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Climate Resilience of Future Grids

Lighting up Lives!

TATA POWER

Odisha: India's best kept secret

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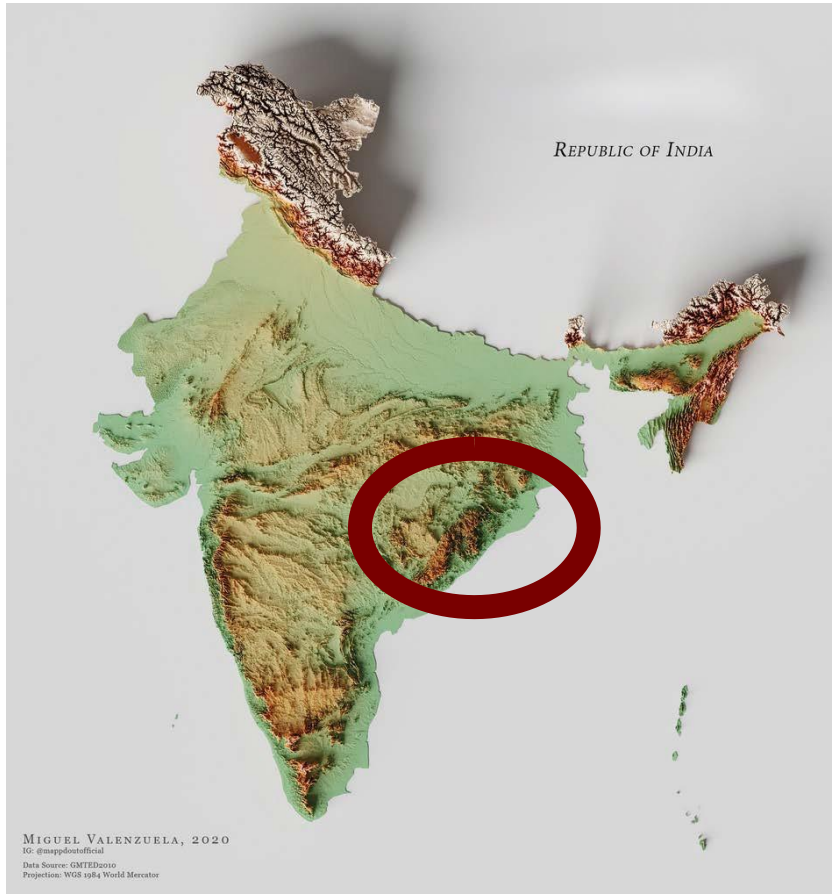
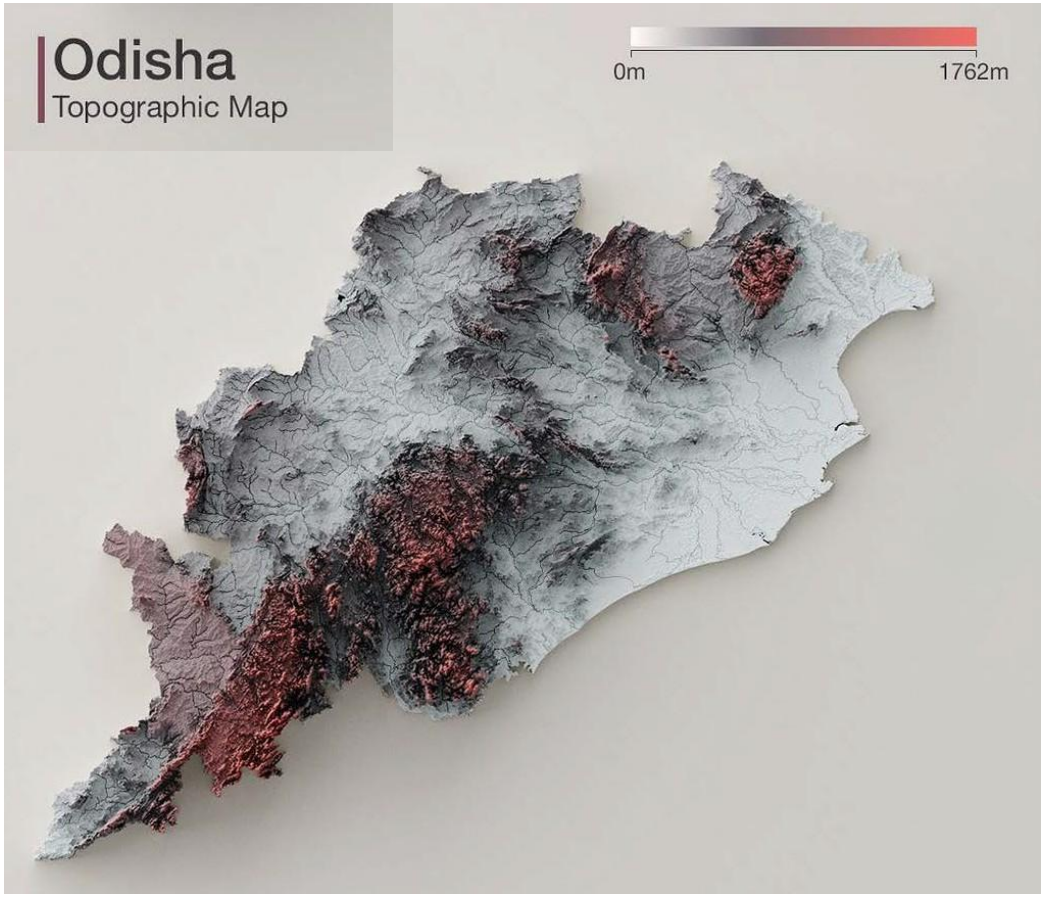
Rich in natural resources, flora, and fauna, Odisha is India's 8th largest state with an area of 155,707 km²





41 million
Population, 11th largest state in India

1 of 6 most
Cyclone prone places globally

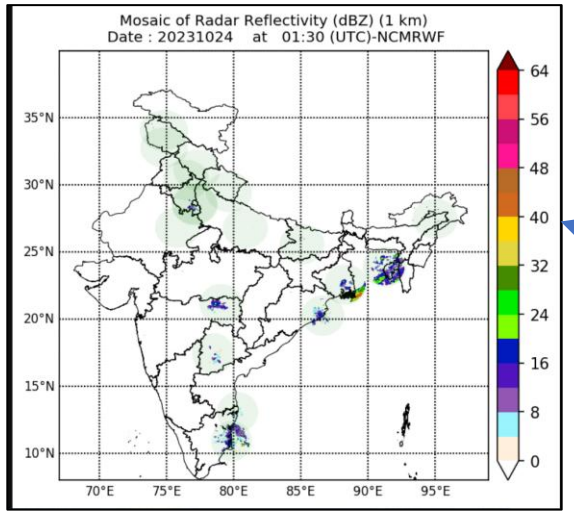
15th largest
State economy with GDP $69 bn

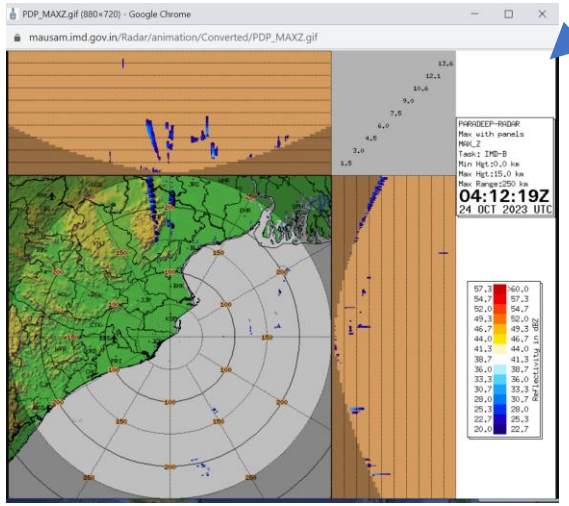
83%
Rural Population

55%
Internet penetration

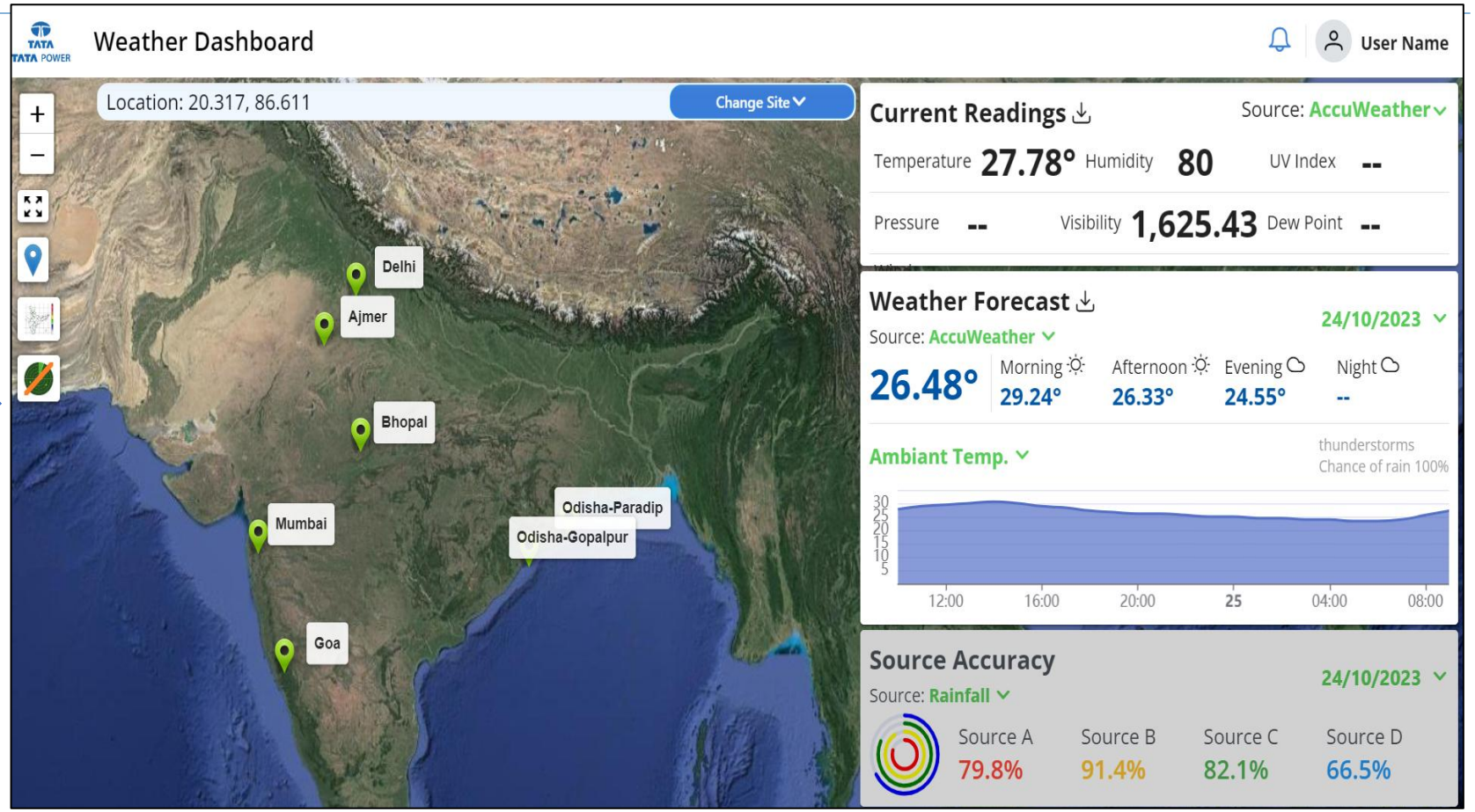
Advance Weather Forecasting -In-house Weather Dashboard

PAN India Live Weather Changes RADAR





Specific Radar which would cover 200-350 KM radius and allow us to monitor weather conditions



- In-house weather Portal for real time weather monitoring & warning is under development
- Installation of weather stations at Strategic locations across the discom area and establishing connectivity of all field devices to a central server where all the weather data can be stored is ultimately envisage

Emergency Plans-Basis for Disaster Management

Elimination of Unsafe Situations & Acts

Robust Safety Management Process

Reduce Direct Economic Loss

Faster Restoration

Rationale

BUILD BACK BETTER

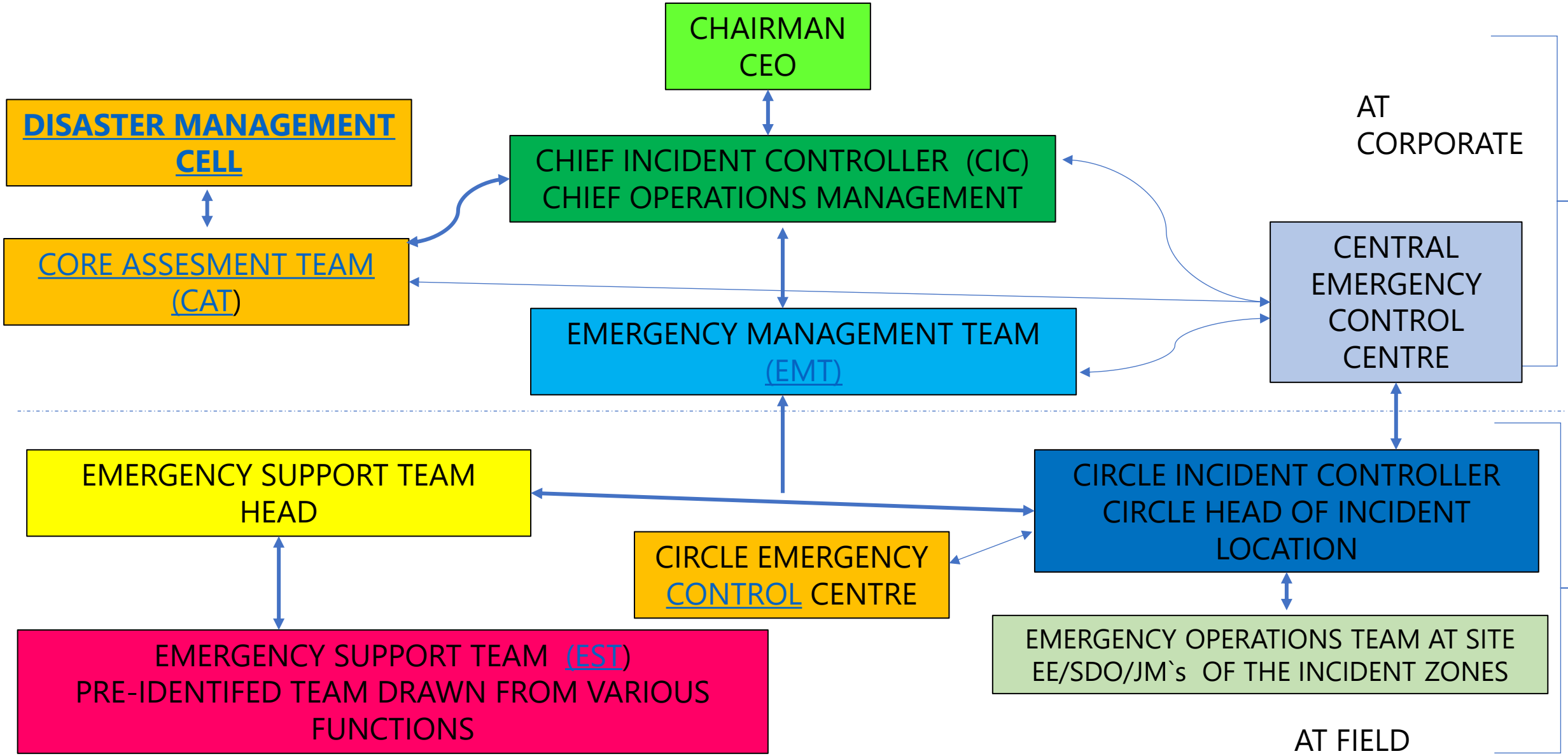
Reduce Damage to Critical Infrastructure

Mitigation & Disaster Resilient Network

Availability & Access to Technology for Early Warning /Action for faster restoration

SCADA ,GIS ,Satellite phones .Weather Stations .IMD

Emergency Plans - Disaster Management Structure



Emergency Plans – Institutional Structure

DISASTER MANAGEMENT CELL

- ✓ DISASTER MANAGEMENT STRUCTURE
  - ✓ CHIEF INCIDENT CONTROLLER
  - ✓ CORE ASSESMENT TEAM
  - ✓ EMERGENCY MANAGEMENT TEAM
  - ✓ EMERGENCY SUPPORT TEAM
  - ✓ CIRCLE INCIDENT CONTROLLERS
  - ✓ CENTRAL EMERGENCY CONTROL CENTR
  - ✓ CIRCLE EMERGENCY CONTROL CENTRE

- ✓ EMERGENCY RESTORATION SYSTEMS
- ✓ EMERGENCY STORES WITH PREIDENTIFED INVENTORY
- ✓ DISASTER T&P
- ✓ NORMAL & ALTERNATE LOCATIONS FOR CONTROL CENTRES
- ✓ COMMUNICATION PLAN FOR CONSUMERS
- ✓ TRANSPORATATION ,STAY,FOOD ,MEDICAL ,SECURITY INCHARGES FOR EACH CIRCLE.
- ✓ ENGAGEMENT OF LOCAL SKILLED AND UNSKILLED WORKFORCE
- ✓ TIE UP WITH VARIOUS BUSINESS ASSOCIATES
- ✓ ARRANGEMENT FOR MANPOWER FROM OTHER DISCOMS .

Emergency Plans – Technology As an Enabler

Communications Technology - IT, GIS, Early Warning Systems, Efficient Information Dissemination

Central Power System Control Centre (CPSCC) - Centralized Monitoring & Control of Power Supply across the Discom. It also acts as Central Emergency Control Centre (CECC) during Disasters .

Supervisory Control & Data Acquisition System (SCADA) - Real Time Visibility and Control of the Network

Weather Stations - Integration of Weather Stations to SCADA for Weather Info

Geographical Information System (GIS) - Mapping of Electrical Assets on Geographical Land base, Optimum Placement of Crew, Damage Assessment. Integration of GIS with Weather Information for Real Time Visibility of Area Affected.

Satellite Phones - At Critical Locations for uninterrupted Communication

SAP CRM - For Customer Information and Customer Management

Real Time Monitoring & Control of Power Network

Integrated Control Centre

All 4 Odisha DISCOMS at Bhubaneswar

Main Control Center	TPCODL
Back Up Control Center	TPWODL, TPNODL & TPSODL

Real-time Operations Management

- 24X7 Monitoring & Control, of electricity network: Main and Backup control centers of Odisha DISCOMS

Technologies Used

- Supervisory Control & Data Acquisition (SCADA) System
- Geographical Information System
- Energy Management System
- Weather Monitoring System
- Satellite Communication

Data Driven Decision Making

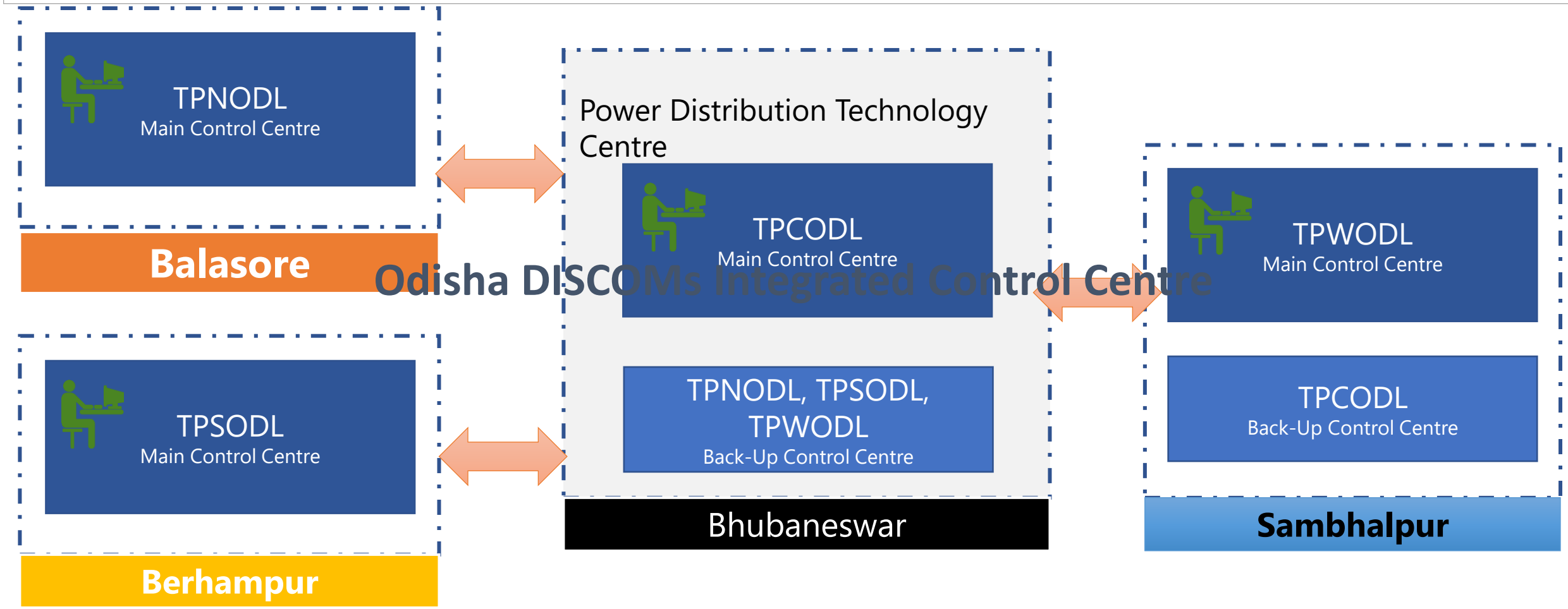
- A Data Centre with over 100 servers having critical communication & storage systems assisting real time decisions

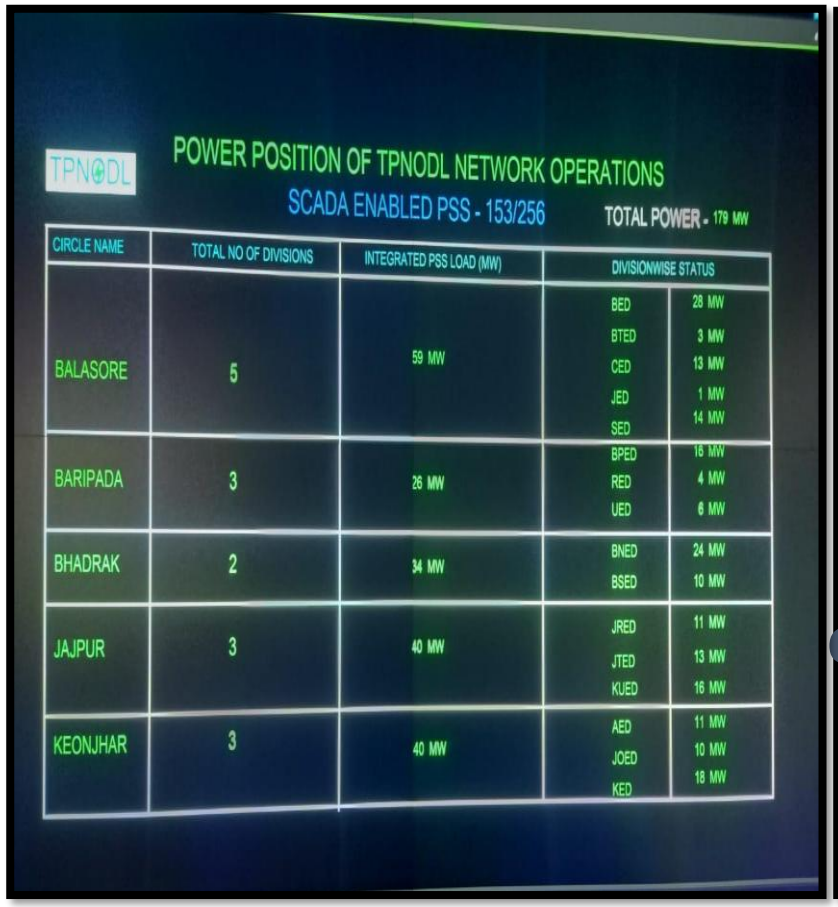
Centralized Real time Power Monitoring and Control through advanced technologies enabling 24X7 reliable power supply.

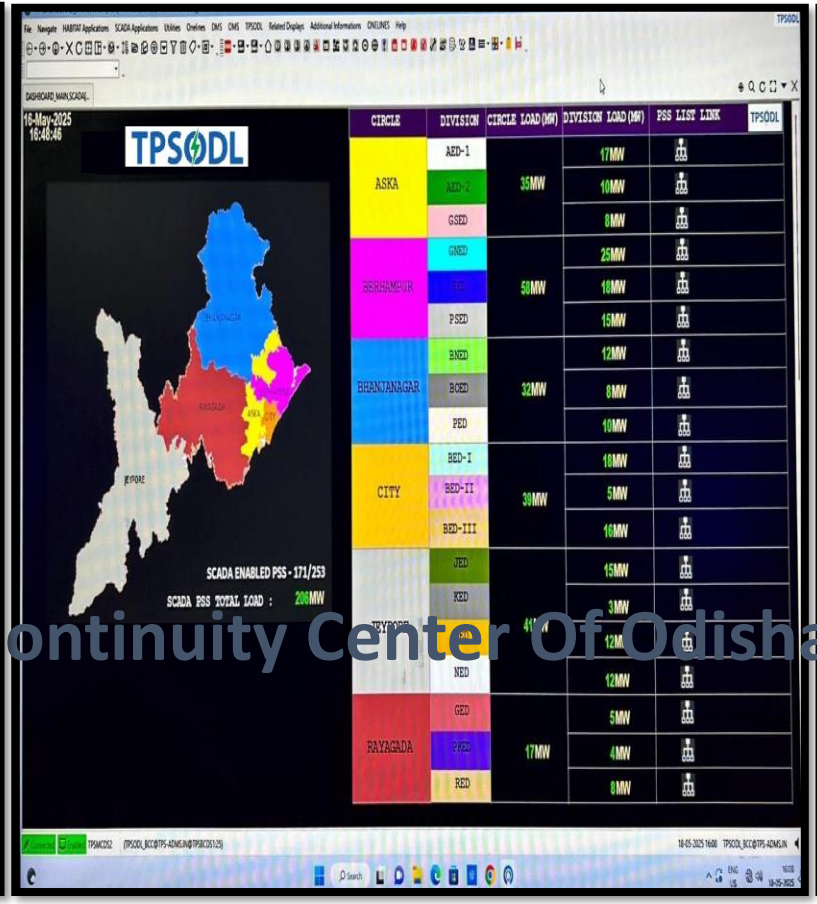
Unique facility for monitoring and control of complete Power Network of DISCOMs in the state from a central location

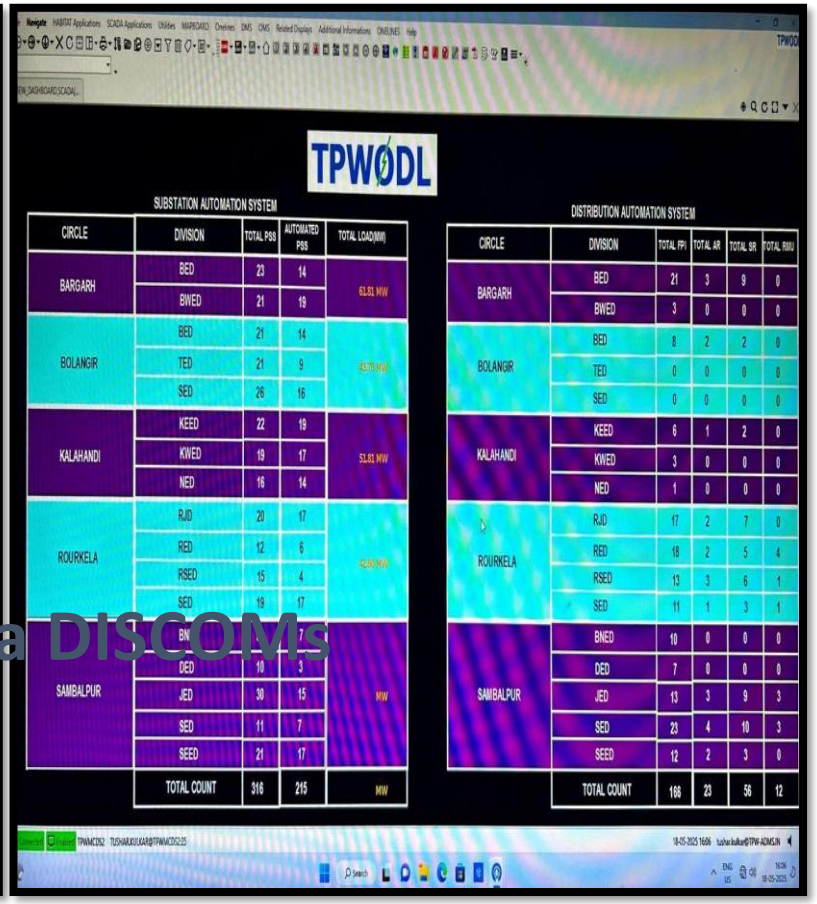
Business continuity center for ensuring smooth operations during normal and natural calamities.

- All Odisha DISCOM Control Centres have high speed data communication links
- Each DISCOM Remote Monitoring & Control is independently controlled from Main or Back-up Control Centre
- This arrangement ensures business continuity during any disaster/failure of Main Control Centre









- This Integrated Centre has necessary infrastructure operating as TPCODL's Main SCADA Control Centre, and Backup center of other three DISCOMs —TPWODL, TPSODL and TPNODL from this centre located at Bhubaneshwar.
- All four DISCOMs has the capability to monitor and control their respective networks from this centralized location, which ensures coordinated operations and improved system efficiency

Emergency Plans – Technology As an Enabler
SCADA-DMS Real Time Monitoring

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BCDD-1 (MW) 27.86MW

KALABAISAKHI -BCDD-1

TPCODL
TP CENTRAL ODISHA DISTRIBUTION LIMITED

	TOTAL	IN SERVICE	OUT OF SERVICE
33kV LINES	28	20	8
11kV I/C	21	21	0
11kV FDR	68	67	1

PSS Name	33kV INC	PTR 11kV INC	11kV FDR	Amp (Y-Ph)	Priority Consumer
Airport	Unit-6	PTR-1	Palaspalii	6.00	1488
			Ganga Nagar	48.00	1265
	RMU	PTR-2	JP RMU F-34	0.00	1
			F-4 Airport	60.00	
Board Colony	INC-1 (FDR-3)	PTR-1	BM RMU_2	27.20	745
			BM RMU-1	49.00	1265
			SM RMU-1	38.80	984
			Flat Unit-9	2.40	
			Gridco Colony	15.00	1345
		PTR-2	JP RMU-36	16.20	
			JP RMU-37	15.00	2364
			SM RMU-2	33.60	462
Delta	(Unit8/Baramunda)	PTR-1	Fire Station	72.00	1765
			Satabdi Nagara	49.60	1443
		PTR-2	Siripur	63.60	1835
Saheed Nagar	Manch FDR-3	PTR-1	JP RMU-2	21.00	1
			F-2 Feeder -3	65.10	
			F-3 Feeder -1	65.50	
	Manch FDR-4	PTR-2	F-4 Feeder -2	50.00	
			F-5 Feeder -4	10.70	
	Rasulgarh(9 pole)		F-6 JP RMU_	13.30	2
			F-7 JP RMU_3	25.00	1
Satya Nagar	(Satyanagar RMU)	PTR-1	JP RMU_14	33.50	708
			F-2 Rahul CO	6.30	162
			F-3 Press	2.90	1036
			JP RMU -13	14.00	346
	(Unit-3 satyanagar OG)	PTR-2	F-5 Plaza	12.70	
			F-6 Satyanagar	44.40	
			F-7 JP RMU-46	22.80	575
			F-8 JP RMU-45	40.00	192
Unit-2	(IG Park)	PTR-1	Market Building	20.04	1050
			Ashok Nagar	47.04	
	(Unit-2 RMu)	PTR-2	Suchana Bhawan	65.04	150
			Janpath	29.04	

PSS Name	33kV INC	PTR 11kV INC	11kV FDR	Amp (Y-Ph)	
Unit-3	KharabelaNagar	PTR-1	RMU SM-5	0.00	
			RMU JP-41	6.90	856
			UNIT-3	39.40	1241
		PTR-2	Maa Giri Durga	14.50	805
			UNIT-2	11.10	459
			RMU JP-42	51.00	1254
			RMU SM-4	22.10	1
Unit-4	SainikSchool	PTR-1	RMU-7	19.20	297
			RMU-23	23.70	314
			RMU-5	27.00	1665
			RMU-6 MS NAGAR	32.20	917
	Unit-6/ Unit2	PTR-2	Sashtri Nagar	0.00	
			RMU-22	7.70	600
			RMU-14	10.30	1
			RMU-15	11.00	625
Unit-6	Unit8 GIS -Unit6/2	PTR-1	Spring Tank	33.50	934
			Medical	15.60	1600
			Unit-1	24.50	1517
	Unit8 GIS -Unit6/1		RMU-7	0.00	178
			RMU-16	0.00	565
	Unit-4/Unit-2	PTR-1	RMU-19	5.90	435
			RMU-8	12.50	438
			Bapuji Nagar	65.20	
			Forest Park	38.80	1142
			Unit-6	15.30	
Unit-8	Chandka 2	PTR-1	Unit-5	9.00	331
			Rajbhawan	1.40	2
	Chandka 1		O.E.R.C	64.60	
			C.B.I	89.20	
	Secretariet-2		Delta	4.00	598
		PTR-2	Assembly	15.60	90
			O,U.A.T	76.00	
	Secretariet-1	PTR-3	Telephone	10.00	809
			Ashok Nagar	12.80	1082
			G.B Nagar	64.80	2913

Home

BCDD-2 BED

LEGENDS

11kV FEEDER(LEAST)

11kV FEEDER(MID)

11kV FEEDER(HIGH)

33kV FEEDER(NORMAL FED)

Emergency Plans – Technology As an Enabler
SCADA-DMS Real Time Monitoring

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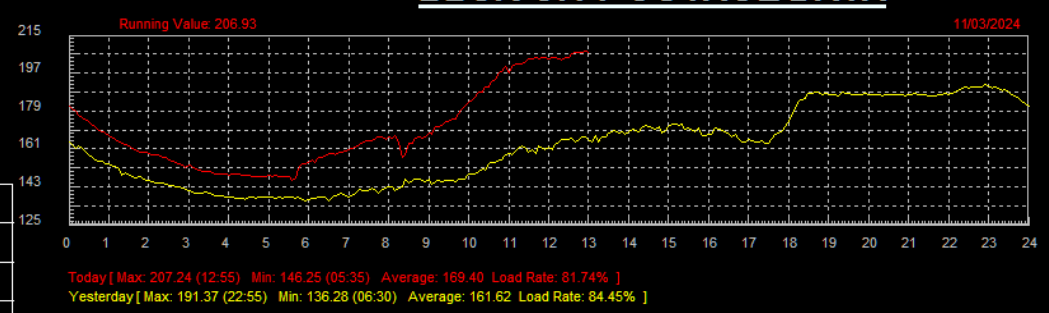
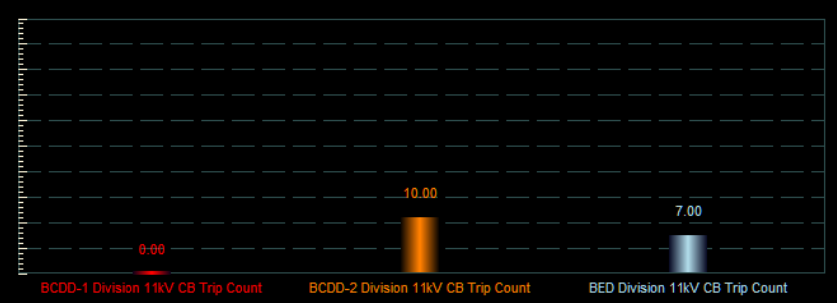
BBSR CITY OUTAGE DATA

TPCODL
TP CENTRAL ODISHA DISTRIBUTION LIMITED
(A Tata Power and Odisha Government Joint Venture)

TOTAL MW	206.93
TOTAL Mvar	51.27
FREQUENCY	50.09

Feeder	System	33kV	11kV
Count	583	222	361
CB Out of Service	62	38	24
CB IN Service	521	184	337





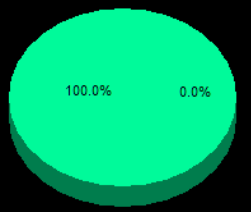
BCDD-1 Division

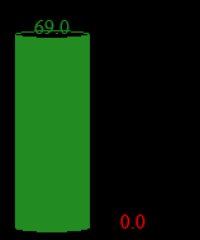
LOAD		Count	BCDD-1 TOTAL	33kV INC	33kV TRF	11kV INC	11kV FDR
Net MW	46.89	CB Out of Service	11	11	0	0	0
Net MVAr	8.10	CB IN Service	129	18	21	21	69

11kV FDR CB Out of Service Lists

Prev Page | Next Page | Objects(0)

	Description	Value





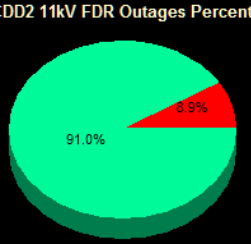
BCDD-2 Division

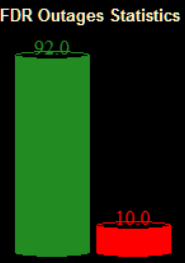
LOAD		Count	BCDD-2 TOTAL	33kV INC	33kV TRF	11kV INC	11kV FDR
Net MW	76.98	CB Out of Service	33	14	4	5	10
Net MVAr	20.50	CB IN Service	231	37	51	51	92

11kV FDR CB Out of Service Lists

Prev Page | Next Page | Objects(0)

	Description	Value
1	Dumduma 11kV HousingBoard CB	Open
2	Infocity 11kV Rajvatika CB	Open
3	Infocity 11kV Infocity CB	Open
4	Khandagiri 11kV JagmohanNagar CB	Open





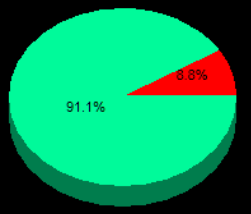
BED Division

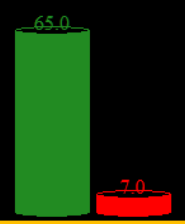
LOAD		Count	BCDD-2 TOTAL	33kV INC	33kV TRF	11kV INC	11kV FDR
Net MW	83.06	CB Out of Service	18	8	1	2	7
Net MVAr	22.67	CB IN Service	161	21	36	39	65

11kV FDR CB Out of Service Lists

Prev Page | Next Page | Objects(0)

	Description	Value
1	Laxmi 11kV RMU 16 CB	Open
2	Laxmi 11kV RMU 14Kalpana1 CB	Open
3	Laxmi 11kV RMU 6 CB	Open
4	LINGIPUR 11kV KUAKHAI CB	Open





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Live Monitoring of Cyclone

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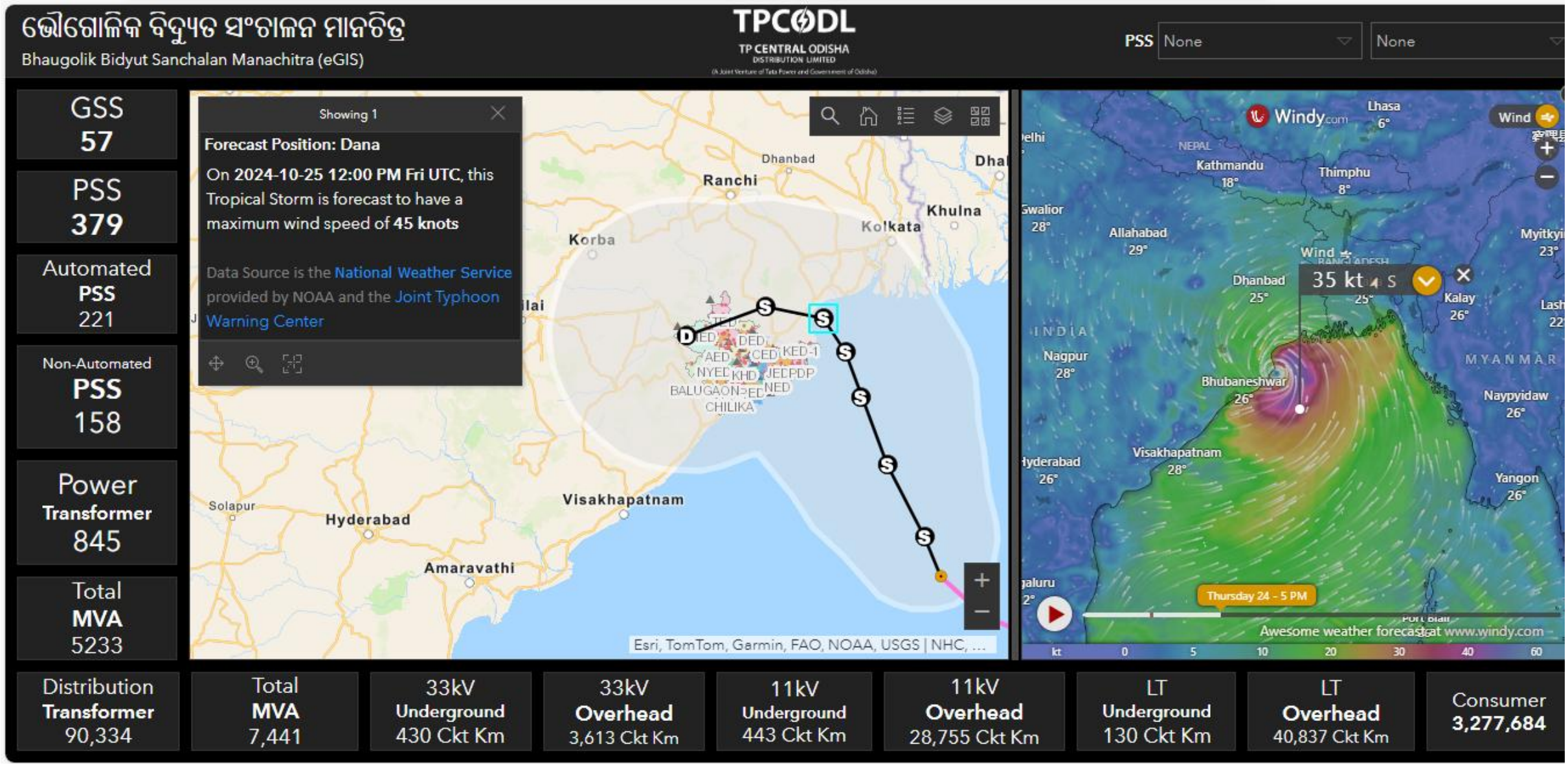
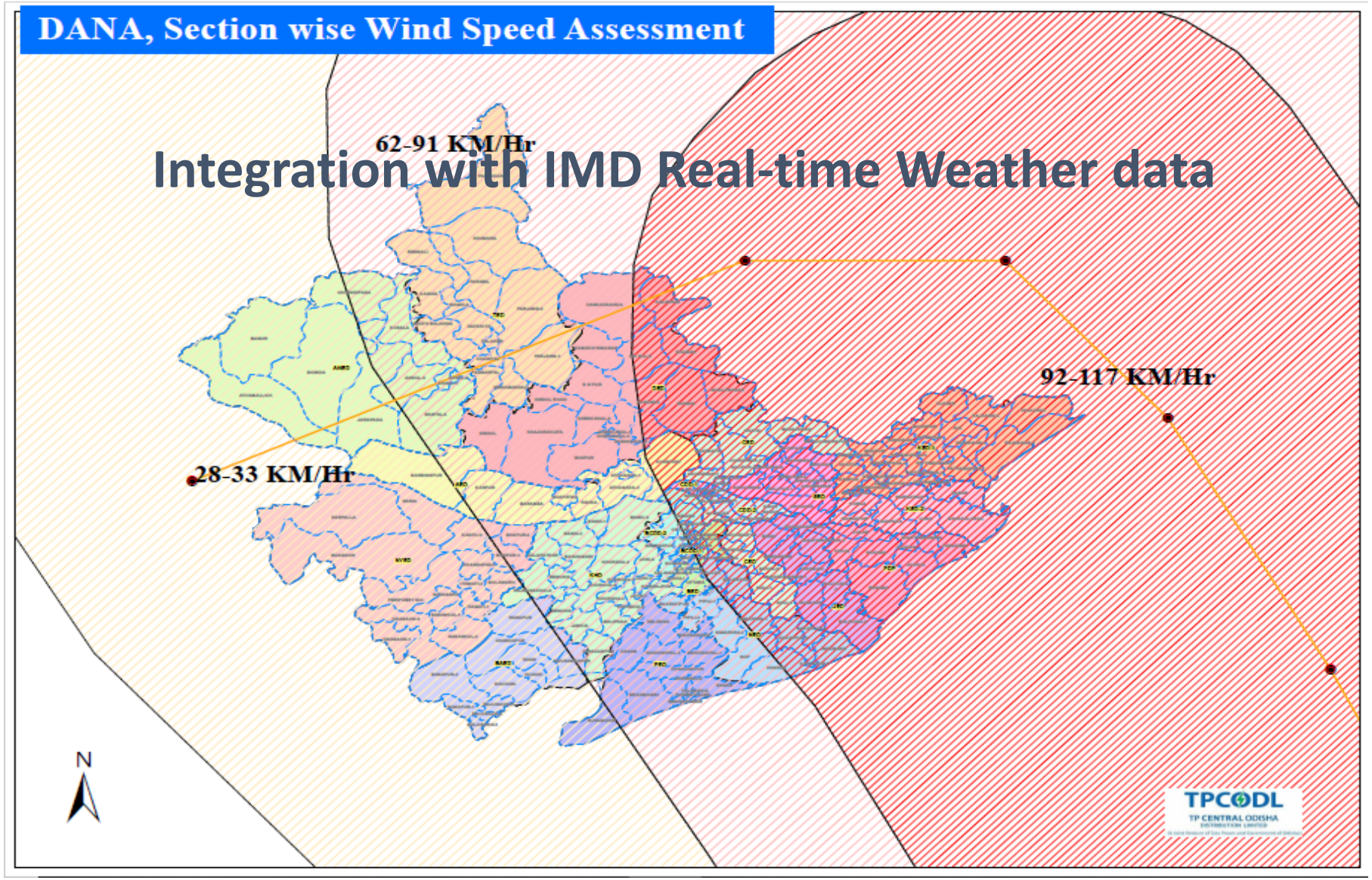


Integration with IMD Real-time Weather data



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Integration with Survey of India & IMD Weather data

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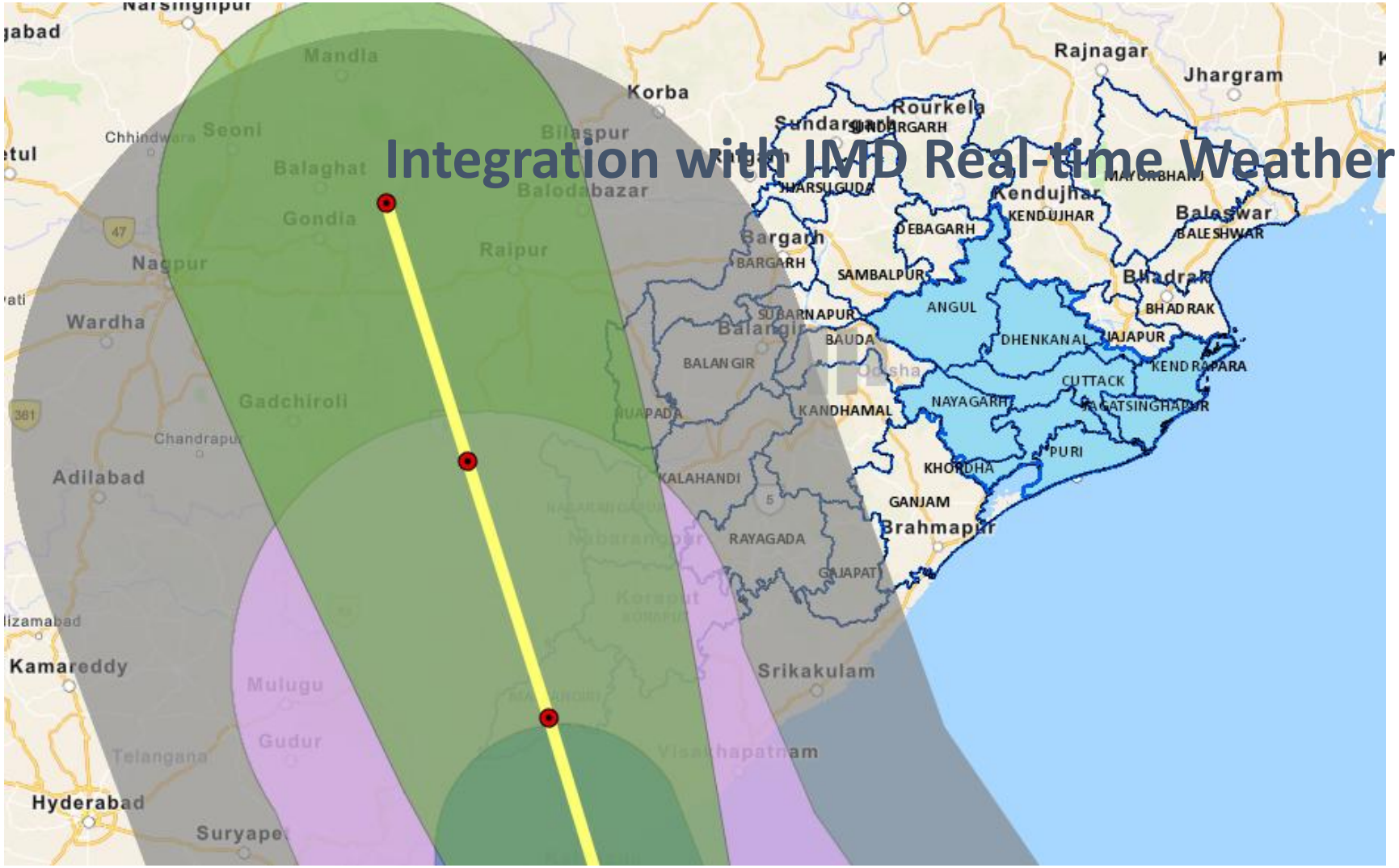
Assessment – Kendrapada (KED1) was predicted to have major impact, and resource was allocated accordingly

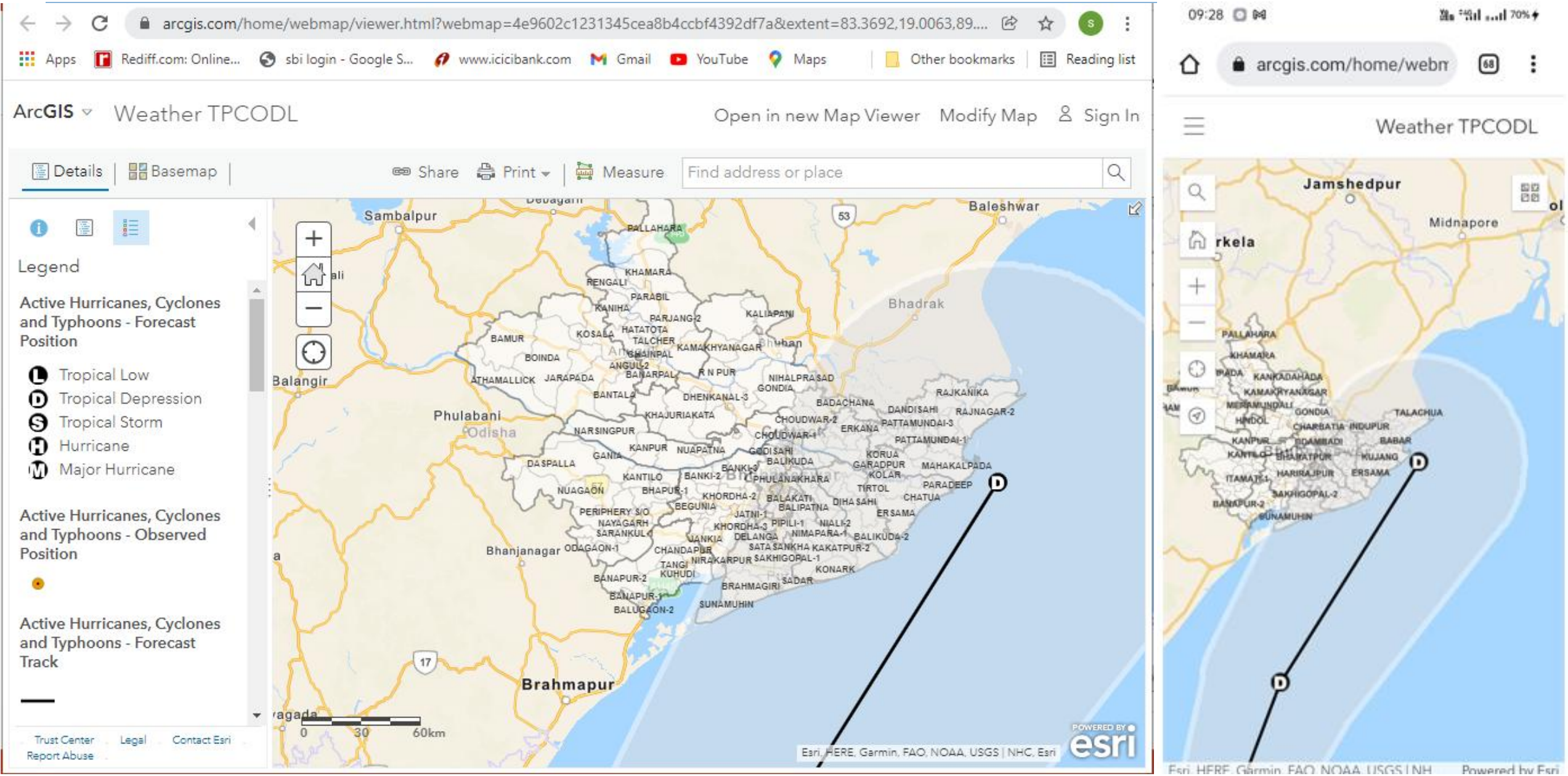
Wind Speed	92-117 km/Hr		62-91 km/Hr		52-61 km/Hr		Overall Count of Villages	Overall Village Area km²
Division	Number of Villages	Total Area km²	Number of Villages	Total Area km²	Number of Villages	Total Area km²		
KED-1	1102	1761					1102	1761
CED	770	1050					770	1050
JED	680	841					680	841
PDP	610	827					610	827
NED	553	765	421	568			974	1333
SED	537	551					537	551
DED	484	1755	733	3269			1217	5024
KED-2	419	698					419	698
CDD-2	147	273					147	273
AED	102	208	443	772	158	505	703	1486
BED	79	138	90	88			169	226
BCDD-2	52	330	62	171			114	501
KHD	3	20	903	1765	26	34	932	1818
ANED			372	1154	695	2045	1067	3200
BAED			92	883	673	1339	765	2222
NYED			81	142	1304	2626	1385	2769
PED			632	1033	31	97	663	1130
TED			1092	3099			1092	3099
Total	**5538**	**9216 km²**	**4921**	**12945 km²**	**2887**	**6647 km²**	**13346**	**28808 km²**

Integration with IMD Real-time Weather data



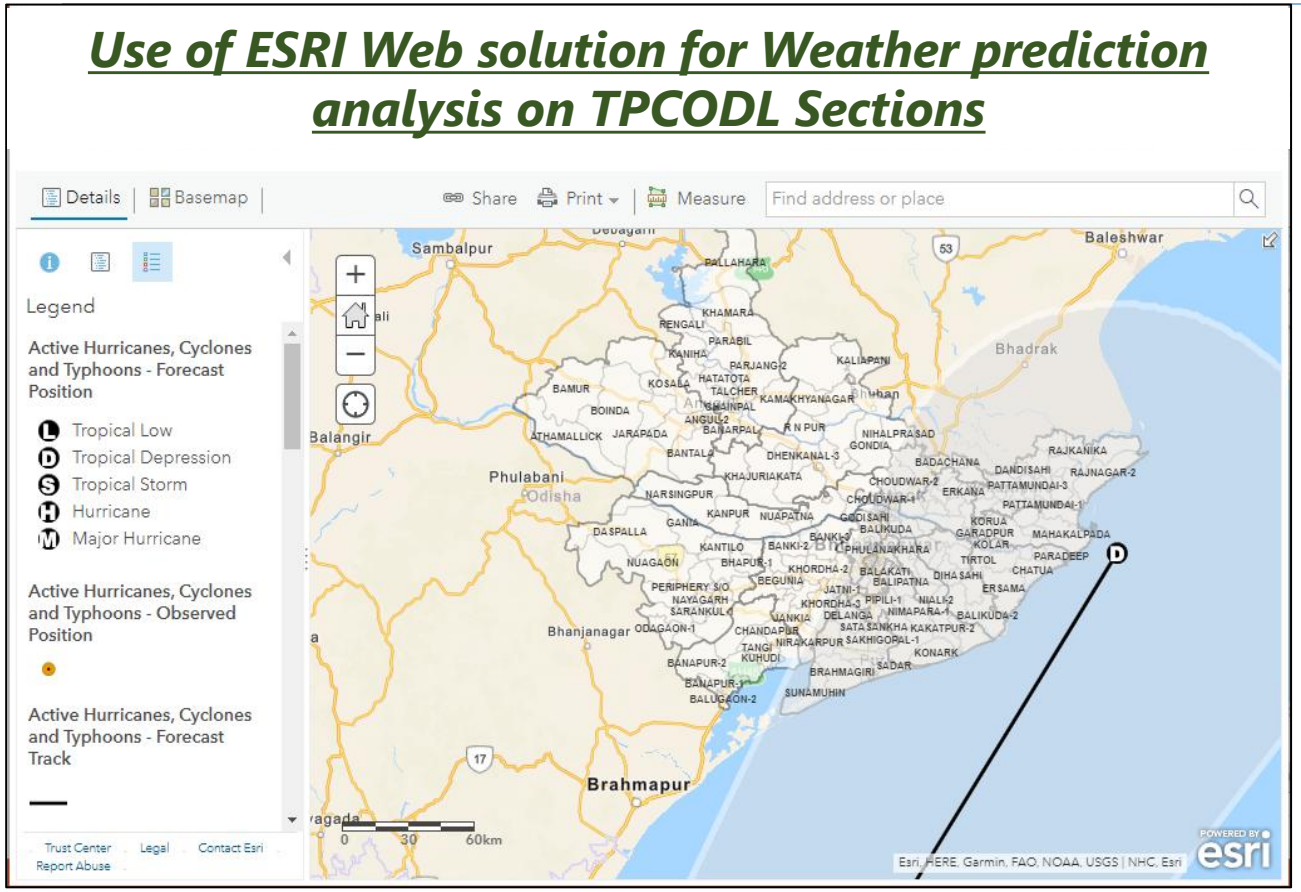
At time of Montha cyclone Oct-2025

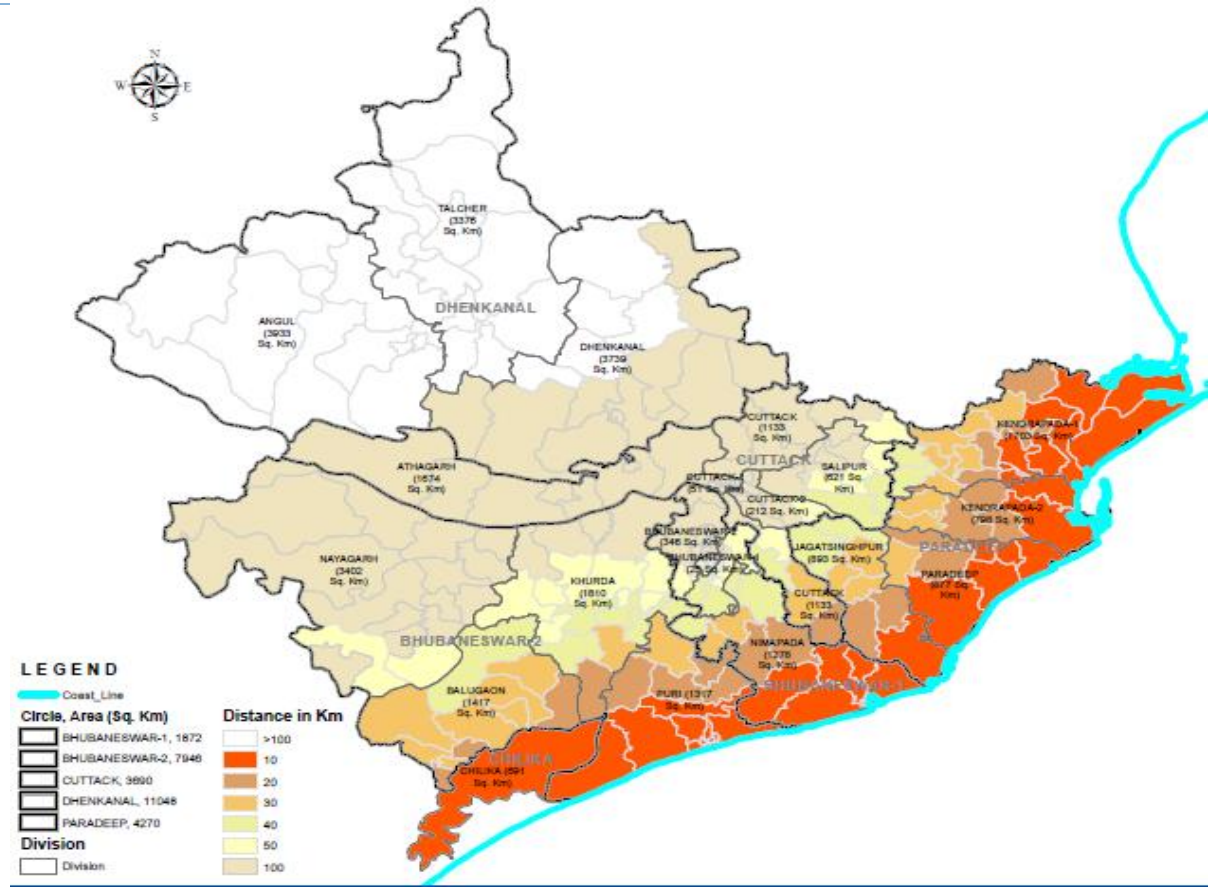
Technology –GIS : Overlay of Active Cyclones on Section Maps



Emergency Plans-Men & Material Deployment using GIS

Use of ESRI Web solution for Weather prediction analysis on TPCODL Sections





Leveraging web based solution for likely to be affected sections on GIS platform for better Resource Deployment:

1. Highlighting affected Sections and Divisions based on the alert and trajectory shared by IMD
2. Using the distance of the section from the coast line and estimated wind speed, plot impact severity on GIS
3. Deployment of Men & Material as per the severity of the impact in the identified sections.

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Collaboration and Resource Sharing

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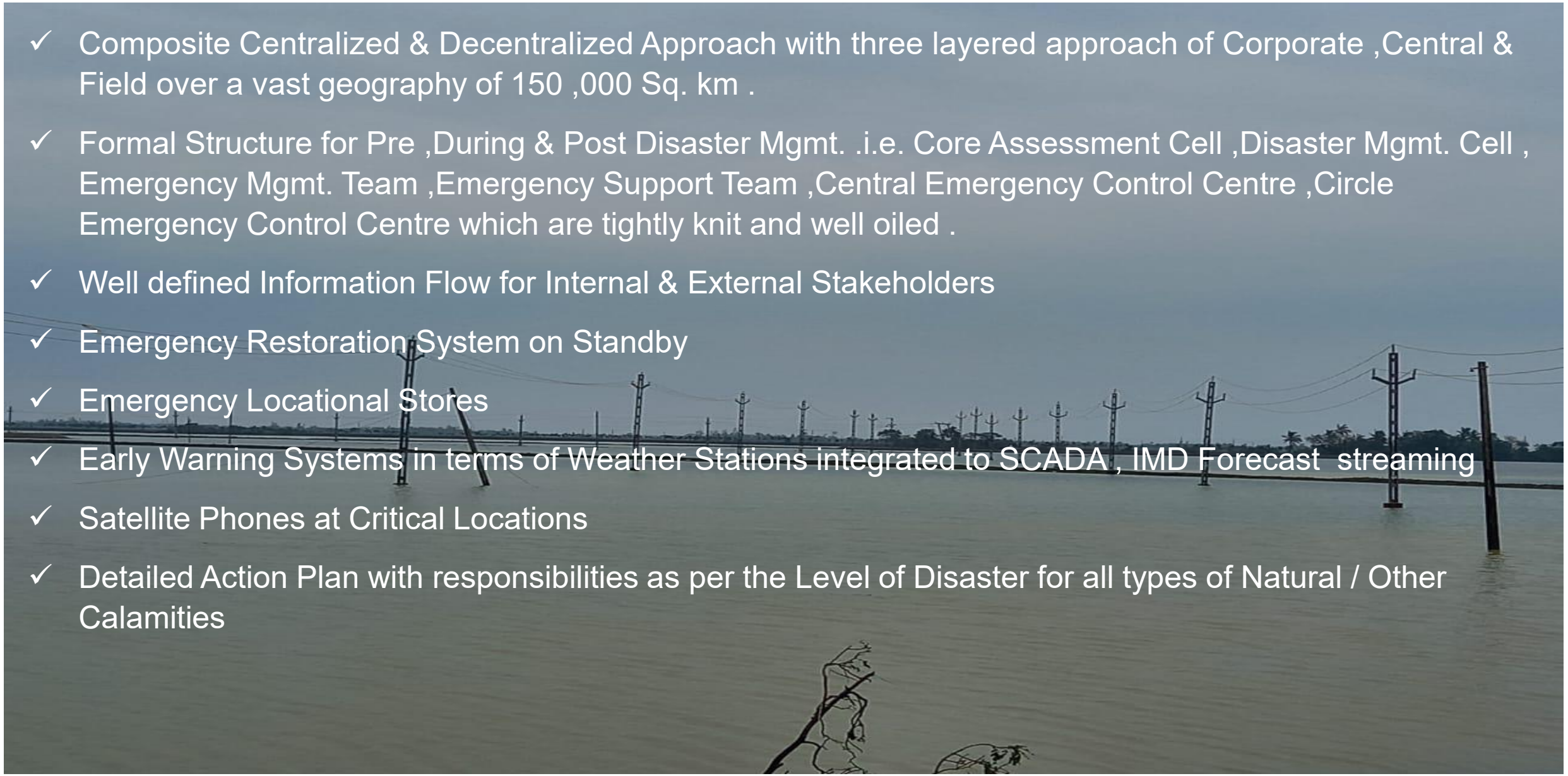
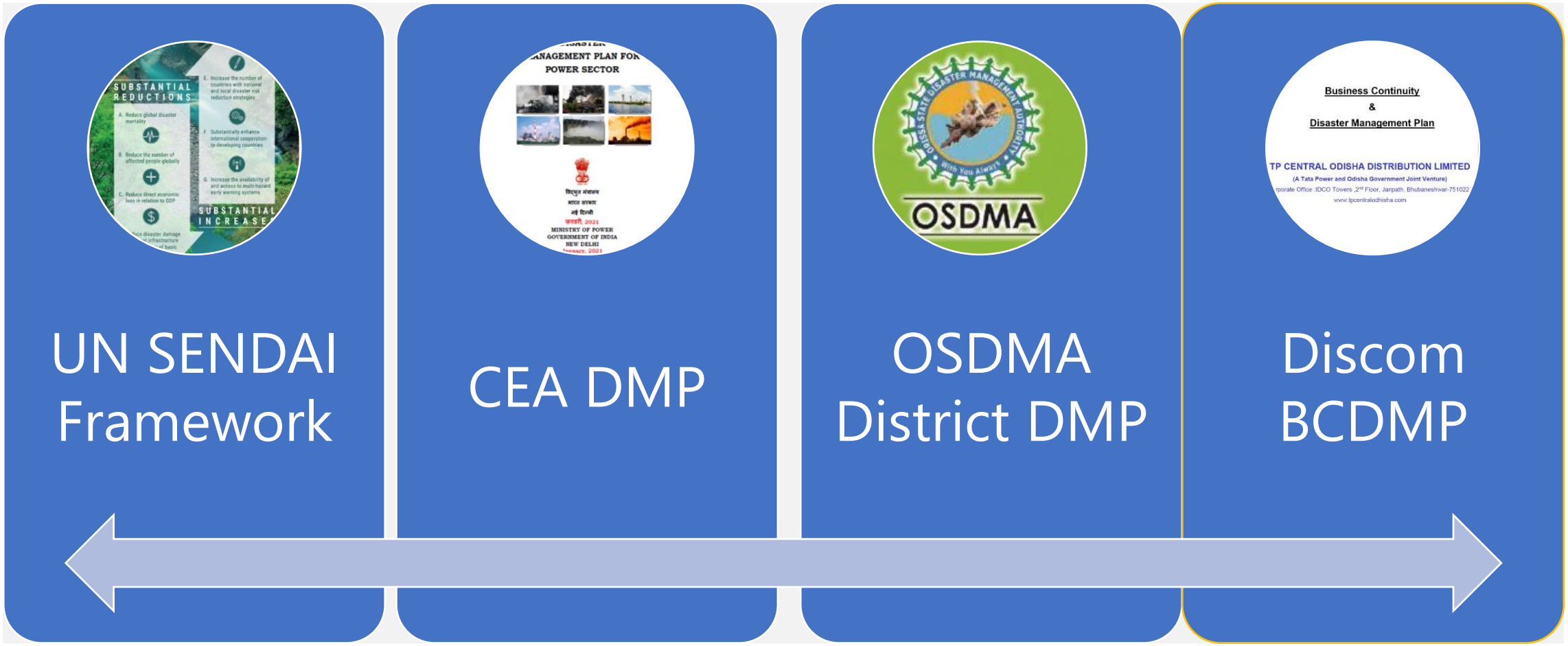


- ✓ Composite Centralized & Decentralized Approach with three layered approach of Corporate ,Central & Field over a vast geography of 150 ,000 Sq. km .
- ✓ Formal Structure for Pre ,During & Post Disaster Mgmt. .i.e. Core Assessment Cell ,Disaster Mgmt. Cell , Emergency Mgmt. Team ,Emergency Support Team ,Central Emergency Control Centre ,Circle Emergency Control Centre which are tightly knit and well oiled .
- ✓ Well defined Information Flow for Internal & External Stakeholders
- ✓ Emergency Restoration System on Standby
- ✓ Emergency Locational Stores
- ✓ Early Warning Systems in terms of Weather Stations integrated to SCADA , IMD Forecast streaming
- ✓ Satellite Phones at Critical Locations
- ✓ Detailed Action Plan with responsibilities as per the Level of Disaster for all types of Natural / Other Calamities



Amalgamation of Sendai Framework ,CEA DMP and District Level DMP
Work on the process started in Nov 2020 and was rolled as a Standard Practise across the organisation in April 2021.

Thank You!

Chart of the Sendai Framework for Disaster Risk Reduction

2015-2030

Scope and purpose

The present framework will apply to the risk of small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters, caused by natural or manmade hazards as well as related environmental, technological and biological hazards and risks.
It aims to guide the multi-hazard management of disaster risk in development at all levels as well as within and across all sectors

Expected outcome

The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries

Goal

Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience

Targets

Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020-2030 compared to 2005-2015	Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared to 2005-2015	Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030	Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030	Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020	Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030	Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030

Priorities for Action

There is a need for focused action within and across sectors by States at local, national, regional and global levels in the following four priority areas.

Priority 1
Understanding disaster risk

Disaster risk management needs to be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment

Priority 2
Strengthening disaster risk governance to manage disaster risk

Disaster risk governance at the national, regional and global levels is vital to the management of disaster risk reduction in all sectors and ensuring the coherence of national and local frameworks of laws, regulations and public policies that, by defining roles and responsibilities, guide, encourage and incentivize the public and private sectors to take action and address disaster risk

Priority 3
Investing in disaster risk reduction for resilience

Public and private investment in disaster risk prevention and reduction through structural and non-structural measures are essential to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment. These can be drivers of innovation, growth and job creation. Such measures are cost-effective and instrumental to save lives, prevent and reduce losses and ensure effective recovery and rehabilitation

Priority 4
Enhancing disaster preparedness for effective response, and to «Build Back Better» in recovery, rehabilitation and reconstruction

Experience indicates that disaster preparedness needs to be strengthened for more effective response and ensure capacities are in place for effective recovery. Disasters have also demonstrated that the recovery, rehabilitation and reconstruction phase, which needs to be prepared ahead of the disaster, is an opportunity to «Build Back Better» through integrating disaster risk reduction measures. Women and persons with disabilities should publicly lead and promote gender-equitable and universally accessible approaches during the response and reconstruction phases

Guiding Principles

Primary responsibility of States to prevent and reduce disaster risk, including through cooperation	Shared responsibility between central Government and national authorities, sectors and stakeholders as appropriate to national circumstances	Protection of persons and their assets while promoting and protecting all human rights including the right to development	Engagement from all of society	Full engagement of all State institutions of an executive and legislative nature at national and local levels	Empowerment of local authorities and communities through resources, incentives and decision-making responsibilities as appropriate	Decision-making to be inclusive and risk-informed while using a multi-hazard approach

Coherence of disaster risk reduction and sustainable development policies, plans, practices and mechanisms, across different sectors	Accounting of local and specific characteristics of disaster risks when determining measures to reduce risk	Addressing underlying risk factors cost-effectively through investment versus relying primarly on post-disaster response and recovery	«Build Back Better» for preventing the creation of, and reducing existing, disaster risk	The quality of global partnership and international cooperation to be effective, meaningful and strong	Support from developed countries and partners to developing countries to be tailored according to needs and priorities as identified by them

Thank You!