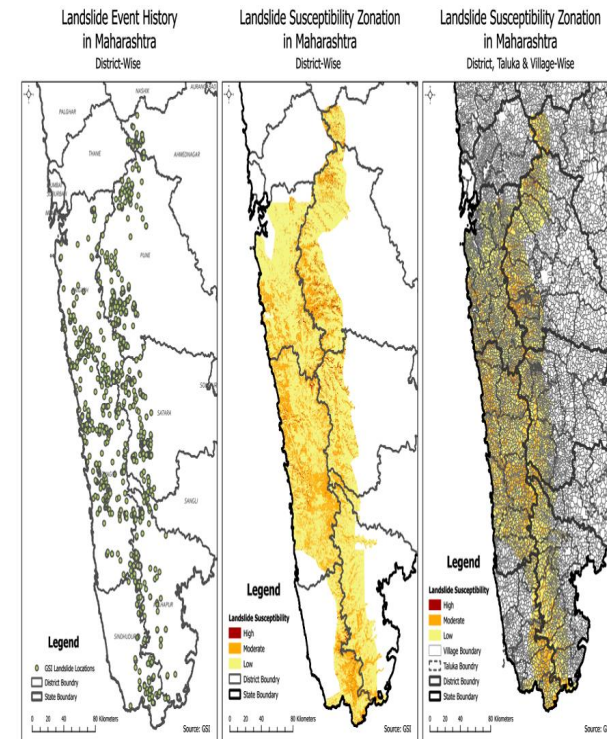




# E-Governance Initiatives by Disaster Management Relief and Rehabilitation Government of Maharashtra

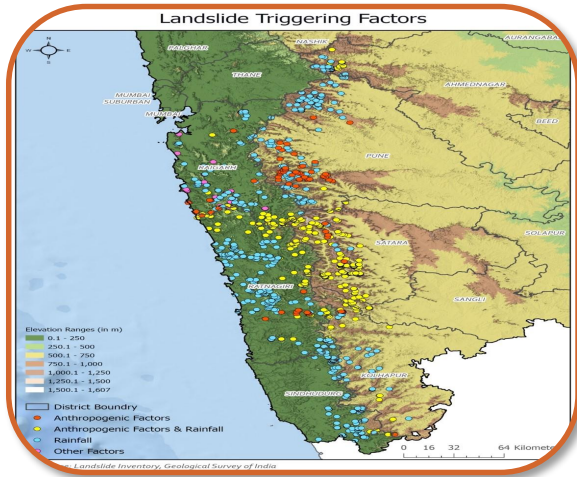


## ‘Land slide risk Mapping & Decision support system ’



**National Conference on e-Governance**  
**e-GOVERNANCE DIVISION**

# Strategy adopted for developing the land risk reduction plan



Extracting the list of prone 13891 locations

Ground Truthing by field teams .

Mitigations measures

Training , awareness EWS, Preparedness & response

## Outcome

Community participation at all levels

Physical survey and risk assessment

Identifying 2643 habitats at risk ( 11 lakh population )

Mitigation measures initiated at 202 places

Shifting of 36 camps ( 7 locations landslide happened and 123 households trapped under debris ,but 384 lives saved due to advance shifting ( Undil,(sindhudurg) ,( Tala,Naneghol, kevnale,Matwan mohala,chirekhind )

Saves time ,cost & labour in communication & transport due to inventory mapping and GPS location sharing .

Effective DSS and control room in charge can take decision of mobilization of resources and coordination with the rescue forces

137 NGOs were engaged and VDMP prepared ( NDMA taken cognizance )

Mock drills and table top exercises are conducted



# Technology used

Remote sensing & GIS maps

IIT Delhi high resolution maps

IRS, MDRN, NDMIS, ERSS,CCTV

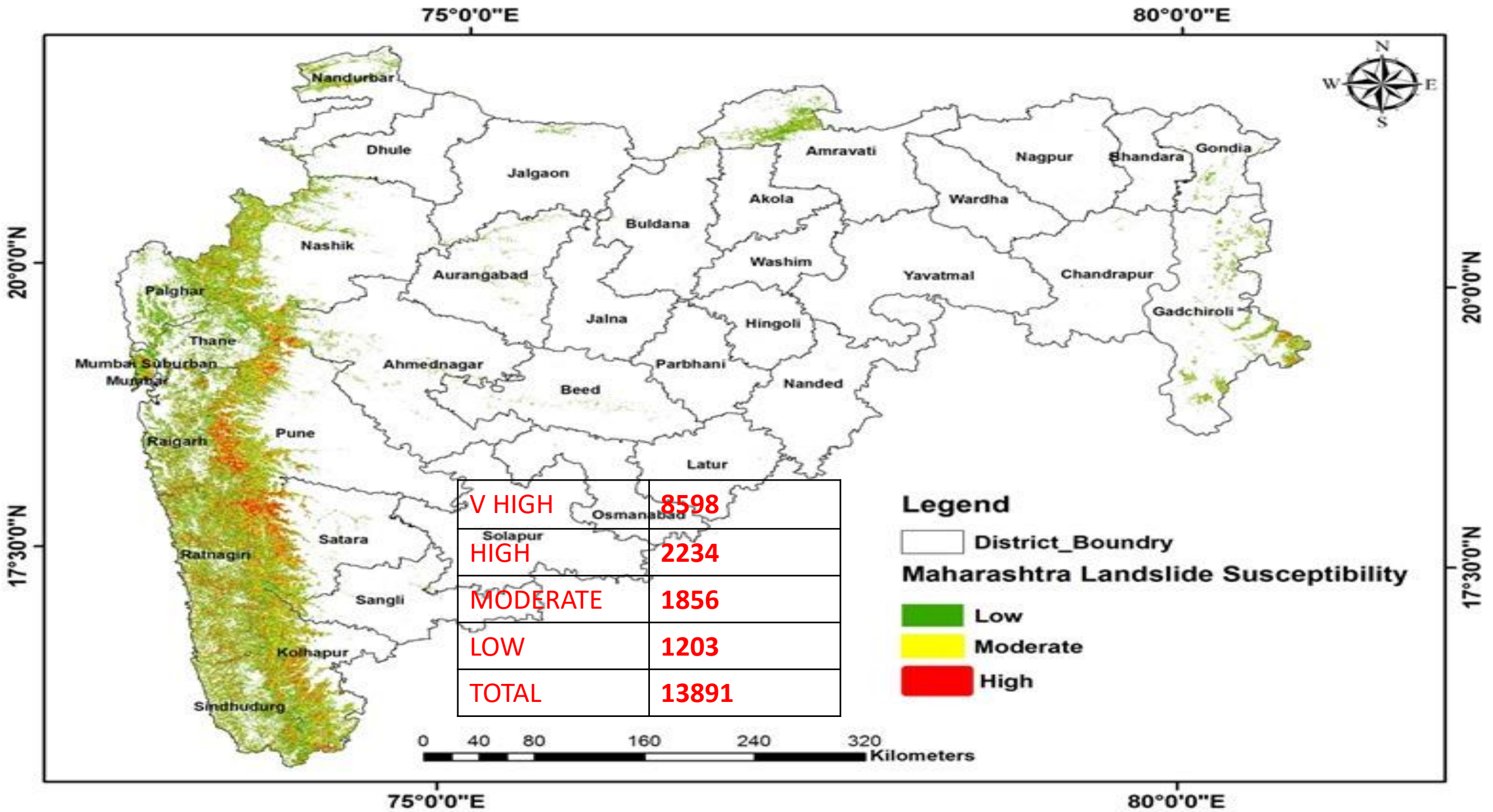
SENSORS & RADARS ( WATER LEVELS ) , SAT phones & HAM

SACHET (CAP ), MEGHDOOT, MAUSAM, BHUKAMP DAMINI apps

Social media ( @ SDMAMaharashtra

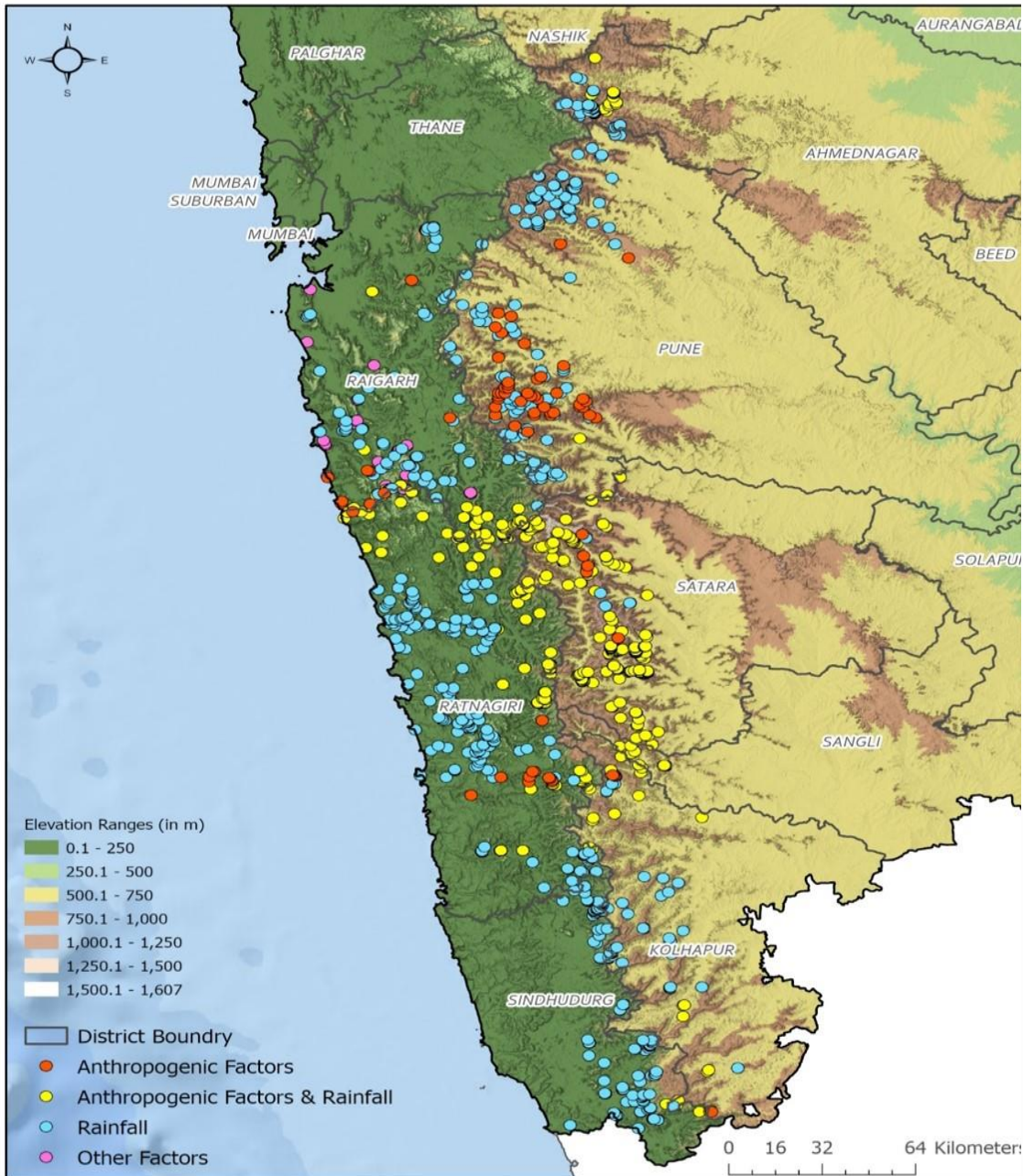
GPS systems QRV vehicles

Whats app & emails , Google sheets shared



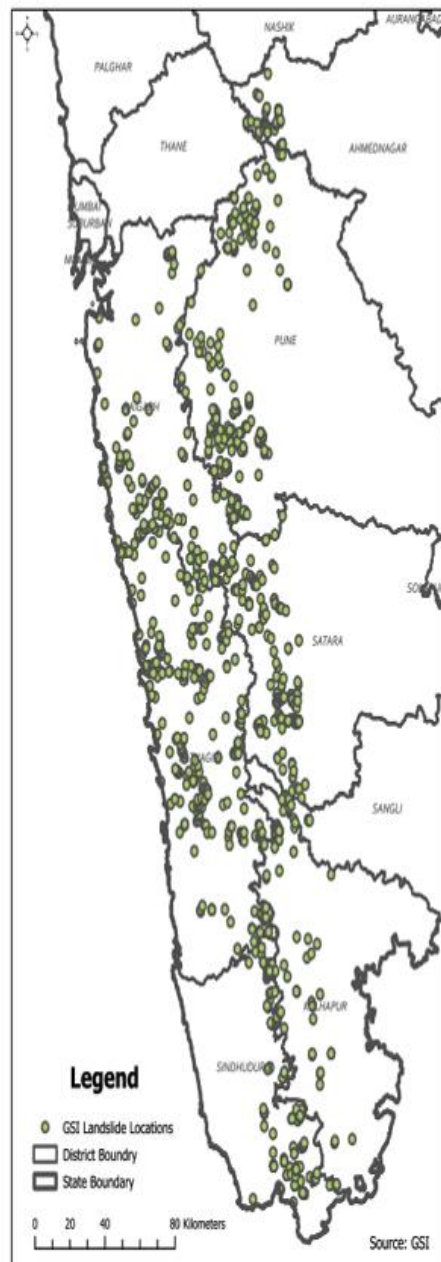


# Landslide Triggering Factors

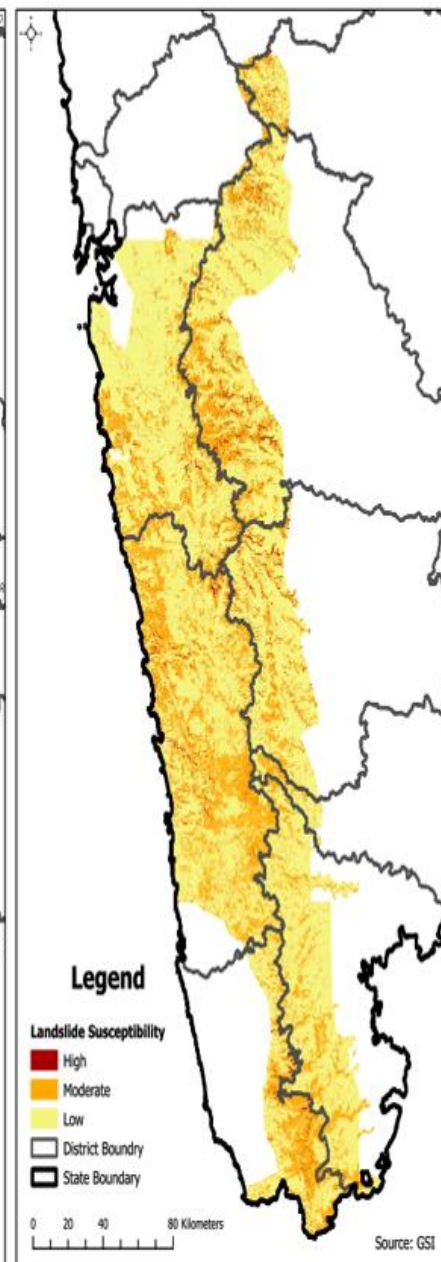


Data Source: Landslide Inventory, Geological Survey of India

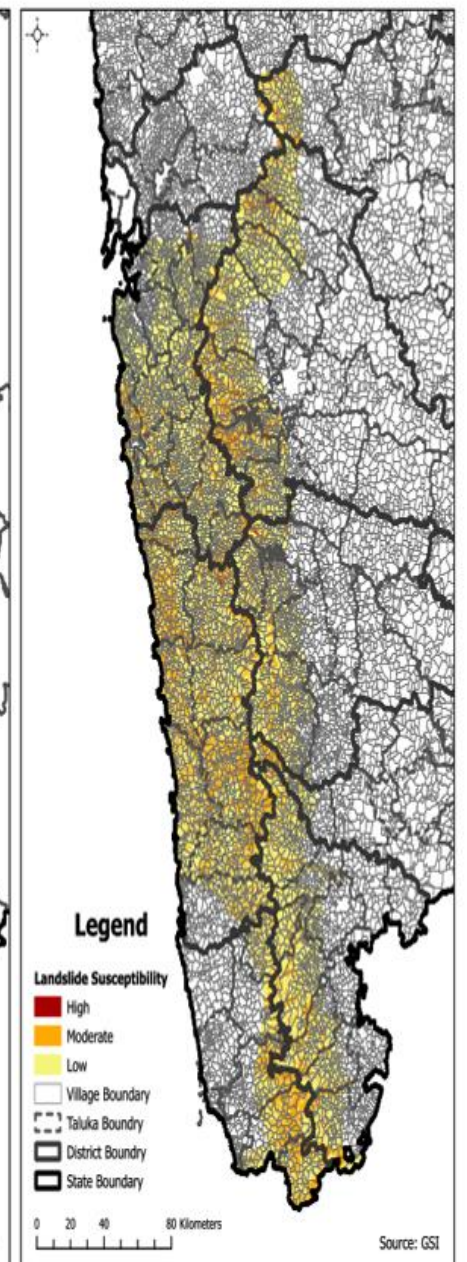
# Landslide Event History in Maharashtra District-Wise



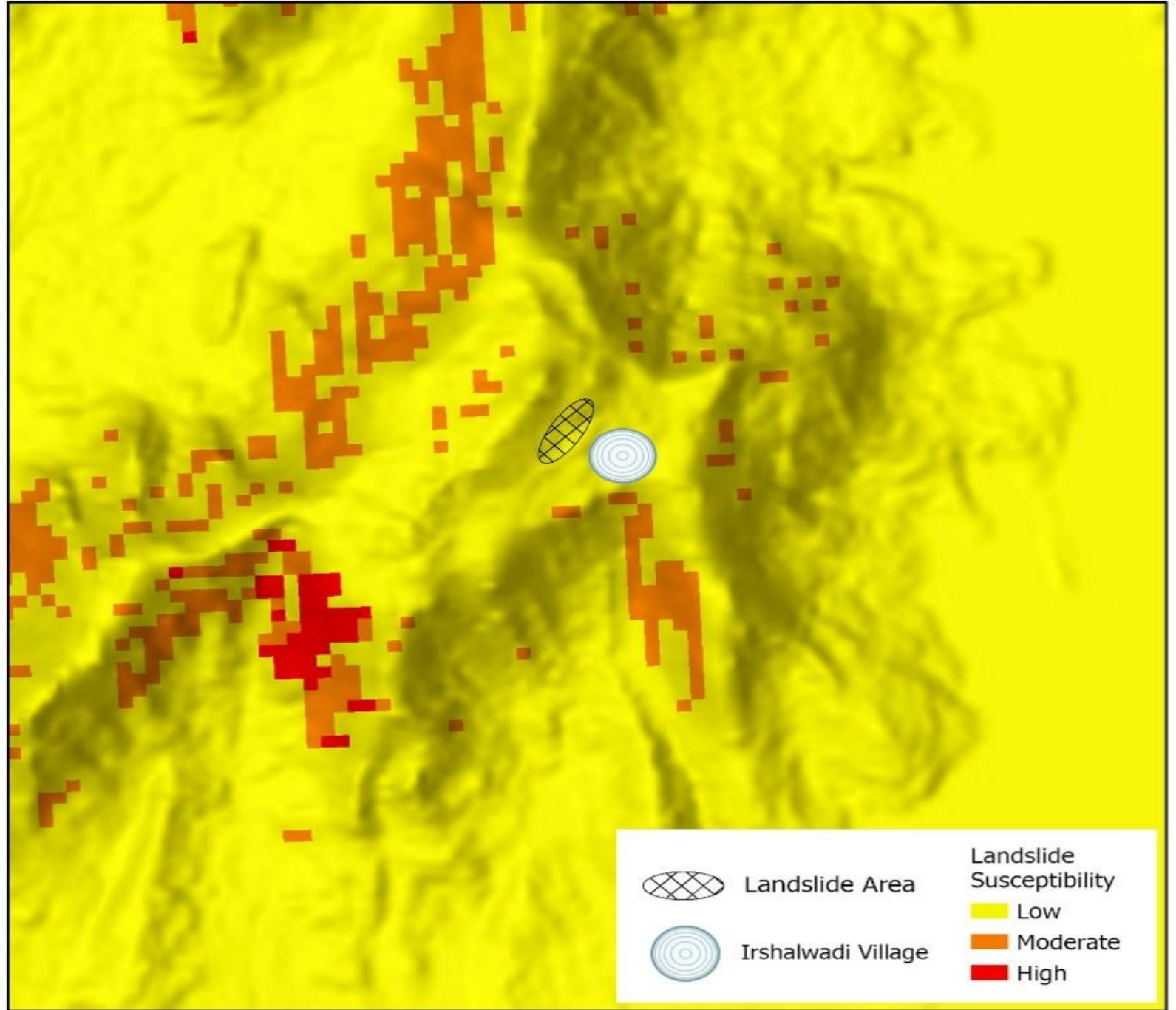
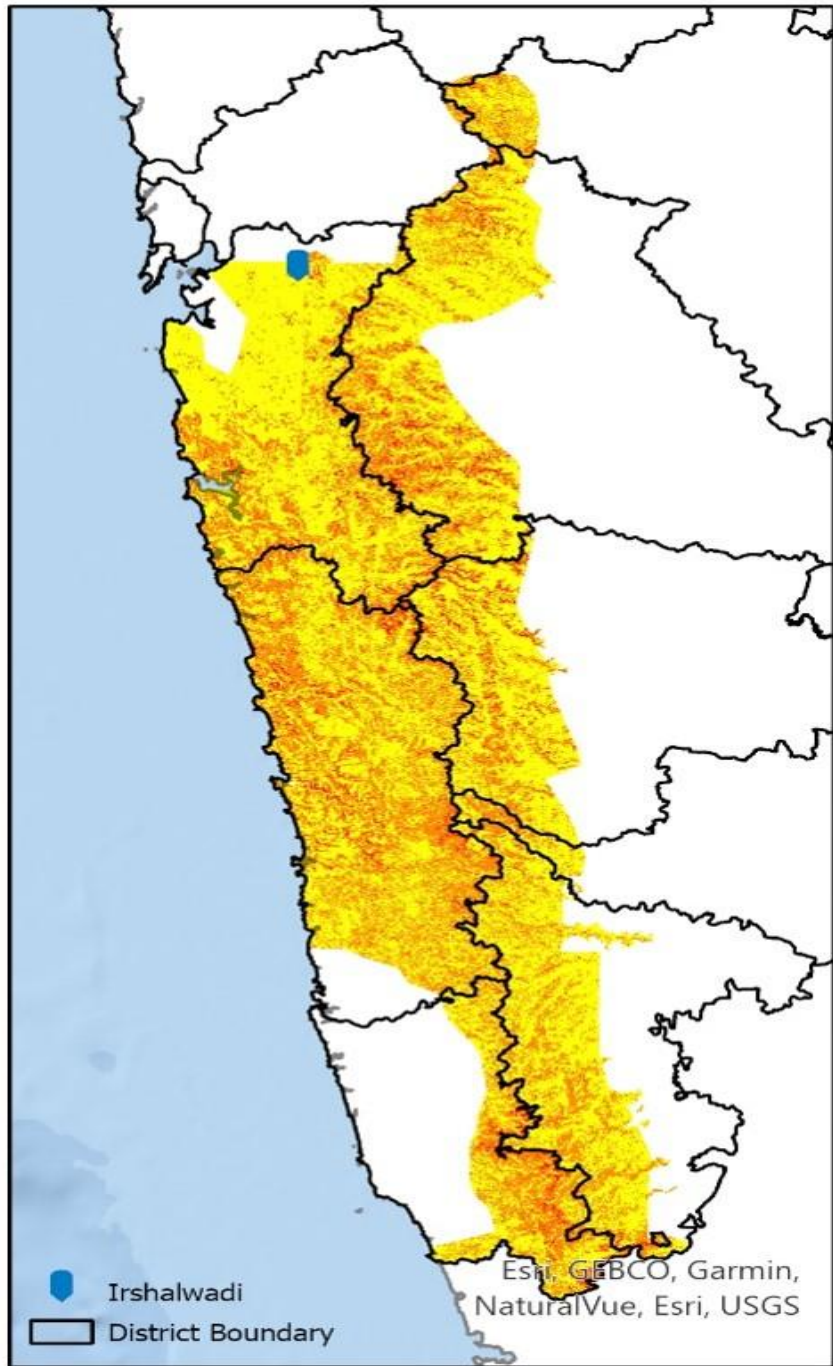
# Landslide Susceptibility Zonation in Maharashtra District-Wise



# Landslide Susceptibility Zonation in Maharashtra District, Taluka & Village-Wise









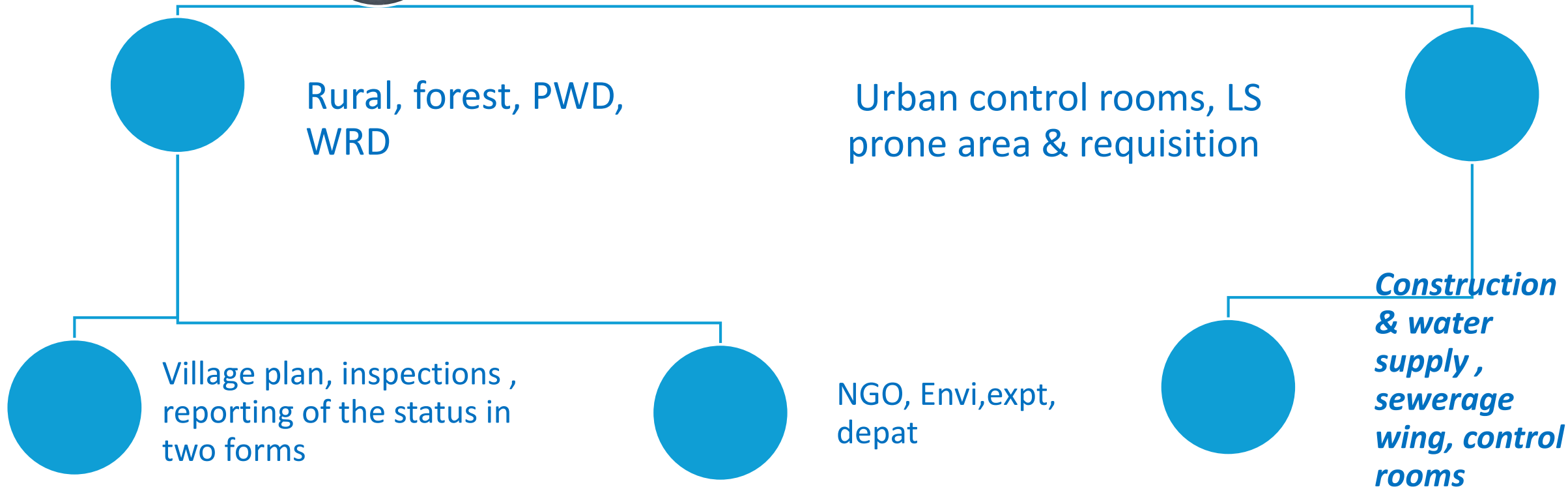
SDMA- L 3 Verification & supply IRS, Requisitions & supply, IMD, NDRF/SDRF , POLICY



DDMA- L2 verification coordination, requisition & supply



TEOC – L1 , Requisition & supply



Rural, forest, PWD, WRD

Urban control rooms, LS prone area & requisition

Village plan, inspections, reporting of the status in two forms

NGO, Envi, expt, depat

**Construction & water supply, sewerage wing, control rooms**



<b>District</b>	<b>Very High Priority villages</b>	<b>Households at risk</b>	<b>Area (Ha)</b>	<b>population</b>
Satara	88	4928	2681.33	15770
Ratnagiri	139	7784	2329.54	24909
Pune	94	5546	2168.72	17747
Kolhapur	59	3304	868.81	10573
Raigad	48	2688	764.15	8602
Thane	23	1311	467.41	4195
Sindhudurg	17	1037	239.17	3318
Ahmednagar	8	448	118.26	1434
Nashik	5	280	68.43	896
Palghar	2	112	67	358
Sangli	2	106	22.06	339
<b>Total</b>	<b>485</b>	<b>27160</b>	<b>9,794.88</b>	<b>88141</b>

Identified by overlaying very high susceptible zones with built-up infrastructure having more than 10 ha.

2348 habitats identified having less than 10 ha area 287000 households with 9.10 lakh population

## Landslide incidences in Maharashtra , GSI from 2014 to 2020

Triggering factor	Incidences	2021	2022	2023	Total
Rainfall	656	113	147	129	1045
Anthropogenic + Rainfall	363	32	15	42	452
Anthropogenic	102	17	8	11	138
Others	42	3	7	3	55
<b>Total</b>	<b>1163</b>	165	177	185	<b>1690</b>

- I. Major land slide occur in second half of July ( 2014 MALIN (181 deaths ), Taliye 2021 (85), Irsalwadi in 2023 ( 82 deaths )
- II. Urbanization, agriculture, road construction, slope cutting, tourism , mining activity, afforestation, erosion , heavy rains, chemical water, forest fire and erosion, heat waves and effect on rock , shallow rooted plants,



Sl. No	Name of Calamity	2018-19	2019-20	2020-21	2021-22	2022-23	Total
1	Flood	108	354	184	377	223	1246
2	Landslide	3	10	13	105	12	143
3	Lightning	96	157	188	207	230	878
4	Cyclone	14	8	26	98	3	149
5	Earthquake	0	1	0	0	0	1
6	Cloud Burst	0	7	3	1	0	11
7	Hailstorm	1	1	2	3	0	7
Total		222	538	416	791	468	2435

Inspection & reporting –  
Alerts & response

VEOC

L1

Monitoring of inspection  
registers & coordination

TEOC

L2

Sorting high risk habitats  
& support

DEOC

L3

Monitoring and sending  
alerts based on

SEOC

L4





Satellite map ( Source -GIS, NRSC, GLC & IIT Delhi )

Listing of Vulnerable locations & villages

Ground Truthing by teams with prescribed forms

Analysis of the report ( rainfall, anthropogenic activity and others )

Decisions on Structural long term measures

Decisions Non structural medium and short measures

Monitoring from June – rainfall + short term forecast & communication

Dashboard monitoring –preparedness ,evacuation L1,L2,L3,L4 & relief & Prepositioning of the rescue forces

Coordination with concerned agencies to respond in golden hours

Sachet app, Mausam now cast , IDRN, IRS, MIS ,Coordinates communication to SDRF ,NDRF ,



## Anthropogenic causes – location wise risk mapping

Districts	Taluka	village	Vulnerable hamlet	Population at risk	activity	Long term measures
KOLHAPUR	Ajra	Hajgoli Kh.	Hajgoli Kh.	204	Crusher	Closing
KOLHAPUR	Ajra	Vinayakwadi	Vinayakwadi	167	Excavation	stop
PUNE	Mulshi-Paud	Kolawali	Kolawali	178	excavation	stop
PUNE	Mulshi-Paud	Shirvali	Shirvali	210	excavation	stop
PUNE	Mulshi-Paud	Kolawali	Kolawali	176	Construction	regulate
PUNE	Mulshi-Paud	Shirvali	Shirvali	220	Tourism	regulate
PUNE	Mulshi-Paud	Kolawali	Kolawali	377	Trek /tourism	regulate
PUNE	Mulshi-Paud	Shirvali	Shirvali	287	deforestation	plantation
PUNE	Mulshi-Paud	Kolawali	Kolawali	326	Crusher	Closing
PUNE	Mulshi-Paud	Shirvali	Shirvali	178	Excavation	stop
PUNE	Mulshi-Paud	Kolawali	Kolawali	327	Road	regulate
PUNE	Mulshi-Paud	Shirvali	Shirvali	293	Construction	regulate
PUNE	Mulshi-Paud	Kolawali	Kolawali	126	Construction	regulate

## Heavy rainfall –location wise risk mapping

Districts	Taluka	Location	Vulnerable hamlet	Population at risk	Short term measures	Long term measures
RAIGAD	Poladpur	Pangaloli	Pangaloli	355	plantation	wall
RAIGAD	Poladpur	Fanaskond	Fanaskond	228	shifting	wall
RAIGAD	Poladpur	Khadkawane	Khadkawane	430	Shifting	wall
RAIGAD	Poladpur	Parsule	Parsule	612	Temporary s	wall
RAIGAD	Poladpur	Kshetrapal	Kshetrapal	309	plantation	wall
RAIGAD	Poladpur	Mahargul	Mahargul	288	Wire mesh	wall
RAIGAD	Poladpur	Kotwal Bk.	Kotwal Bk.	167	Shifting	wall
RAIGAD	Poladpur	Goldara	Goldara	430	Wire mesh	wall
RAIGAD	Poladpur	Kotwal Kh.	Kotwal Kh.	137	Plantation	wall
RAIGAD	Poladpur	Palchil	Palchil	354	plantation	wall
RAIGAD	Poladpur	Ombali	Ombali	234	Wire mesh	wall
RAIGAD	Poladpur	Kudpan Bk.	Kudpan Bk.	316	concrete	wall
RAIGAD	Poladpur	Kamthe	Kamthe	221	Shifting	wall
RAIGAD	Poladpur	Morsade	Morsade	361	rehabilita	wall
RAIGAD	Poladpur	Sade	Sade	213	Plantation	wall

<b>TSPs</b>	<b>Subscribers in that locality</b>	<b>SMS delivered</b>	<b>Delivery time</b>	<b>Area</b>
<b>From June 1,2024 to 11.08.2024</b>				
<b>BSNL</b>	7,77,824	63,33,472	36 minutes	Raigad, Ratnagiri, Sindhudurg, Satara, Kolhapur
<b>Vodaphone-Idea</b>	35,16,953	2,05,50,859	21 minutes	
<b>Airtel</b>	28,80,925	1,96,42,775	14 minutes	
<b>Jio</b>	29,02,832	1,92,08,496	14 minutes	
<b>MTNL</b>	11,450	54,350	21 minutes	
<b>Total</b>	1,00,89,984	6,57,89,952		

**TSP(SMS)**

BSNL CAP XML Sent Successfully भारतीय हवामान विभाग ... (Marathi)

Vodafone-Idea CAP XML Sent Successfully भारतीय हवामान विभाग ... (Marathi)

Reliance Jio CAP XML Sent Successfully भारतीय हवामान विभाग ... (Marathi)

Airtel CAP XML Sent Successfully भारतीय हवामान विभाग ... (Marathi)

**Internet Users**

Web Browser CAP XML Sent Successfully भारतीय हवामान विभाग ... (Marathi)

Mobile App CAP XML Sent Successfully भारतीय हवामान विभाग ... (Marathi)

**Satellite Media**

GAGAN CAP XML Sent Successfully Extremely Heavy Rain... (Marathi)

Sender Contact No : 8655308473

**Warnings :**

Event Description: Extremely Heavy Rain

Severity: WARNING

Certainty: Very Likely

Effective Date & Time: 24 Jul 2024, 1:00 PM

Expiry Date & Time: 25 Jul 2024, 8:30 AM

Area Description: Pune, Satara districts of Maharashtra

Area covered: 28957.448000000004 Sq. Km (approx.)

Message (English): Extremely heavy rainfall at isolated places in ghat areas and moderate rain in plains over Pune, Satara in next 24 hours.

Message (Marathi): भारतीय हवामान विभाग पुढील २४ तासांत घाट परिसरात काही ठिकाणी अति मुसळधार पाऊस. पुणे, सातारा येथे मैदानी भागात मध्यम स्वरूपाचा पाऊस .तरी नागरिकांनी सतर्क राहावे. मंत्रालय नियंत्रण कक्ष मुंबई.

Instruction: Please follow SDMA guidelines.



Agency Name	Agency	Count/ Status
TSP	Vodafone-Idea	32472990 SMS
TSP	BSNL	358824 SMS
TSP	MTNL	N/A
TSP	Reliance Jio	18329868 SMS
TSP	Airtel	24614355 SMS
Browser Notification	Web browser	Received by 28 out of 151 subscribers



469 types of items with codes recorded of all districts – 32 lakh inventory record is ready on IRS system

India

DashBoard >>Show Your District Inventory Report

Download PDF

	Quantity	Item Discription	Department/Agency Name
elf contained	20 Nos	LOCATION : kolhapur SOURCE : Govt LAST UPDATION : 29/11/2021	DEPT NAME :Collector Office Kolhapur DEPT ADDR :Collector Office Kolhapur CONTACT NO. : 02312659232
	6 Nos	LOCATION : kolhapur SOURCE : Govt LAST UPDATION : 29/11/2021	DEPT NAME :Collector Office Kolhapur DEPT ADDR :Collector Office Kolhapur CONTACT NO. : 02312659232
	36 Nos	LOCATION : kolhapur SOURCE : Govt LAST UPDATION : 29/11/2021	DEPT NAME :Collector Office Kolhapur DEPT ADDR :Collector Office Kolhapur CONTACT NO. : 02312659232
	700 Nos	LOCATION : kolhapur SOURCE : Govt LAST UPDATION : 29/11/2021	DEPT NAME :Collector Office Kolhapur DEPT ADDR :Collector Office Kolhapur CONTACT NO. : 02312659232
	900 Unit	LOCATION : kolhapur SOURCE : Govt LAST UPDATION : 29/11/2021	DEPT NAME :Collector Office Kolhapur DEPT ADDR :Collector Office Kolhapur CONTACT NO. : 02312659232
sons)	50 Unit	LOCATION : kolhapur SOURCE : Govt LAST UPDATION : 29/11/2021	DEPT NAME :Collector Office Kolhapur DEPT ADDR :Collector Office Kolhapur CONTACT NO. : 02312659232

Showing 1 to 6 of 6 entries

# L1 to L2 - High risk monitoring & Action report ( TEOC )

Village name	Habitat local name	Population	Manpower available	Shelter Name	GPS location Of staging area	Demand to TEOC			
						Manpower		Machineries/equipments	
						Civil	rescue	Code no.	Required number
								<b>Excavator</b>	
								<b>Cranes</b>	
								<b>Ambulances</b>	
								<b>Transport Buses</b>	

## L2 to L3 - High risk monitoring & Action report ( DEOC )

Village name	Habitat local name	Population	Manpower available	Shelter Name	GPS location of staging area	Demand to DEOC			
						Manpower		Machineries/equipments	
						Civil	rescue	Code no.	Required number
								<b>Water tanker</b>	
								<b>Trucks</b>	
								<b>Tractor</b>	
								<b>Jeeps</b>	

## L3 to L4 - High risk monitoring & Action report ( SEOC )

Village name	Habitat local name	Population	Manpower available	Shelter Name	GPS location of the staging area	Demand to SEOC			
						Manpower ( Numbers )		Machineries/equipments	
						Civil	Rescue ( SDRF/NDRF )	Code no.	Required number
								<b>Excavator</b>	
								<b>Cranes</b>	
								<b>Ambulances</b>	
								<b>Transport Buses</b>	



## Way Forward

- i. Slope master plan and development regulation policy
- ii. Mining activity , construction, tourism regulation policy
- iii. Slope inclinometer
- iv. Drone survey during monsoon
- v. Immediate afforestation at forest fire area
- vi. Soil & water conservation plan
- vii. Any future development work will have component of disaster risk & mitigation
- viii. Finding nature based solutions, to avoid forest fires, erosion control, developing proper drainage lines on slopes

Thank you