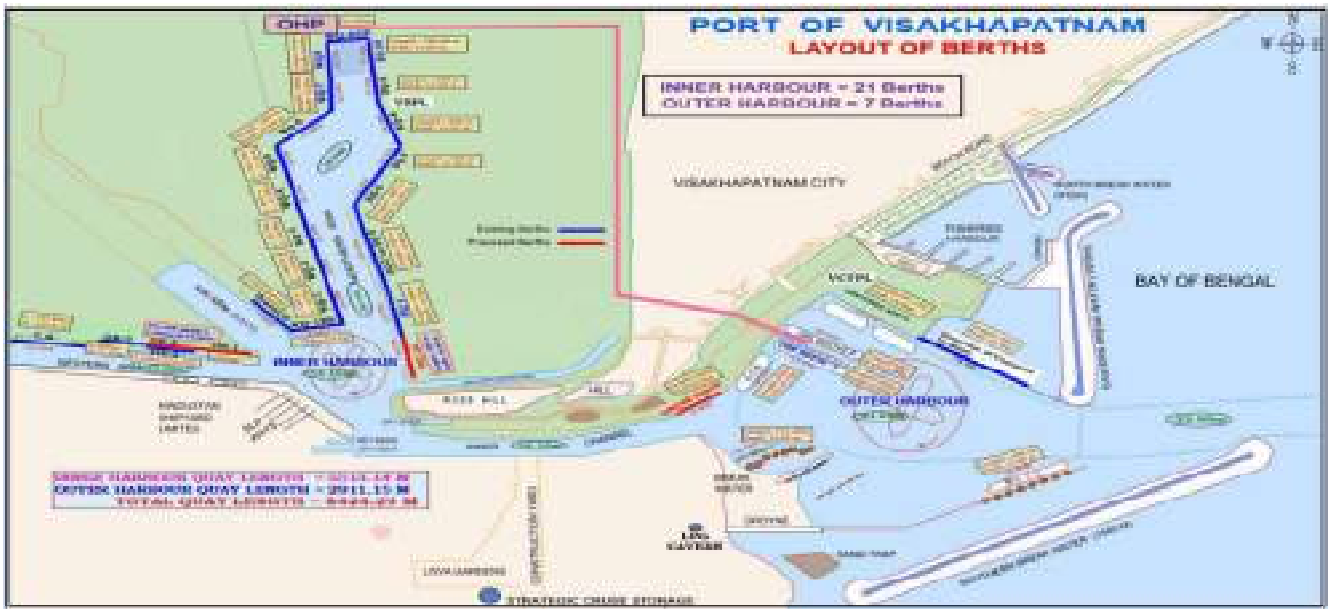


Figure: Layout of Berths, Port of Visakhapatnam

2.2 Material Handling Data:

Ammonium Nitrate (AN) unloaded at EQ-3 and EQ-6 wharf of Visakhapatnam Port Authority (VPA). The cargo handled details provided by port are as below.

Sr. No.	Year	Total vessels	Low avg. tonnage	High avg. tonnage	Total tonnage
1	2021-22	21	1,604	16,029	2,08,761
2	2022-23	18	3,011	22,469	2,70,846
		39	4,615	38,498	4,79,607

3. Methodology

The consequences of released toxic or flammable material are largely dependent on the prevailing weather conditions. Consequences of loss of containment can lead to hazardous situation in any industry handling potentially hazardous materials. Following factors govern the severity of consequence of the loss of containment.

- Intrinsic properties: flammability, toxicity, and reactivity.
- Dispersive energy: pressure, temperature, and state of matter.
- Quantity present
- Environmental factors: weather (wind speed, wind direction, atmospheric temperature &pressure).

Consequence analysis and calculations are effectively performed by computer software using models validated over several applications. Consequence modeling is carried out by PHAST of DNV Software.

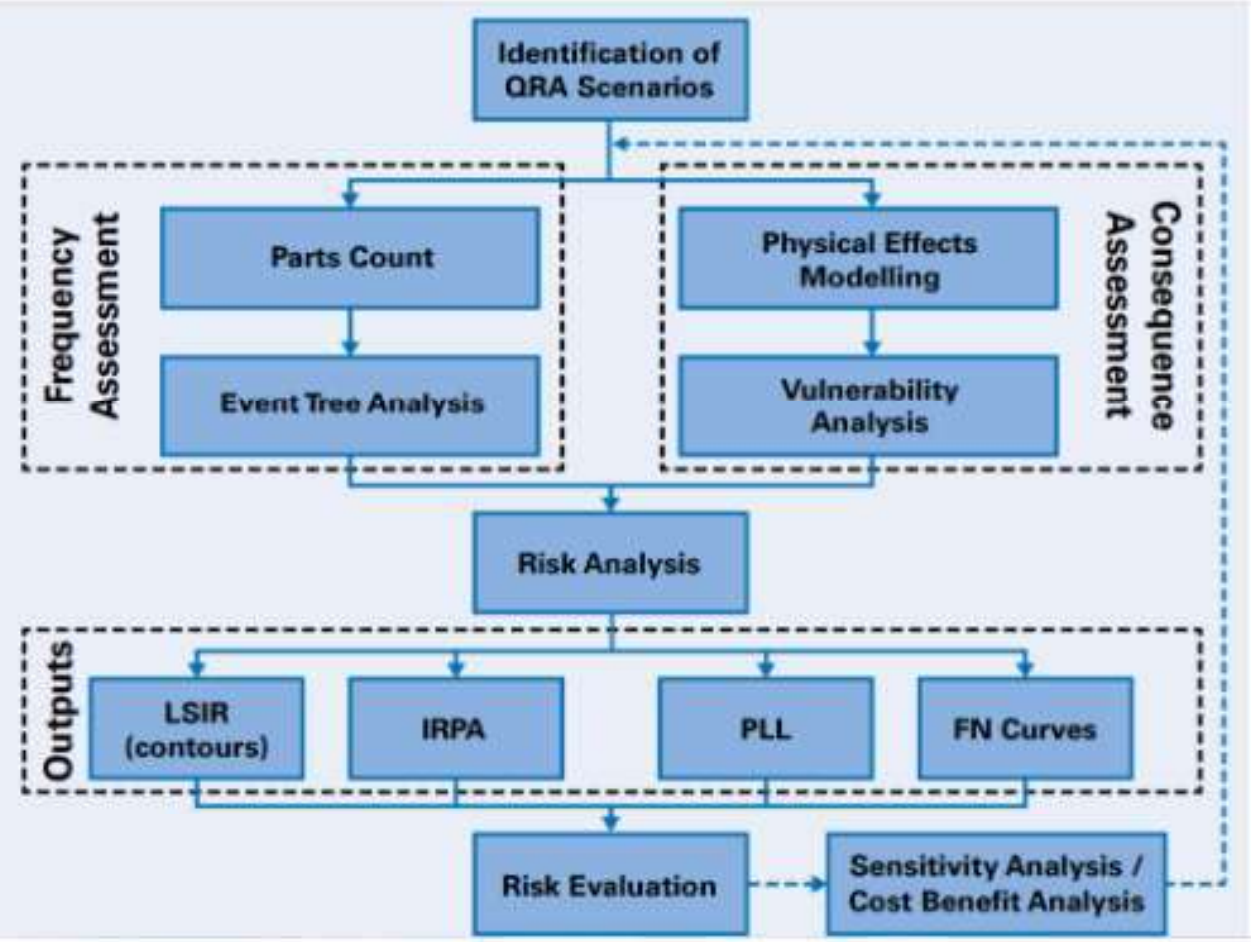
PHAST uses the Unified Dispersion Model (UDM) capable of describing a wide range of types of accidental releases. The Model uses a particularly flexible form, allowing for sharp-edged profiles, which become more diffuse downwind.

PHAST contains data for many chemicals and allows definition of mixtures of any of these chemicals in the required proportion. The calculations by PHAST involve following steps for each modeled failure case:

- Run discharge calculations based on physical conditions.
- Model first stage of release (for weather category).
- Determine gas release after decomposition.
- Dispersion modeling considering weather conditions.

Flow chart for consequence analysis is shown in the form of event tree for release of flammable liquid.

Figure 0-1: Methodology adopted for the study



3.1 Assumptions

1.2 tons of Ammonium nitrate in baggage form is unloaded at EQ-3 and EQ-6 wharf and 12-15 bags are packaged in a container at a time. Approx 20 Tons quantity of AN handling in is considered for the analysis. The transportation by road will be by closed container or open truck and passing by the port limit to the consignee.

There are Two Building Nearby Berth:

Berth EQ-6: Building With 10 People Within 500 M

Berth EQ-3: Building With 20 People Within 100 M

While Unloading, Gang of 12 will be present.

Atmospheric Parameters

The atmospheric parameters which are considered while conducting this study is as under:

Atmospheric Temperature	27^0C
Atmospheric pressure (mmHg)	760
Relative humidity	70%
Solar Radiation flux (KW/m2)	0.7

Wind Speed

It is observed that average wind speed of magnitude of 2-5 m/s blows for majority of the time in a year. Hence predominant wind speed for Visakhapatnam is 2-5 m/s.

Weather Category

One of the most important characteristics of atmosphere is its stability. Stability of atmosphere is its tendency to resist vertical motion or to suppress existing turbulence. This tendency directly influences the ability of atmosphere to disperse pollutants emitted into it from the facilities. In most dispersion scenarios, the relevant atmospheric layer is that nearest to the ground, varying in thickness from a few meters to a few thousand meters. Turbulence induced by buoyancy forces in the atmosphere is closely related to the vertical temperature gradient.

Temperature normally decreases with increasing height in the atmosphere. The rate at which the temperature of air decreases with height is called Environmental Lapse Rate (ELR). It will vary from time to time and from place to place. The atmosphere is said to be stable, neutral, or unstable according to ELR is less than, equal to or greater than Dry Adiabatic Lapse Rate (DALR), which is a constant value of 0.98°C/100 meters.

Pasquill stability parameter, based on Pasquill – Gifford categorization, is such a meteorological parameter, which describes the stability of atmosphere, i.e., the degree of convective turbulence. Pasquill has defined six stability classes ranging from

`A' (extremely unstable) to `F' (moderately stable). Wind speeds, intensity of solar radiation (daytime insulation) and nighttime sky cover have been identified as prime factors defining these stability categories.

Table 0-1: Pasquill stability classes

Stability class	Definition	Stability class	Definition
A	Very Unstable	D	Neutral
B	Unstable	E	Slightly Stable
C	Slightly Unstable	F	Stable

When the atmosphere is unstable and wind speeds are moderate or high or gusty, rapid dispersion of pollutants will occur. Under these conditions, pollutant concentrations in air will be moderate or low and the material will be dispersed rapidly. When the atmosphere is stable and wind speed is low, dispersion of material will be limited and pollutant concentration in air will be high. In general, worst dispersion conditions (i.e. contributing to greater hazard distances) occur during low wind speed and very stable weather conditions.

Stability category for the present study is identified based on the cloud amount and wind speed. For risk analysis the representative average annual weather conditions are assessed based on the following:

Predominant weather stability classes of “F” & “D” are selected with wind speed 2 m/s & 5 m/s respectively for consequence analysis.

Wind Speed (m/s)	Pasquill Stability
2	F
5	D

The consequence results are reported in tabular form for all the weather conditions and graphs for worst case weather conditions.

3.2 Software Used

DNV PHAST 8.7.1 has been used for consequence analysis include discharge and dispersion calculations.

4. Hazards Associated with Handling Ammonium Nitrate

The release of Ammonium Nitrate can lead to different types of fire or explosion scenarios. These depend on the material released, mechanism of release, temperature and pressure of the material and the point of ignition. Types of flammable effects are as follows.

In this analysis it was assumed that:

- The probability of fatality was 100% at locations where the overpressure would be greater than 42 kPa.
- The probability of fatality was 50% at locations where the overpressure would be between 42 kPa and 21 kPa.
- The probability of fatality was 10% where the overpressure would be between 21 kPa and 3.5 kPa.
- The probability of fatality was zero at locations where the overpressure would be less than 3.5 kPa.
- Distances to the various overpressure levels were then calculated using the standard methodology described above.
- The overpressure vs distance after the calculation of 20 tonnes of Ammonium nitrate for the overpressure criteria are as below.

Sr. No.	Overpressure (kPa)	Prob. of fatality
1	42	100%
2	21	50%
3	3.5	10%

Decomposition after the fire and toxic gases release in the environment (NH3, NO, NO2 and CO).

When heated to temperatures above 175°C AN starts to decompose. A number of decomposition reactions can take place, the actual balance of which is very sensitive to the particular conditions (e.g. temperature, pressure, degree of confinement, extent of contamination etc.)

4.1 Hazards Associated with Explosive Material

Damage Criteria:

Damage estimates due to overpressure & toxic dispersion have been arrived at by taking in to consideration the published literature on the subject. The consequences can then be visualized by the superimposing the damage effects zones on the proposed plan site and identifying the elements within the project site as well as in the neighboring environment, which might be adversely affected, should one or more hazards materialize in real life.

4.2 Overpressure Damage:

The following tables give effect due to different overpressure on equipment and people.

Table 0-2: Over Pressure Damage Criteria with Damage to People

Over Pressure (mbar)	Mechanical Damage to Equipment	Damage To People
300	Heavy damage to plant & structure	1% death from lung damage >50% eardrum damage >50% serious wounds from flying objects

100	Repairable damage	>1% eardrum damage >1% serious wounds from flying objects
30	Major glass damage	Slight injury from flying glass
10	10% glass damage	No damage

Table 0-3: Over Pressure Damage Criteria with Mechanical Damage to Equipment

Over Pressure		Mechanical damage to Equipment
Bar	K Pa	
0.0014	0.14	Annoying noise (137 dB if of low frequency 10–15 Hz)
0.0021	0.21	Occasional breaking of large glass windows already under strain
0.0028	0.28	Loud noise (143 dB), sonic boom, glass failure
0.0069	0.69	Breakage of small windows under strain
0.0103	1.03	Typical pressure for glass breakage
0.0207	2.07	Safe distance" (probability 0.95 of no serious damage below this value); projectile limit; some damage to house ceilings; 10% window glass broken
0.0276	2.76	Limited minor structural damage
0.03-0.069	3.4-6.9	Large and small windows usually shattered; occasional damage to window frames
0.048	4.8	Minor damage to house structures
0.069	6.9	Partial demolition of houses, made uninhabitable
0.138	13.8	Corrugated asbestos shattered; corrugated steel or aluminum panels, fastenings fail, followed by buckling; wood panels (standard housing) fastenings fail, panels blown in
0.09	9.0	Steel frame of clad building slightly distorted
0.138	13.8	Partial collapse of walls and roofs of houses

Over Pressure		Mechanical damage to Equipment
Bar	K Pa	
0.207	20.7	Concrete or cinder block walls, not reinforced, shattered
0.158	15.8	Lower limit of serious structural damage
0.172	17.2	50% destruction of brickwork of houses
0.207	20.7	Heavy machines (3000 lb.) in industrial building suffered little damage; steel frame building distorted and pulled away from foundations.
0.207-0.276	20.7-27.6	Frameless, self-framing steel panel building demolished; rupture of oil tanks
0.276	27.6	Cladding of light industrial buildings ruptured
0.345	34.5	Wooden utility poles snapped; tall hydraulic press (40,000 lb) in building slightly damaged
0.345-0.482	34.5-48.2	Nearly complete destruction of houses
0.482	48.2	Loaded, lighter weight (British) train wagons overturned
0.482-0.551	48.2-55.1	Brick panels, 8 –12 in. thick, not reinforced, fail by shearing or flexure
0.62	62.0	Loaded train boxcars demolished
0.689	68.9	Probable destruction of buildings; heavy machine tools (7,000 lb) moved and badly damaged, very heavy machine tools (12,000 lb) survive

4.3 COMPOSITION OF AN DECOMPOSITION GASES

The toxic components (CO, NO, NO2, NH3) collectively represent 1.9% by weight (1.5% by volume) of the total mixture. The molecular weight of the mixture is calculated as 24.46 which is lighter than air.

5. Consequence Analysis

The consequence analysis is carried out to determine the extent of spread (dispersion) by accidental release which may lead to fire & explosion resulting in generation of overpressures and toxic dispersion etc.

In order to form an opinion on potentially serious hazardous situations and their consequences, consequence analysis of potential failure scenarios are conducted. It is qualitative analysis of hazards due to various failure scenarios. In consequence analysis, each failure case is considered in isolation and damage effects predicted, without considering the secondary events or failures it may cause, leading to a major disastrous situation. The results of consequence analysis are useful in developing Disaster Management Plan and in developing a sense of awareness among operating and maintenance personnel. It also gives the operating personnel and population living in its vicinity, an understanding of the hazard they are posed to.

5.1 Consequences associated with the handling of Ammonium Nitrate:

5.1.1 An Explosion risks

The HSE have previously advised (Technica, 1990a) that explosion efficiencies applicable to storage of AN for bulk over 2 m pile size as 80%. The TNT mass equivalence of AN is considered as 55%.

The equivalent mass of TNT used as the basis for consequence modelling is as below;

20 Tonnes × 0.8 × 0.55 = 8.8 Te (Tonne's equivalent)

Overpressure vs. Distance Model

Using the efficiency and equivalence factors, a mass of Ammonium Nitrate is equated to a mass of TNT. The distances to defined overpressures of interest are calculated using the 'TNT overpressure vs. scaled distance' relationship. An 'Overpressure vs. Scaled

Distance' relationship can take the form of an equation or graph. In this case an equation is used which is sourced from the US Army [Bulson 1997] and has the form:

$$p_0 = \frac{4120}{Z^3} - \frac{105}{Z^2} + \frac{39.5}{Z}$$

Where, 2 < po < 160 psi gauge

$$Z = \frac{R}{W^{1/3}}$$

and, 3 < Z < 20 ft/lbs1/3

In this analysis it was assumed that:

- The probability of fatality was 100% at locations where the overpressure would be greater than 42 kPa.
- The probability of fatality was 50% at locations where the overpressure would be between 42 kPa and 21 kPa.
- The probability of fatality was 10% where the overpressure would be between 21 kPa and 3.5 kPa.
- The probability of fatality was zero at locations where the overpressure would be less than 3.5 kPa.
- Distances to the various overpressure levels were then calculated using the standard methodology described above.
- The overpressure vs distance after the calculation of 20 tonnes of Ammonium nitrate for the overpressure criteria are as below.

Sr. No.	Overpressure (kPa)	Prob. of fatality	Distance (m)
1	42	100%	88
2	21	50%	130
3	3.5	10%	460

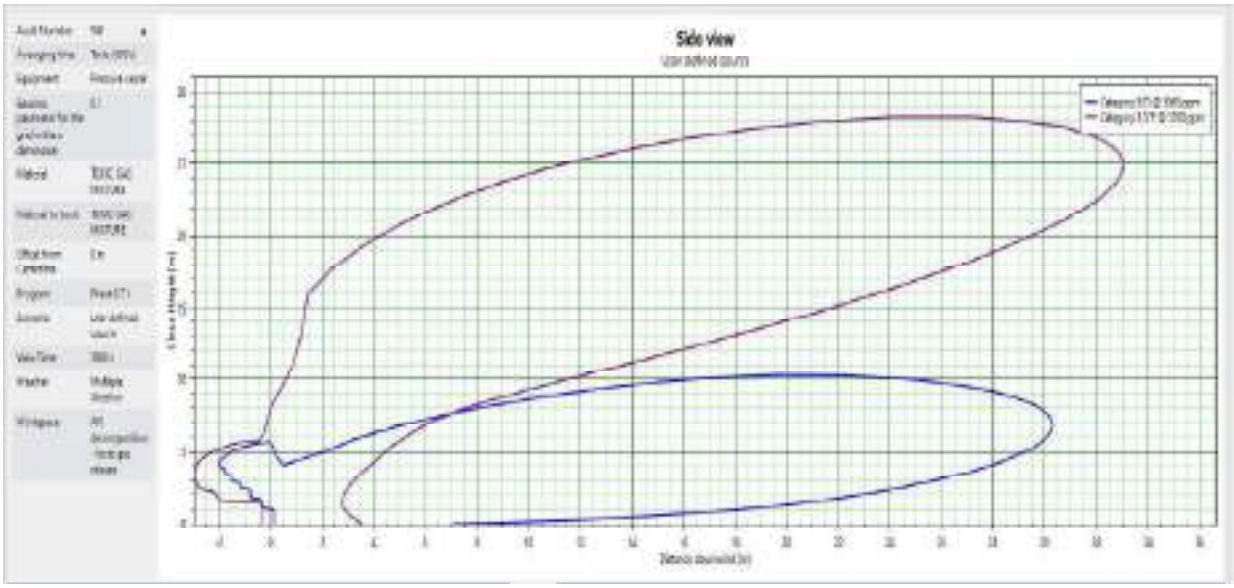
5.1.2 Decomposition after the fire and toxic gases release in the environment (NH3, NO, NO2 and CO).

When heated to temperatures above 175°C AN starts to decompose. A number of decomposition reactions can take place, the actual balance of which is very sensitive to the particular conditions (e.g. temperature, pressure, degree of confinement, extent of contamination etc.)

Decomposition Products:

The toxic components (CO, NO, NO2, NH3) collectively represent 1.9% by weight (1.5% by volume) of the total mixture. The molecular weight of the mixture is calculated as 24.46 which is lighter than air.

The toxic dispersion downwind distance has been determined using the DNV-PHAST software. The toxic dispersion results are shown below for the various wind speed and atmospheric stability conditions (1.5 F and 5 D):



As per above figure the 5260 ppm level conc. is reached till 30 meters at height around 5 meters. The table below shows the downwind distance for the conc. level with height.

Sr. No.	Height of interest (m)	Wind speed	Downwind Distance (m)
1	0	1.5-F	3.59
		5-D	7
2	1	1.5-F	2.8
		5-D	18
3	2	1.5-F	2.9
		5-D	22
4	3	1.5-F	3.3
		5-D	25
5	4	1.5-F	3.8
		5-D	27
6	5	1.5-F	4
		5-D	29

From above table and figure, it is evident that the gas mixture is remained buoyant and the effects are mostly at height above the ground level and in case of 5 m/s wind speed and D stability conditions. So, the 100% fatalities will be in the range of 22 meters for 2 m height conditions.

5.2. Failure frequency for the explosion and decomposition of Ammonium Nitrate:

AN fire on road vehicles:

For AN fire on road vehicles as per the literature the event frequency is as 2×10^{-9} per vehicle-km. For the approximately 10,000 movements (for approximately 2,00,000 Tonnes per year) per year this equates to 2×10^{-5} per km-yr.

AN Explosion During Road Transport:

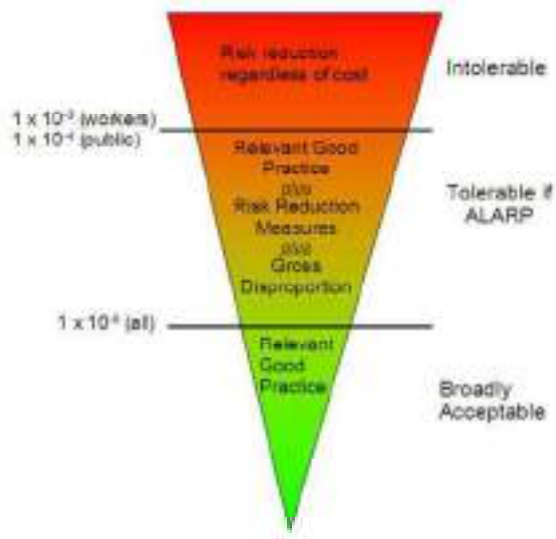
For AN explosion as per the literature the conditional probability of explosion in the event of fire is considered as 10%. The event frequency for AN explosion is therefore calculated as 2×10^{-10} per vehicle-km. For the postulated 10,000 movements (for approximately 2,00,000 Tonnes per year) per year this equates to 2×10^{-6} per km-yr.

5.3 Individual Risk Criteria:

The individual risk contours have been plotted on the below port layout after assessing the consequences and frequency of explosion and decomposition of AN.

Individual risk criteria are often used with the As Low As Reasonably Achievable (ALARP) principle which sets an upper bound below which risk must be reduced (Intolerable level) and a lower bound that is a target that may not be achieved (Broadly acceptable level). The UK HSE has suggested the following values for individual annual fatality risk:

Figure: Individual risk criteria



Intolerable (per year)		Broadly acceptable (per year)	
Workers	**Public**	**Workers**	**Public**
1×10^{-03}	1×10^{-04}	1×10^{-06}	1×10^{-06}

Distance and Individual Risk

Sr. No.	Distance (m)	Individual Risk (per year)
1	30	6.03×10^{-6}
2	100	3.20×10^{-6}
3	130	1.20×10^{-6}
4	450	2.00×10^{-7}

6. Individual Risk Contour

Individual Risk contours are shown in below figures:

Figure: Individual risk contours for EQ-3 wharf

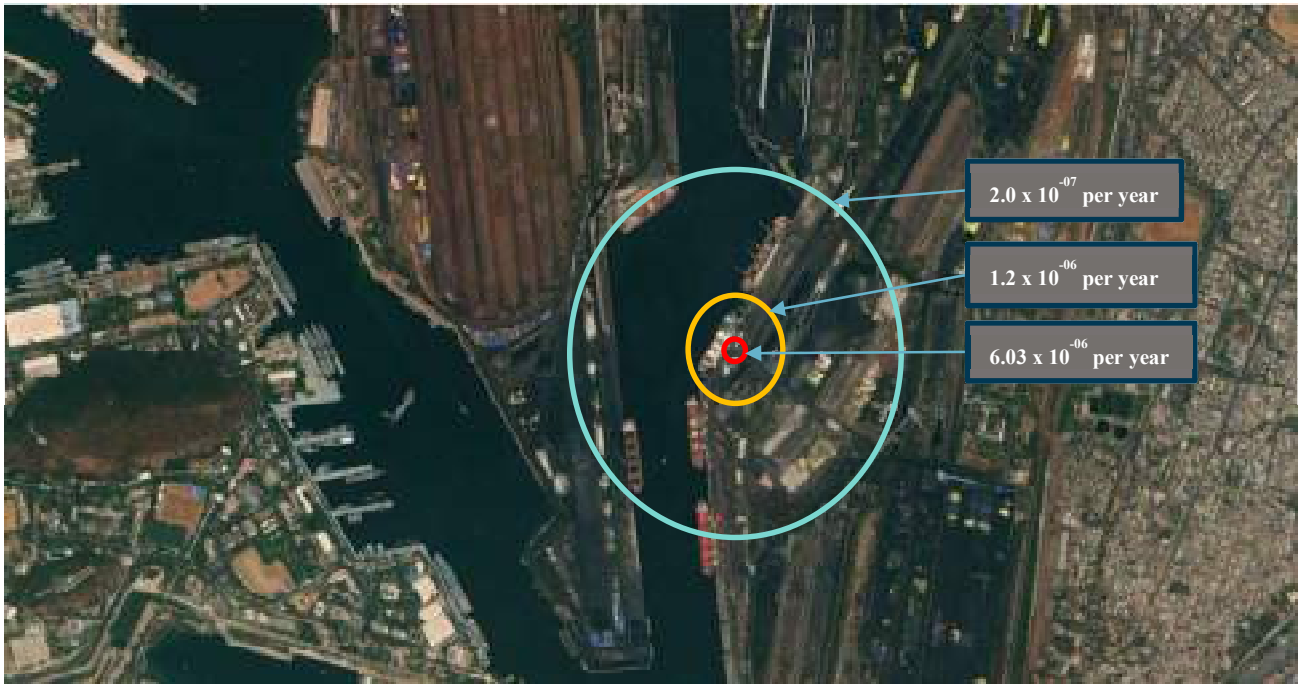


Figure: Individual risk contours for EQ-6 wharf

7. Conclusion

The individual risk contours for the 30 meters from the handling area are 6.03×10^{-6} per year compared to the UK HSE criteria and it is falling in ALARP region.

8.Recommendations & Mitigation Measures

- Adequate fire-fighting facility as per NFPA 490 (replaced by 400) shall be provided at ammonium nitrate storage and handling premises.
- The Emergency action plan should be in place in case of emergencies arises during the handling of Ammonium nitrate cargo.
- Follow the Standard operating procedure (SOP), 2020 for handling Ammonium Nitrate prepared by VPT traffic department.
- The firefighting arrangements and precautions are mentioned for vessel/ship side fire. but during the unloading operations at EQ-3 and EQ-6 wharf, the firefighting arrangements are not mentioned in SOP. SOP shall be revised to include all the precautionary measure required for handling Ammonium Nitrate.
- Training shall be imparted to all personnel involved in handling Ammonium Nitrate.
- Provision of The Ammonium Nitrate Rules, 2012, amended in 2021 shall be ensured.

9.References

- Data received of Ammonium nitrate from the Vizag port, Vizag.
- Quantitative Risk Assessment report of Bunbury outer harbour for marlston hill, DNV Technica, Jan 1994.
- An estimate of the TNT-Equivalent net explosive quantity (NEQ) of the Beirut port explosion using publicly available tools and data, C. Stennett et. al., Propellants, Explosives, Pyrotechnics, 2020.
- An investigation into the relative risks from the road transport of blasting explosives in maximum loads of 5 tonne and 16 tonne, R. Merrifield, HSE, 1994.
- Hazard and Risk Assessment, Moranbabh Ammonium Nitrate project, Dyno Nobel Asia Pacific limited, October 2006.
- Loss prevention in the process industries, Volume 2, Second edition, Lees, F. P., 1996.
- Guidance on ALARP decisions on COMAH, UK HSE, SPC / Permissioning / 37.

ANNEXURE – 7

ANNEXURE-A

Environment Impacts matrix sheet for Modernization and Expansion projects of VPT

	Environment components					Action plan	Present Status
Phase	**Air**	**Noise**	**Water**	**Land**	**Socio Economic Environment**		
Construction							
Impacts due to quarrying operation	-NA-	-NA-	-NA-	-NA-	-NA-	Construction material shall be obtained only from Approved mines.	**Construction Phase of Project is Completed.**
Impacts due to effluents from labour camps	-NA-	-NA-	-NA-	-NA-	-NA-	The sewage generated from construction sites and labor camps shall be disposed into inland drainage system.	
Impacts due to Dredging	-NA-	-NA-	-NA-	-NA-	-NA-	The increase in turbidity levels of marine water at the project site due to sediments is a temporary, as there are no sensitive species located in the site there are no significant impacts.	
Impacts due to operation of construction equipment	-NA-	-NA-	-NA-	-NA-	-NA-	The mufflers shall be used and modifications in the engines as per requirement shall be carried out for minimizing the noise levels.	
Impacts due to transportation of construction materials	-NA-	-NA-	-NA-	-NA-	-NA-	Vehicles having RTA pollution levels testing certificate only shall be deployed for material movement.	
Operation							
Cargo handling operations	-ve	-ve	-ve	-ve	+ve	A standard and well-structured EMS is in place for combating environment pollution effectively.	As per EMP the Visakhapatnam Port Authority Established Environment Cell with qualified Persons under the supervision of Chief Engineer for strict compliance of Environmental Issues.
Solid waste	-	-	-	-ve	-		
Environmental impact of ship traffic	-ve	-ve	-ve	-	-		

ANNEXURE – 8

Sub: STATEMENT SHOWING THE DETAILS OF CER (CORPORATE ENVIRONMENT RESPONSIBILITY) IN VPA FOR YEAR OF 2024 - 2025

Sl.No.	Description of work	Expenditure incurred (Rs. in Crores)	Remarks
1.	**2.**	**3.**	**4.**
1.	Operation and Maintenance of Continuous Online Ambient Air quality monitoring Stations (CAAQMS) at 3 identified areas of VPA	0.3092	Work is in Progress.
2.	Sampling and analysis of Marine Sediments at Visakhapatnam Port	0.0138	Work is in Progress.
3.	Harbour water quality monitoring at high and low tides.	0.1170	Work is in Progress.
4.	Sampling, Analysis & Testing of raw sewage treated water of 10 MLD STP of VPA	0.0782	Work is in Progress.
5.	Operation and Maintenance Sewage Treatment Plant to handle total hospital sewage of 25 KLD at Golden Jubilee Hospital, Vishakhapatnam Port Trust for a period of 5 years.	0.0338	Operation and Maintenance is in Progress.
6.	Operation and Maintenance Sewage Treatment Plant Sullage at AOB 20 KLD for a period of 18 months.	0.3673	Treatment of Sullage water from canteen.
7.	Monitoring of Ground water samples to assess the contamination due to run off and water stagnation in cargo stacking Yards in Port area.	0.0220	Monitoring of Ground / Leachate Water is in Progress
8.	Engagement of Environment Cell Chief Manager, Manager and 3no.s of Supervisors on contract basis for Environment Cell of VPA.	0.3120	Engaged for Environmental Cell Works
9.	Marine Ecology Study	0.0412	Work in progress
10.	Providing PLC based MDSS at different areas in port area.	4.0000	Work Completed. PLC Based MDSS work is completed
11.	Construction of 4 covered storage sheds at various locations in Port area.	116.0400	3 Covered Sheds Construction work is completed. Another Shed work is in Progress.
12.	Mechanical sweeping on Port roads	1.9000	3no.s of Mechanical Sweeping Machine is deployed
13.	Three Truck Mounted and 7 Trolley Mounted Fog Canons	3.0000	Controlling of dust at operational area.
14.	Providing plantation of 10,000 Nos Avenue & Fruit Bearing plants**.**	0.0900	Work is in progress.
15.	Removal of Floating material from Drains	0.6600	Work is in progress.
16.	Green Belt Development (Maintenance)	5.0000	Work is in progress.
17.	Water Sprinkling on roads by Water Tankers	1.9200	Work is in progress.
18.	Internal roads and drains cleaning by Manpower	0.761	Work is in progress.
19	Environmental Audit and Development of Action plan for effective monitoring of Environmental Performance Indicators baseline study by NPC	0.2360	Report submitted.
20	AAQ Monitoring by Gravimetric method through M/s. MSV Analytical Laboratory	0.1275	Work in Progress.
	Total	**135.029**	

ANNEXURE – 9

ISO 9001, ISO 14001
ISO 45001
ISPS COMPLIANCE PORT

SAGARMALA
PORT LED PROSPERITY

विशाखपट्टणम पोर्ट प्राधिकरण
(पत्तन, पोत परिवहन एवं जलमार्ग मंत्रालय)
VISAKHAPATNAM PORT AUTHORITY
(Ministry of Ports, Shipping & Waterways, Govt. of India)
విశాఖపట్నం పోర్ట్ అథారిటీ

No. IENG/ Env.Cell/ MoEF /EC/Pt.I
Date: 15.07.2024.

To
The Member Secretary,
Ministry of Environment, Forests and Climate Change,
Integrated Regional Office, Green House,
Gopalareddy Road,
Vijayawada,
Andhra Pradesh - 520010

Sir,

Sub: Environment Clearance for various projects of Visakhapatnam Port Authority, Visakhapatnam -Submission of the Half-yearly Compliance reports - Reg.

Ref: 1. VPA -EC &CRZ clearances obtained from MOEF&CC for various projects.
2. This Office Previous Lr. No. IENG/Env.Cell/MoEF/EC/Pt.I dated 29.12.2023

***

Please find herewith the attachment of half yearly compliance report on EC's obtained by the VPA for kind perusal and information please.

Encl: As above.

DESPATCHED 17/7/24 4-30pm

Yours faithfully,

15/7/24
CHIEF ENGINEER (I/c)
मुख्य अभियंता
CHIEF ENGINEER
विशाखपट्टणम पोर्ट ट्रस्ट
Visakhapatnam Port Trust

ANNEXURE – 10

(10)

भारत सरकार
Government of India
वाणिज्य और उद्योग मंत्रालय
Ministry of Commerce & Industry
पेट्रोलियम तथा विस्फोटक सुरक्षा संगठन (पैसो)
Petroleum & Explosives Safety Organisation (PESO)
डोर न. 7-20-13, किरलामपुडी लेआउट
विशाखापट्टनम- 530017
Door No. 7-20-13, Kirlampudi Layout,
Visakhapatanam - 530017

E-mail : dyccevizag@explosives.gov.in
Phone/Fax No : 0891-2722257

दिनांक /Dated : 28/12/2022

फाइल सं /File No : P/SC/AP/14/1437 (P34431)

सेवा में /To

visakhapatnam portt rust,
VISAKHAPATNAM PORT,
AOB Building, Near Sea Horse Junction,
Visakhapatnam,
Visakhapatnam (Urban),
Taluka: Visakhapatnam (Urban),
District: VISAKHAPATNAM,
State: Andhra Pradesh
PIN: 530035

विषय /Sub : Plot No, NIL, VISAKHAPATNAM PORT TRUST, VISAKHAPATNAM, Visakhapatnam (Urban), Taluka: Visakhapatnam (Urban), District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 530035 मे स्थित विद्यमान पेट्रोलियम वर्ग A,B Retail Outlet की अनुज्ञप्ति संख्या P/SC/AP/14/1437 (P34431) - नवीकरण के संदर्भ में ।
Existing Petroleum Class A,B Retail Outlet at Plot No, NIL, VISAKHAPATNAM PORT TRUST, VISAKHAPATNAM, Visakhapatnam (Urban), Taluka: Visakhapatnam (Urban), District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 530035 - Licence No P/SC/AP/14/1437 (P34431) - Reg Renewal of Licence.

महोदय /Sir(s),

कृपया आपके उपर्युक्त विषय से संबंधित पत्र संख्या X दिनांक 15/12/2022 का संदर्भ ग्रहण करें ।

Please refer to your letter No. X dated 15/12/2022 on the subject.

अनुज्ञप्ति सं P/SC/AP/14/1437 (P34431) दिनांक 04/01/2002 दिनांक 31/12/2025 तक नवीनीकृत कर लौटाई जा रही है ।
Licence No. P/SC/AP/14/1437 (P34431) dated 04/01/2002 is returned herewith duly renewed upto 31/12/2025.

कृपया पेट्रोलियम नियम,2002 के अधीन बनाए गए नियम 148 में दी गई प्रक्रिया का कड़ाई से पालन करें । अनुज्ञप्ति के नवीकरण हेतु समस्त दस्तावेजों को दिनांक 31/12/2025 या उससे पहले इस कार्यालय में प्रस्तुत करें ।
Please follow the procedure strictly as laid down in rule 148 of the Petroleum Rules, 2002 and submit complete documents for the Renewal of the licence so as to reach this office on or before 31/12/2025.

कृपया पावती दें । Please acknowledge the receipt.

भवदीय /Yours faithfully,

((जे.सरकार)
(J. Sarkar))
उप मुख्य विस्फोटक नियंत्रक
Dy. Chief Controller of Explosives
विशाखापट्टनम/Visakhapatanam

(अधिक जानकारी जैसे आवेदन की स्थिति, शुल्क तथा अन्य विवरण के लिए हमारी वेबसाइट : http://peso.gov.in देखें)
(For more information regarding status,fees and other details please visit our website: http://peso.gov.in)

(1)

भारत सरकार
Government of India
वाणिज्य और उद्योग मंत्रालय
Ministry of Commerce & Industry
पेट्रोलियम तथा विस्फोटक सुरक्षा संगठन (पेसो)
Petroleum & Explosives Safety Organisation (PESO)
डोर न. 7-20-13, किरलामपुडी लेआउट
विशाखापट्टनम- 530017
Door No. 7-20-13,
Kirlampudi Layout,
Visakhapatanam - 530017

E-mail : dyccevizag@explosives.gov.in
Phone/Fax No : 0891-2722257

संख्या /No. P/SC/AP/14/2145 (P209114)

दिनांक /Dated : 28/12/2023

सेवा में
/To,

The Board of Trustee,
Visakhapatnam Port Authority,
Port Area, Visakhapatnam.,
VISAKHAPATNAM,
Visakhapatnam (Urban),
Taluka: Visakhapatnam (Urban),
District: VISAKHAPATNAM,
State: Andhra Pradesh
PIN: 530035

विषय /Sub : Plot No, NA, Visakhapatnam Port Trust, Premists North Cabin, Visakhapatnam, Visakhapatnam (Urban), Taluka: Visakhapatnam (Urban), District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 530035 में स्थित विद्यमान पेट्रोलियम वर्ग A,B Retail Outlet की अनुज्ञप्ति संख्या P/SC/AP/14/2145 (P209114) - नवीकरण के संदर्भ में ।
Existing Petroleum Class A,B Retail Outlet at Plot No, NA, Visakhapatnam Port Trust, Premists North Cabin, Visakhapatnam, Visakhapatnam (Urban), Taluka: Visakhapatnam (Urban), District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 530035 - Licence No. P/SC/AP/14/2145 (P209114) - Reg Renewal of Licence.

महोदय /Sir(s),

कृपया आपके उपर्युक्त विषय से संबंधित पत्र संख्या OIN1557357 दिनांक 26/12/2023 का संदर्भ ग्रहण करें ।
Please refer to your letter No. OIN1557357 dated 26/12/2023 on the subject.

अनुज्ञप्ति सं P/SC/AP/14/2145 (P209114) दिनांक 09/10/1978 दिनांक 31/12/2026 तक नवीनीकृत कर लौटाई जा रही है ।
Licence No. P/SC/AP/14/2145 (P209114) dated 09/10/1978 is returned herewith duly renewed upto 31/12/2026.

कृपया पेट्रोलियम नियम,2002 के अधीन बनाए गए नियम 148 में दी गई प्रक्रिया का कडाई से पालन करें । अनुज्ञप्ति के नवीकरण हेतु समस्त दस्तावेजों को दिनांक 31/12/2026 या उससे पहले इस कार्यालय में प्रस्तुत करें ।
Please follow the procedure strictly as laid down in rule 148 of the Petroleum Rules, 2002 and submit complete documents for the Renewal of the licence so as to reach this office on or before 31/12/2026.

कृपया पावती दें । Please acknowledge the receipt.

भवदीय /Yours faithfully,

((एस. के. भोले))
(S. K. Bhole))
विस्फोटक नियंत्रक
Controller of Explosives
कृते उप मुख्य विस्फोटक नियंत्रक
For Dy. Chief Controller of Explosives
विशाखापट्टनम/Visakhapatanam

(अधिक जानकारी जैसे आवेदन की स्थिति, शुल्क तथा अन्य विवरण के लिए हमारी वेबसाइट . http://peso.gov.in देखें)
(For more information regarding status,fees and other details please visit our website: http://peso.gov.in)
Note:-This is system generated document does not require signature.

Website : http://peso.gov.in
Email: explosives@explosives.gov.in
दूरभाष/ Telephone : 0712-2510248
फैक्स/ FAX 0712-2510577
कार्यालयीन उद्देश्य के सभी पत्रादि "मुख्य विस्फोटक नियंत्रक" के पदनाम से भेजे जाए उनके व्यक्तिगत नाम से नहीं

All communications intended for this Office should be addressed to the 'Chief Controller of Explosives' and NOT to him by name.

भारत सरकार
GOVERNMENT OF INDIA
वाणिज्य और उद्योग मंत्रालय
Ministry of Commerce & Industry
पेट्रोलियम तथा विस्फोटक सुरक्षा संगठन
Petroleum and Explosives Safety Organisation
(पूर्व नाम – विस्फोटक विभाग)
(Formerly- Department of Explosives)
'ए'-ब्लाक, पाँचवा तल, केन्द्रीय कार्यालय परिसर,
"A" Block, 5th Floor, CGO Complex,
सेमिनरी हिल्स, नागपुर - 440 006 (महा)
Seminary Hills, Nagpur- 440006

37/P

पत्रांक / No. G-22(47)118/VII दिनांक / Dated : 09/03/2022

To,

The Chief Engineer,
Engineering Department,
M/s. Visakhapatnam Port Trust,
Visakhapatnam – 530 035.

Sub: Approval for Rehabilitation of Breasting and Mooring Dolphin at OSTT Jetty, Visakhapatnam Port Trust under Petroleum Rules, 2002 - Regarding.

Dear Sirs,

Please refer to your letter No. IM&EE/MOF/MII/8585 dated 17/02/2022 & inspection of the subject facilities by officer of O/o Dy. Chief Controller of Explosives, Visakhapatnam on 29/01/2021. Subsequently, M/s. Visakhapatnam Port Trust has submitted compliance report dated 15/02/20212 to the O/o Dy. Chief Controller of Explosives, Visakhapatnam. The inspection report along with recommendations of Dy. Chief Controller of Explosives, Visakhapatnam dated 17/02/2021 on the subject matter.

O/o Dy. Chief Controller of Explosives, Visakhapatnam has reported that M/s. Visakhapatnam Port Trust has conformed the avability of 2 Nos. of Class – III fire floats and 3 Nos.of tug boats as a Portable arrangement made for firefighting as per OISD 156, and recommended for handling the ships at the subject jetty restricted upto 1,00,000 DWT only.

In view of above the approval is accorded for the handling of vessels upto 1,00,000 DWT with following conditions :

1) A detailed clause wise compliane to OISD 156 shall be ensured.
2) SOP shall be strictly followed and regular safety audit to be carried out.
3) All activities shall be supervised by your technical competent persons.
4) Flame proof equipments with CCE approval details shall be maintained.
5) Details of hoses/unloading arms shall be regularly tested.
6) HC/Fire detectors at strategic locations to be maintained.
7) Automatic shutdown initiation due to HC/Fire detection to be incorporated suitably.
8) No other activities to be carried out within 100 Mtrs. Radius from the unloading Arm/manifold.
9) All due safety precautions shall be taken to prevent accidents.

This is issues with the concurrence of the Chief Controller of Explosives.

379
15/3/22

Yours faithfully,

(S.D. Mishra)
Controller of Explosives
for Chief Controller of Explosives

P.T.O.

ANNEXURE – 11

...పోటీ!

• దూసుకుపోతున్న ప్రధాన పార్టీల అభ్యర్థులు • సిట్టింగ్ ఎమ్మెల్యే పతివాడకే మరో ఛాన్స్ ఇచ్చిన టీడీపీ • త్రిముఖ పోటీ అనివార్యమంటున్న విశ్లేషకులు

దానికి 20 రోజులు ముందుముందే ప్రచార పర్వాన్ని ప్రారంభించిన నాగ మాధవి టిక్కెట్ ఖరారైన తర్వాత మరింత వేగం పెంచి జనాల హృదయాల్లో స్థానం [illegible] చేసుకునేందుకు గట్టిగా ప్రయత్నం చేస్తున్నారు. జాతీయ పార్టీల విషయానికి వస్తే, టీడీపీ తరపున పతివాడ రమణకు ఆ పార్టీ ఆదిలోనే టిక్కెట్ ప్రకటించడంతో ఆయన కూడా పెద్ద ఎత్తున ప్రచారానికి శ్రీకారం చుట్టి ముందుకు సాగుతున్నారు. గతంలో [illegible] ఎమ్మెల్యేగా కూడా పతివాడ రమణ ఎన్నికల బరిలో నిలిచిన వైనం తెలిసిందే. మరో జాతీయ పార్టీ కాంగ్రెస్ విషయానికి వస్తే [illegible]. ఆయన కూడా ప్రచారానికి శ్రీకారం చుట్టారు.

కోటి రూపాయల నగదు పట్టివేత

(విశాఖపట్నం), ప్రభ న్యూస్: విశాఖ జిల్లా నర్సీపట్నంలో కారులో తరలిస్తున్న కోటి రూపాయలను పట్టుకున్నారు. దీనికి సంబంధించిన వివరాలు ఇలా ఉన్నాయి. ఎన్నికల నేపథ్యంలో [illegible] చెక్ పోస్టు ఏర్పాటు చేసి వాహన తనిఖీలు నిర్వహిస్తుండగా ఓ [illegible] రూపాయల నగదును గుర్తించారు. వాహనంలో ఉన్నవారిని ప్రశ్నించగా, తాము [illegible] నుండి పాడేరు బ్యాంకుకు [illegible] తీసుకెళ్తున్నట్లు తెలిపారు. [illegible] నగదు [illegible] ఎస్.ఐ. [illegible] ఈ దాడిలో [illegible] నగదును [illegible] అప్పగిస్తున్నట్లు తెలిపారు.

జైల్లో ఉన్నాను!

• జగన్‌పై టీడీపీ ఎమ్మెల్సీ బాబూ రాజేంద్రప్రసాద్ కామెంట్

అమరావతి, ఆంధ్రప్రభ: అవినీతికి బ్రాండ్ అంబాసిడర్ అయిన జగన్ నేను విన్నాను..నేను ఉన్నాను.. అని పైగా [illegible] చెబుతున్నారని, దీనికి బదులు నేను తిన్నాను..నేను జైల్లో ఉన్నాను.. అంటే బాగుంటుందని టీడీపీ ఎమ్మెల్సీ బాబు రాజేంద్రప్రసాద్ వ్యాఖ్యానించారు. మంగళ వారం ఉండవల్లి ప్రజావేదికలో మీడియాతో మాట్లాడుతూ ప్రతిపక్షనేత జగన్ [illegible] అన్ని అబద్ధాలు మాట్లాడారని, టీడీపీ నాయకులు, కార్యకర్తలు అందరూ [illegible] జగన్ [illegible]. [illegible] ఉన్నాయన్నారు. [illegible]

ఫిరాయింపులతో ఖూనీ!

• తెలంగాణ భూములు దోచిన జగన్‌కు కేసీఆర్ మద్దతు ఇస్తారా? : టీ టీడీపీ నేత రావుల

హైదరాబాద్, ఆంధ్రప్రభ: ముఖ్యమంత్రి చంద్రశేఖరరావు పార్టీ ఫిరాయింపులను ప్రోత్సహిస్తూ ప్రజాస్వామ్యాన్ని ఖూనీ చేస్తున్నారని తెలంగాణ టీడీపీ [illegible] రావుల చంద్రశేఖర్ రెడ్డి [illegible]. [illegible] ఫిరాయింపులు [illegible] ఆయన అన్నారు. తెలంగాణ భూములు కొల్లగొట్టి, అక్రమంగా దోచుకుని 16 నెలలు జైలులో కూర్చున్న వైకాపా అధ్యక్షుడు జగన్ గెలవాలని కేసీఆర్, కేటీఆర్‌లు ఎలా కోరుకుంటారని ఆయన ప్రశ్నించారు. ఫెడరల్ ఫ్రంట్ ఏర్పాటు చేసి [illegible] కేసీఆర్ ఇప్పుడు మాటమార్చి జాతీయ పార్టీ అంటూ కొత్త రాగం ఎత్తుకున్నారని రావుల ఎద్దేవా చేశారు.

"MoEF&CC", [illegible] OR-1 & OR-2 [illegible] F.No.10-62/2016-IA-III [illegible] 07.03.2019 EC&CRZ [illegible] MoEF&CC, GoI [illegible] http://envfor.nic.in" [illegible]	"MoEF&CC", [illegible] EQ-2 [illegible] EQ-5 [illegible] F.No.11-10/2016-IA-III [illegible] 07.03.2019 EC&CRZ [illegible] MoEF&CC, GoI [illegible] http://envfor.nic.in" [illegible]

TIMES

THE TIMES OF INDIA, VISA

FINANCE MINISTER ARUN JAITLEY SLAMS OPPOSITION-RULED STATES FOR 'ROBBING FARMERS' OF PM-KISAN SCHEME BENEFI

Pulwama attack: CRPF will not celebrate Holi

Gurgaon: The CRPF will not officially celebrate Holi this year as a mark of respect to its 40 jawans killed last month in a suicide attack in Jammu and Kashmir, where the force eliminated 210 terrorists in 2018, the force's chief said on Tuesday.

During an event to the mark 80th raising day of the force at its group centre here, CRPF Director General (DG) R R Bhatnagar also said the influence of left-wing extremists or Naxals has reduced by 40 per cent and only a few areas in the country are now affected. Paying tributes to the slain personnel, the DG said the force is creating a mobile app in order to provide help to the families of jawans killed in action. "there will be no official celebrations in the force during the Holi festival on March 21 as a mark of respect to the 40 troops killed in the suicide attack in Pulwama on February 14," the DG said. PTI

BJP-led govt faces fl today, CM Sawant co

'Will Deal With People Like Parrikar Did'

Pramod Sawant was sworn in as CM during the early hours of Tuesda

Panaji: The new BJP-led government in Goa will face the floor test in the state Assembly on Wednesday to prove its majority just a day after Speaker Pramod Sawant was sworn in as chief minister with an unprecedented two deputies past midnight capping a frenetic day of political wrangling.

The government claims majority with the support of 21 MLAs —12 from the BJP, three each of allies Goa Forward Party (GFP) and Maharashtrawadi Gomantak Party (MGP) and three Independents. The strength of the 40-member House has been reduced to 36 following the death of chief minister Manohar Parrikar and BJP MLA Francis D'Souza and resignations of two Congress MLAs Subhash Shirodkar and Dayanand Sopte.

The Congress, which is the single largest party with 14 MLAs, had also staked claim to form the government. There is also an NCP legislator in the House. Governor Mridula Sinha has convened a special session of the Assembly at 11.30 am Wednesday to enable the chief Minister to prove his majority in the House, an official said. After multiple postponements of the oath ceremony o Monday, Sawant, a two-time MLA from Sanquelim in North Goa, was sworn in at the Raj Bhavan at 1.50am. An ayurveda practitioner, Sawant is also a dedicated RSS worker.

Reflecting a generational shift in the BJP, Sawant, 45, was administered the oath of office and secrecy along with 11 other ministers including those from the MGP and the GFP. He succeeded Parrikar, who died on Sunday after

Woman naxal killed in C

Rajnandgaon: A woman Naxal, carrying a gunned down on Tuesday in an encounter garh's Rajnandgaon district, police said. Th muna alias Sagan Bai, 46, was allegedly inv minister in the erstwhile Madhya Pradesh dent of Police Kamlochan Kashyap said.

Jamuna was working as a secretary of s. The skirmish took place lice station area, when a Chhattisgarh and Madhy al operation along the int

THE INDIAN EXPRESS
WORLD
WEDNESDAY 15.12.2021

SPYWARE SCANDAL

Pegasus may be shut down or its creator NSO sold

Beset by govt curbs and lawsuits, maker of military-grade spyware may default on loan

THEL AVIV

NSO Group, the Israeli firm whose Pegasus spyware was found to have been used to snoop on journalists, activists and heads of state around the world, is exploring options including a sale of the company or a refinancing of its debt as it faces mounting pressure from customers and lawsuits, people familiar with the matter said.

The company has hired investment banks to explore options, including a sale, the people said. Potential buyers have been approached, but no deal is imminent, they said. The talks could change at any time, they said, asking not to be identified discussing confidential matters.

The company has been in talks with investment banks on and off for more than a year, but the discussions have intensified in the last few months as NSO faces a cash crunch and mounting legal challenges, the people said. NSO has also been struggling to raise the new debt it needs to refinance a $500 million loan that comes due in February, the people said.

NSO has been engaged by a number of buyout firms, including Novalpina Capital, which put the company under new management in 2019, the people said. Those talks ended without a deal, they said.

NSO has come under fire for the use of its software by governments to spy on journalists, activists and political opponents. Amnesty International and Forbidden Stories, a Paris-based media nonprofit, last year published a leaked list of more than 50,000 phone numbers that had been selected for surveillance by NSO clients since 2016. Reporters from The Washington Post and other news organizations later found that at least 37 of the phones they examined had been successfully hacked with Pegasus.

NSO has said it sells its software only to vetted governments and intelligence agencies for the purpose of fighting terrorism and crime. The company has said it does not operate the software and has no access to the data collected by its clients.

The company's problems have been building for years, but they have escalated in recent months. In July, the US Commerce Department added NSO and other companies to a trade blacklist, saying they had developed software that enabled foreign governments to "maliciously target" government officials, journalists, businesspeople, activists, academics and embassy workers.

Apple and Facebook have also filed lawsuits against NSO, accusing the company of violating their users' rights. In November, Microsoft said it had found that NSO had developed software that could exploit a previously unknown flaw in its Windows operating system.

Those developments have made it difficult for NSO to raise money from investors, the people said. The company has also been unable to refinance its debt because it has not been profitable in recent years, they said.

NSO has been exploring a sale since at least the summer, the people said. Its founders, Shalev Hulio and Omri Lavie, have been open to selling the company, which is based in Israel, for the right price, the people said.

But NSO's valuation has fallen significantly from the $1 billion it was valued at in a deal in 2019, the people said. The company is now worth less than $500 million, they said.

NSO has also been working to refinance its debt, the people said. The company has been in talks with lenders including Credit Suisse and Goldman Sachs, the people said.

NSO has said it is committed to making sure its technologies are used responsibly. The company has said it has terminated contracts with customers that misused its software.

Tory unrest against Boris grows with Covid curbs vote

LONDON

THE British government on Tuesday eased some restrictions to reduce pressure on Prime Minister Boris Johnson's embattled government, which faced a rebellion by dozens of lawmakers from his Conservative Party over new measures to curb the spread of the Omicron coronavirus variant.

Johnson's government has been criticised for its handling of the pandemic, including a series of rule-breaking parties at Downing Street and other government offices during lockdowns last year.

Police said they were investigating reports that at least 12 gatherings had been held in Johnson's office and residence on May 20, 2020, when Britain was under strict lockdown rules to curb the spread of the coronavirus.

Johnson has apologised for attending one of the parties, saying he thought it was a work event. He has refused calls to resign.

Johnson's Conservative MPs have previously been divided on how to respond to the pandemic, but the new restrictions appeared to be met with broad support in the House of Commons, where the government has a large majority.

Opposition lawmakers criticised the government for not introducing the measures earlier, as infections with the Omicron variant have been rising rapidly in London and other parts of England.

Health Secretary Sajid Javid said the government was "acting as fast as we can" to protect the public from the new variant, which is spreading "exponentially" in London.

Under the new rules, which will take effect on Wednesday, people in England will be required to wear face coverings in cinemas, theatres and places of worship, and to work from home if they can. Nightclubs will be required to close.

Johnson's government has also said it will require people returning from abroad to take a coronavirus test and self-isolate for two days.

Javid said the government was also considering requiring people to show proof of vaccination to enter nightclubs and large events, but that it would not introduce "vaccine passports" for other venues.

Johnson's government has been criticised for its handling of the pandemic, including a series of rule-breaking parties at Downing Street and other government offices during lockdowns last year.

Police said they were investigating reports that at least 12 gatherings had been held in Johnson's office and residence on May 20, 2020, when Britain was under strict lockdown rules to curb the spread of the coronavirus.

Johnson has apologised for attending one of the parties, saying he thought it was a work event. He has refused calls to resign.

Opposition lawmakers criticised the government for not introducing the measures earlier, as infections with the Omicron variant have been rising rapidly in London and other parts of England.

Health Secretary Sajid Javid said the government was "acting as fast as we can" to protect the public from the new variant, which is spreading "exponentially" in London.

Under the new rules, which will take effect on Wednesday, people in England will be required to wear face coverings in cinemas, theatres and places of worship, and to work from home if they can. Nightclubs will be required to close.

Johnson's government has also said it will require people returning from abroad to take a coronavirus test and self-isolate for two days.

Javid said the government was also considering requiring people to show proof of vaccination to enter nightclubs and large events, but that it would not introduce "vaccine passports" for other venues.

Johnson's Conservative Party has been in power for more than a decade, and the new restrictions were met with broad support in the House of Commons, where the government has a large majority.

Opposition lawmakers criticised the government for not introducing the measures earlier, as infections with the Omicron variant have been rising rapidly in London and other parts of England.

Health Secretary Sajid Javid said the government was "acting as fast as we can" to protect the public from the new variant, which is spreading "exponentially" in London.

Under the new rules, which will take effect on Wednesday, people in England will be required to wear face coverings in cinemas, theatres and places of worship, and to work from home if they can. Nightclubs will be required to close.

Johnson's government has also said it will require people returning from abroad to take a coronavirus test and self-isolate for two days.

Javid said the government was also considering requiring people to show proof of vaccination to enter nightclubs and large events, but that it would not introduce "vaccine passports" for other venues.

Live on Life: Omicron travel ban goes on || Politician confused

Tornado toll rises to 88 in five US states

MAYFIELD

KENTUCKY officials moved on Tuesday to shut down all operations at a candle factory where rescuers have retrieved remains, and warned that 70 people are still unaccounted for, as the death toll from a series of tornadoes rose to 88 in five US states.

Governor Andy Beshear said he could have been confronted with the most devastating tornado outbreak in the state's history in the December 10 storm that wrecked the factory.

The governor said the search for victims would continue "as long as it takes".

Mayfield Mayor Kathy Stinnett said the factory, which employed about 110 people, was "completely destroyed".

"We're still in search and rescue mode," she said.

Beshear said he had spoken to President Joe Biden about the disaster and that the federal government would help the state.

The governor said he had also spoken to Tennessee Governor Bill Lee, whose state was also hit by the storms.

Tennessee officials said they had confirmed 25 deaths in the state.

Illinois Governor JB Pritzker said he had spoken to Biden and that the federal government would help the state.

Pritzker said he had also spoken to Lee, whose state was also hit by the storms.

Tennessee officials said they had confirmed 25 deaths in the state.

Lt Col Andrew, 7, Alaina, 5, and Aiden, 4, pose for a picture in a bedroom in their home near Czechoslovakia, Missouri, in this December 13 photo. AP

Kids get sucked into raging storm

- Trey and Regina Hooker and their three daughters sought shelter in a windowless bathroom in their southwest Illinois home as storms raged across the middle of the US.
- To pass the time and in their "safe space" with the clock approaching 9 pm on Friday evening, the girls' mom looked for Aunt Sandy photo of the three in bed next to the bathtub — all of them smiling, Sandy's hooking her favorite doll (see photo above).
- Fifteen minutes later, Sandra Hooker said, a tornado obliterated the home, carrying the family members dozens of yards through the air into a field where first responders found them in mud. Aiden, a third-grader who loved swimming, dancing and cheerleading, died; one of dozens killed in five states.
- The other family members were injured, but survived. Seven-year-old Aydden told doctors by the time around "in the tornado," Hooker said.

Afghans angry after US lets soldiers off the hook

KABUL

AN Afghan woman gang-raped two young girls and then killed them and a neighbour before strangling herself in her home in Kabul, police said on Tuesday, in a case that has shocked the country.

Abdul Ahmadi, 37, who had left three children and a wife behind in the province, was found dead in his bed on Monday morning, police said.

The Pentagon said it was looking into reports that two US service members were also killed in the attack, which police said was carried out by a man who had served in the Afghan army.

The Pentagon said it was looking into reports that two US service members were also killed in the attack, which police said was carried out by a man who had served in the Afghan army.

The Pentagon said it was looking into reports that two US service members were also killed in the attack, which police said was carried out by a man who had served in the Afghan army.

Live on Life: Omicron travel ban goes on || Politician confused

Time running out on Iran Nuke deal'

BERLIN

EUROPEAN diplomats on the sidelines of the UN climate summit in Glasgow said on Tuesday that they were running out of time to save the 2015 Iran nuclear deal, which is on the verge of collapse.

Diplomats from Britain, France and Germany said they were "deeply concerned" that Iran was not engaging seriously in talks to revive the deal, which has been in limbo since former US president Donald Trump withdrew from it in 2018.

"We are running out of time," the diplomats said in a joint statement.

సీమ, ఉత్తరాంధ్ర జిల్లాల కోసం

మూడు రాజధానులే ముద్దు

ఓటీఎస్‌తో సర్వ హక్కులు

మా బహిరంగ సభకు అనుమతివ్వండి

వేతనాలు... పెన్షన్లపై సీఎస్‌వి తప్పుడు లెక్కలు

ANDHRA PRABHA - DAILY

on 15-12-2021 (WEDNESDAY)

...ని నగరంలో చేపట్టిన ...

ఆర్డర్ నెం.ఎస్ఇఐఎఎ/ఎపి/విఎస్పి/ఐఎన్‌డి/06/2019/1027167.74 & 164.65 - తేది: 26.10.2021 ప్రకారం విశాఖపట్నం పోర్ట్ ట్రస్ట్, విశాఖపట్నం వద్ద క్రూజ్-కం-కోస్టల్ కార్గో టెర్మినల్ యొక్క అభివృద్ధి ప్రాజెక్టు కొరకు ఇసి & సిఆర్‌జడ్ క్లియరెన్స్ "ఎంఓఇఎఫ్ & సిసి" కొత్త ఢిల్లీ వారిచే ఇవ్వబడినది. క్లియరెన్స్ లేఖల యొక్క ప్రతి ఎంఓఇఎఫ్ & సిసి యొక్క అధికారిక వెబ్‌సైట్ http://envfor.nic.in వద్ద అందుబాటులో కలదు.

ఆంధ్రప్రభ - దినపత్రిక B: 15.12.2021 (బుధవారము)

ANNEXURE – 12

Environment Management

Environment Management

The Port of Visakhapatnam, Environment Management wing is maintaining harmony between Port development and environmental protection.

Port of Visakhapatnam is accredited with ISO Certification (ISO 14001) by the Indian Register of Quality Systems for the Environmental Management System standards in all its activities including related support services.

An Environmental Monitoring Committee (EMC) is in place with members representing Citizen Welfare Associations, NGOs, Academic Institutions, Industries/Defense, Trade, Observers from APPCB, Government Organization's and Senior Officers of the Port. The Committee reviews the implementation of long term and short term directives issued by APPCB and also reviews the environmental activities to be implemented by the Port. The Committee also inspects various operational areas of the Port and advises improvements on the Enviro
out and gives suggestions for additional Environmental pollution mitiga
necessary based on the requirements from time to time.

Statutory Documents.

Environmental Clearance – EC Costal Regulation Zone - CRZ	Consent for Establishment - CFE	Consent for Operations – C
EC-1 Half Year Report-2023	CFE FOR OR1&2	CFO-Compliance Report Oct,2023
EC for VGCB	CFE FOR WQ7&8	CFO FOR Cruise cum Cargo Terminal
EC for WQ-6, WQ-8 and EQ-10	CFE FOR EQ-2 TO EQ-5	CFO FOR VGCB
EC for OR-I and OR-II	CFE FOR Cruise cum Cargo Terminal	CFO FOR VPA
EC for Multipurpose Berth		
EC for OHC, WQ-7 & WQ-8, Container Teminal-1		
EC for LPG Handling Jetty		
EC for Iron Ore Handling Faclity		
EC for EQ-2 to EQ- 5		
EC for EQ-1A & EQ-1		
EC for Cruise cum Cargo Terminal		
EC for 4 Multi Purpose Berths		

FOG CANNON

SWEEPING MACHINE

Hi I am Port Assistant

Environmental Form-V statement for FY 31-03-2023 **Environmental Clearance for various projects of VPA 2nd Half Year-2022**

Three Sub-Committees are constituted to review and monitor AAQ (Ambient Air Quality), Green Belt Development and Hazard Management. The EMC reviews the findings of the Sub-Committees and advises suitably on the environmental improvement measures.

Environmental cell has been established to monitor the environmental activities of the Port, duly appointing persons qualified in the field of Environment Management.

The measures taken by the Port to mitigate Environmental Pollution include:

- Monitoring of Ambient Air Quality at six locations in and around the Port area by Port and third parties like Andhra University Development Center and APPCB.
- Monitoring of harbour water quality at regular intervals through Andhra University Development Center.
- Monitoring of STP waters before and after treatment at regular intervals.
- Regular monitoring of pollution control measures in and around Port area and residential areas.
- Preparation of Environmental Management Action Plan and Comprehensi and land use plan for all occupied and unoccupied areas for the next MECON, Ranchi.
- Distribution of pamphlets and display of message boards on Environment Management.
- Development of Environmental Parks/ Nurseries and maintenance of Islands in and around Port areas.

- Continuous development of Green Belt in and around Port area.
- Mechanization of Cargo Handling Operations in phases.
- Monitoring effluent of Port based industries before discharging into Port Waters and ensuring that they posses consent of APPCB for their activities.

The Port is taking all possible measures to contain the pollution and the maintain the ambient air quality within permissible limits. In addition to the above measures, the Port is

- Modernizing the cargo handling facilities for coal, iron ore, fertilizers etc.,
- Re-organizing stack yards
- Insulating coal stack yards by providing high rise walls along with dust suppression system as long term measure to avoid dust pollution.
- Implemented MDSS (Mechanical Dust Suppression System) Automation in 04 pump houses and 100 sprinklers branches using PLC and SCADA.
- Developed a truck parking terminal to facilitate parking of 667 trucks and trailers to prevent traffic congestion on port roads.
- Deployed 02 nos of Mechanical road sweeping machine and 02 nos of dry fog machine to the various locations for mitigation of dust and air pollution.

Environmental Compliances:

- Filing of returns in the compliance (annual/half yearly) to the conditions put forth by MoEF& CC/APPCB/CPCB at the intervals specified in the consent order. Maintaining records in environmental cell and put up the same to EMC meetings/ HOD meetings.
- Maintenance of QMS, EMS & OHSAS records and files and putforth during internal or external auditing.
- Liasioning with the monitoring agencies engaged in Environment monitoring works.
- Submission of the required data for presenting at the time of attending the court trials. Filing of remarks and reasons with reference to court cases being filed against pollution caused as and when required.
- Collection and submission of information after proper scrutiny to the person who requests the information under RTI Act rule.
- Filling of online application with MoEF & CC for environmental clearanc expansion projects,

Environment Management System of VPA

Environment Management System at VPA
Environmental Form-V statement for FY 31-03-2022
Environmental Clearance for various projects of VPA 2nd Half Year-2022
EMS Sustainable development measures by VPA
Environment Management System of VPA

Visakhapatnam Port Authority, Port Area, Visakhapatnam-530035
e-reg.vpt@gov.in
+91 8912873677
FAX: +91- 891- 2565023
GST No. 37AAALV0035C1ZE
PAN: AAALV0035C

Important Links

Life certificate for Pensioner's of VPA
Tenders
Reports
About Us
Feedback

Quick links

Career
Services & Infrastructure
Our Commitment
VPA Online Payment
News & Events

Hi I am Port Assistant

Pages

Gati Shakti

Vigilance Corner

Citizens / Employees Corner

Posts from @vptIndia **Follow**

Visakhapatnam @ · Apr 28

Visakhapatnam Port Authority Welcomes #TheWorld ! @shipmin_india

5 200

Website visitors

Hi I am Port Assistant

ANNEXURE – 13

विशाखपट्टणम पोर्ट प्राधिकरण
सिविल इंजीनियरिंग विभाग
प्रशासनिक भवन, पोर्ट क्षेत्र
विशाखपट्टणम – 530035 (आ.प्र.)

విశాఖపట్నం పోర్ట్ అథారిటీ
VISAKHAPATNAM PORT AUTHORITY
CIVIL ENGINEERING DEPARTMENT
Administrative Building, Port Area
Visakhapatnam – 530035 (A.P)

SAGARMALA
PORT-LED PROSPERITY

No.: IENG/Env.Cell/Form-V/2023
Date: 30.09.2023

To,
The Environmental Engineer,
Regional Office,
A.P. Pollution Control Board,
Beside RTA Office,
Madhavadhara VUDA Layout,
Visakhapatnam – 530018.

Sir,

Sub: Submission of Environmental Statement Form-V –Reg.
Ref: As per EC General Conditions.

Please find herewith the Environmental Statement in Form-V for the Financial Year ending 31.03.2023 as per Rule No.: 14 of E(P) Act, 1986.

Encl: As above

11/10/23 12.28 PM
DESPATCHED

Yours faithfully,

CHIEF ENGINEER
CHIEF ENGINEER
विशाखपट्टणम पोर्ट ट्रस्ट
Visakhapatnam Port Trust

Annexure - C

Environmental and CRZ Clearance

For

Development of Multipurpose Terminal by replacement of existing **EQ-2 to EQ-5** berths to cater to 14.00 M draft vessels in Inner Harbor of Visakhapatnam Port Trust on DBFOT basis by M/s Visakhapatnam Port Trust vide letter dated **07.03.2019 bearing F.No.11-19/2015-1A-III**

Compliance on Conditions of Environmental Clearance for Development of Multipurpose Terminal by replacement of existing EQ-2 to EQ-5 berths to cater to 14.00 M draft vessels in Inner Harbor of Visakhapatnam Port Trust on DBFOT basis

ENVIRONMENT CLEARANCE CONDITIONS		
S. No	**Specific Conditions**	**Compliance Status for the period of Apr'24 – Sep'24**
i	Construction activity shall be carried out strictly according to the provisions of CRZ Notification, 2011. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation zone area.	**Complied.** VPA Strictly following the CRZ Rules and Environmental Clearance Conditions.
ii	All the recommendations and conditions specified by the Andhra Pradesh Coastal Zone Management Authority who has recommended the project vide letter No. 64/APCZMA/2017.535 dated February, 2018 shall be Complied with.	**Noted and Complied.**
iii	The project proponent shall ensure that the project is in consonance with the new CZMP prepared by the State Government under the provisions of the CRZ Notification, 2011.	**Noted and Complied.** VPA consonance with the new CZMP Rules and Regulations.
iv	The project proponent shall ensure that no creeks or rivers are blocked due to any activities at the project site and free flow of water is maintained.	**Noted for Compliance.** VPA ensure no blockages of any creeks or rivers due to any of VPA project activities.
v	Dredging shall not be carried out during the fish breeding season	**Complied.** If maintenance dredging required, dredging plan shall be prepared accordingly.
vi	Dredging, etc shall be carried out in the confined manner to reduce the impacts on marine environment.	**Complied.**
vii	Dredged material shall be disposed safely in the designated areas.	**Complied.** VPA Strictly followed the CWPRS guidelines. The copy CWPRS report is enclosed as **Annexure - 1**.
viii	Shoreline should not be disturbed due to dumping. Periodical study on shoreline changes shall be conducted and mitigation carried out, if necessary. The details shall be submitted along with the six monthly monitoring report.	**Complied.** • Periodical study on shore line changes is ensured by VPA on regular basis as directed. • Details of Shoreline study by APSAC (Andhra Pradesh Space Application Centre) are enclosed as **Annexure - 2**.
ix	While carrying out dredging, an independent monitoring shall be carried out by Government Agency/Institute to check the impact and necessary measures Shall be taken on priority basis if any adverse impact is observed.	**Complied.** VPA carried out sediment analysis by NABL accredited Laboratory M/s. S.V. Enviro labs and Consultants, Visakhapatnam. Harbour water quality monitoring carried out by Andhra University.
x	The water requirement (1,36,100 m^3/month) for the present project will be met from Greater Visakhapatnam Municipal Corporation (GVMC). The ground water if required shall only be tapped with prior permission from CGWA.	**Noted and complied.** If the requirement of water consumption exceeds, then VPA take the permission from CGWA.
xi	Marine ecological studies as carried out by M/s Terracon Ecotech Pvt. Ltd., NABET accredited EIA Consultant under the supervision of MECON Ltd. and its mitigation measures for protection of flora & fauna, mangroves, Olive Ridley's Turtles etc as given in the EIA-EMP Report shall be complied with in	**Complied.** The details of EIA / EMP recommendations and VPA compliance status is enclosed as **Annexure - 3**.

	letter and spirit.	
xii	A copy of the Marine and riparian biodiversity management plan duly validated by the State Biodiversity Board shall be submitted before commencement of implementation.	**Complied.**
xiii	A continuous monitoring programme covering all the seasons on various aspects of the coastal environs need to be undertaken by a competent organization available in the State or by entrusting to the National Institutes/renowned Universities with rich experiences in marine science aspects. The monitoring should cover various physico-chemical parameters coupled with biological indices such as microbes, plankton, benthos and fishes on a periodic basis during construction and operation phase of the project. Any deviations in the parameters shall be given adequate care with suitable measures to conserve the marine environment and its resources.	**Complied.** • Marine Sediment analysis is carried out by NABL Accredited laboratory M/s. S.V. Enviro Labs, Visakhapatnam. • Harbour Water Quality Monitoring is carried out by Andhra University.
xiv	Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components as a part of the management plan. Marine ecology shall be monitored regularly also in terms of all micro, macro and mega floral and faunal components of marine biodiversity.	**Complied.** VPA carried out marine ecology study through Andhra University. The study report copy is enclosed as **Annexure - 4**.
xv	The project proponents would also draw up and implement a management plan for the prevention of fires due to handling of coal.	**Complied.** VPA having Emergency Preparedness Plan including fire control measures. VPA having Own Fire Brigade with sufficient trained personnel.
xvi	Spillage of fuel / engine oil and lubricants from the construction site are a source of organic pollution which impacts marine life, particularly benthos. This shall be prevented by suitable precautions and also by providing necessary mechanisms to trap the spillage.	**Complied.** Construction work is completed.
xvii	Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986.	**Noted and Complied.** VPA is not having any processing facility in port area. The City Waste Water is Treated in VPA 10MLD Capacity of STP. The Treated Sewage Water being analyzed by NABL accredited laboratory. The parameters are within the PCB limits. Test Reports are available in Environmental Monitoring Reports.
xviii	All the recommendations mentioned in the rapid risk assessment report, disaster management plan and safety guidelines shall be implemented.	**Complied.** VPA conducted Risk Assessment and VPA having Disaster Management Plan, Oil Spill Contingency Plan and Emergency Preparedness Plan. Regularly VPA conducting Mock Drills and trainings for the employees.
xix	Measures should be taken to contain, control and recover the accidental spills of fuel and cargo handle.	**Complied.** VPA having Oil Spill Contingency Plan, Disaster Management Plan with well-equipped and trained personnel. Extracted pages of Oil Spill Contingency Plan are enclosed as **Annexure - 5**.

xx	Necessary arrangement for general safety and occupational health of people should be done in letter and spirit.	**Complied.** VPA had ISO 45001:2018 Certified Complainant port, VPA conducting Periodical health checkups employees.
xxi	All the mitigation measures submitted in the EIA report shall be prepared in a matrix format and the compliance for each mitigation plan shall be submitted to the RO, MoEF&CC along with half yearly compliance report.	**Complied.** The EIA matrix format is enclosed as **Annexure - 6**.
xxii	As per the Ministry's Office Memorandum F.No.22-65/2017-IA.III dated 1st May 2018, the project proponent shall prepare and implement Corporate Environment Responsibility (CER) Plan.	**Complied.** The detailed report on item wise expenditure incurred for environment management plan for the year of 2024-25 is enclosed at **Annexure-7**.
	GENERAL CONDITIONS	**Compliance Status for the period of Apr'24 – Sep'24**
i	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality.	**Complied.** Construction work is completed.
ii	Full support shall be extended to the officers of this Ministry/ Regional Office at Bangalore by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.	**Noted and Complied.**
iii	A six-Monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Bangalore regarding the implementation of the stipulated conditions.	**Complied.** Previously VPA submitted on 15.07.2024 copy is enclosed as **Annexure - 8**.
iv	Ministry of Environment, Forest and Climate Change or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.	**Noted for Comply.**
v	Ministry of Environment, Forest and Climate Change or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.	**Noted for Comply.** Same General Condition no. iv (above) is repeated.
vi	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with the satisfaction of the Ministry.	**Noted.**
vii	In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment, Forest and Climate Change.	**Noted and Complied.**
viii	The project proponents shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work.	**Complied.**
ix	A copy of the clearance letter shall be marked to concerned Panchayat/local NGO, if any, from whom any suggestion representation has been made received while processing the proposal.	**Complied.**
x	A copy of the environmental clearance letter shall also be displayed on the website of the concerned State Pollution Control Board. The EC letter shall also be displayed at the Regional Office, District Industries centre and Collector's *Office/* Tehsildar's office for 30 days.	**Complied.**

6.	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.	**Complied.** VPA NOC photo copies are enclosed as **Annexure - 9**.
7.	The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental and CRZ Clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seen on the website of the Ministry of Environment, Forest and Climate Change at http://www.envfor.nic.in. The advertisement should be made within Seven days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Chennai.	**Complied.** Copies of advertisement published by VPA in newspaper are enclosed at **Annexure - 10**.
8.	This Clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.	**Noted.**
9.	Any appeal against this Clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.	**Noted.**
10.	Status of Compliance to the various stipulated environment conditions and environmental safe guards will be uploaded by the project proponent in its website.	**Complied.** VPA ensures for uploading of EC compliance report in the VPA website. Screen shot is enclosed as **Annexure - 11**.
11.	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, ZillaParisad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions /representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	**Complied.**
12.	The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF&CC, the respective Zonal Office of CPCB and the SPCB	**Complied.** VPA ensures for uploading of EC compliance report in the VPA website. Screen shot is enclosed as **Annexure - 11**.
13.	The Project proponent shall also submit six monthly reports on the status of compliance of the stipulated Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF&CC, the respective Zonal Office and the SPCB.	**Complied.** VPA submitted the Half Yearly Compliance Report for the period of Oct'2023 to Mar'2024 on 15.07.2024. The letter copy is enclosed as **Annexure - 8**
14.	The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF&CC by e-mail.	**Complied**. The Form-V submitted to Environment Engineer, RO APPCB, Visakhapatnam on Dt. 30.09.2024. Copy Enclosed as **Annexure - 12** VPA ensures for uploading of EC compliance report in the VPA website. Screen shot is enclosed as **Annexure - 11**.

15.	The above stipulated would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act 1974 the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and the EIA Notification 2006, including the amendments and rules made thereafter.	**Complied.**

ANNEXURE – 1

***Fax* No.0891-2565023**

Government of India
Ministry of Water Resources, River Development and Ganga Rejuvenation
Central Water & Power Research Station
Khadakwasla, Pune – 411 024

Tel : 020-24103421
Fax : 020-24381004
E-mail : kudale_md@cwprs.gov.in

No.101/13/72-PH II Dated: 10.03.2016

Chief Engineer,
Visakhapatnam Port Trust
Visakhapatnam 530 035.

(Attn: Shri. M.R. Rajanikanth, SE)

Sub: Sediment Transport Investigation at Visakhapatnam Port –Dumping Ground - Reg.
Ref: VPT fax letter. No. IENG/SE-V/AE-I/CWPRS/2016 dated 25 Feb. 2016

Sir,

With reference to your fax on the subject matter, this is to inform that based on the Radio-active studies conducted at Visakhapatnam, dumping ground is suitable for disposal of contemplated dumping activity. From the sounding chart (Fig.1 given in the Annexure) obtained from dumping ground survey conducted in the year 2015 and also in view of the fact that maintenance dredging of the port is reasonably low, it is opined that spoil ground of 2.6 Sq.km area is suitable for proposed dumping. The material to be disposed, 9.66 Lakh Cum, from the proposed capital dredging (Table.1) is not expected to come back towards the shipping channel. Radio-active Tracer studies conducted along with BARC indicated that disposed sediment predominantly moved towards South-West direction.

Maintenance dredging quantities during the period 2010 to 2015 (Table.2) indicates that annual maintenance dredging requirement would be of the order of 2.56 Lakh.cum. It is learnt that all the material being dredged from the sand trap area is being used for the beach nourishment of the down-drift northern coastline to tackle the littoral drift phenomenon and to maintain the dynamic equilibrium of the coastline and thus reducing the quantity of deep-sea dumping. Annual maintenance dredging carried out from other operational areas only, which is not that significant, is to be dumped in the deep-sea dumping ground besides the occasional capital dredging quantity.

Since the dumping ground is located in the deeper contours beyond -40m, with more offset distance of 1.45Km from the port approach channel, the chances of the dumped material finding its way back in to the port approach area are negligible with the expected dumping rates.

Radio-Active Tracer studies conducted by CWPRS along with BARC in the dumping ground area of Visakhapatnam Port during January to April 2010 indicated that the predominant spread of the dumped material is in NE-SW direction. Longitudinal distances covered by tracer towards north-east and south-west from injection point were about 300 meters and 880 meters respectively. Similarly, the spread in the north-west and south-east direction was about 170 meters on either side from injection point during the observed period (Fig.2).

Results drawn from a numerical model study, conducted to assess the spread of the disposed material in deep-sea dumping ground at a location in the vicinity of Visakhapatnam are useful to understand the bed thickness change and suspended sediment concentration for a typical disposal rate. Since the calibration of mathematical model is on the basis of radio-active tracer studies conducted at Visakhapatnam, inferences drawn are reliable if the similar disposal rates are contemplated. However, regular monitoring is suggested by conducting periodic bathymetric surveys in and around the dumping grounds.

It can be seen from figure.3 that maximum bed thickness change at the dumping location is of the order of 8.0cm at the end of two months dumping at the rate of six dumps a day by a dredge having 4500 cum hopper. With this rate of disposal, contemplated dredging of 9.66 lakh.cum would be completed in 36 days only. Bar graph showing the bed thickness change versus number of days of dumping is given in Figure.4. The dredge material has been dispersed over a large area giving a negligible increase of thickness in the surrounding areas. So it can be inferred that dumping of dredge spoil do not cause any appreciable changes on the morphology at the dumping locations and surrounding area.

A typical Suspended sediment concentration (SSC) map obtained from the numerical model on 13th day of dumping at the specified rate is given vide Fig.5. It may be noted that SSC in the central portion is 0.06 kg/cum with lesser values in the surrounding area. These insignificant SSC values spreading over a larger areal extent is desirable from environmental considerations. Above information indicate that change in the water column parameters and bed morphology as well, is expected to be less due to the impact of dumping. Alternate disposal at different sub domains within the dumping ground may be adopted to further reduce the impact of dumping. It is suggested to monitor and review the performance of the dumping ground area by conducting periodical bathymetric surveys immediately before and after the dumping.

Thanking you,

Yours faithfully,

10/3/16

(M. D. Kudale)
Additional Director

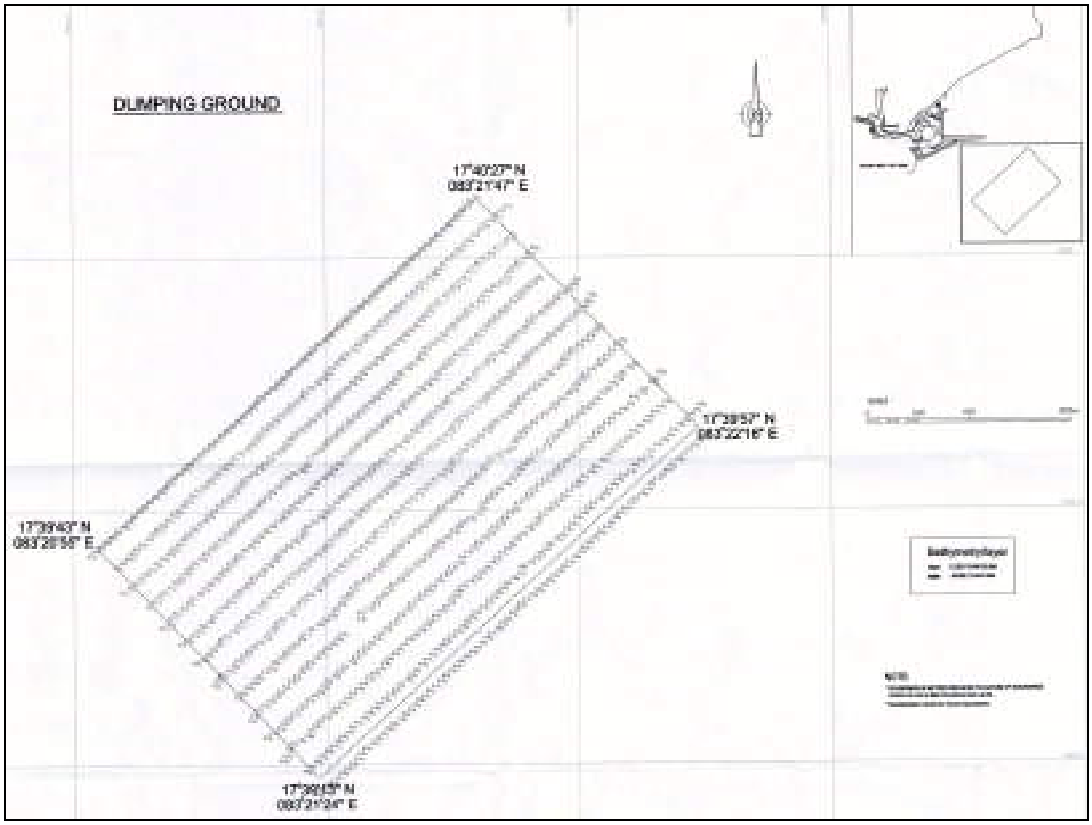


***Fig. 1**: Index map of Dumping ground at Visakhapatnam port showing the extent and Soundings*

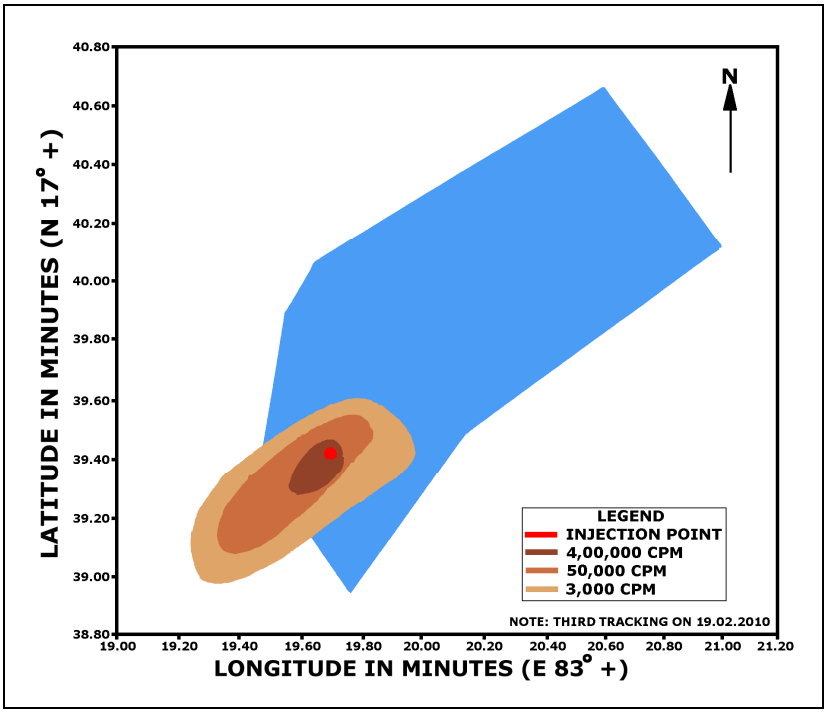


***Fig. 2**: Bed Transport / spreading pattern as per the Radio-Active Tracer study at Visakhapatnam port*

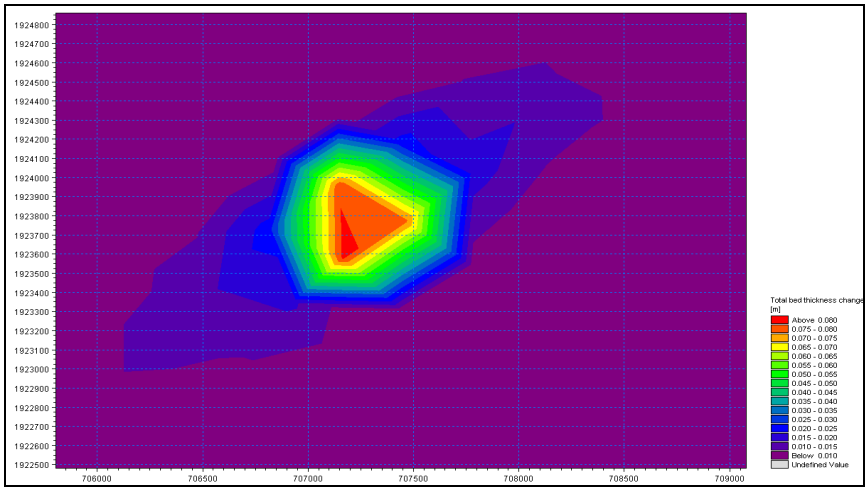


***Fig. 3**: Bed thickness change at the end of two months dumping period*

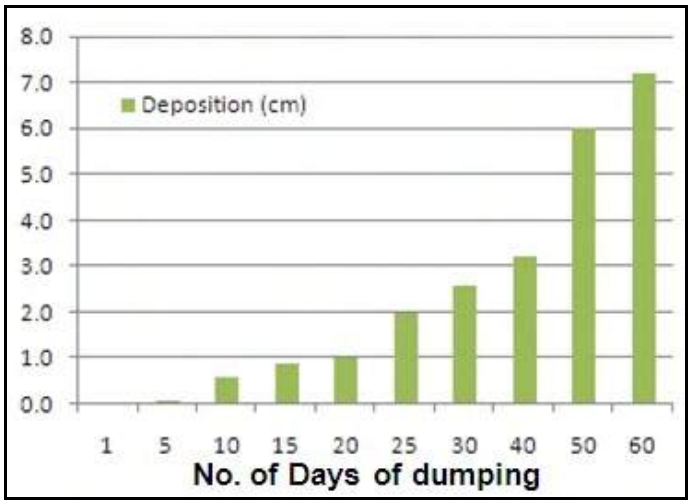


***Fig. 4**: Bed thickness change Vs No. of Dumping days*

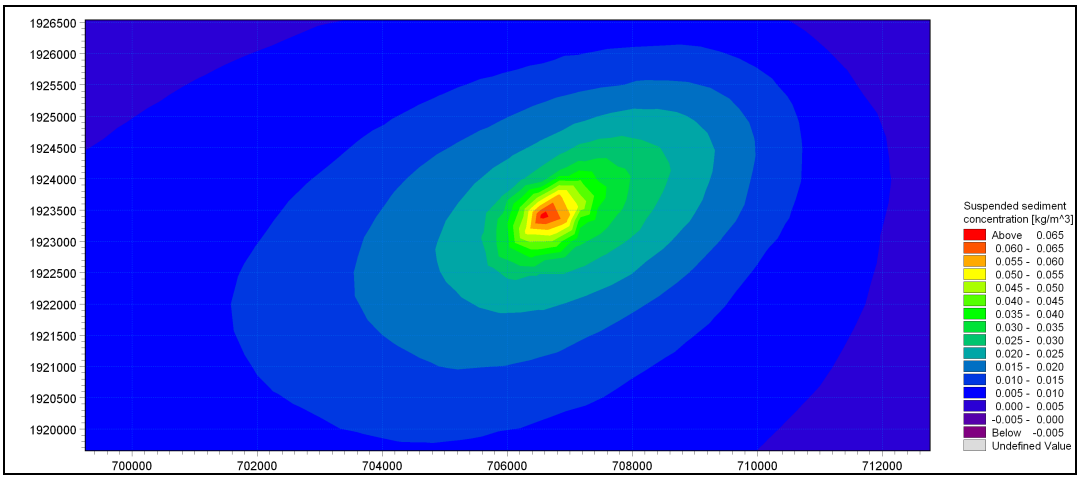


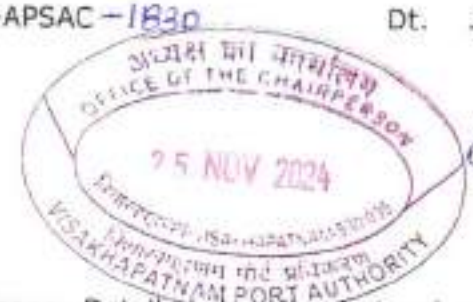
***Fig.5**: Suspended Sediment Concentration map during dumping*

ANNEXURE – 2

APSAC ANDHRA PRADESH SPACE APPLICATIONS CENTRE (APSAC)
ISO 9001:2015 ITE & C Department, Government of Andhra Pradesh

Dr. B.Sundar, IFS
Vice Chairman

Lr. no. SAC-12022/63/2022-DMSCS-APSAC – 1830 Dt. .10.2024



To
The District Collector,
Visakhapatnam - 530002

Dy Chairman
CE

EE(EC)
4/9/12

Sub: Gride wise Shoreline Changes maps -Detailed shoreline hotspot report – Detailed maps- Visakhapatnam District – Reg.

***

Dear Sir/Madam,

1. The Andhra Pradesh Space Applications Center (APSAC) is carrying out Shoreline Changes mapping for the Andhra Pradesh coast. Shoreline geometry remains one of the key parameters in the detection of coastal erosion and deposition. Remote Sensing and Geographical Information Systems (GIS) are important tools for quantifying shoreline change on a temporal scale. The satellite images from 28th November 1990 and 6th March 2021 are the oldest and newest data sets used for the assessment of the coastal dynamics of the Visakhapatnam district.
2. The Digital Shoreline Analysis System (DSAS), a software application that works within the Environmental Systems Research Institute (ESRI)'s ArcGIS software, is employed in this study.
3. In the present study, the shoreline change rates are classified into seven classes based on the magnitude of changes. The erosion and accretion status during 1990-2021 for the Visakhapatnam district (**64.97 km**) with the lengths (km) is computed.
4. The analysis and shoreline change map are enclosed. In summary, the shoreline analysis indicates that 19.12 km (**29.43%**) of the Visakhapatnam coast is eroding, 24.42 km (**37.59%**) is under accretion, and 21.43 km (**32.98%**) is in a stable state. These lengths exclude the rocky coast, sea wall, and breakwaters. The eroding areas and areas under accretion require

CE

Address: # 40-17-3/1, M.G.Road, Labbipet, Vijayawada - 520 010
Phone: 0866-2973510, e-mail: apsac.itec@gmail.com, website:http://apsac.ap.gov.in

interventions, as both geological phenomena can affect microclimate and biogeochemical cycles.

5. Regional and detailed grid wise maps of the Visakhapatnam district are shared for carrying out ground truth verification by the field Engineers and technical officers associated with the protection of coastal resources. We request their feedback on the GIS analysis presented by APSAC for further processing.

Yours faithfully,

Vice Chairman

Encl: Shoreline Changes Map, Gridewise detailed map, Brief Description, Merits and Demerits of Accretion

Copy to

1. The Member Secretary, AP Coastal Zone Management Authority, Paryavaran Bhavan, Gurunanak Colony, Vijayawada- 520 007
2. The Commissioner, Greater Visakhapatnam Municipal Corporation (GVMC), Visakhapatnam
3. The Chairperson, Visakhapatnam Port Trust, Visakhapatnam

MONITORING AND SHORELINE CHANGE ANALYSIS STATUS REPORT FOR VISAKHAPATNAM DISTRICT USING REMOTESENSING AND GIS

Coastal shorelines or land-sea interfaces change in response to natural or anthropogenic interference. Natural factors may be morphological, climatological, or geological. Shoreline geometry remains one of the key parameters in detecting coastal erosion and deposition. Coastal features interact with waves, tides, rivers, storms, tectonic, and physical processes. Erosion (landward retreat) and deposition (advance and growth through accretion) can both present challenges to coastal communities and infrastructure. The vulnerability of coastal areas increases due to erosion, which can threaten human activities along the coasts. Changes (whether short-term or long-term) in the position and geometry of shorelines are crucial in understanding coastal dynamism and managing coastal areas. Remote sensing and GIS are considered important tools for quantifying shoreline change on a temporal scale.

The Digital Shoreline Analysis System (DSAS) is a software application that works within the Environmental Systems Research Institute (ESRI) Geographic Information System (ArcGIS) software. The US Geological Survey developed DSAS. The prime activity in the shoreline analysis workflow is the extraction of shoreline positions through digitization. DSAS computes rate-of-change statistics for a time series of shoreline vector data. A baseline is constructed to serve as the starting point for all transects cast by the DSAS application. DSAS generates transects perpendicular to the baseline at a user-specified spacing (100 m) alongshore. The transect shoreline intersections along this baseline are then used to calculate the rate-of-change statistics. The reported rates are expressed as meters of change along transects per year. The results obtained from the analysis of shoreline changes are in the form of numbers, i.e., ±m/yr, where + indicates accretion and - indicates erosion.

The satellite images from 28th November 1990 (LANDSAT - Thematic Mapper) and 6th March 2021 (LANDSAT 8 Operational Land Imager) are the oldest and newest datasets used. Other datasets include the Indian Remote Sensing Satellite (IRS) P3 Linear Imaging and Self Scanning (LISS) Sensor-III from 29th January 1999; IRS P6 LISS III from 14th February 2005 and 19th January 2010; and LANDSAT8–Operational Land Imager (OLI) from 22nd March 2015. The quantitative results are plotted in a GIS environment showing the magnitude of changes. The classification of shoreline changes is a subjective aspect. In this study, shoreline change rates are classified into seven classes. Considering the magnitude of changes, each of the erosion and accretion categories is divided into three sub-classes. A marginal change of ±0.5m/yr is considered as no change or stable coast.

The shoreline along the Visakhapatnam coast was analyzed for the period 1990-2021 to estimate shoreline changes (erosion, accretion, and stable areas). The shoreline length used in the analysis is the shore face length (excluding the interior parts of rivers/creeks) obtained from LANDSAT–Thematic Mapper and LANDSAT 8 - OLI satellite data. The erosion/accretion status during 1990-2021 for the Visakhapatnam district (64.97 km) with the lengths (km) is given in tabular form. Only four categories of shoreline are present in the district. A significant extent of the shoreline falls under the category of Stable Coast. The shoreline analysis indicates that about 29% of the coast is eroding, 38% is accreting, and 33% is in a stable state. These lengths exclude rocky coasts, sea walls, and breakwaters.

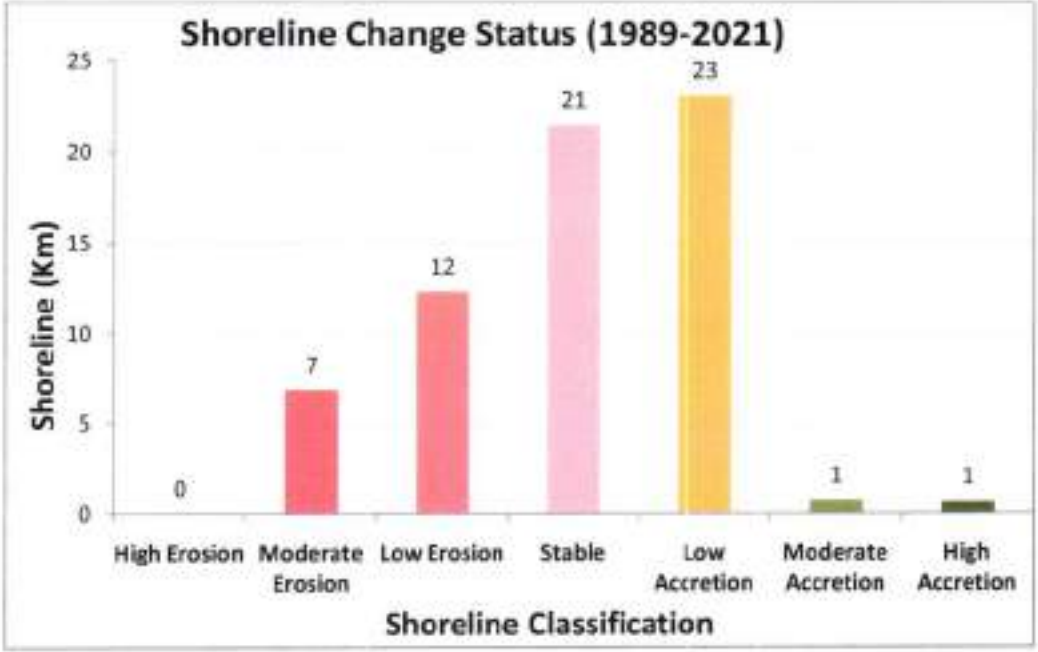
Table-1 Shoreline change Classification and Location Status.

Sl. No	Shoreline Classification (m/year)	Class length (Km)	Location (Nearest village/river/ creek)
1	High Erosion (> -5)	0.00	
2	Moderate Erosion (-5 to -2)	6.83	Beemunipatnam Northside area,Chepalupada area, North side Gostani river place.
3	Low Erosion (-2 to -0.5)	12.29	Annavaram places, Northside Gostani river area, Southside Beemunipatnam, Rushikonda area,
4	Stable Coast (-0.5 to +0.5)	21.43	Southside of Gostani River, Rushikonda area, Enadada, north and south side of port area,
5	Low Accretion (+0.5 to +2)	23.06	Appikonda area, Southside of Gangavaram port area, Southside of Visakhapatnam port places, near Rushikonda Place
6	Moderate Accretion (+2 to +5)	0.72	Near Gostani River mouth area, Southside of Visakhapatnam post area, Appikonda place,
7	High Accretion (>+5)	0.64	Near appikonda seawall area, Southside port places,
	Total	**64.97**	

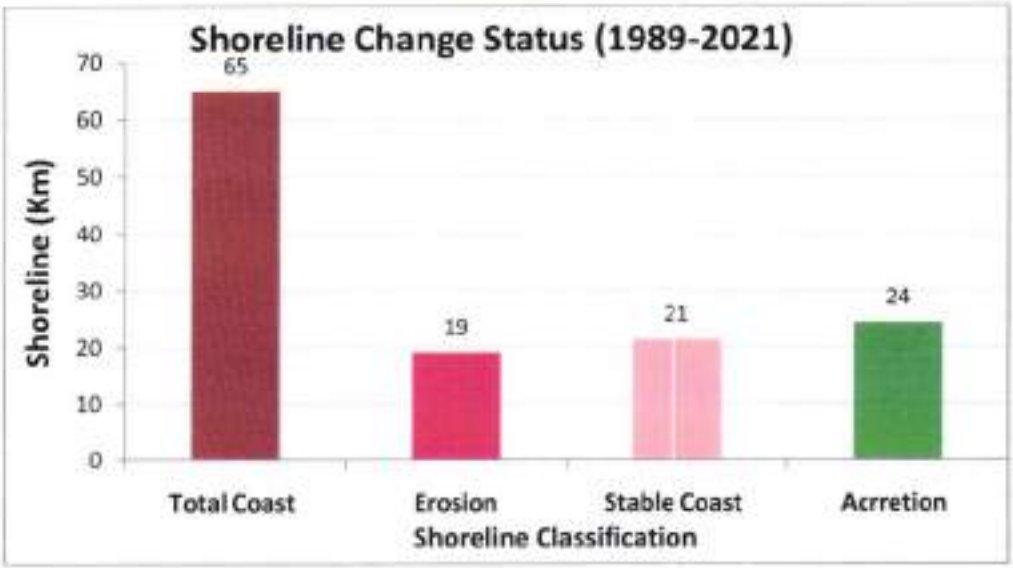
Table- 2 Classification of Shoreline Change in Visakhapatnam District

Classification of Coast	Length of the Coast (km)	Cumulative Length (km)	Percentage of Coast (%)	Cumulative (%)
Length of coastline	64.97			
High Erosion	0.00		0	
Moderate Erosion	6.83		10.51	
Low Erosion	12.29	19.12	18.92	29.43

Stable	21.43	21.43	32.98	32.98
Low Accretion	23.06		35.49	
Moderate Accretion	0.72		1.11	
High Accretion	0.64	24.42	0.99	37.59



Graph-1 Shoreline chage classification Status for Visakhapatnam district



Graph-2 Shoreline chage overall Status for Visakhapatnam district

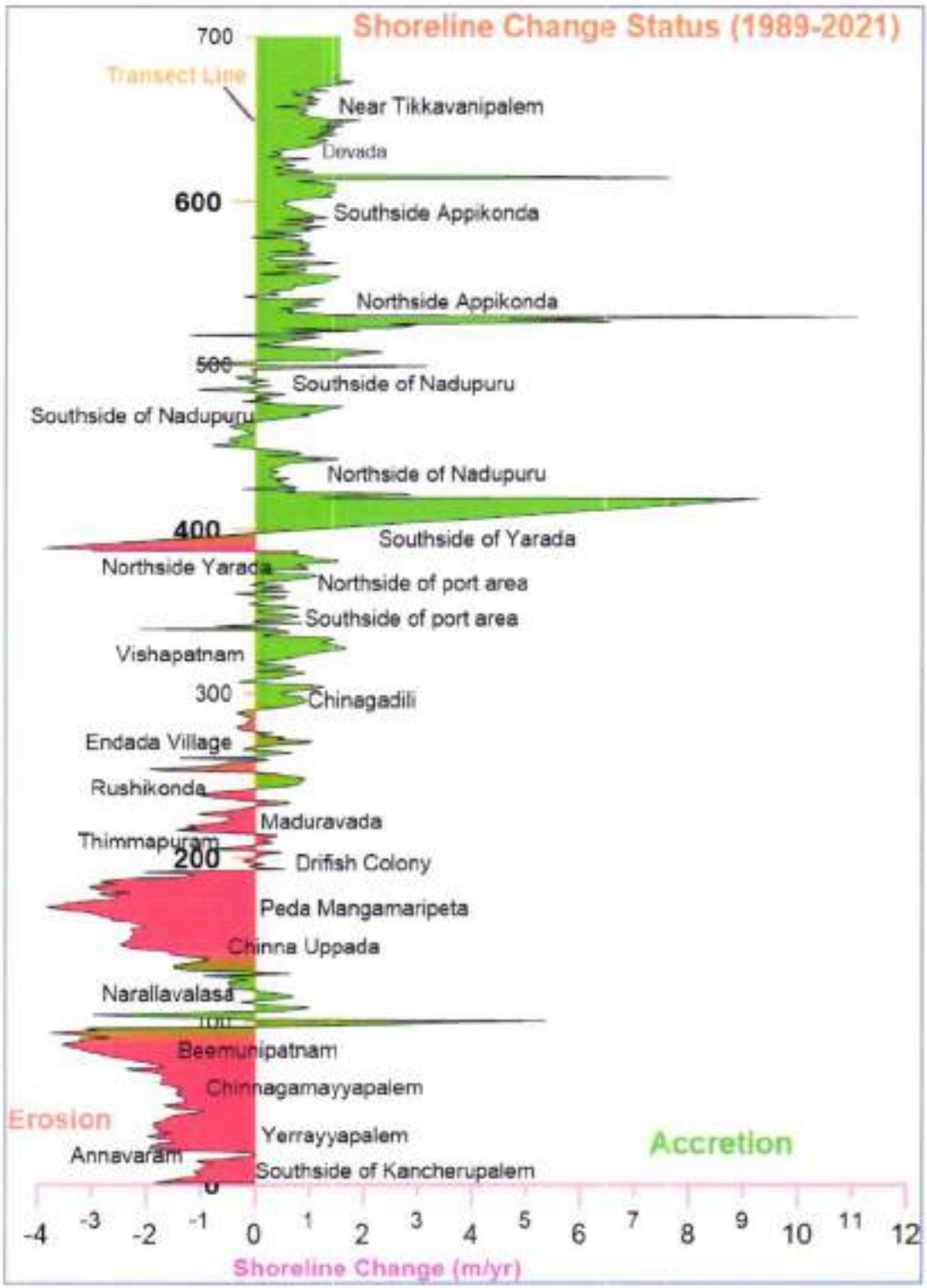
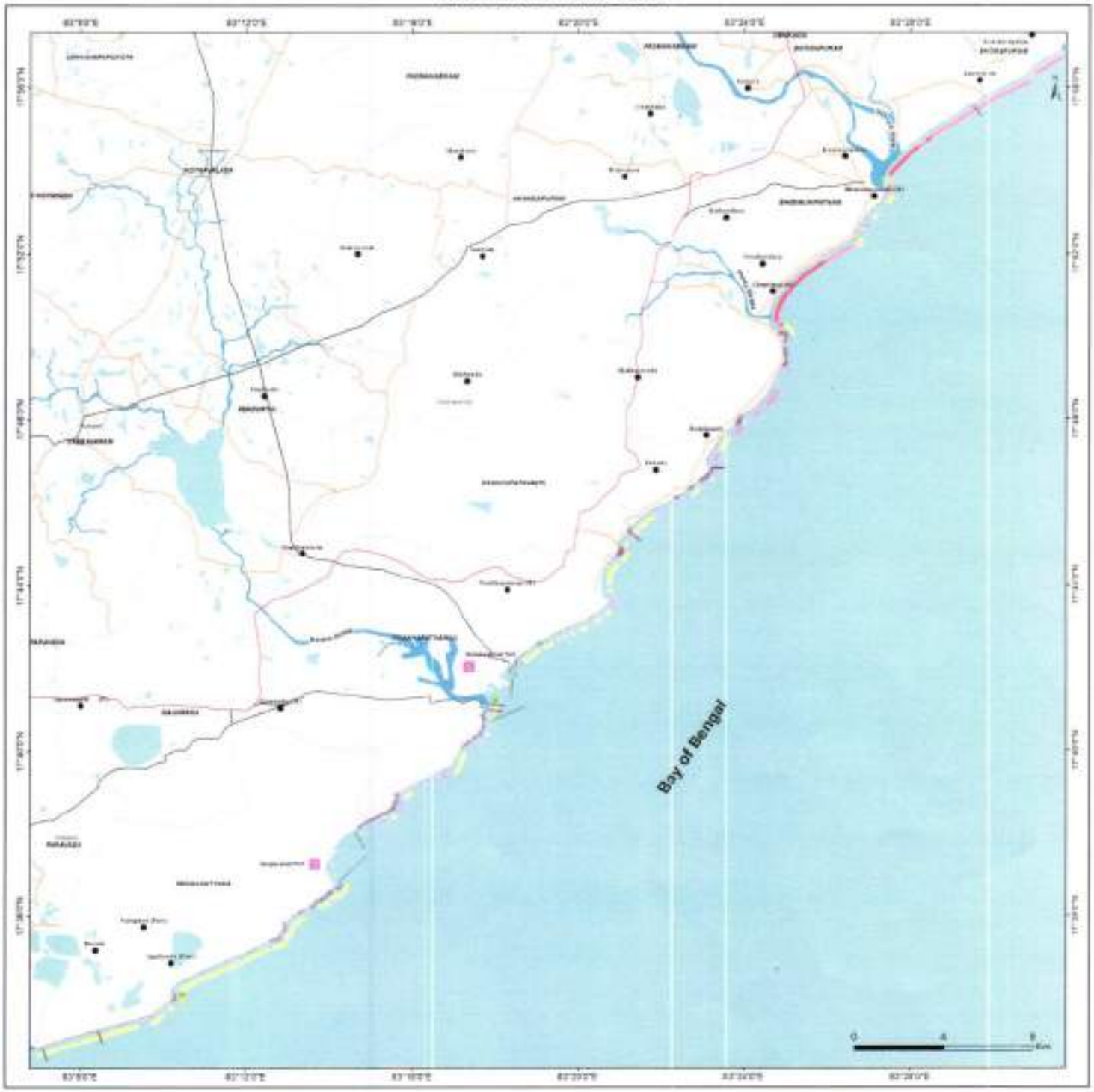


Figure- 1 Shoreline Change status along Visakhapatnam Coast

1988 - 2021

VISAKHAPATNAM

SHORELINE CHANGE MAP
ANDHRA PRADESH



Shoreline change Trend for Period 1988 - 2021

- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

Data Sources : Satellite Data

Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3 -LISS- III	10/03/1999
IRS P6 -LISS- III	09/02/2005
IRS P6 -LISS- III	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

- National Highway
- State Highway
- District Road

- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Mandal Boundary
- Tank/Pond/Lake
- River/Creek

S.No	Shoreline Classification (m/year)	length in Km
1	High Erosion (> -5)	0.00
2	Moderate Erosion (-5 to -2)	6.83
3	Low Erosion (-2 to -0.5)	12.29
4	Stable Coast (-0.5 to +0.5)	21.43
5	Low Accretion (+0.5 to +2)	23.06
6	Moderate Accretion (+2 to +5)	0.72
7	High Accretion (> +5)	0.64
	Total	**64.97**

A.P. SPACE APPLICATIONS CENTRE
ITE&C Department, Govt. of A.P
Vijayawada - 520010

1988 - 2021

SHORELINE CHANGE MAP
ANDHRA PRADESH

Official Use

Visakhapatnam | **65O5NE**

Shoreline change Trend for Period 1988 - 2021

- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

Data Sources: Satellite Data

Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3-LISS- III	10/03/1999
IRS P6-LISS- III	09/02/2005
IRS P6-LISS- III	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

Administrative Boundaries

- District Boundary
- Mandal Boundary
- Village Boundary
- National Highway
- State Highway
- District Road

Km

0 — 2.25 — 4.5

- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Tank/Pond/Lake
- River/Creek

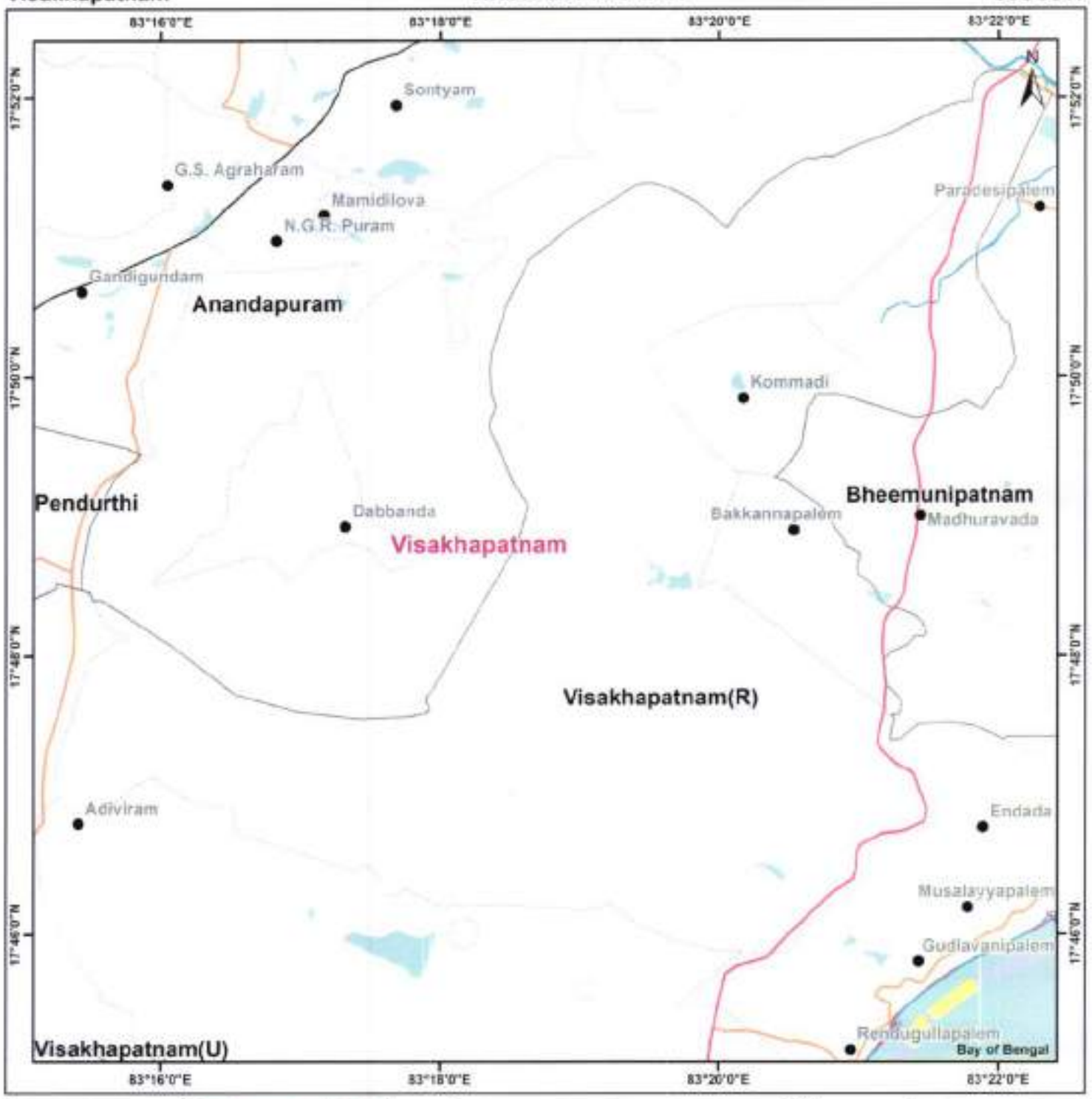
A.P. SPACE APPLICATIONS CENTRE
ITE&C Department, Govt. of A.P
Vijayawada - 520010.

1988 - 2021

SHORELINE CHANGE MAP
ANDHRA PRADESH

Official Use

Visakhapatnam **65O5SW**



Shoreline change Trend for Period 1988 - 2021

- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

Data Sources: Satellite Data

Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3-LISS- III	10/03/1999
IRS P6-LISS- III	09/02/2005
IRS P6-LISS- III	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

Administrative Boundaries

- District Boundary
- Mandal Boundary
- Village Boundary
- National Highway
- State Highway
- District Road

Km
0 2.25 4.5

- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Tank/Pond/Lake
- River/Creek

A.P. SPACE APPLICATIONS CENTRE
ITE&C Department, Govt. of A.P
Vijayawada - 520010

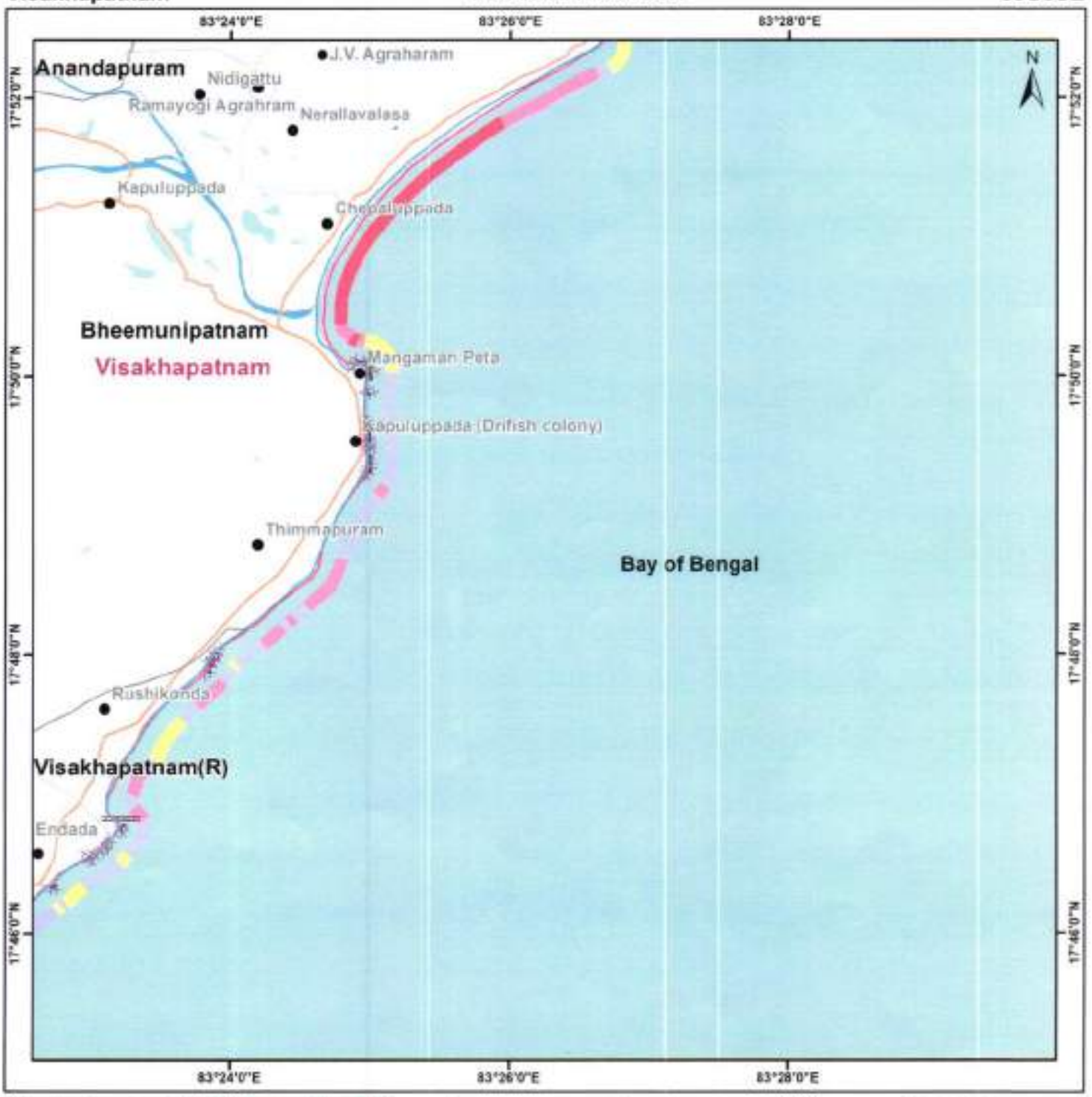
1988 - 2021

Visakhapatnam

SHORELINE CHANGE MAP
ANDHRA PRADESH

Official Use

65O5SE



Shoreline change Trend for Period 1988 - 2021

- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

Data Sources: Satellite Data

Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3-LISS- III	10/03/1999
IRS P6-LISS- III	09/02/2005
IRS P6-LISS- III	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

Administrative Boundaries

- District Boundary
- Mandal Boundary
- Village Boundary
- National Highway
- State Highway
- District Road

Km

0 2.25 4.5

- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Tank/Pond/Lake
- River/Creek

A.P. SPACE APPLICATIONS CENTRE
(RSAC Department, Govt. of A.P
Vijayawada - 520015.

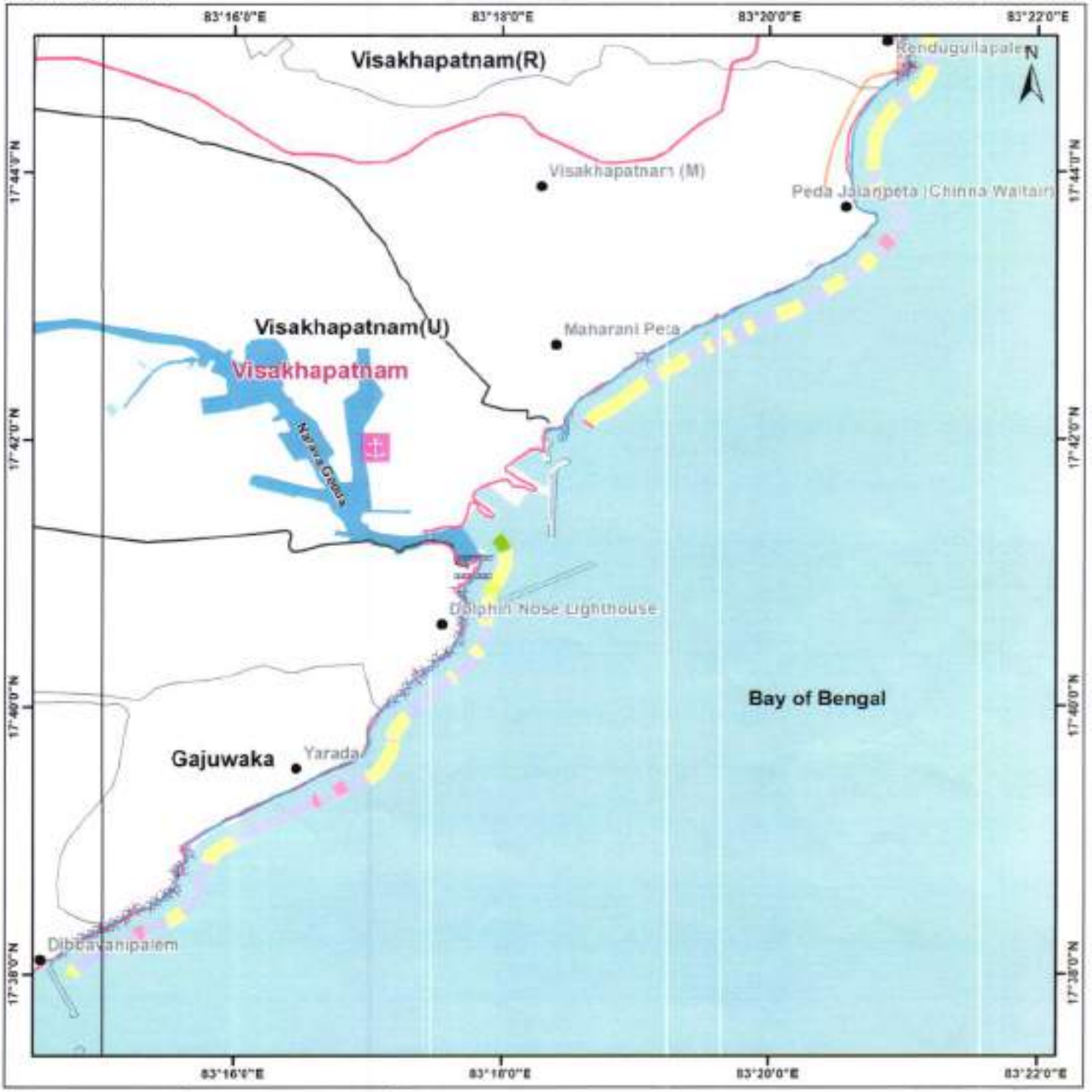
1988 - 2021

SHORELINE CHANGE MAP
ANDHRA PRADESH

Official Use

Visakhapatnam

65O6NW/ 65O2NE



Shoreline change Trend for Period 1988 - 2021

- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

Data Sources: Satellite Data

Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3-LISS- III	10/03/1999
IRS P6-LISS- III	09/02/2005
IRS P6-LISS- III	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

Administrative Boundaries

- District Boundary
- Mandal Boundary
- Village Boundary
- National Highway
- State Highway
- District Road

0 2.5 5 Km

- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Tank/Pond/Lake
- River/Creek

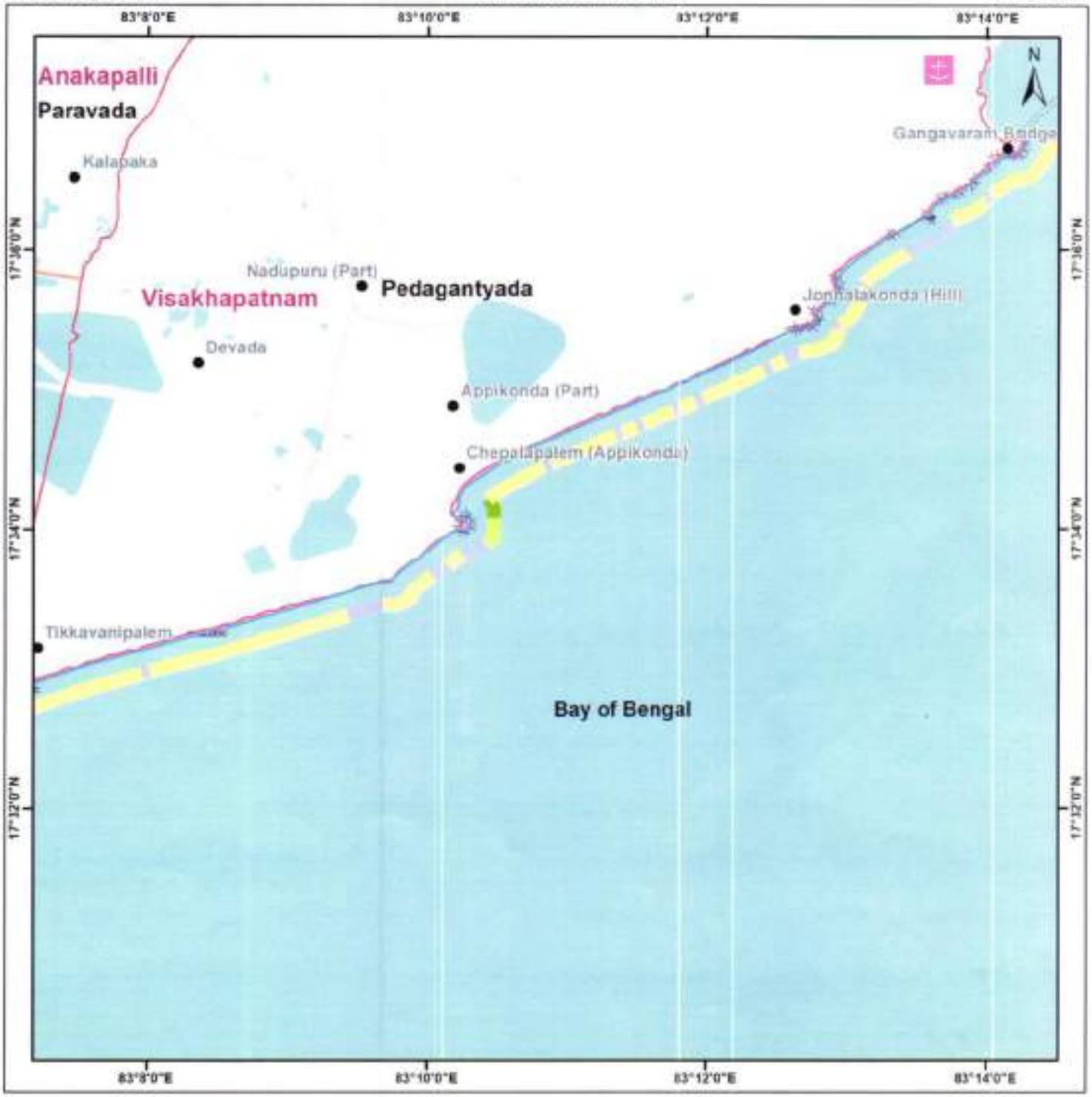
A.P. SPACE APPLICATIONS CENTRE
(IT&C Department, Govt. of A.P.
Vijayawada - 520010)

1988 - 2021

SHORELINE CHANGE MAP
ANDHRA PRADESH

Official Use

Visakhapatnam — **65O2SE**



Shoreline change Trend for Period 1988 - 2021

- High Erosion
- Moderate Erosion
- Low Erosion
- Stable
- Low Accretion
- Moderate Accretion
- High Accretion

Shoreline Date

- 12/10/1988
- 21/03/2021

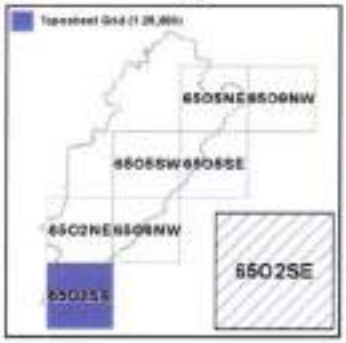
Data Sources: Satellite Data

Sensors	Date of acquisition
Landsat5-TM	12/10/1988
IRS P3-LISS- III	10/03/1999
IRS P6-LISS- III	09/02/2005
IRS P6-LISS- III	03/03/2010
Landsat8-OLI	13/03/2015
Landsat8-OLI	21/03/2021

Administrative Boundaries

- District Boundary
- Mandal Boundary
- Village Boundary
- National Highway
- State Highway
- District Road

Km
0 — 2.25 — 4.5



- Habitation
- Port
- Groyne
- Breakwater
- Rock
- Seawall
- Tank/Pond/Lake
- River/Creek

A.P. SPACE APPLICATIONS CENTRE (TE&C Department, Govt. of A.P) Vijayawada - 520010.

ANNEXURE – 3

VISAKHAPATNAM PORT AUTHORITY

Sub: Compliance on Conditions & Recommendations made in EMP/DMP:

S. No.	Recommendation	VPA Compliance
1	The proposed project would require significant amount of construction material. During construction phase, runoff from these sites would increase soil erosion from such sites. If such sites are left untreated after excavation of construction material, then rainwater is likely to get stored in these sites, which are then likely to serve as breeding habitats for mosquitoes.	**Complied.** Construction Work is Completed.
2	During construction phase, labour would migrate in the project area. Adequate arrangements for potable water supply, sewage treatment and disposal, solid waste management have been suggested as a part of the study to mitigate pollution due to labour camps.	
3	Sewage from the labour camps shall be conveyed to the existing STP. There is sufficient unutilized capacity in the sewage treatment plant. The total handling capacity of the STP is 10 mld. At present 6-7 mld of sewage is treated in the sewage treatment plant.	
4	A total quantity of dredged material likely to be generated in the proposed project has been estimated as 8,66,249 m^3 of which 1,84,000 m_3 will be generated due to up gradation of existing facility and creation of new facilities. The dredged material would be disposed at designated site.	
5	Major sources of noise during construction phase are due to operation of various construction equipment. Modeling studies were conducted to assess the increase in noise level due to operation of various construction equipments, and no increase in noise levels were anticipated as a result of various activities, during the project construction phase.	
6	Vehicular movement for the transportation of construction material and operation of construction equipment in the area is likely to increase temporarily during the construction period. However, the vehicular pollution is not expected to lead to any major impacts on ambient air quality could be one of the possible sources of incremental air pollution during the construction phase.	
7	Appropriate measures to control air pollution have been recommended as a part of Environmental Management Plan.	
8	Proposed project is likely to have adverse impacts of marine ecology and benthic flora fauna. The project area has moderate productivity. Area to be dredged recolonizes in short duration, after the cessation of dredging activities. This means that though the dredged stretches are likely to get recolonized, the ecology is not expected to develop up to the pre-project levels.	**Complied.** Construction Work is Completed.
9	There are no sites of ecological significance in and around the project area. Likewise, no spawning ground was observed.	

10	High turbidity due to heavy suspended solid load during dredging or disposal of dredged materials results in clogging of gills of fishes thereby causing asphyxiation. But since fishes are free swimming they very well avoid such areas and move to safer areas. Once the turbidity is over due to currents, they come back to the area.	
11	Economic benefits of a port are manifold and significant positive impacts are expected during construction phase of the proposed project, as it will lead to mushrooming of allied business activities, which provide an impetus to overall development of the area.	
12	Some of the locals will get direct employment in project construction activities or indirect employment due to mushrooming of allied business activities.	
Impacts during Operation Phase and their Mitigation:		
1	Vehicular movement for the transportation of cargo is likely to increase during the operation phase. The entire operation would be handled in dry state is closed conveyor system. Thus, no major impact on air pollution is envisaged.	• VPA ensures regular cleaning of roads with Mechanical Sweeping Machines and through manually. • VPA ensures water sprinkling on Port roads through water tankers to avoid dust emission (180trips/ day). • VPA ensures coverage of tarpaulin over dust cargo stacks.
2	Solid waste in the proposed project could be generated mainly from three sources viz. institutional/ office waste, domestic waste and waste from cargo handling etc. This could comprise floating materials, packaging, polythene or plastic materials. It is proposed to be routinely collected and is disposed at a designated solid waste disposal site.	VPA complying the recommendations in EIA duly ensuring the removal of floating material and safe disposal of the same to GVMC dumping area at Kaapuluppada, VSP.
3	The present system of iron ore handling through semi mechanized process has the capacity to handle less than 12000 Tonnes of iron ore. A receiving conveyor system with a rated capacity of 3000 TPH compatible with the wagon unloading from tippler house to the stockyard is proposed as a part of the project. The proposed system will reduce fugitive emissions. Hence, the proposed expansion and modernization is not expected to cause any significant adverse impacts and will be beneficial for the environment.	--
4	Impact of accidental release of solid cargo, particularly during rough weather, can take place. It would have limited impact on the environment. However, the port operations may be hampered if the ship is damaged or the cargo goes overboard that could risk navigation.	Noted for compliance.
5	Escapement of bulks such as iron ore, bulk cargo and container cargo during unloading is not expected to cause any serious impact, as they are non-toxic.	--
6	Recommendations of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78), shall be implemented to prohibit all ships from discharging wastes at sea. MARPOL 73/78 requires that ships retain all the wastes on board until reaching port.	Being complied.
7	Vessels shall be equipped with dedicated holding tanks for sewage and oily wastes and have the capacity to compact and store garbage.	VPA ensure to comply the recommendation in EMP through marine department of VPA.

8	Effluent from workshops, oil storage, etc. will contain oil and grease particles which shall be treated in an oil skimmer and suitably disposed after treatment. The collected oily matter is stored in cans, etc. and disposed at landfill sites designated by the district administration.	VPA ensure to comply the recommendation in EMP through marine department of VPA.
GREENBELT DEVELOPMENT		
	Greenbelt was developed around the stack yards. Plantation programme is being pursued by VPT on a Continuous basis for the last 2 decades for continual improvement and addition of Green Belt in and around Port area. So, far 4,30,000 sampling has been planted over an area of 630 acres at different areas including port operational areas, residential and city areas. Similarly, greenbelt will be developed as a part of development of the proposed berths.	Complied.
PORT AREA EMERGENCY RESPONSE PLAN		
	A detailed plan for oil and chemical spill is being implemented at Vishakhapatnam Port. Likewise, a Disaster Management Plan for implementation in the event of various natural and manmade hazards too has been formulated and is under implementation. The same shall be implemented for the proposed projects as well.	Being complied.

Summary of Environmental Monitoring Programme for implementation during project construction phase					
S.No.	**Aspects**	**Parameters to be monitored**	**Frequency of monitoring**	**Location**	**Compliance Status**
1	**Marine Water**				
a	Physical-Chemical Parameters	pH, Salinity, EC, TDS, Turbidity, Phosphates, Nitrates, Sulphates, Chlorides	Once in three months	9 sites	Construction Work Completed.
b	Biological Parameters	Light penetration, Chlorophyl, Primary Productivity Phytoplanktons Zooplanktons	Once in three months	9 locations	Construction Work Completed.
2	**Sediments**				
a	Physical-Chemical Parameters	Texture, pH, Sodium, Potassium, Phosphate, Chlorides, Sulphates	Once in three months	9 sites	Construction Work Completed.
b	Biological Parameters	Benthic Meio-fauna, benthic Macro-fauna	Once in three months	9 sites	Construction Work Completed.
3	Ambient Air Quality	SPM, RPM, SO2 and NOx	Summer, Post-monsoon and Winter seasons Twice a week for four consecutive weeks per season.	6 sites close to construction site(s)	Construction Work Completed.
4	Noise	Equivalent Noise Level	During peak construction activities	Construction Site(s)	Construction Work Completed.
Summary of Environmental Monitoring Programme for implementation during project operation phase					
S.No.	**Aspects**	**Parameters to be monitored**	**Frequency of monitoring**	**Location**	**Compliance Status**
1	**Marine Water**				
a	Physical-Chemical Parameters	pH, Salinity, EC, TDS, Turbidity, Phosphates, Nitrates, Sulphates, Chlorides	Once in three months	9 sites	Being complied.

b	Biological Parameters	Light penetration, Chlorophyl, Primary Productivity Phytoplanktons Zooplanktons	Once in three months	9 locations	Being complied.
2	**Sediments**				
a	Physical-Chemical Parameters	Texture, pH, Sodium, Potassium, Phosphate, Chlorides, Sulphates	Once in three months	9 sites	Being complied.
b	Biological Parameters	Benthic Meio-fauna, benthic Macro-fauna	Once in three months	9 sites	Being complied.
3	Ambient Air Quality	SPM, RPM, SO2 and NOx	Summer, Post-monsoon and Winter seasons Twice a week for four consecutive weeks per season.	6 sites close to construction site(s)	Being complied.
4	Noise	Equivalent Noise Level	During peak construction activities	Construction Site(s)	Being complied.
5	Greenbelt Development	Rate of survival and growth of various species	Once per month	Various plantation sites	Being complied.

INTEGRATED ENVIRONMENTAL MONITORING PROGRAMME

S.No.	Name of Work	Description of work/sampling areas	Parameters	Compliance Status
1	Continuous online Ambient Air quality monitoring (CAAQM)	Monitoring of ambient air quality in Residential and Port operational areas is being carried out by GITAM University as a pilot study • St. Aloysius School • R&D Yard • CISF tower near S6 Conveyor	$PM_{2.5}$, PM_{10}, SO_2 and NOx	Being complied. VPA installed 3 CAAQM stations at R&D Yard, GVMC stadium and GCB area and monitoring is done through AUDC
2	Monitoring of ambient air quality	Monitoring of ambient air quality in Industrial & Residential areas is being carried out by AUDC/AU weekly twice at following three locations in three shifts: • ONGC Building • R&D Yard, • DLB Canteen	$PM_{2.5}$, PM_{10}, SO_2 and NOx	Being complied. VPA installed 3 CAAQM stations at R&D Yard, GVMC stadium and GCB area and monitoring is done through Andhra University, VSP

		2 locations near 3 project sites being developed as a part of the present proposal.		
3	Monitoring of Harbour water quality	Analysis of water samples collected during low tide and high tide for assessing the Harbour water quality by AUDC/AU quarterly at: • 9 locations (Inner & Outer Harbour) • 2 locations near 3 project sites being developed as a part of the present proposal	PH, Color, Odor, TSS, DO, BOD, Oil& Grease, Sulphide, Ammonical Nitrogen, Free Ammonical Nitrogen, Total Kjeldahl Nitrogen, Cyanide, Fluoride, heavy metals and faecal Coliform	Being complied. VPA complying the recommendation in EIA for monitoring of harbour water quality through Andhra University, Visakhapatnam.
4	Monitoring of harbour water quality for the assessment of dredging impact	Bed samples and water samples are being collected during dredging and analyzed by GITAM University, parameters concerned are physico-chemical parameters Sampling points: • Northern Arm • Western Arm • Outer harbor 2 locations near 3 project sites being developed as a part of the present proposal	DO, Turbidity, Phosphate, Sulphate, Ammonia, and heavy metals.	Being complied. VPA complying the recommendation in EIA for monitoring of harbour water quality through Andhra University, Visakhapatnam.
5	Noise	Equivalent Noise Level near 2 locations near each of the 3 Project sites	Once per month	Being complied.
6	Greenbelt Development	Rate of survival and growth of various species	Once per month	Being complied.

ANNEXURE – 4

1st half- yearly 2024 report

Marine Ecological Sensitivity assessment studies for preparing Biodiversity Monitoring and management plan in Visakhapatnam Port

Submitted to

Department of Civil Engineering
Visakhapatnam Port Authority
Visakhapatnam

Submitted
by

Department of Environmental Sciences
Andhra University
Visakhapatnam

1st half- yearly, 2024 report on

MARINE ECOLOGICAL SENSITIVITY ASSESSMENT STUDIES FOR PREPARING BIODIVERSITY MONITORING AND MANAGEMENT PLAN IN VISAKHAPATNAM PORT

Submitted to

DEPARTMENT Of CIVIL ENGINEERING

VISAKHAPATNAM PORT AUTHORITY

VISAKHAPATNAM

Submitted by

PROF. T. BYRAGI REDDY

DEPARTMENT OF ENVIRONMENTAL SCIENCES

ANDHRA UNIVERSITY

VISAKHAPATNAM - 530 003

List of Tables

List of Figures

Background of the study:

Coastal marine ecosystems provide a variety of ecosystem services for humans; however, these systems are susceptible to both terrestrial and marine factors because they are situated in the coastal ecotone (Ray and Hayden, 1992; Reizopoulou et al., 2014). Consequently, coastal marine ecosystems are very sensitive to environmental change and human activities (Halpern et al., 2004; Hoegh-Guldberg and Bruno, 2010; Perry et al., 2010). Marine ecosystem services are declining due to various problems, including marine pollution, eutrophication, habitat loss, and the degradation of biodiversity (Solan, 2004; Worm et al., 2006; Deegan et al., 2012; Johnston et al., 2015, Hewitt et al., 2016; Le Moal et al., 2019). However, ocean uses are still often located in sensitive biological and ecological areas without much consideration of their impact (Douvere and Ehler, 2009; Hu et al., 2019).

Life on earth is supported by the surrounding ecological conditions and the natural resources. Continents and oceans are the two major divisions comprising of all the ecosystems. The ocean serves as a source of food, energy, and minerals. About 75 % of the earth' surface is covered with oceanic waters which have a rich wealth of marine life. If we say that land is dominated by plant biomass, then we also have to accept that animal biomass dominates the oceanic waters.

Seas and oceans constitute the marine ecosystems. When compared to

land based terrestrial ecosystems, the marine ecosystems have certain unique features. They are:

1. The oceanic environment is very wide covering 75% of the earth's surface
2. The oceanic systems are very deep in which life extends to all depths
3. Sea is continuous
4. The water is in continuous movement both in vertical and horizontal dimensions
5. The water is salty with an average salt content of 35 g/litre
6. The concentration of dissolved nutrients is low. Ecology deals with organisms, populations, communities, ecosystems and the biosphere.

Marine ecology deals with the study of the environment and life in marine waters. It involves the study of a) Marine organisms and their habitat (physical support, light and transparency, nutrients, temperature, salinity and osmotic processes, gases, hydrostatic pressure, viscosity, circulation of water) b) Divisions of Marine environment (open sea-pelagic environment, epipelagic environment, mesopelagic zone, bathypelagic zone, abyssopelagic zone, and sea bottom- benthic environment) c) Distribution of marine life (planktons-floaters, Phytoplanktons, Zooplanktons, The nektons and the benthos).

Life on earth originated from oceanic waters. Creatures living on land need to deal with gravity, dehydration, great temperature variations, and

many other factors which are normally not encountered in oceans. But the marine organisms are affected by the factors like

A. Depth of oceanic water

B. Change in salinity

C. Change in temperature

D. Change in turbidity

E. And other environmental factors.

Marine Ecology involves the understanding of all these aspects.

A. Depth Zones in Oceans:

The continental margin forms the part of the sea bed that borders all the land frontiers. It consists of three zones as Continental shelf, continental slope and Deep Ocean basins. The continental shelf extends from the coast to a depth of 130 m. The width averages to about 75 kilometers. This shelf zone collects much of the sediments(deposits of sand and mud) that are carried by the rivers from land. The continental slope begins at the outer edge of the shelf. The slope is much steeper than the shelf and plunges to great depths of 3.6 kilometers. The width ranges from 20 to 100 kilometers. Submarine canyons extend into these slopes. The canyon heads may form some deep-sea fans and levees. The area between continental slope and deep ocean floor is known as continental rise. The deep ocean basin is called as the abyssal plain. Abyssal hills, gyots, sea mounts and deep-sea trenches are the physiographic features of the basin.

The deep ocean basins consist of deep-sea peaks, valleys, and plains which lie beyond the continental margin in the ocean basin. The mid-ocean ridges are the unique features of the ocean basins. Deep valleys also cut across the ridges in many places. Frequent volcanic activity is also expected in some valleys. The two chief sources of deep-sea sediment are the land itself and marine life. Marine life sediment consists mainly of tiny shells and the remains of dead organisms of the plankton. When such matter makes up a large part of sediment, they are called as oozes.

B. Salinity

Sea water contains much mineral salts to the extent of increasing its density. The oceans and seas put together contain about 5 x 10 16 tons of salts. One cubic foot of average sea water contains 2.2 pounds of salt. Salinity is generally reported in terms of ppt or parts per thousand (abbreviated o/oo), the number of pounds of salt per 1,000 pounds of water. It is affected by precipitation, evaporation and movement of water masses. It also varies from the surface zone to the deep ocean waters. Based on this factor, animals living in marine waters are classified into a) Stenohaline animals - restricted life with salinity b) Euryhaline animals – life that can be found at all levels of salinity. The marine communities are adapted to live in high saline waters. The osmotic properties of seawater are another problem of marine animals.

C. Temperature:

The Temperature fluctuation is minimum in oceanic waters. Arctic waters are colder. Tropical waters are warmer. The variation is seasonal and diurnal. Ocean animals show a varied response to the temperatures. There are two kinds of animals.

Stenothermal animals – the ones which live within 20°C 2. Eurythermal animals – the animals which can withstand the wide range of temperature variations. The cold-water forms also show an increase their in sizes. The surface temperature of the oceanic waters vary from about -2 °C near the North and South poles to about 30 °C near the equator. In the Polar Regions, the surface sea water freezes. The western tropical Pacific has the warmest surface water. Ocean currents affect the surface temperature.

D. Light and Photic Zones:

Light is very essential for the marine life. For photosynthesis, heating, radiations and vision are related to this factor. It determines the plant and animal life and depends on the angle of incidence. Perpendicular rays go deeper into the oceans.

E. Ocean Water Pressure

The difference in pressure (pgh) comes due to the thickness of water column(h), density of water (p) and the acceleration due to gravity (g). This has a great influence over the life and deposition, and solubility of $CaCO_3$ mechanisms. There are two classes: 1. Eurybathic -Animals live with great

vertical range (Eg. Natica) 2. Stenobathic -narrow range (Eg. Turris). Other factors: The other abiotic factors which have much impact on marine ecosystems are tides, currents and waves.

F. Marine Life

Marine life ranges in size from microscopic one-celled organisms to the blue whale, which may measure up to 30 meters long. Ocean plants and plantlike organisms use sunlight and the minerals in the water to grow. Sea animals eat these organisms and one another. Based on the variations in physical condition and the presence of certain specific kinds of animals and plants, the Marine environment is broadly classified into a) pelagic zone - open sea -entire sea water above ocean floor - encompasses a neritic zone and an oceanic zone. b) Benthic zone - ocean (bottom)- encompasses the littoral and deep-sea zones. All ocean life can be divided into three groups. These groups are: (1) the plankton, (2) the nekton, and (3) the benthos.

Description of Marine Ecology: The area of the port is located in a fjord estuary and the surrounding areas also could be crucial for the thriving of marine ecosystems directly and indirectly. Zooplankton is algal forms and juveniles of many shrimps, crabs and fishes and indicates the productivity and abundance in the area. Many important marine ecosystems such as intertidal ecosystems, estuaries, shallow water areas etc are present in the study site.

Scope of Work:

The assess the existing status of marine ecology in and around the project site and to prepare a suitable bio diversity monitoring and management plan for Visakhapatnam Port, the following attributes were studied by using the appropriate methods of marine/coastal sampling as per standard guidelines and understand the intertidal area through sample collection and analysis were carried out by Department of Environmental Sciences, Centre for Industrial and Scientific Consultancy (CISC), Andhra University, Visakhapatnam. Water analysis done to understand the pollution and effects in the area.

Primary Productivity

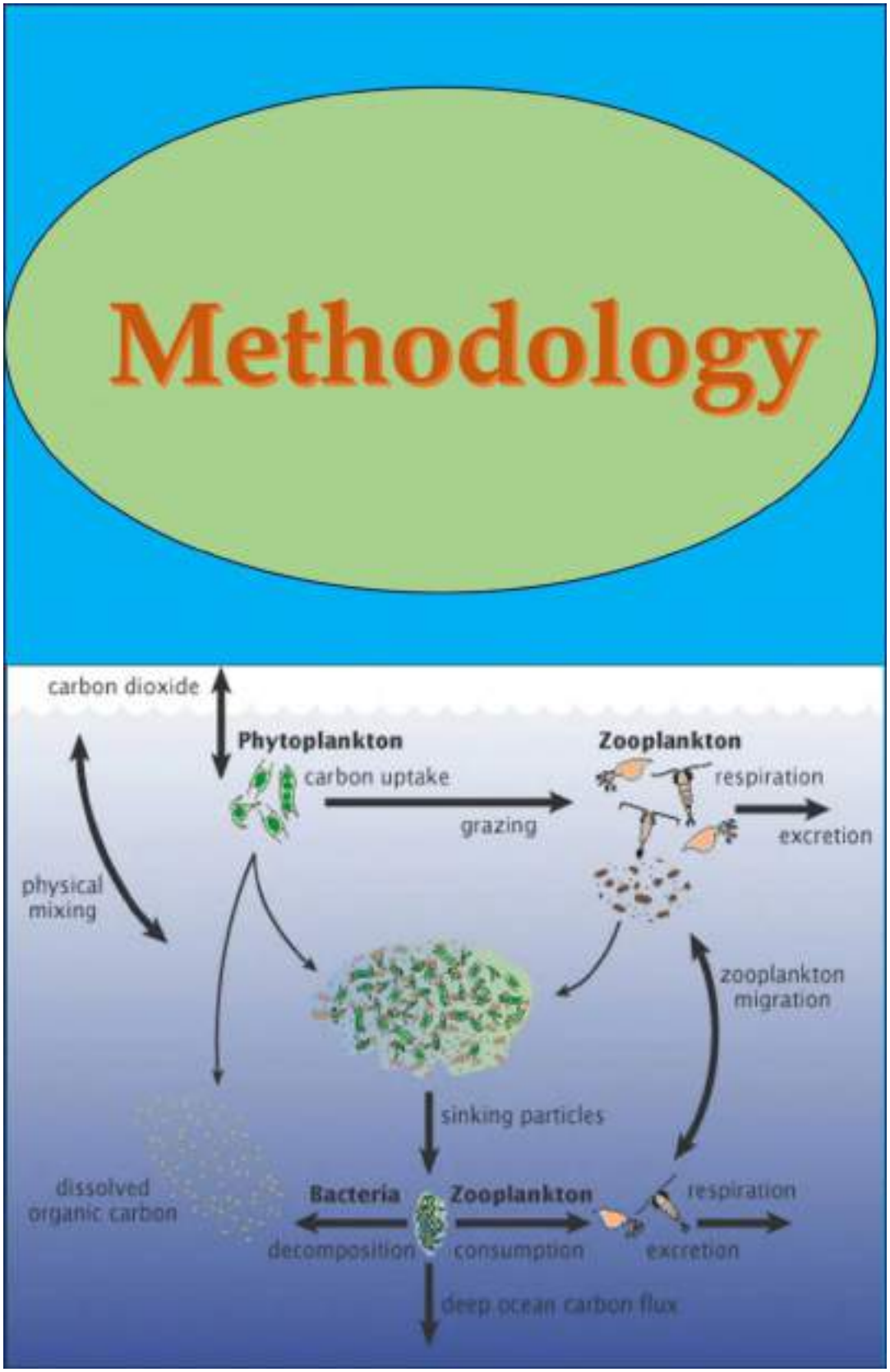
Phytoplankton

Zooplankton, Benthic fauna

Nekton, Beach ecology (Intertidal survey & costal survey)

Bio-accumulation of heavy metals

The project report was prepared and submitted for the Visakhapatnam Port Authority (VPA) for its project activities Viz, Strengthening, Deepening and Modification by the Department of Environmental Sciences, Centre for Industrial and Scientific Consultancy (CISC), Andhra University, Visakhapatnam.


Methodology
carbon dioxide
Phytoplankton
carbon uptake
grazing
Zooplankton
respiration
excretion
physical mixing
zooplankton migration
sinking particles
dissolved organic carbon
Bacteria
Zooplankton
respiration
decomposition
consumption
excretion
deep ocean carbon flux

Methodology

Centre for industrial and Scientific consultancy (CISC), Andhra University, Department of Environmental Sciences to undertaken a Marine Ecological Sensitivity Assessment study in and around for the harbour of Visakhapatnam Port Authority (Lat. 17041'40" N and Long. 83016'52" E) and coastal waters (~35m) as a part of their commitment to harbour expansion needs in that area. Taking into account the available expertise and the Department's acquaintance with Marine Biological Investigations of Visakhapatnam coastal waters, it was agreed that the study be held as per request from Department of Environmental Sciences, Andhra University. The scope of the Investigation related to monitoring physico-chemical variables and marine biology at 7 pre-determined locations (4 in the main Harbour; 1 Fishing harbour and 2 Sea) representing conditions in the inner harbour (stations 1-4), fishing harbour (st.5) and two locations (sts. 6 & 7) in the open sea as reference points being away from the Harbour (Fig.1).

It was also agreed that water quality and sediment characteristics be studied (as one time observation). For evaluation of water quality, the proposed variables included sea temperature, pH, dissolved oxygen, salinity, turbidity (in place of suspended particulate matter), nitrogen as ammonia, nitrite and nitrate, reactive silicate and phosphate. In addition, total nitrogen and phosphorus were also proposed to differentiate between inorganic and organic fractions. Sediment parameters consisted of organic carbon and its texture.

Marine Biological investigations included taxonomic enumeration (including species diversity) and quantification of phytoplankton, zooplankton and benthos at the above 7 locations. It was decided to lay emphasis on seabed life (macrobenthos) since they are the most vulnerable to any environmental disturbance. It was also proposed to estimate phytoplankton chlorophyll at all locations and primary productivity limited to two/three sites in the harbour and close to the coast. Experimental trawling was also proposed (~35m) to find out the fishery component of this area.

Study Area:

Visakhapatnam port is located in the ford estuary of the Meghadri River and is one of the significant ports of Andhra Pradesh. The location of the port is very ideal in the sense that it affords protection from cyclones which strike the east coast regularly, by a high promontory into the sea, known as Dolphin's Nose Hill which is to the north of the entrance channel. The low tidal range of a maximum of 1.82 meters is also advantageous for the location of the port.

Till the end of the 19th century, major commercial activity in Visakhapatnam was centred on the deep-water port with ships anchored off the sheltered coast. Post world war-I, the Bengal-Nagpur Railways constructed the Inner Harbor and the actual development of Visakhapatnam took place during 1927-33 that resulted in Vizag gaining importance as a hub of maritime/industrial activity.

The estuarine area serves as both a commercial and defence area and is very important for the development of the state and defence. Out of 13 major ports Visakhapatnam Port is one among situated on East coast of India. The first South East Asian port which got ISO certifications for Quality (ISO, 9001), Environment (ISO, 14001) and Safety (OHSAS, 18001). The Port is existing from 1933 till date taking an amazing role in building the nation duly serving industrial, commercial and Agricultural Sectors.

One more multi commodity berth EQ.4 was added to it in 1955. To meet the requirement of Oil Companies facilitating the discharge of crude and petroleum products two berths OR.1 & OR.2 were developed in the year 1957. Subsequently 4 more berths were added in the Inner Harbor between years 1965 to 1968. During the year 1976 Outer Harbor has been developed. The outer harbor is having Ore Berth (OB-I & OB-II), General cargo berth (GCB), LPG berth, OSTT, Container terminal and dredger berth.

The Visakhapatnam port is presently handling coal at west quay of Inner harbour. However, due to depth constraints in the inner harbour the larger size vessels of coal are lightened/handled at outer harbour due to availability of deeper dredge depths in the outer harbour.

The coal at GCB is unloaded from the ships on the wharf using floating cranes and the unloaded cargo is loaded in to the trucks using loaders and stacked in the back up area of the berth and at East Yard until it is lifted to the concerned parties. Handling of COAL at GCB by conventional method and

transportation through trucks from the berth to the stack yard are observed to be the main sources of Air pollution. Therefore, to minimize the dust, coal handling is totally mechanized and is being operated by Vedanta on PPP (Public –Private Partnership) mode.

Iron ore is handled at ore berth in outer harbour. The ore received from wagons is unloaded at ore handling plant and stacked. The handling of ore is done through fully mechanized facility. The conveyor passing through city and having interface was covered. However small quantity of iron ore fines is handled at west quay of inner harbour.

Fertilizer is handled at east quay of inner harbour, which is away from the city. The Visakhapatnam port trust in the earlier years of inception used to handle very less cargo and habitations were very much scattered with less population. Subsequently, due to the establishment of major industries in Visakhapatnam and its surroundings public habitation around Port increased abnormally while the port activities had increased steadily over a period of time.

The Port of Visakhapatnam, right from its inception, handles maximum cargo compared to other major ports for the past 7 years and thus is classified as a premier Port of India has been handling dry bulk cargo and the share of dusty cargo is about 50% of the total cargo. More or less the same level is being maintained for the past two decades. Handling of dusty cargo is neither unique to port of Visakhapatnam nor to other Indian seaports. It is a global practice

that has existed for over few decades. Sea Ports that act as gate ways to sea borne domestic and international trade are required to handle variety of cargoes required by the industries and Port of Visakhapatnam handling large volumes of coal, iron ore, fertilizer is no exception. With volumes of cargo going up the dust levels have also increased correspondingly and VPA is making all efforts to mitigate the same by taking certain environment protection measures such as dust suppression systems by water sprinkling.

Therefore, VPT committed to convert the present semi mechanized system into a fully mechanized system within built dust suppression system to minimize the emission of dust into the surrounding environment as it was found out through a scientific study carried out by an independent agency that the factors influencing the generation of dust pollution are mainly due to non-mechanized method of handling of dry bulk cargo such as coal, iron ore, fertilizer etc contributing for dust emissions during loading/unloading and transportation through trucks. Hence, loading and unloading of domestic, agricultural and commercial goods may cause ecological and water quality degradation of surrounding area of marine water. The following report encompasses the biodiversity and water quality parameters of the area to assess how the environment is at the time of the data collection.

Sampling Locations earmarked on Map

The proposed project site is located on the shore of Bay of Bengal,

Visakhapatnam, Andhra Pradesh. The project location image captured from Google earth of the Visakhapatnam Port Authority is shown inFigure 1.

Table. 1: The Sub-tidal (offshore) locations with co-ordinates.

S. No.	Sampling Locations	Longitude Latitude
1	Inner Harbour between East Quay& West Quay	17^0 42′ 03.2″ N 83^0 16' 54.5" E
2	Turning Circle, Inner Harbour	17^0 41' 34.4" N $83^0$16' 52.3" E
3	Turning Circle, Outer Harbour	17^0 41'10.6" N $83^0$18' 10.3" E
4	—0.3km Off Ramakrishna Beach (North of Port)	17^0 42' 53.9" N $83^0$19' 52.7" E
5	—3.0 km off Ramakrishna Beach (North of Port)	17°42' 08. 6" N 83°20' 14.4" E
6	—0.3 km Off Yarada Beach (South of Port)	17°39' 33.4" N 83°17' 02.9" E
7	—3.0 km Off Yarada Beach (South of Port)	17°38' 50.6' N 83^0 I4 44.1"E

Table 2: Beach Ecology Transect locations with co-ordinates

Transect no.	Location		Longitude Latitude
i	R.K. Beach (Near Submarine Museum) I		N17°43.048' E83°19.822'
ii	Yerada Beach		N17°39.078' E83°15.812'
Coastal Survey			
A	Start	5-6 km southwest of the port	N 17'38'57.67" E 83°15'38.44"
	End		N 17°39'15,37" E 83°16'6.84"
B	Start	5-6 km northeast of the port	N 17°43'7.76" E 83°20'2.75"
	End		N 17°42'5331" E 83°19'31.94"

Fig. 1: The Google image depicting the present study area

Fig. 2: The Google image showing the sampling locations of the present study

Date of sampling: June, 15th to 30th 2024

Method of sampling:

Phytoplankton and zooplankton sampling:

Plankton nets of mesh sizes 100µm and 25 µm are used for sampling of zooplankton and phytoplankton respectively. The nets are suspended horizontally to a vessel to collect the sample. The speed of the vessel and the diameter of the net opening are taken into consideration to know how much water is filtered for the sampling of the given number of plankton. 3 iterations are taken in each field site to have a mean value of the samples.

Phytoplankton:

Samples were collected from the surface water by using Towing a plankton net (mouth diameter 0.35mm) made of bolting silk (30 mesh size 48µm) for half an hour. These samples were preserved in 5% neutralized formalin and used for quantitative analysis in the method of Sukhanovo (1978). Numerical plankton analysis was carried out using Utermohl's invented plankton microscope.

Identified by using Hustedt (1930-1966), Venkararaman (1939), Cupp (1943), Subramanian (1946), Prescott (1954), Desikachary (1959 & 1987), Hendey (1964), Steidinger and Williams (1970), Taylor (1976) and Anandet al (1986).

Chlorophyll-a:

Samples filtered through Whatman GF/C filter papers and Chlorophyll was extracted into 90% acetone. The resulting-colored acetone was measured in Spectrophotometer at deferent wavelengths and the same acetone extracts were acidified and measured for the phaeo-pigments as per APHA manual (1989).

Zooplankton:

Samples were collected from the surface water by horizontal towing of plankton net with mouth diameter of 0.35m made of bolting silk (70 mesh size 200µm) for half an hour. After collection, the samples were preserved in 5% neutralized formalin and used for quantitative analysis.

Identified by Dakin and Colefax (1940), Davis (1955), Kasthurirangan (1963), Wickstead (1965) Damodara Naidu (1981). For quantitative analysis of Zooplankton, known quantity of water (100 ltr) was filtered through a bag net (0.33 mm mesh size) and filtrate was made upto 1 ltr in a wide mouthed bottle and then enumerated using Utermohl's invented plankton microscope. The density is expressed as number of organisms/m^3.

Fig. 3: sampling Collection of sediment and Zooplankton

Benthic sampling:

A benthic grab is used to collect sediment of the ocean floor and associated organisms at all the given sites. 3 iterations are used in

each site to collect both macro and micro-benthos of the area.

Samples were collected using a Van veen grab which covered an area of 0.1m^2. The wet sediment was sieved with varying mesh sizes for segregating the organisms. The organisms retained in the sieved were fixed in 5-7% formalin and stained further with Rose Bengal solution for easy spotting at the time of sorting. After a day or two, the organisms were sorted into various groups. The number of organisms in each grab sample was expressed as number per meter square. According to size, benthic animals are divided into three groups.

(i) Macrobenthos, (ii) Meiobenthos , (iii) Microbenthos (Mare, 1942)

Identified by: Fauvel (1953), Day (1967) referred for Polychaetes, Branes (1980), Lyla et al., (1999) for Crustaceans, Subba Rao et.al (1991), Ramakrishna (2003) for Molluscs.

Fig. 4: Phytoplankton and Benthos Sampling

Nekton sampling: Nektonic organisms' data is collected through catch data from the nearest landing center.

Beach ecology: A team has gone into intertidal areas of the given areas during low tide and did a species identification and count in 20*20 quadrants in both sandy and rocky intertidal areas. Photos are taken of the organisms for identification.

Methodology for Preservation:

- The plankton are preserved in 20 per cent ethyl alcohol and saltwater.
- The other organisms are photographed immediately and notpreserved
- Methodology for Sampling and Analysis:

Methodology of Analysis:

Zooplankton and Phytoplankton Analysis:

1. **Microscopic examination**: Place the prepared slide under a compound microscope and examine it at low magnification (e.g.,10x or 20x) to locate and identify zooplankton organisms. Use identification keys or taxonomic guides specific to the region andtarget organisms to assist with identification.
2. **Counting and quantification**: Randomly select several fields of

view and switch to a higher magnification (e.g., 40x or 100x) for accurate counting and quantification. Count the number of individuals of each identified species within the chosen fields of view. If necessary, repeat the process for multiple subsamples toobtain statistically significant results.

3. **Data analysis**: Calculate the abundance and diversity indices based on the counted individuals. Common metrics include total abundance, species richness, Shannon-Weaver diversity index, and evenness. Use appropriate statistical methods to analyze and interpret the data.
4. **Data recording:** Record all relevant data, including sampling location, date, sampling depth, preservative used, and identification information for each zooplankton species. Maintain a standardized data sheet or database to ensure consistency and facilitate future comparisons or analyses.

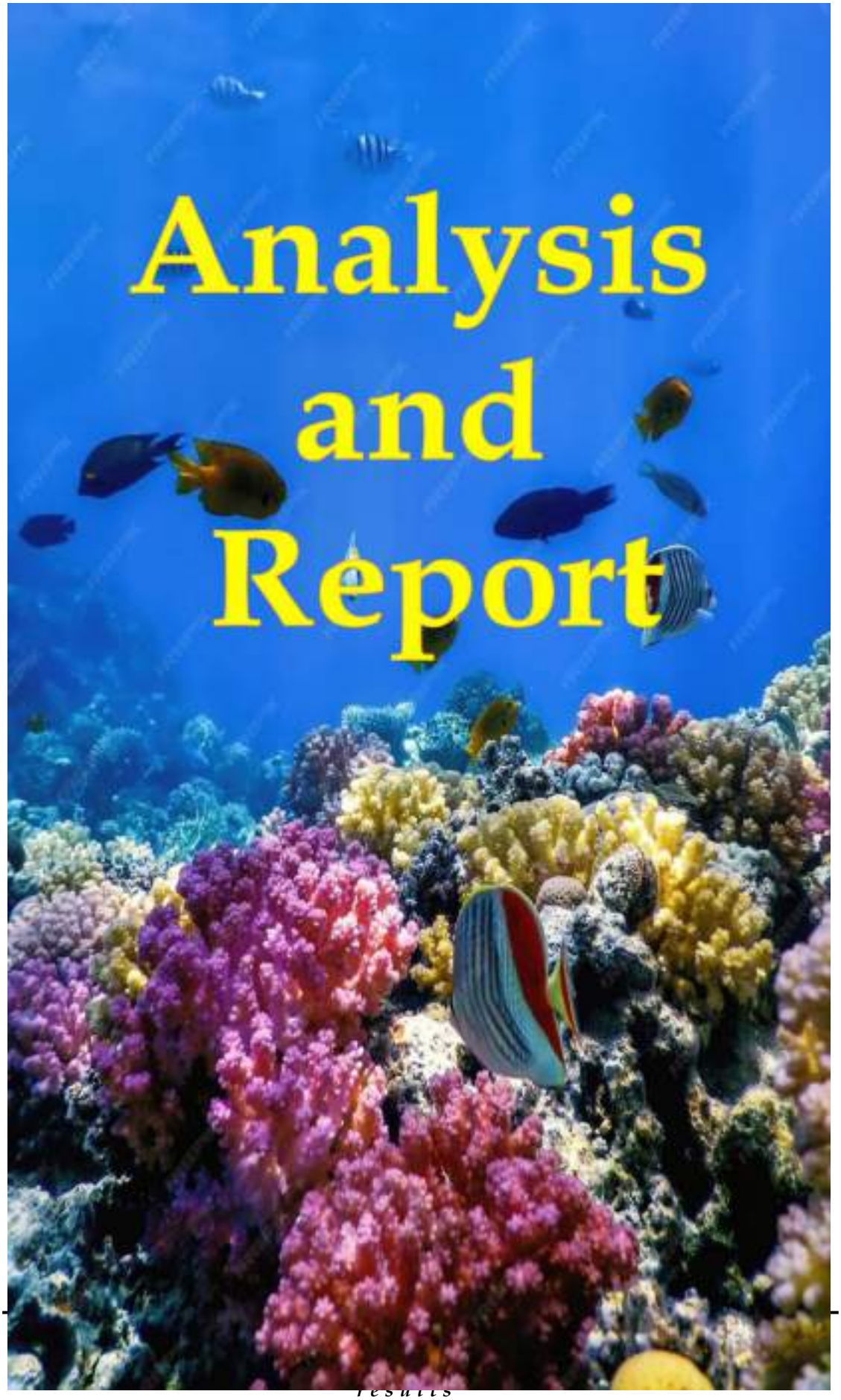
b. Benthic sampling analysis: Benthos are sieved and the organisms areidentified.

c. Nekton analysis: The samples are photographed and identified. The species and abundance count are taken into consideration.

Table. 3: Marine Ecological Studies of Visakhapatnam Port and its sampling methods & analysis of marine ecological sensitive studies

Parameter	Method	Instrument	Reference
Depth (m)	-	Sonar	-
S. D. Transp (m)	-	Secchi-disc	-
Sea Water Temp. (^{0}C)	Temp. Probe	Quanta Hydro Lab with appropriate sensors	-
Turbidity (NTU)	Turbidity Meter	Quanta Hydro Lab with appropriate sensors	-
Salinity (PSU)	Argentometric Method (Precipitation titration with $AgNO_3$)	Quanta Hydro Lab with appropriate sensors + Analytical estimation	Std. method for examination of water and waste water APHA 1989 – 17th Edition – 4500-CI-B, Page 4-68
pH	Electrometric	Quanta Hydro Lab with appropriate sensors	-
DO (mg/L^{-1})	Winklers (Titration with Hypo)	Quanta Hydro Lab with appropriate sensors	APHA 1989 – 17th Edition – 4500-CI-B, 4-152
Ammonia (N) (µmol.L^{-1})	Spectrophotometer	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
NO_2 – N (µmol.L^{-1})	Spectrophotometer (Azo-dye formation)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
NO_3– N (µmol.L^{-1})	Spectrophotometer (UV method)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
Phosphates-P (µmol.L^{-1})	Spectrophotometer (UV method)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
Silicate (µmol.L^{-1})	Spectrophotometer (UV method)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
Total Nitrogen (µmol.L^{-1})	Spectrophotometer (UV method)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
T. Phosphorous (µmol.L^{-1})	Spectrophotometer (UV method)	BRIAC-UV Spectrophotometer	Grasshoff et.al, 1999
Primary Productivity (MgC/m^3/hr)	Dark and light bottle	Estimating DO	Gaarder, T and Gran, H.H. (1927) Subba Rao, D.V. (2002)
Sediment Grain Size	Wet Sieving and pipette analysis	Gravimetric and particle size analysis	Krumbein W.C. and Pettijohn F.J. (1938)

Sand (%) Silt (%) Clay (%)		through conventional sieving	and Holme NA, Mclntyre AD (Eds. 1984)
Sediment Organic Matter (%)	Wet Oxidation	Initial digestion using a strong Oxidant followed by Fe Titration.	Walkley Black, later as modified Gaudette et.al.1974
Phytoplankton (nos. ml^{-1})	As numbers per ml using sedgwick counting chamber	Initial sedimentation of 1l volume of sample with Lugol's Iodine	UNESCO 1978
Zooplankton (no.s m^{-3})	Bongo net (twin sampler) Hydrobios Counting cell for enumeration	Digital flow meter used for volume of water filtered Stereozoom microscope for counting	UNESCO 1968, ICES 2000
Macrobenthos (no.s $haul^{-1}$)	Dredge and Grab Sampling	Initial sieving through 0.5mm mesh size, counter under magnification	Analysis according to Holme and Mclntyre (1984) Eleftheriou & Mclntyre 2005


Analysis
and
Report

ANALYSIS AND REPORT:

Hydrological Conditions:

Primary Productivity:

Most marine primary production is generated by a diverse collection of marine microorganisms called algae and cyanobacteria. Together these form the principal primary producers at the base of the ocean food chain and produce half of the world's oxygen. In the present work, marine water samples were from 7 different locations and transferred to 300ml Dissolved Oxygen (DO) bottles (one light and one dark bottle). The experiment was performed using dark and light bottle method. One bottle was fixed with Winkler reagent for initial oxygen. The other light bottle and dark bottle were kept in a bucket containing same water sample for 24 hours.

After 24 hours, both samples were fixed with Winkler A and B and the DO were analyzed. The increase in dissolved oxygen of water as a result of photosynthesis was measured in light bottle; simultaneously decrease in oxygen of dark bottle was measured to estimate the respiration in the same sample.

Water quality:

Water quality characteristics consisted of conventional variables (namely Depth, Secchi disc, Water Temperature, Conductivity, Turbidity, Total Suspended Matter, pH, Salinity, Dissolved Oxygen, Dissolved Oxygen

Saturation, Nitrite, Nitrate, Ammonia, Dissolved Inorganic Nitrogen, Phosphate, Silicate, Total Nitrogen, Total Phosphorous, Dissolved Organic Nitrogen, Dissolved Organic Phosphate) intended for Environment Impact Assessment. Both surface and bottom samples were collected in two phases during June 2024 for the above physicochemical characteristics. Altogether Seven GPS prefixed sampling locations were visited for monitoring the study area (Fig.3). The following tabulation shows minimum, maximum and, mean values and (SE±) in respect of overall water quality off Visakhapatnam Port and two locations in the open sea. Table. 2 shows water quality data at the selected locations.

Table. 4: Water quality characteristics at the selected location of Visakhapatnam Port, June 2024.

S. No.	Sample -1	Sample - 2	Sample - 3	Sample - 4	Sample - 5	Sample - 6	Sample - 7
Temp	33	33	33	31	29	31	29
Depth	12.7	20.2	16.7	25.2	4.9	33.6	40.3
Secchi Disc (m)	1.4	1.7	1.2	2.2	0.5	3.1	2.6
Conductivity (ms.cm-1)	53.7	54.9	54.7	57.3	55.9	56.2	56.6
Turbidity (NTU)	9.4	9.9	10.7	5.5	6.6	3.3	5.8
TSM	74	97	89	80	28	17	24
pH	8.14	7.63	7.96	8.19	8.36	8.36	8.37
NO_2	7.3	7.5	3.5	1.4	3.1	0.5	0.0

NO_3	13.4	9.7	11.4	8.1	10.3	2.5	5.8
NH_3	20.6	21.4	20.5	6.9	13.1	3.9	3.6
DIN	39.7	37.4	34.1	15.5	25.4	6.6	8.8
PO4	13.8	17.0	24.0	8.4	2.6	0.1	0.4
SiO4	166.9	170.2	177.4	80.6	39.1	29.8	90.2
DO	6.64	4.93	4.29	4.71	1.93	5.36	5.36
Salinity	33.89	34.70	34.57	36.45	35.77	35.77	35.91
TN	173.8	210.5	325.9	78.7	127.5	57.0	46.4
TP	13.9	17.1	24.6	8.7	2.8	0.2	0.4
DON	134.1	173.2	291.8	63.2	102.1	50.3	37.6
DOP	1.20	1.42	2.46	0.88	0.24	0.10	0.38

(**Note:** All parameter values expressed in mg/l except pH, depth, secchi-disc, temperature, conductivity and turbidity.)

In the present study, depth ranged from 4.9m to 40.3m and secchi-disc transparency 0.5m to 3.1m. Average seawater temperature was high (~29.5 0C) which reflects hot weather conditions. Salinity was high (35.91); dissolved oxygen was ranges from 1.93 to 6.64 mg/l, however very low DO levels (1.93mg/l) were observed sampling location - 5 in the surface waters which may be due to polluted conditions found in the inner harbour. Turbidity ranged from 3.3 NTU to 10.7 NTU; pH alkaline (≤8), TSM loads high (97mg/l), high total nitrogen (325.9mg/l), high phosphate (24.6mg/l), silicate (177.4mg/l), which together indicated impacting conditions from industrial wastage and domestic sewage.

Sediment Characteristics

In marine benthic ecology, sediment grain size or granulometry is considered an important variable that determines the composition and

characterization of benthos. The nature of biological community living in sediment is always related to sediment type (Gray, 1974). Sediment type could be defined in a number of different ways, one of which is the sediment particle size distribution. In marine benthic monitoring studies, biological communities are routinely compared to sediment particle size distribution.

Gray (1974) reported that diversity within shelf habitats is lowest in mud, higher in sand and highest in mixed mud and sands-sediment with a median particle diameter of about 200 µm. Any correlation between the benthic organisms and sediment nature (texture, structure and organic content) should therefore be taken as the key to benthic ecology. The nature of sediment is determined by the complex interaction of a large number of factors such as the source and supply of sedimentary material, its transportation, deposition and post-depositional changes, if any, of mainly biogenic origin (e.g. bio-deposition and bio-turbation) etc. In conjunction with more extensive benthic surveys, sufficient information can be derived from a measurement of the combined sand, silt and clay levels as well organic content of the sediment.

During the present study, detailed analysis of sand, silt, clay and organic carbon was carried out for 6 locations as per the requirement (st.M4 could not be sampled for technical reasons). Table 4 contains data on the sediment texture and %organic content in respect of these locations. The following tabulation shows summarized information (range, mean and SE) on sediment nature and organic content.

Table. 5: Summary of Sediment nature and characteristics

S. No.	Characteristics	Min	Max	Mean	SE
1	Silt (%)	25.21	86.21	57.36	10.18
2	Sand (%)	13.65	74.64	42.47	10.18
3	Clay (%)	0.10	0.33	0.16	0.03
4	Sediment organic carbon (%)	1.01	9.72	5.21	1.47

From the data presented above, organic carbon is high (mean 5.21%). Sand ranged from 13.65% (st. M3) to 74.64% (st. M6), Silt ranged from 25.21% (st. M6) to 86.21% (st. M3) and average clay was very low (mean 0.16 %). In sts. M3 and M5 very high organic carbon content was observed and also mud (Silt + Clay) is highest at the same locations. It is generally established that soft sediments contain more organic carbon than those with coarse particles. The predominant reason for the relatively high mud levels could be related to submarine drilling activity during the last few years at station M3 and fishing harbour effect at station M5.

Heavy metals:

In the present study, the gastropod sample was collected for Heavy metals analysis. The shows that the presence of heavy metal concentration is below detectable level and copper and other metals are absent in observed gastropod sample.

ZOOPLANKTON

Zooplankton numerical abundance (Ind./10m3), and diversity at the harbor and sea locations off Visakhapatnam was studied according to standard procedures before the onset of active monsoon. Altogether seven zooplankton samples were collected representing the seven stations. As mentioned before, the sampling locations and reference sites were selected in such a manner they adequately represented the ecological conditions in and around the Visakhapatnam harbour.

Zooplankton were identified to the group level since they were poorly poor represented inside the harbour. As a matter of fact, there were hardly any active zooplankton at the stations examined inside the harbour evidently due to poor seawater quality. The forms were identified with the help of a binocular stereomicroscope following standard taxonomic references (e.g., Nishida, 1985, ICES identification leaflets for plankton, 1939-2001; Kasturirangan, 1963 and Newell and Newell, 1977). All abundance data were converted to density (ind./10m3) using the volume of water filtered by the net.

Zooplankton count and species in the area:

Zooplankton was collected during pre-monsoon area and showed biomass between 38 and 43 ml/100 m3 in the study areas. The Total population per each sample ranged from 288912 to 392047. The biomass and population have been observed to be minimal in the inner harbour and highest in the Outer

harbour area. Copepods and Decapods are dominant in RK Beach and Yarada areas. While in average, Tintinnids, Copepods and decapods are Dominant groups in all areas. The dominant groups in Inner Harbour are bivalves.

Table. 6: Numerical abundance of zooplankton (ind./10m3).

Taxa	Sampling Locations							Total	%
	1	2	3	4	5	6	7		
Copepod	373	84	169	89	2757	13989	1894	19355	87.9
Bivalve Veliger	8	314	0	46	317	51	209	945	4.3
Mysis sp.	0	0	0	0	17	0	61	78	0.4
Cyclopoida	20	15	2	8	12	0	8	65	0.3
Lucifer sp.	0	5	0	0	31	27	218	281	1.3
Spirotricha	0	5	8	0	10	12	4	39	0.2
Saggita sp.	0	0	6	0	31	810	12	859	3.9
Protozoea	0	0	0	0	31	0	12	43	0.2
Zoea	0	0	0	0	17	0	21	38	0.2
Gastropod Veliger	0	0	0	0	0	15	12	27	0.1
Polychaete larva	0	0	0	0	0	15	40	55	0.2
Cladocera sp.	0	0	0	0	0	0	21	21	0.1
Megalopa	0	0	0	0	0	0	12	12	0.1
Nauplius	0	0	0	0	0	0	61	61	0.3
Amphipod	0	5	0	0	0	0	31	36	0.2
Foraminifera	2	0	4	6	1	11	10	34	0.2
Fish eggs	0	0	68	0	0	0	0	68	0.3
Others	0	0	0	0	4	0	10	14	0.1
	403	428	257	149	3228	14930	2636	22031	100.0

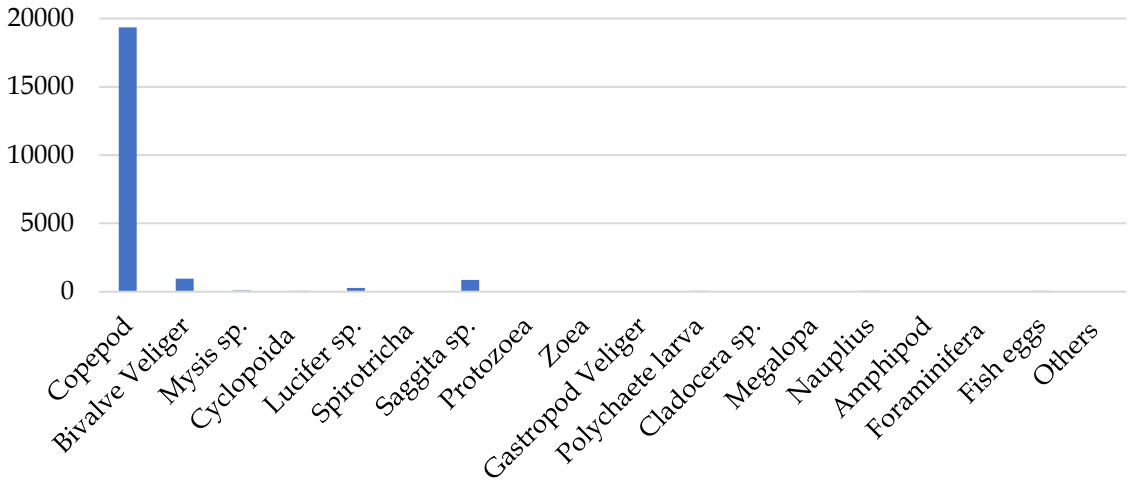


Fig. 5: Numerical Abundance of Zooplankton

Composition

During this study, copepods constituted the bulk (87.9%) of the population followed by the arrow work *Sagitta* (3.9%), larval forms (4.5%) and contribution by other groups (7.6%) (F). Table 8 shows numerical abundance of zooplankton at the selected stations. Based on the data, it is found that the order of maximum abundance of zooplankton relates to copepods (max 13969 ind./10m3) at st.6 in the open sea.

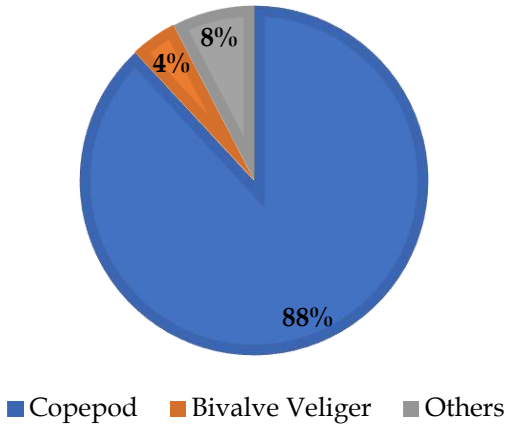


Fig. 6: Composition of Zooplankton

Minimum numbers (84-89 ind./10m3) within the polluted habitat in the harbour. Among the larval plankton, bivalve veligers outnumbered all others. It is noteworthy that there were most abundant (314 ind./10m3) at st.2 located in the north channel affected by sewage pollution.

Phytoplankton:

In the present study carried out during pre-monsoon and the observations on phytoplankton consisted of species composition and their numerical abundance at 7 selected locations. Surface samples consisted of net hauls (30µm mesh size) towed alongside boat (2-3knots) for about 5-10 minutes. All net hauls were fixed in buffered 5% formaldehyde and stored until analysis in the Laboratory. For taxonomic identification, a research microscope (Leica, DMLS) with x400 was utilized. All taxonomic identifications were carried out according to Subrahmanyam (1946), Santhanam et al. (1987) and Tomas (1997).

Phytoplankton biomass was observed between 60 and 80 ml/100 m3 in the study areas. The Total population per sample ranged from 10220983 to 15905782. The biomass and population have been observed to be minimal in the RK beach offshore area and highest in the Outer harbour area. The dominant groups, in general, are *T. pseudonana*, *Skeletonema, Thalassiosera, Asterionellopsis, Rgizocelenia and Asteromphalus* genii.

Table. 7: Numerical abundance of Phytoplankton (ind./10m3).

Name of the Species	Sampling locations							Total	%
	1	2	3	4	5	6	7		
T. pseudonana	356	152	165	0	0	0	0	673	24.9
Skeletonema costatum	13	20	10	36	347	30	10	466	17.2
T. coromandeliana	0	0	0	50	267	13	0	330	12.2
Protoperidinium granii	0	205	23	7	43	0	0	278	10.3
Thalassiosira subtilis	10	66	46	27	112	0	0	261	9.6
P. seriata	0	13	10	17	13	17	20	90	3.3
R. stolterfothii	0	0	3	7	40	13	10	73	2.7
Chaetoceros lorenzianus	0	0	0	10	7	13	20	50	1.8
Rhizosolenia setigera	3	7	7	0	10	13	7	47	1.7

Nitzschia sp.	0	7	0	13	26	0	0	46	1.7
Chaetoceros sp.	7	3	7	7	7	3	7	41	1.5
Navicula sp.	10	0	13	0	0	10	0	33	1.2
L.minimus	0	0	0	7	30	0	0	37	1.4
Nitzschia longissima	0	3	7	0	20	0	0	30	1.1
R. robusta	0	13	0	3	10	0	0	26	1.0
Gloeocapsa sp.	23	0	0	0	0	0	0	23	0.9
Monas socialis	13	0	10	0	0	0	0	23	0.9
Diplopsalis sp.	0	0	0	0	20	0	0	20	0.7
Oscillatoria princeps	3	7	10	0	0	0	0	20	0.7
Bacteriastrum hyalinum	0	0	0	0	0	10	7	17	0.6
R.styliformis	0	0	0	7	3	0	0	10	0.4
Lauderia annulata	0	0	10	0	0	0	0	10	0.4
Cylindrotheca closterium	0	0	0	0	10	0	0	10	0.4
P. angulatum	0	0	0	0	3	7	0	10	0.4
Cymbella sp.	10	0	0	0	0	0	0	10	0.4
Microcystis pulverea	10	0	0	0	0	0	0	10	0.4
Trichodesmium sp.	0	0	0	0	0	3	7	10	0.4
Hemiaulus sinensis	0	0	0	0	0	0	7	7	0.3
O.limosa	0	0	0	0	0	7	0	7	0.3
Melosira sp.	7	0	0	0	0	0	0	7	0.3
Amphiprora alata	3	3	0	0	0	0	0	6	0.2
O. sinensis	3	3	0	0	0	0	0	6	0.2
Cosmarium sp.	3	0	3	0	0	0	0	6	0.2
C. jonesianus	0	0	0	0	3	0	0	3	0.1
Lithodesmium undulatum	0	0	0	0	0	0	3	3	0.1
Eucampia cornuata	0	0	0	0	0	3	0	3	0.1
Thalassiothrix frauenfeldii	0	0	0	0	3	0	0	3	0.1
Total	**474**	**502**	**324**	**191**	**974**	**142**	**98**	**2705**	100.0

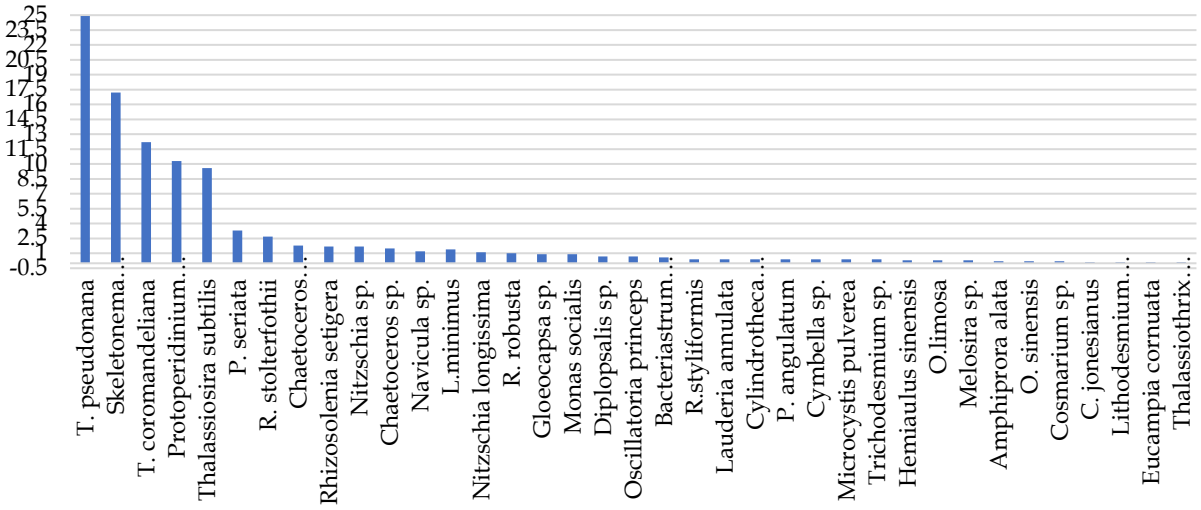
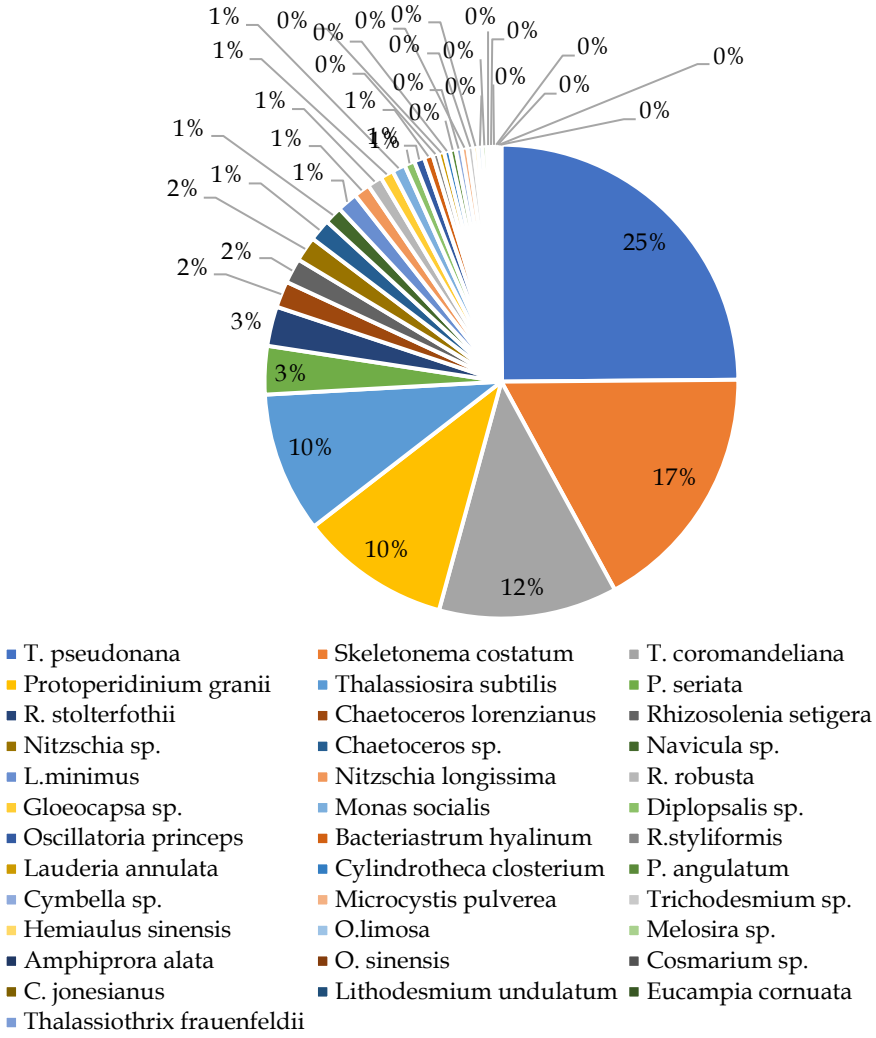


Fig. 7: Numerical Abundance of Phytoplankton

Fig. 8: Composition of phytoplankton



Select Species of Phytoplankton (Diatoms)

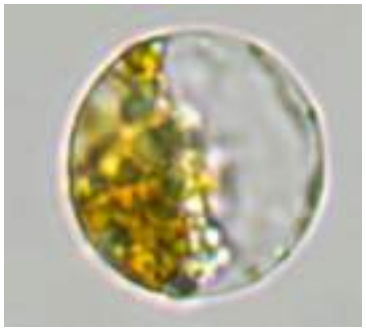


Fig. 9: *T. pseudonana*

Fig. 10: Skeletonema costatum

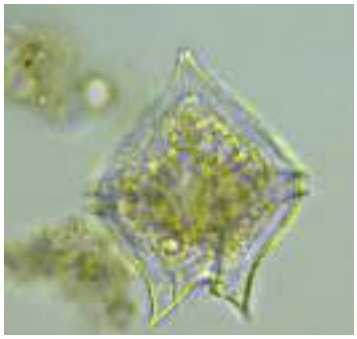


Fig.11: Protoperidinium granii

Fig. 12: Thalassiosira subtilis

Fig. 13: Chaetoceros lorenzianus

Fig. 14: Rhizosolenia setigera

Fig. 15: *Navicula* sp.

Fig. 16: *Gloeocapsa* sp.

Fig.17: Diplopsalis sp.

Fig. 18: *Oscillatoria princeps*

Fig. 19: Bacteriastrum hyalinum

Fig. 20: *Lauderia annulata*

Fig. 21: Cylindrotheca closterium

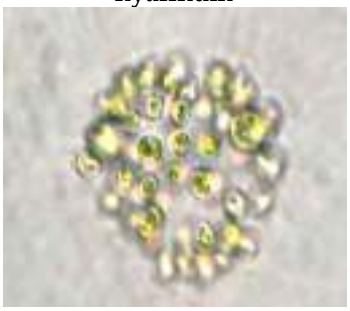


Fig. 22: Microcystis pulverea

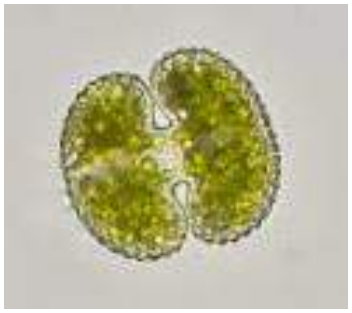


Fig. 23: Cosmarium sp.

Benthic sampling:

Collected Benthic samples showed varied dominant groups between Inner Harbour area and other areas. The Species count in general varied from 4 to 17. The Dominant groups in general are Tanaids, Neptys, Amphipods, and Cossurids.

Table. 8: List of species and dominant groups in the present study

Location	Number	Species count	Dominant groups
Outer harbour	1,245	17	Tanaids, Amphipods, Nephtys dibranchis Cossurids
Inner harbour	688	12	Cirratulus, Nephtys, Cossurids, Tanids
Between East quay and West quay	86	4	Cirratulus, Nephtys Cossurids, Tanids
RK beach - offshore	200	5	Tanaids, Amphipods, Nephtys dibranchis Cossurids
RK beach nearshore	345	10	Tanaids, Amphipods, Nephtys dibranchis Cossurids
Yarada offshore	260	7	Tanaids, Amphipods, Nephtys dibranchis Cossurids
Yarada nearshore	445	9	Tanaids, Amphipods, Nephtys dibranchis Cossurids

Nekton sampling:

The Nekton samples are from local catch and also from research trawl nets. The most common species seen are jellyfish, Sargent fishes, gobies, mullets and fewer numbers of elasmobranchs are also seen.

Table. 9: Species count and dominant groups in the study

Location	Number per hawl	Species count	Dominant groups
Outer harbour	180	4	Nemepteridae, Abudefduf, Mugilidae
Inner harbour	80	4	Mugilidae, Abudefduf, Gobidae Scyphozoa
Between East quay and West quay	76	3	Gobidae Scyphozoa Mugilidae
RK beach offshore	348	17	Rastrelliger kanagurta, Nemepteridae, Scyphozoa
RK beach nearshore	345	22	Abudefduf sp, Nemepteridae, Scyphozoa
Yarada offshore	420	23	Scyphozoa, Rastrelliger kanagurta, Nemepteridae,
Yarada nearshore	322	16	Rastrelliger kanagurta, Nemepteridae, Scyphozoa

Heavy metals:

In the present study, the gastropod sample was collected for Heavy metals analysis. The shows that the presence of heavy metal concentration is below detectable level and copper and other metals are absent in observed gastropod sample.

Beach Ecology:

Intertidal Biodiversity survey:

Intertidal Biodiversity survey was conducted in Yarada and RK Beach sandy shores and rocky shores. The following are the results of the same. The areas showed the abundance of diversity in both sandy and rocky shores.

Flora;

In flora, 4 trees, 2 shrubs, 10 herbs and 1 alga were observed during the study. Out of the 17 species observed, family Arecaceae was the most dominant family. *1pomeabiloba, Spinifex littoreus and Boerhavia diffusa* are the only three species of flora found in Transect B. *Ulvalactuca* was the only algal species which was found during the complete study. It was found only on a patch of rock present on the transect B. A mangrove patch present near the port was surveyed. It showed presence of three species viz. *Avecinia officinalis, Acanthus ilicifolius and Sessuvium portulachstrum.* The species richness of flora was more in Transect A. The distribution pattern of coastal flora shows *pomeabiloba* as the most frequent, dominant and abundant plant species present in the study area followed *by Spinifex littoreus.*

Table. 10: The list of flora observed during the present study

S. No.	Botanical Name	Habit	Family
1	*Acanthus ilicifolius*	Herb	Acanthaceae
2	*Avecinia officinalis*	Shrub	Acanthaceae
3	*Boerhavia diffusa*	Herb	Nyctaginaceae
4	*Borassus flabellifer*	Tree	Arecaceae
5	*Cocos nucifera*	Tree	Arecaceae
6	*Cyperus sp*	Herb	Cyperaceae
7	*Fimbristylis sp*	Herb	Cyperaceae
8	*Indigofera sp*	Herb	Fabaceae
9	*Ipomoea biloba*	Shrub	Convolvulaceae
10	*Launaeas armentosa*	Herb	Asteraceae
11	*Opuntiasp*	Herb	Cactaceae
12	*Phoenix sylvestris*	Tree	Arecaceae
13	*Prosopis juliflora*	Tree	Fabaceae
14	*Sessuvium portulachstrum*	Herb	Aizoaceae
15	*Spinifex littoreus*	Herb	Poaceae
16	*Typha angustata*	Herb	Typhaceae
17	*Ulvalactuca*	Algae	Ulvaceae

Fig. 24: *Cocos nucifera*

Fig. 25: *Sesuvium portulacastrum*

Fig. 26*: Borassus flabellifer*

Fig. 27: *Scaevola taccada*

Fauna:

The Transect A was more diverse area found during the study period. In fauna, 13 molluscs, 3 crustaceans, 2 butterflies and 3 bird species were observed during the study. Class Bivalvia of Mollusca was dominant. Species like *Papia textile and Sunetta effosa* were the species which were most common in the present study area.

The birds sighted during the study were also the most commonly sighted ones and are least concern according to IUCN. The birds sighted during the study were also the most commonly sighted ones and are least concern according to IUCN. In crab species, Fiddler crabs and Mottled Sally Lightfoot were the crabs which were seen only in transect A. The species richness of fauna is more on Transect A. No butterfly species was seen during the survey on transect B. Considering the distribution pattern of the fauna, molluscs were the most frequently, densely and abundantly distributed group followed by crustaceans, birds and butterflies

Figure. 11: list of Fauna observed at transect area during the study period

Location	Number (per square meter)	Species count in Average	Dominant groups
RK Beach shore	245	34	Caulerpaceae, Echinometridae, Ulvaceae, Gobidae Blennidae Portunidae Menippidae Astroidea
Yarada shore	320	42	Astroidea Emerita Ocepoda Ulvaceae Caulerpaceae

The different types of fauna were observed during the survey. The list of molluscs observed is given below in Table. 12.

Table. 12: List of Molluscs

S. No.	Scientific Name	Class	Family
1	*Anadara gubernaculum*	Bivalvia	Arcidae
2	*Babylonia spirata*	Gastropoda	Babyloniidae
3	*Olivafaba*	Gastropoda	Olividae
4	*Paphia textile*	Bivalvia	Veneridae
5	*Sunnetaeffosa*	Bivalvia	Veneridae
6	*Neritaoryzarum*	Gastropoda	Neritidae
7	*Mesocibotabistrigata*	Bivalvia	Arcidae
8	*Carditacalyculata*	Bivalvia	Carditidae
9	*Donaxscortum*	Bivalvia	Donacidae
10	*Sepia aculeate*	Cephalopoda	Sepiidae

11	*Gastranapolygona*	Bivalvia	Tellinidae
12	*Meritrixmeritrix*	Bivalvia	Veneridae
13	*Placuna placenta*	Bivalvia	Placunidae

During the present survey, the Arthropoda (Crustaceans and Insects (Butterfly)) observed during the survey are given below in the Table. 13.

Table. 13: List of Arthropoda- (Crustaceans and insects)

Arthropoda- Crustaceans			
S. No.	**Common Name**	**Scientific Name**	**Family**
1	Fiddler crab	*Uca spp.*	Ocypodidae
2	Mottled Sally Lightfoot	*Grapsus grapsus*	Grapsidae
3	Ghost Crab	*Ocypode spp.*	Ocypodidae
Arthropoda - Insecta (Butterflies)			
1	Common Lime Butterfly	*Papiliode moleus*	Papilionidae
2	Common Bottle blue	*Graphium sarpedon*	Papilionidae

Some of the Species observed during the present study:

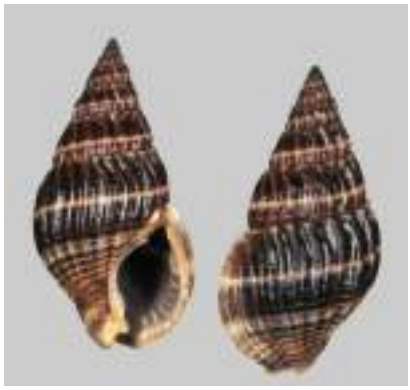


Fig. 28: *Nassarius olivaceus*

Fig. 29: *Ptychobela nodulosa*

Fig. 30: *Nassarius foveolatus*

Fig. 31: *Sphenopus arenaceus*

Fig. 32: Leucosia anatum

Fig. 33: Charybdis affinis

Fig. 34: *Charybdis* sp.

Fig. 35: Myra fugax

Fig. 36: Bursa rana

Fig. 37: *Papiliode moleus*

Fig. 38: *Graphium sarpedon*

The list of birds observed during the survey is given below in Table. 14.

Table. 14: List of Birds

S. No.	Common Name	Scientific Name	Family
1	Black Kite	*Milvus migrans*	Accipitridae
2	Common myna	*Acridother estristis*	Sturnidae
3	House crow	*Corvus splendens*	Corvidae

Fig. 39: ***Milvus migrans***

Fig. 40: ***Corvus splendens***

Fig. 41: ***Acridotheres Tristis***

The overall coastal diversity of flora and fauna is fair and any development activity inside the port premises would not have much effect on the coastal diversity.

Fisheries

Visakhapatnam is one of the important fish landing Centre's of Andhra Pradesh. Secondary fish data was procured from State Fishery Department, Fishery Survey of India & Department of Animal Husbandry Dairying & Fisheries. For supporting above data, local fish market and landing Centre data were studied.

The fish production data for the period 2016-17 to 2019-20 for nine major coastal States of India was procured from secondary source i.e., Department of Animal Husbandry Dairying & Fisheries. As per data, Andhra Pradesh has the highest fish production in India.

Visakhapatnam coastal marine fish and shrimp production data was procured from State Fishery Department. According to last five-year available data (Table. 15), there was a continuous increase in the production of marine fish and shrimp. As per data analysis, Indian Mackerel *(Rastrelliger kanagurta) and* Tuna (Tunnies) are the most dominant fishes at Visakhapatnam coast. Subsequently, very less quantity Bombay duck *(Harpodan nehereus)* and Hilsa (*Tenualosa ilisha*) catch was observed.

Table. 15: State wise maximum contribution to production of fish in India (In Lakh Tons)

Coastal States of India	2015-16	2016-17	2017-18	2018-19	2019-20
Andhra Pradesh	23.52	27.66	56.11	39.91	41.74
Goa	1.12	1.18	1.24	1.2	1.05
Gujarat	8.09	8.16	9.54	8.41	8.59
Karnataka	5.81	5.58	7.46	5.88	6.32
Kerala	7.28	5.92	7.81	8.01	6.8
Madhya Pradesh	1.15	1.39	2.82	1.73	2
Maharashtra	5.8	6.63	7.94	5.68	5.61

Odisha	5.22	6.08	11.42	7.59	8.18
Tamil Nadu	7.1	6.69	8.54	6.9	7.57
West Bengal	16.71	17.02	32.59	17.82	17.82
Puducherry	0.54	0.5	0.57	0.47	0.51
India	107.62	114.31	203.79	135.73	141.64

Table. 16: Total annual catch of marine fish & shrimp during 2011 to 2015 – Visakhapatnam.

SN	Name of the fishes	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
1	Shark	607	460.225	342.316	119.2	80.84
2	Skates	114	253	207.323	196.872	120.21
3	Rays	545	256.442	218.68	141.653	132.74
4	Oil Sardine	1008	3491	3484	3854	5290.82
5	Other Sardine	741	1344	1870	2248	2540
6	Hilsa Shad	19	34	184	99	102
7	Other Shads	437	303	498.8	312	350
8	Thrisocies	439	587	429	1139	1241
9	Anchovies	2289	2216	3159	4663	4521
10	Other Clupeids	516	876	1174	2988	3100
12	Chriocentrus	495	520	397	290	320
13	Polynemids	839	1149	777	339	410
14	Chorinemus	367	562	441	257	260
15	Trichuridae	2004	1637	3644	7830	6845
16	Carangids	3545	4241.41	1897	2964	2857
17	Indian mackeral	7873	11669.38	15774	14090	12345
18	Other mackerals	2502	5036.82	3462	4057	5621
19	S.commerson	1599	914	592	503	680
20	S.guttatus	749	676	439	311.8	350
21	S.Ieneoitus	408	419	141	117	120
22	Tunnies	6496	6142.251	4090.865	10037.638	10998.54
23	Mugil	951	497	148	83.72	110.24
24	Eels	700	214.626	194.985	123.986	154.21
25	Cat fish	692	547	659	481	598
26	Threadfin breams	638	934	1447	838	911
27	Pigface breams	416	435	332	293	302

28	Other perches	1151	1156	1294	1605	1826
29	Scianids	562	362	153	320	540.14
30	Leoignathus	742	491	2329	1147	1325.54
31	Black Pomfrets	985	409	3618.364	1921.76	1628.55
32	Silver Pomfrets	729	524.516	285.31	363.207	251.47
33	Sole (flat fish)	662	219	303	358	421
34	P.monodon	1148	497.93	453.674	612.776	750.36
35	P.indicus	967	677.904	538.616	419.564	520.41
36	Meta peneaus	3707	1817.85	1125.315	4230.376	4829.23
37	Non peneaid	1037	4188.081	7214.14	6120.457	5650.25
38	Mannecrustaceans	3341	1266.13	2299	2231.427	2310.84
39	Other crustaceans	14	34	49	56	46
40	Lobsters	410	220.748	17.911	5.056	11.95
41	Molluscans	471	380	41.81	96.4	100.82
42	Squids & cuttlefish	2468	688.07	2019.569	931.603	805.75
43	Mischallaneous	12202	16983.231	13496.576	11110.9	15986.19
	Total	**67712**	**75358.614**	**81241.254**	**89906.395**	**97365.1**

Visakhapatnam is well known as a hub of fishing activity. During fish market survey at Visakhapatnam fishing harbour a variety of fish were observed include yellow fin tuna, Prawns, Mackerel, King fish, Sardine, Ribbon fish, Sole fish, etc. As per local fishermen the Yellowfin tuna *(Thunnus albacares)* are the dominant species, it contributing 20% -30% to the total catch of the region.

Figure.42: The local, wholesale and fish market at Visakhapatnam Fishing Harbour

During local fish market survey some varieties of dry fishes are observed. The local women are engaged fulltime in procuring, drying, packing and marketing of dried fish at Visakhapatnam, these activities provide employment and economic security to local fisherman. Small shrimp such as acetes, ribbonfish, serfish, mackerel, sardines, flatfishes, and sciaenids are mainly used in the dried form.

Marine Turtle

In recent years, Visakhapatnam has become an increasingly popular destination for tourists. The degradation of the aquatic and coastal environments is mostly caused by infrastructural expansion, tourism, and increased pollution. Because of this, sea turtles find it challenging to nest here, and as a result, this beach is rarely used as a nesting site.

Reasons for the Loss of Nesting Beaches: water pollution, beach erosion, sea level rise, uncontrolled coastal development and other human activities. Uncontrolled fishing during nesting seasons, Non-use of turtle excluder device, increased marine traffic, offshore developmental activity, Threats from domestic dogs, wild boars & human being, Incidental catch in mechanized fisheries were treat to nesting for turtles.

Activities Supporting Conservation: Create a thorough action plan for the conservation of sea turtles in cooperation with all law enforcement agencies, businesses, and local communities. prohibiting the release of heavy metals, pesticides, heavy oils, heavy waters, and other toxic effluents into or close to beaches where turtles breed. prohibiting the throwing of waste into the water or on the beach, such as fishing nets, plastic bags, and other items that could kill sea turtles accidentally. coordinated beach and near-shore waterway cleanups by the local fisheries and forest departments and other government organizations. It is important to start this before sea turtles breed and to promote awareness about marine turtles.

CONCLUSION

The features of the water quality showed that the harbor waters are heavily contaminated due to the current circumstances (poor tidal exchange). The harbor waters have become extremely eutrophic, or nutrient built-up, due to the excessive enrichment of inorganic nitrogen and phosphorus caused by waste additives and ineffective mixing. This has resulted in the extinction of sensitive species and the proliferation of pollution-tolerant taxa like *Skeletonema costatum*, which is known to inhabit polluted marine water bodies frequently with exclusive dominance as in the present case.

When compared to similar aquatic bodies, zooplankton also showed a low diversity of life. Macrobenthos's life is completely destroyed. Nowhere in the harbor's bottom sediments was there any macroscopic life. The large concentrations of organic materials and sulfur-tainted hydrogen emissions attest to this. In fact, no life was found in the sediments even in 2008, when this laboratory conducted a similar investigation on the quality of harbor water and marine biodiversity. The conditions seem to have gotten worse over the years following, primarily due to an increase in the amount of waste being discharged into the harbor and an ineffective mixing system.

BIBLIOGRAPHY

Ray, G.C.; Hayden, B.P. Coastal zone ecotones. In Landscape Boundaries; Springer: New York, NY, USA, 1992; pp. 403–420.

Reizopoulou, S.; Simboura, N.; Barbone, E.; Aleffi, F.; Basset, A.; Nicolaidou, A. Biodiversity in transitional waters: Steeper ecotone, lower diversity. Mar. Ecol. 2014, 35, 78–84.

Halpern, B.S.; Walbridge, S.; Selkoe, K.A.; Kappel, C.V.; Micheli, F.; D'agrosa, C.; Bruno, J.F.; Casey, K.S.; Ebert, C.; Fox, H.E.; et al. A global map of human impact on marine ecosystems. Science 2008, 319, 948–952.

Hoegh-Guldberg, O.; Bruno, J.F. The impact of climate change on the world's marine ecosystems. Science 2010, 328, 1523–1528.

Perry, R.I.; Cury, P.; Brander, K.; Jennings, S.; Möllmann, C.; Planque, B. Sensitivity of marine systems to climate and fishing: Concepts, issues and management responses. J. Mar. Syst. 2010, 79, 427–435.

Solan, M.; Cardinale, B.J.; Downing, A.L.; Engelhardt, K.A.; Ruesink, J.L.; Srivastava, D.S. Extinction and ecosystem function in the marine benthos. Science 2004, 306, 1177–1180.

Worm, B.; Barbier, E.B.; Beaumont, N.; Duffy, J.E.; Folke, C.; Halpern, B.S.; Jackson, J.C.; Lotze, H.K.; Micheli, F.; Palumbi, S.R.; et al. Impacts of biodiversity loss on ocean ecosystem services. Science 2006, 314, 787–790.

Deegan, L.A.; Johnson, D.S.; Warren, R.S.; Peterson, B.J.; Fleeger, J.W.; Fagherazzi, S.; Wollheim, W.M. Coastal eutrophication as a driver of salt marsh loss. Nature 2012, 490, 388.

Johnston, E.L.; Mayer-Pinto, M.; Crowe, T.P. Chemical contaminant effects on marine ecosystem functioning. J. Appl. Ecol. 2015, 52, 140–149.

Hewitt, J.E.; Ellis, J.I.; Thrush, S.F. Multiple stressors, nonlinear effects and the implications of climate change impacts on marine coastal ecosystems. Glob. Chang. Biol. 2016, 22, 2665–2675.

Le Moal, M.; Gascuel-Odoux, C.; Ménesguen, A.; Souchon, Y.; étrillard, C.; Levain, A.; Moatar, F.; Pannard, A.; Souchu, P.; Lefebvre, A.; et al. Eutrophication: A new wine in an old bottle? Sci. Total Environ. 2019, 651, 1–

Douvere, F.; Ehler, C. Ecosystem-based marine spatial management: An evolving paradigm for the management of coastal and marine places. Ocean Yearb. Online 2009, 23, 1–26.

Hu W, Yu W, Ma Z, Ye G, Dang E, Huang H, Zhang D, Chen B. Assessing the Ecological Sensitivity of Coastal Marine Ecosystems: A Case Study in Xiamen Bay, China. *Sustainability*. 2019; 11(22):6372.

Annexure - 5

VISAKHAPATNAM PORT TRUST

MARINE DEPARTMENT
VISAKHAPATNAM – 530035
ANDHRA PRADESH

COMPREHENSIVE
DISASTER MANAGEMENT PLAN

JANUARY -2021

ENVIRONMENTAL TECHNICAL SERVICES PVT. LTD.
MOBILE NO. 0-9873552267, 0-9810830190
EMAIL – SS@ETSINFRA.COM, JPSHRI@GMAIL.COM

FOREWORD

This study has been carried out by M/s Environmental Technical Services Private Limited, New Delhi, Work Order No. IMAR/MSS (tenders)/2020/15/, Dated 05/05/2020 based on inputs received form Visakhapatnam Port Trust, Visakhapatnam. M/s Environmental Technical Services Private Limited, would like to take this opportunity to extend their thanks to the Visakhapatnam Port Trust, Visakhapatnam, management and officers who co-operated in supplying the data and information required, thus maximizing the effectiveness of the study. The study identified the hazards and analysed the consequences of potential accident scenarios. The above study results, conclusions and recommendations were based on the information made available to ETS Private Limited at the time of study. ETS Private Limited exercised all reasonable skill, care and diligence in carrying out the study. However, this report should not be deemed as any undertaking, warranty or certificate and cannot be challenged in any court of law of the country.

Environmental Technical Services Pvt. Ltd. New Delhi

Place : New Delhi
Date : 11.01.2021

Dr J. P. Shrivastava
Managing Director

VISAKHAPATNAM PORT TRUST

PART I

DISASTER MANAGEMENT PLAN