Kerala Floods 2018

Building Back Better

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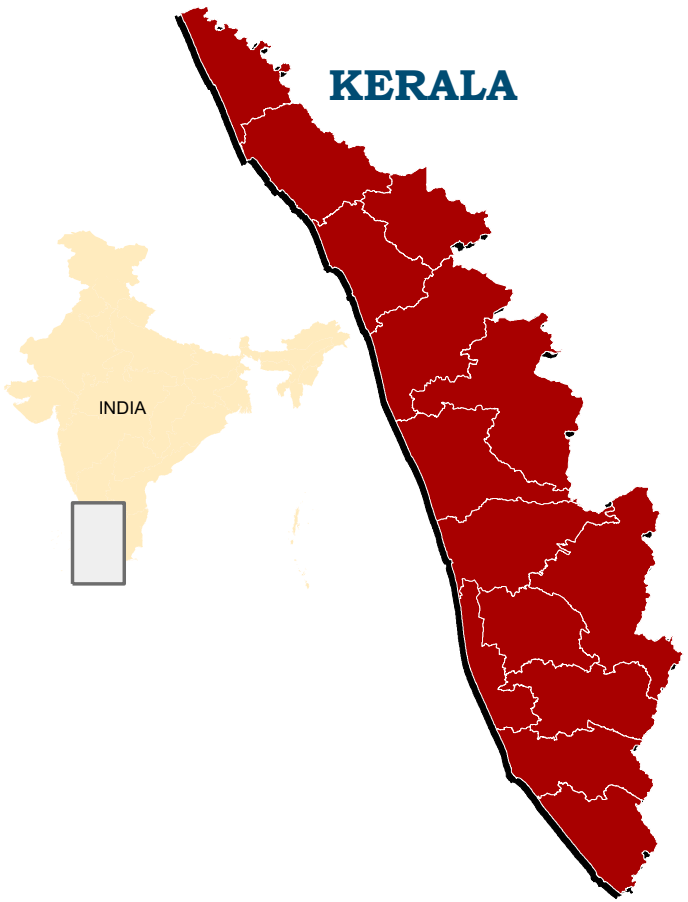
Chief Resilience Officer, Kerala (Dept. of Environment)
&
Member Secretary, KSDMA & Head, KSEOC (Dept. of Disaster Management)
Govt of Kerala

Kerala at a Glance



Capital: Thiruvananthapuram

Geographical area: 38,863 km^2

Population: 33.38 million

Population Density: 859/km^2

Administrative Districts: 14

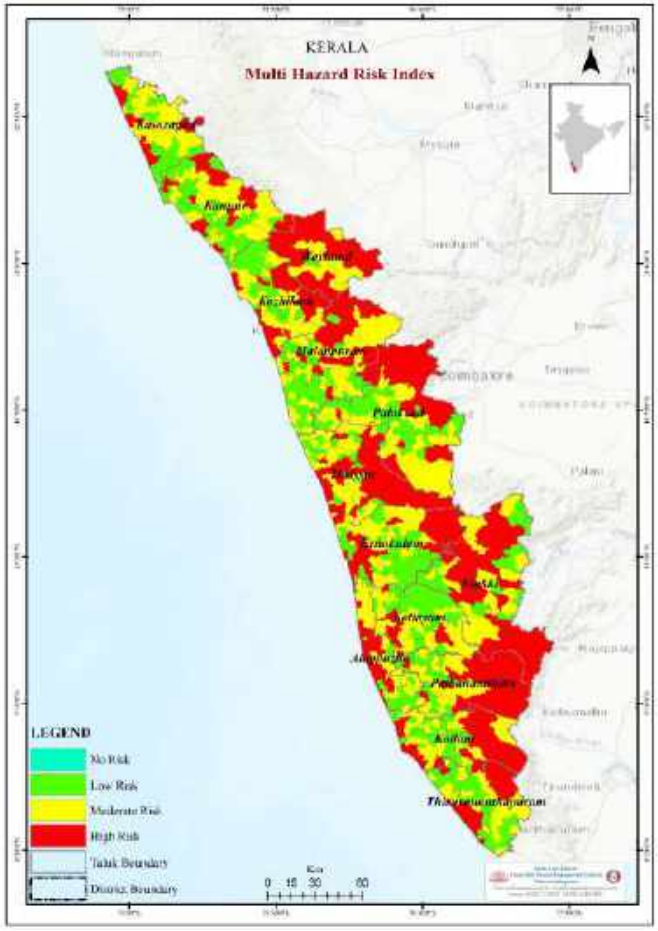
Average Annual Rainfall: 3100 mm

Kerala's Vulnerabilities

Kerala is multi hazard prone

KERALA – HAZARD SUSCEPTIBILITIES

- **LANDSLIDE PRONE** 14.4%
- **FLOOD PRONE** 14.5%
- **COAST LINE PRONE TO HAZARDS** 55.5%



Land subsidence due to tunnel erosion or soil piping is a slow hazard that has recently been affecting hilly areas

The coastline is prone to erosion, monsoon storm surges and sea level rise

The State lies in seismic zone III which corresponds to Moderate Damage Risk Zone (MSK VII)

Highly vulnerable to climate change & extreme weather events

Kerala's Social Capacities

Highest Human Development Index (0.784)

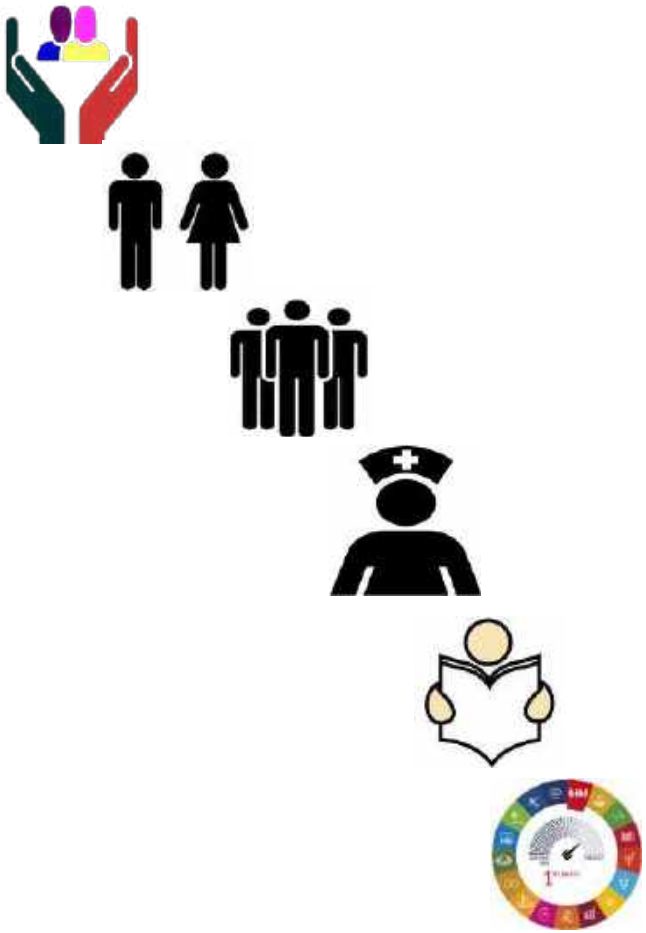
Best Sex ratio (females/1000 males): 1084

Lowest Population Growth Rate (4.9)

Highest Health Index (76.5)

Highest Literacy rate (93.9)

Highest SDG Index (92/100)



Institutional Focus – Towards a Safer State…

2012-17 — Focus: Human Resource, State & District Institutional Strengthening

2017-22 — Focus: Decentralisation – devolution of DM into Local Governments

2022-27 — Focus: Resilient Homes – Climate Change and DRR Aware

Kerala's Vulnerabilities

1	Natural Hazards	Flood (Riverine, Urban and Flash Floods)
2		Landslides (includes debris flows, rock fall, rock avalanche, rock slide, landslips and mud slips)
3		Drought
4		Coastal hazards (High waves, Storm surges, Kallakadal, Tsunami, Salt Water Intrusion, Coastal erosion)
5		Wind (Cyclone, Gustnados, Gusty winds)
6		Lightning
7		Earthquakes
8		Human epidemics
9		Plant disease epidemics and pest attack on crops
10		Avian epidemics
11		Animal epidemics
12		Pest attack of human habitations
13		Forest Fire
14		Meteorite/asteroid impacts
15		Soil Piping
16		Heat wave/sunburn/sunstroke
17		Natural background radiation

Kerala's Vulnerabilities

1	Anthropogenic Hazards	Stampedes
2		Fire cracker accidents
3		Petro-chemical transportation accidents
3		Industrial accidents
4		Dam break
5		Dam spillway operation related floods & accidents
6		Oil spill
7		Road accidents involving civilian transport vehicles
8		Human induced forest fire
9		Human-animal conflicts
10		Fire accidents in buildings and market places
11		Boat capsizing
12		Accidental drowning
13		Building collapse
14		Hooch accident
15		Air accidents
16		Rail accidents
17		Terrorism, riots and Naxalite attacks
18		Nuclear and radiological accidents
19		Space debris impacts
20		Biological accidents
21		Occupational hazards
22		Accidents in Armed Forces premises

Disasters

3.1 Natural calamities of cyclone, drought, earthquake, fire, flood, tsunami, hailstorm, landslide, avalanche, cloud burst, pest attack and cold wave & frost, considered to be of severe nature by the Government of India, and requiring expenditure by a State Government in excess of the balances available in its own State Disaster Response Fund (SDRF), will qualify for additional assistance from NDRF, as per the established procedure.

Nationally notified


CLOUD BURST


AVALANCHE


DROUGHT


PEST ATTACK


COLD WAVE


CYCLONE

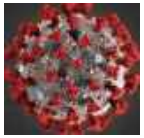

HAIL STORM


TSUNAMI


EARTHQUAKE


FIRE


LANDSLIDE


COVID19

State Specific


HEAT WAVE/SUN BURN/SUN STROKE


STRONG WIND

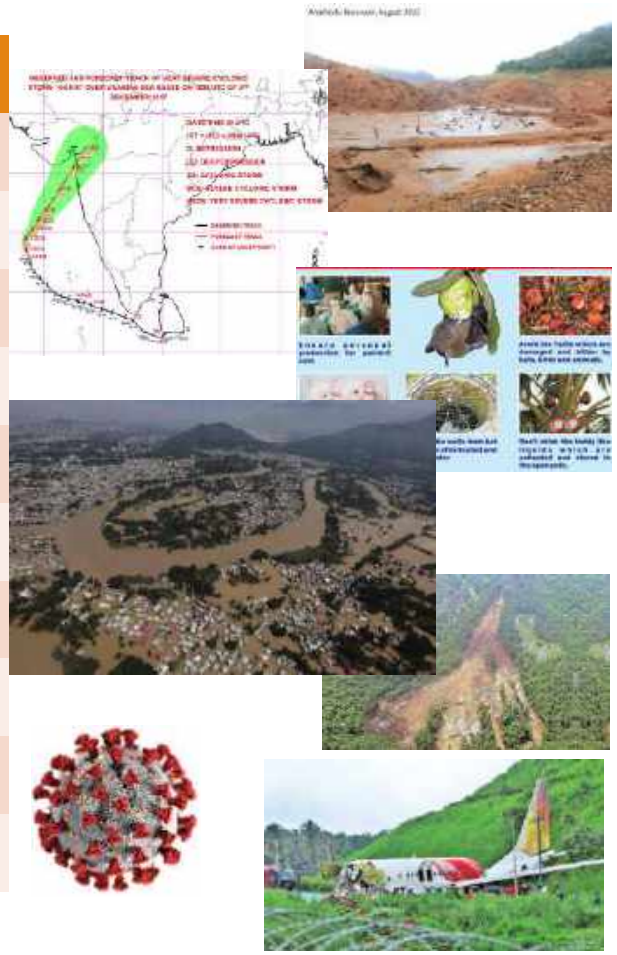

SOIL PIPING


LIGHTNING


COASTAL EROSION

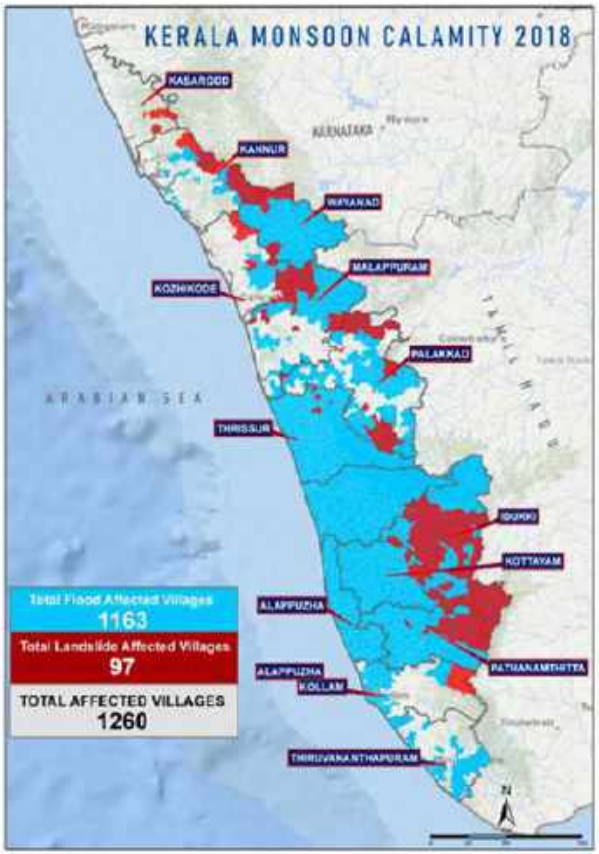
Recent disasters

Event	Year	Damage/Fatality
Drought	2012-13	₹23.78 billion
Drought	2016	₹9.93 billion
Cyclone Ockhi	2018	142 fatalities
Nipha Virus	2018	17 fatalities
Floods & Landslides	2018	451 fatalities
Floods & Landslides	2019	125 fatalities
Covid19	2020…	29,355 fatalities
Landslides	2020	69 fatalities
Air Crash	2020	18 fatalities
Landslides	2021	27 fatalities



Floods 2018

Kerala Floods 2018



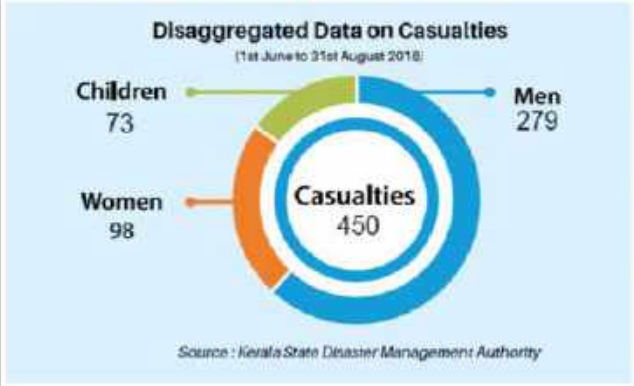
All 14 districts affected

1260/1664 villages affected

687 km² land flooded

Over 5000 landslide

1260 out of 1664 villages were affected	687 km2 area of land marooned	14,315 houses fully damaged	2,70,000 houses partially damaged	0.15 Million Ha of standing crops damaged



7,51,000 poultry & 7,953 domestic animals lost

3 million electric connections damaged

510 Bridges and Culverts damaged

9538 kms of Major roads and 77,328kms of rural roads damaged

Kerala Floods 2018

“തലയ്ക്ക് മീതെ വെള്ളം വന്നാൽ അതിനും മീതെ വള്ളം ഇറക്കണം”

“When floods rise above your heads, float boats above it”

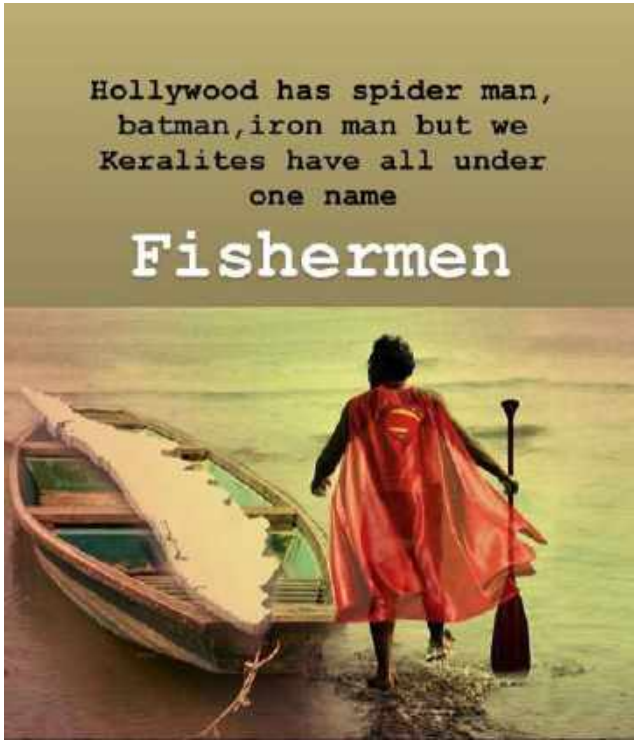
Live plotting of location details of stranded people received through multiple channels and handed over to forces

Rescue priority: pregnant women, children, elderly and persons with disabilities

Biggest deployment of the armed forces for rescue operations in the history of the country

National Disaster Response Force	Air Force	Indian Army & ETF	Navy	Coast Guard	BSF
59 teams	22 helicopters	23 columns	40 Boats	35 boats & life rafts	4 Company including water wings

Harnessing Human Spirit in Rescue



Kerala's own Army the FISHERMEN navigated troubled waters voluntarily to **SAVE 65,000 lives**

Landslide 2019

The HQ - 2019

Institutional Mechanisms…

Gap analysis – Technical consultations 2020

- Land Management
- Human Settlement
- Agriculture
- Mining
- Hazard Susceptible zones
- Forest Management
- Water Management

- The gap analysis is used to develop the 5 year plan of KSDMA 2022-27

Report may be found here https://bit.ly/3S5y9ww

2022-27

Sl. No	SENDAI Target	Kerala's Action
1	Reduce Disaster Mortality by 2030	Strengthen Anticipatory Actions through Disaster Literacy Campaigns
2	Reduce Number of affected people by 2030	Create Resilient Homes
3	Reduce economic loss by 2030	Create Risk Transfer Mechanisms
4	Reduce infrastructure loss by 2030	Mainstream Risk-Informed Planning
5	Ensure Local Strategies for DRR by 2030	Continue Strengthening State, District and Local Government Disaster Management Institutional mechanisms
6	Increase International Cooperation by 2030	Institutionalise the Netherlands-Kerala, Norway-Kerala cooperation
7	Increase access to Early Warnings Systems and Disaster Risk Information by 2030	Adopt advanced science and technology for disaster risk reduction and actively promote citizen science

KaWaCHaM

THE WORLD BANK
IBRD · IDA | WORLD BANK GROUP

CMS
SIMPLIFYING LIFE

The Orange Books – SOPs (Monsoon & cascading hazards)

Anticipatory Actions Guidelines approved under DM Act 2005

Unifies the actions of state and national actors

IRS notified through orange book and updated every year

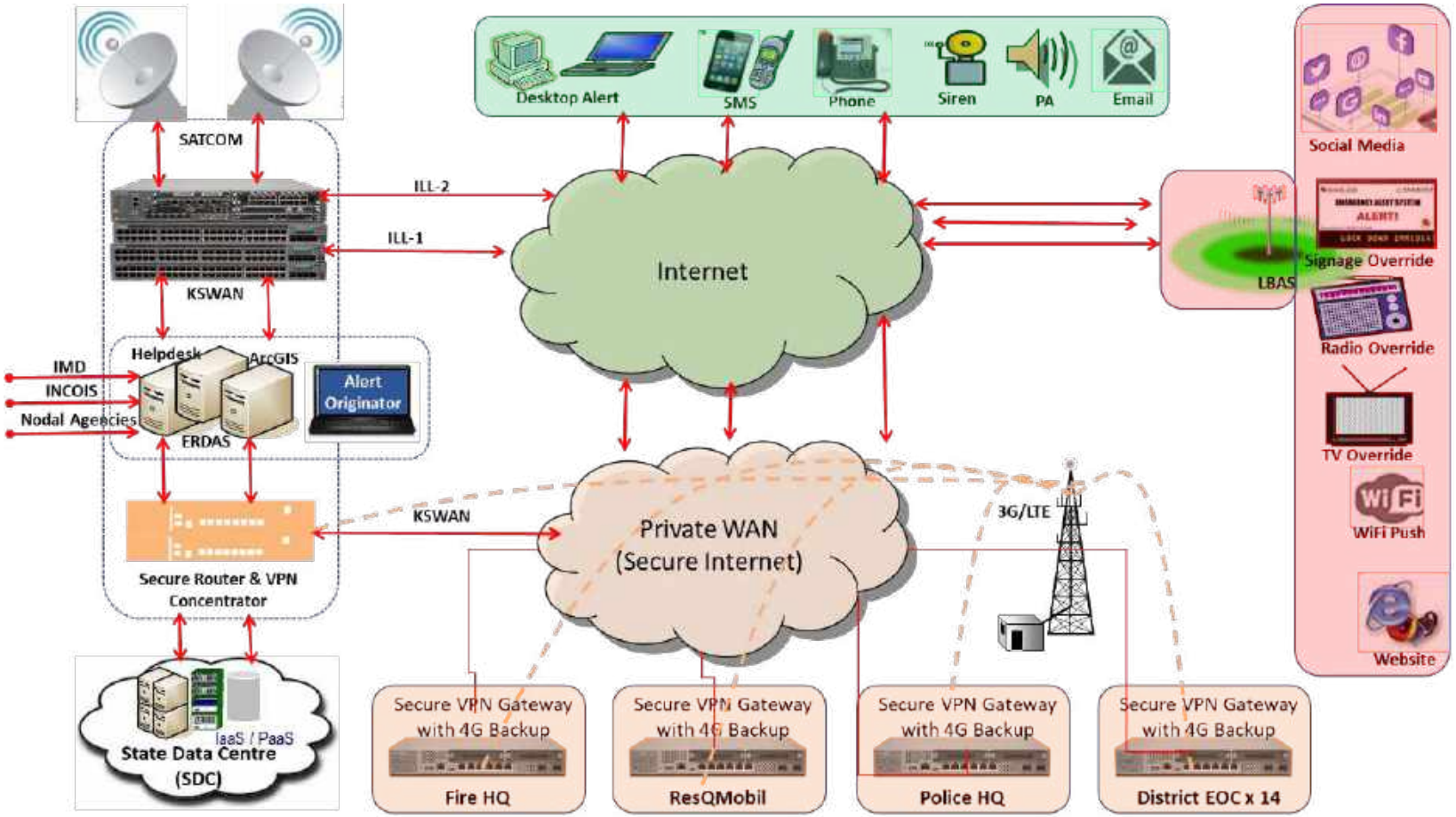
Covers 36 departments

Detailed coverage of financial and legal framework

Evaluation of monsoon prognosis by 24 agencies

Warning and anticipatory actions updated every year

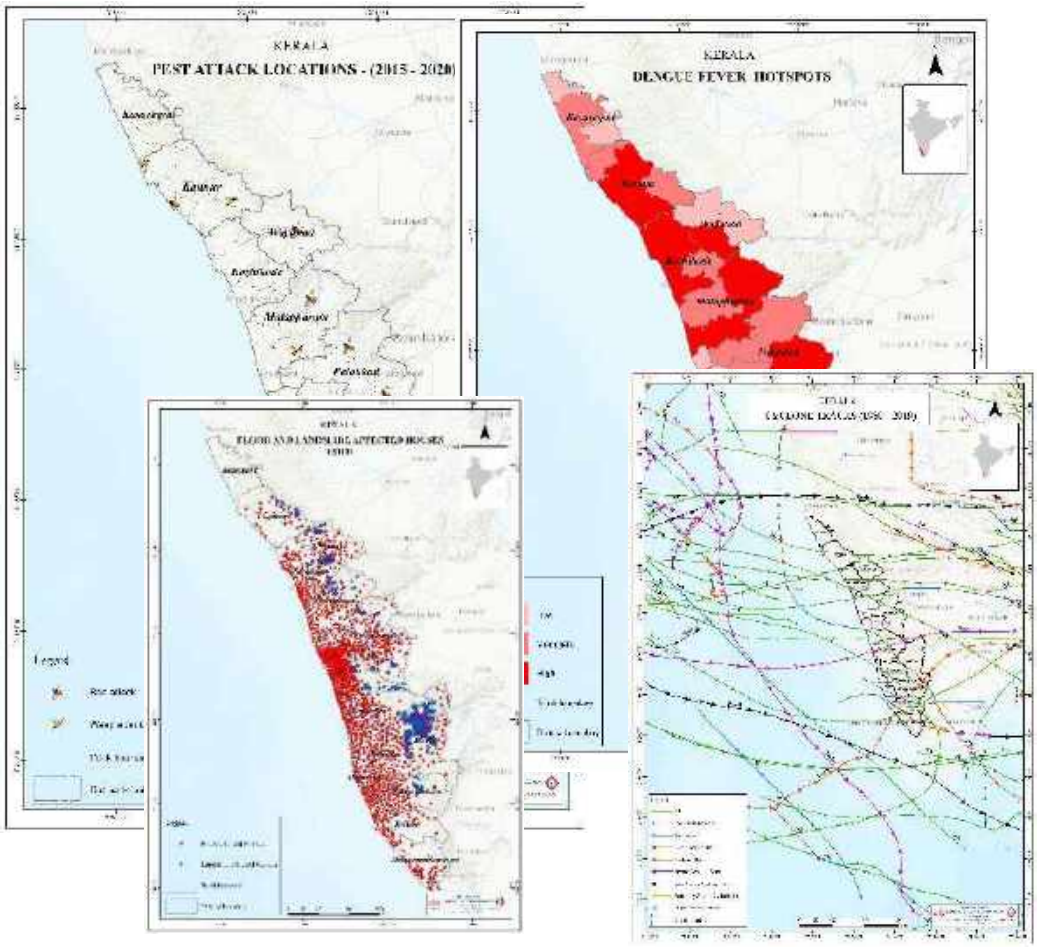
The hard & software



The Risk Knowledge

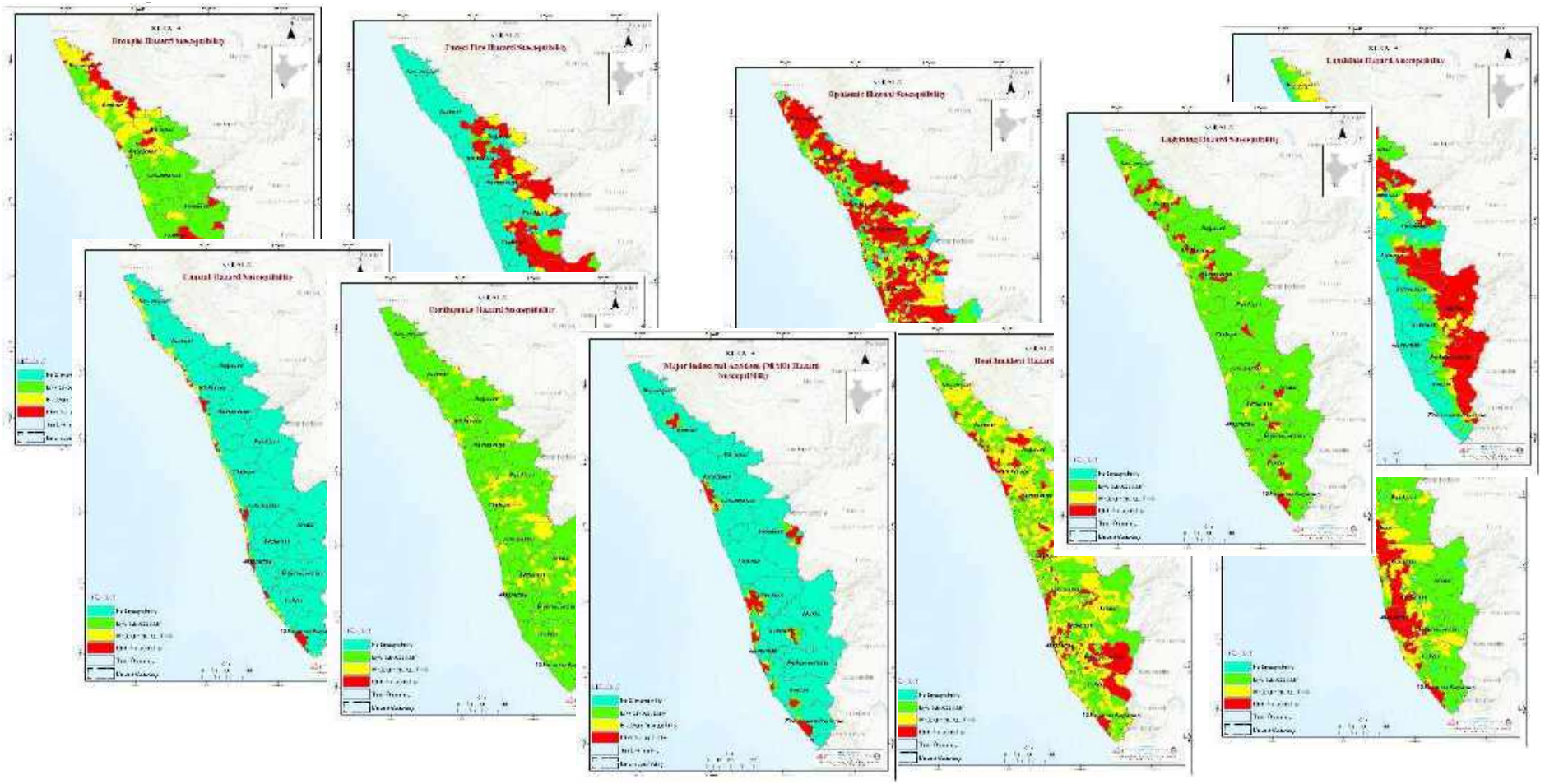
➢ HVRA Version 2

- KSEOC does HVRA inhouse
- Risk Lab
- No consultancy services are used
- Version 1 was done in 2016
- Version 2 based on risk indexing approach
- Local Governments ranked based on risk index for priority actions



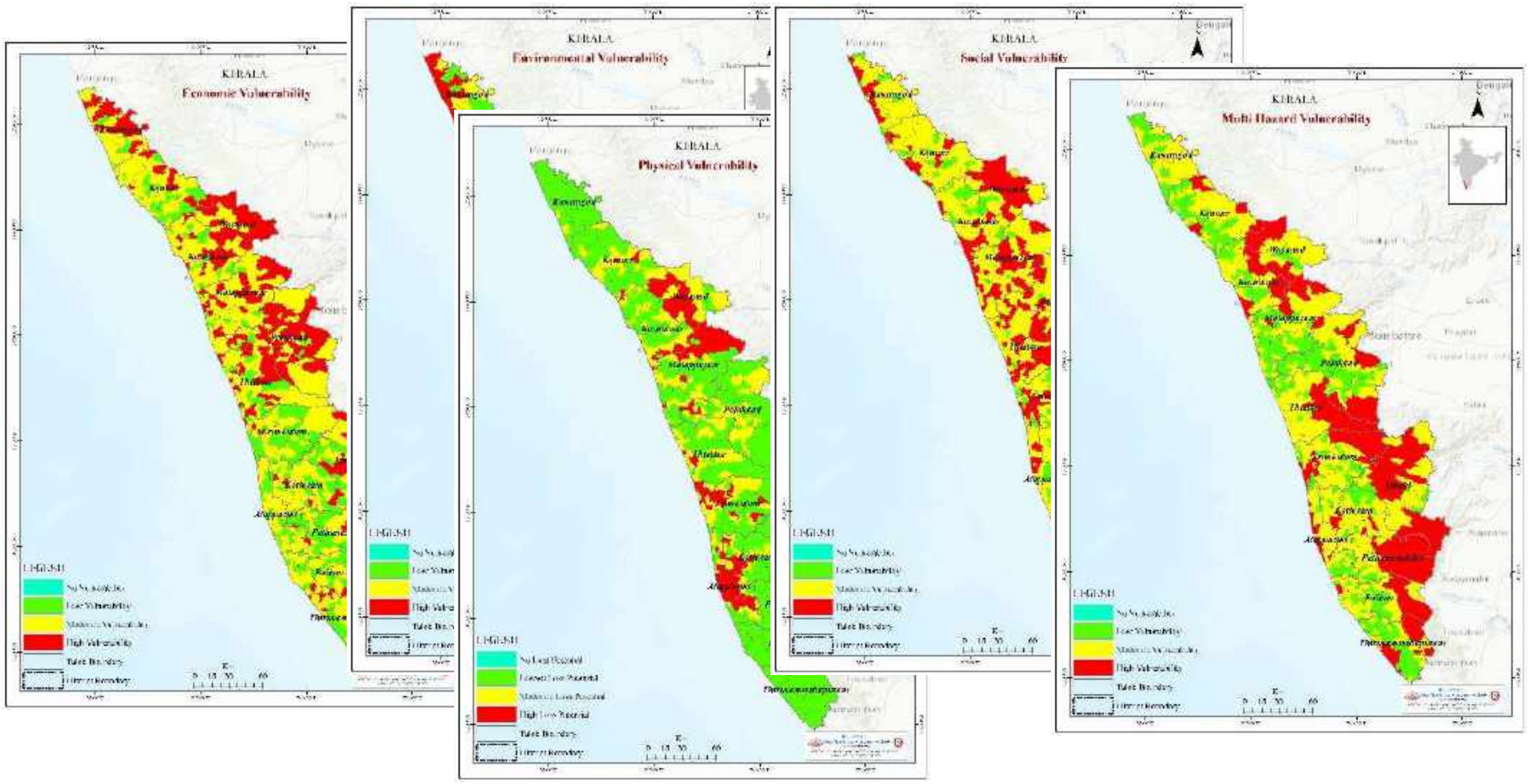
The Risk Knowledge

- **Hazard susceptibility ranking of local governments**



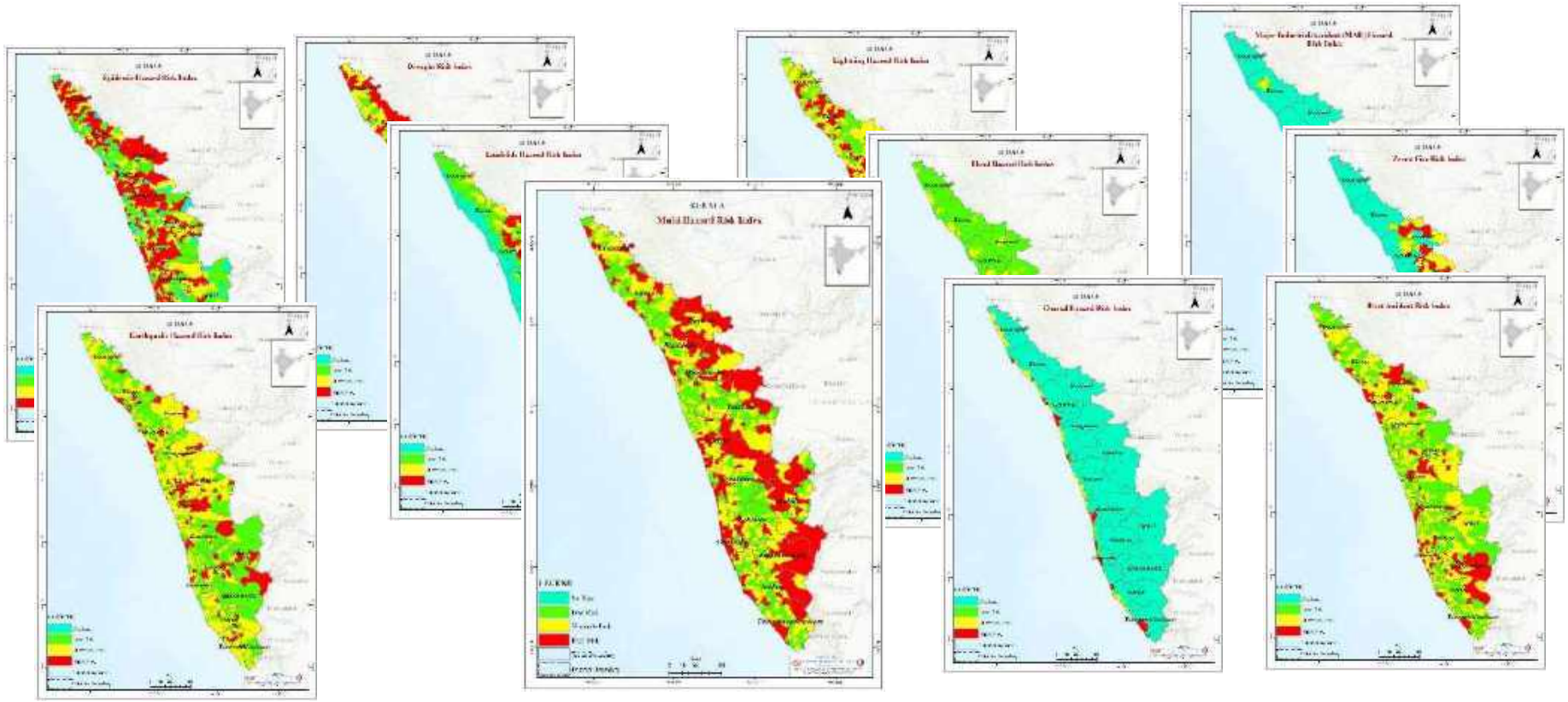
The Risk Knowledge

- **Vulnerability ranking of local governments**



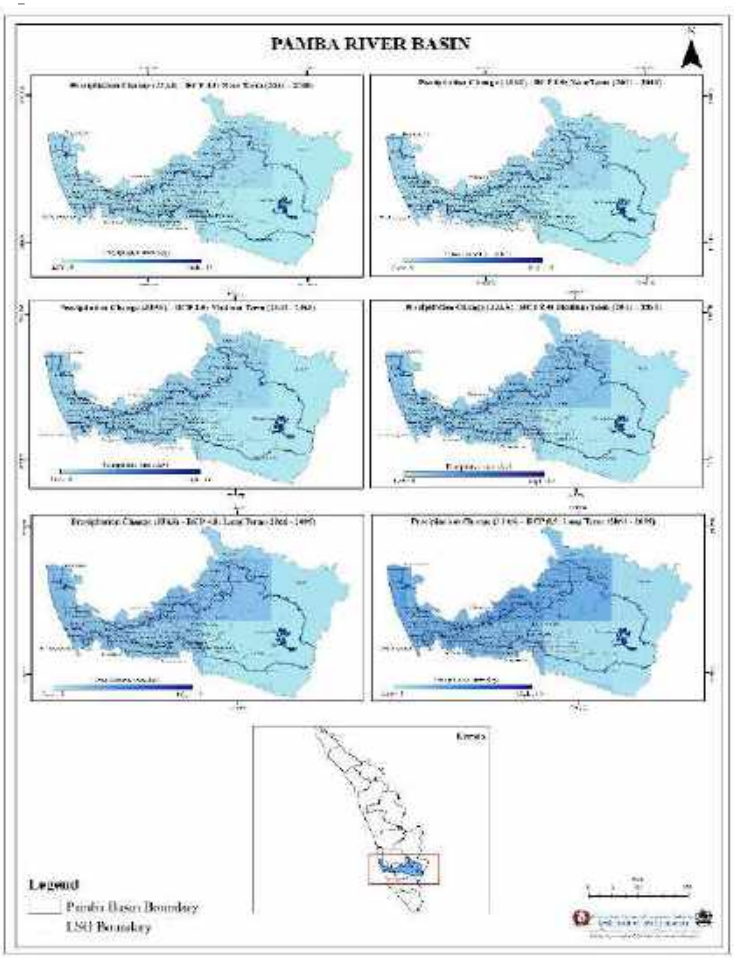
The Risk Knowledge

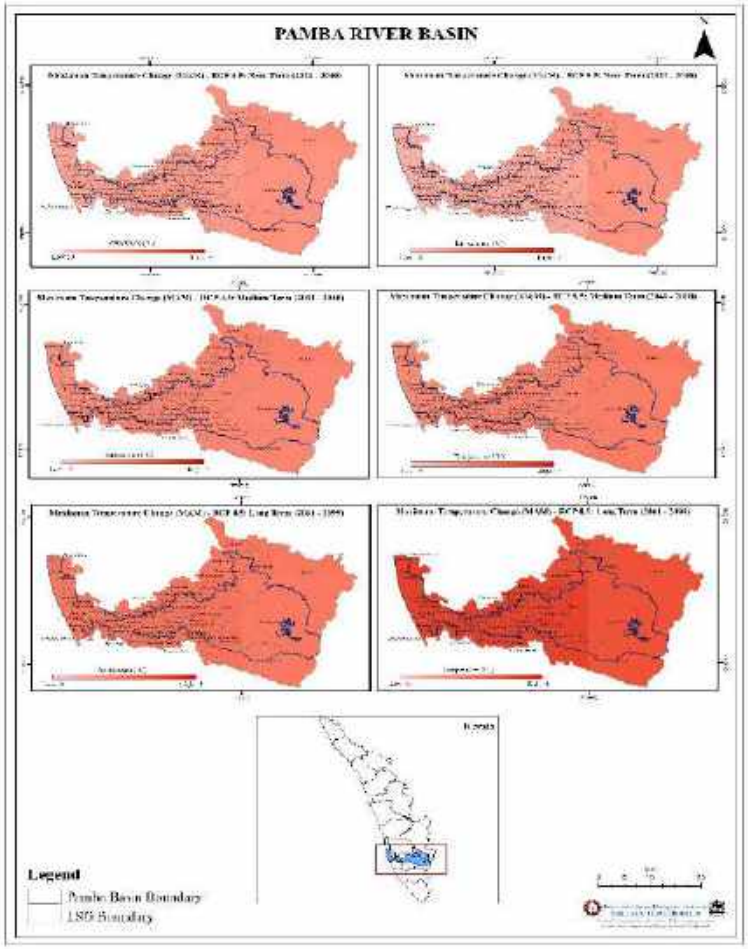
- **Multi-hazard risk ranking of local governments**



The Risk Knowledge

- **AR5 CORDEX – rainfall & temperature**





The Risk Knowledge

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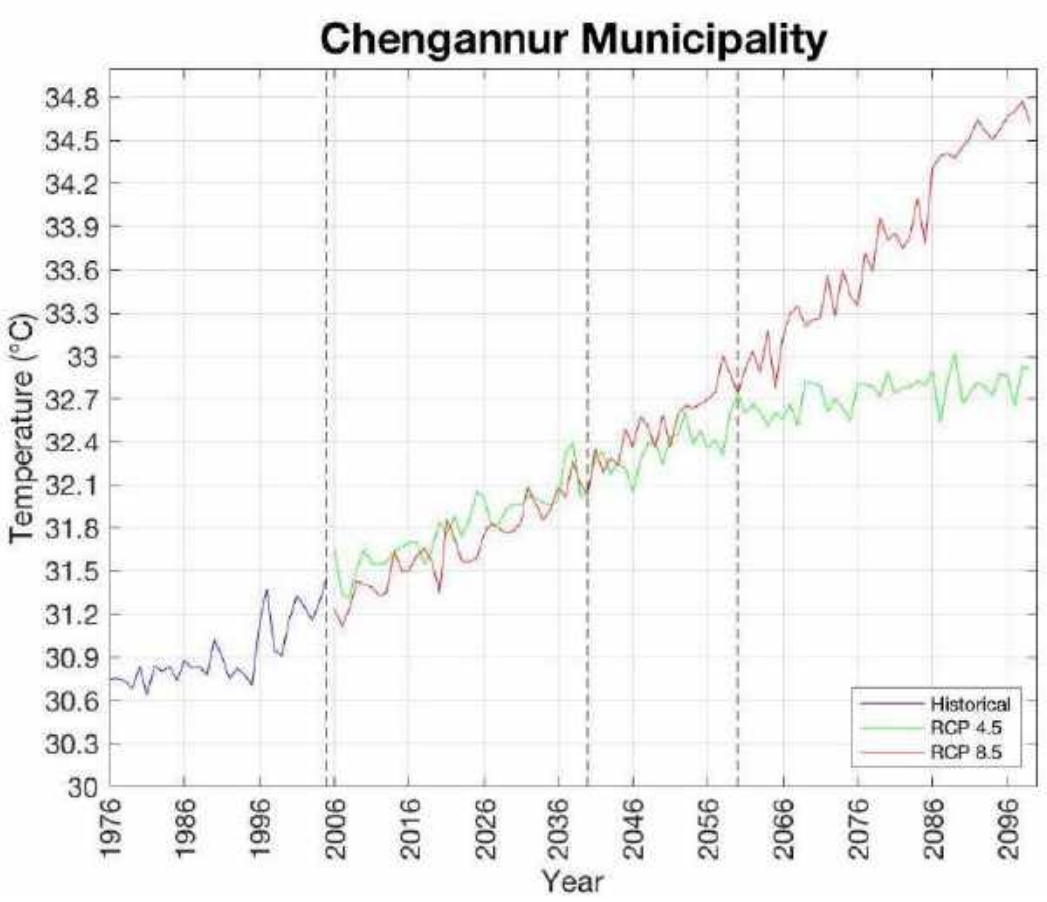


Climate Change effects on Kerala – precipitation

Table 1. Precipitation change per day in the LSGs of Pamba river basin during south west monsoon season (JJAS) for the scenarios RCP 4.5, RCP 8.5 [Near Term (2021-2040), Medium term (2041- 2060) and Long term (2061- 2099)] and historical period (1976-2005)

PRECIPITATION CHANGE (mm/day) - JJAS									
Sl. No	District	Taluk	LSG	RCP4.5			RCP8.5		
				Near	Medium	Long	Near	Medium	Long
1	Alappuzha	Chengannur	Ala	1.3	2.1	3.4	1.4	2.8	5.1
2	Alappuzha	Ambalapuzha	Alappuzha Municipality	1.5	2.4	4.0	1.6	3.3	5.9
3	Alappuzha	Ambalapuzha	Ambalapuzha North	1.5	2.4	4.0	1.6	3.3	5.9
4	Alappuzha	Ambalapuzha	Ambalapuzha South	1.5	2.4	4.0	1.6	3.3	5.9
5	Alappuzha	Karthikapally	Arattupuzha	1.3	2.1	3.4	1.4	2.8	5.1

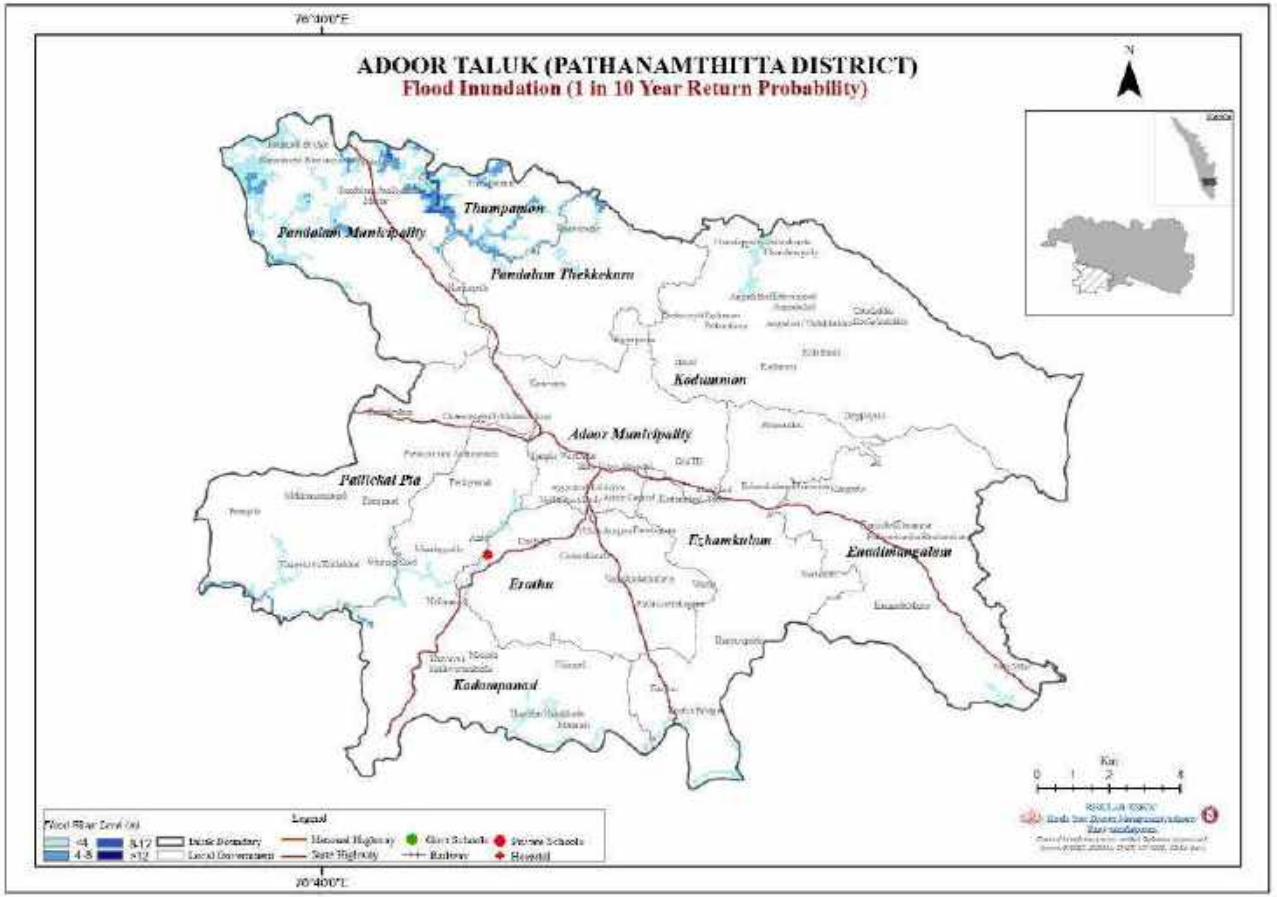
Climate Change effects on Kerala – temperature

Table 2: Minimum near-surface air temperature change in the LSGs of Pamba river basin in the Winter Season (JF) for the scenarios RCP 4.5, RCP 8.5 [Near Term (2021-2040), Medium term (2041- 2060) and Long term (2061- 2099)] and historical period (1976-2005)

MINIMUM TEMPERATURE CHANGE (°C) - JF									
Sl. No	District	Taluk	LSG	RCP4.5			RCP8.5		
				Near	Medium	Long	Near	Medium	Long
1	Alappuzha	Chengannur	Ala	1.0	1.5	2.0	0.8	1.7	3.3
2	Alappuzha	Ambalapuzha	Alappuzha Municipality	0.9	1.4	1.9	0.6	1.6	3.2
3	Alappuzha	Ambalapuzha	Ambalapuzha North	0.8	1.4	1.9	0.5	1.5	3.2
4	Alappuzha	Ambalapuzha	Ambalapuzha South	0.8	1.4	1.9	0.5	1.5	3.2
5	Alappuzha	Karthikapally	Arattupuzha	0.8	1.4	1.9	0.5	1.5	3.2

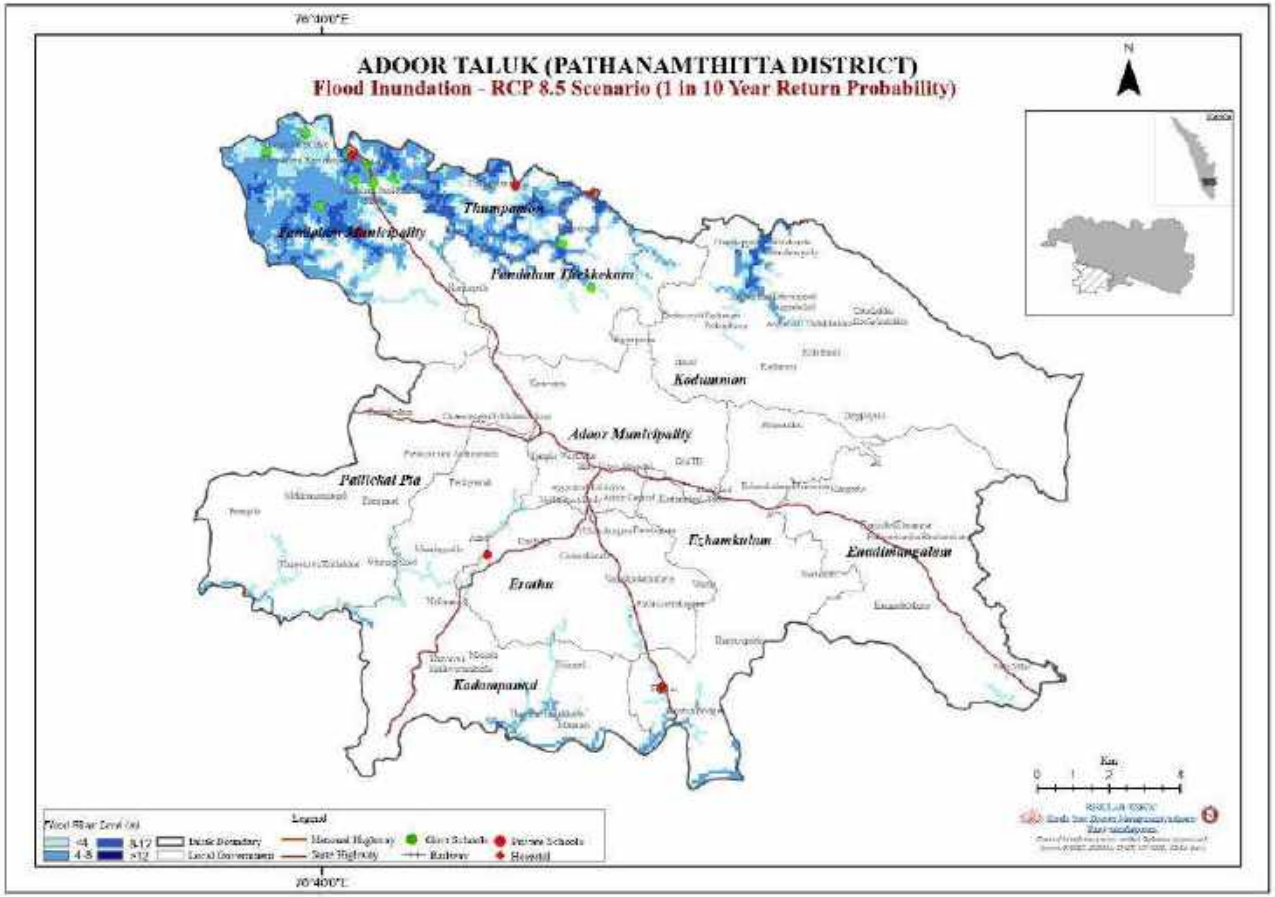
The Risk Knowledge

- **Flood return probabilities – historical (1 in 10 yrs to 1 in 500 yrs)**



The Risk Knowledge

- **Flood return probabilities – RCP 8.5 (1 in 10 yrs to 1 in 500 yrs)**



More Room for River

PATHANAMTHITTA DISTRICT ADOOR TALUK						
Name of exposed Hospital/School (LSGI)	Return Probability (Historic)					
	1 in 10 Year	1 in 25 Year	1 in 50 Year	1 in 100 Year	1 in 200 Year	1 in 500 Year
Erathu						
School						
Erathu	✓	✓	✓	✓	✓	✓
Ezhamkulam						
Hospital						
St Thomas Hospital, Malakara					✓	✓
School						
Ezhamkulam						✓
Pandalam Municipality						
School						
Govt. S.V.L.P.S Cherickal						✓
Govt.U.P.S Mangaram						✓

- **If a critical infrastructure is in 1 in 10 in Historical and RCP 8.5 scenario flood probable area, incrementally move it out to 1 in 25**

PATHANAMTHITTA DISTRICT ADOOR TALUK						
Name of exposed Hospital/School (LSG)	Return Probability (Climate Change Scenario - RCP 8.5)					
	1 in 10 Year	1 in 25 Year	1 in 50 Year	1 in 100 Year	1 in 200 Year	1 in 500 Year
Erathu						
School						
Erathu	✓	✓	✓	✓	✓	✓
Ezhamkulam						
Hospital						
St Thomas Hospital, Malakara	✓	✓	✓	✓	✓	✓
School						
Ezhamkulam	✓	✓	✓	✓	✓	✓
School for Deaf, Erathu					✓	✓
Kadampanad						
School						
Govt.L.P.G.S Mannady						✓
Govt. L.P.B.S Mannady						✓
V.H.S.S Mannady						✓
Kodungallur Municipality						
School						
Govt.L.P.S Angadical			✓	✓	✓	✓
Pandalam Municipality						
School						
Govt. L.P.S Edayadiyil		✓	✓	✓	✓	✓
Govt. S.V.L.P.S Cherickal	✓	✓	✓	✓	✓	✓
Govt. S.V.L.P.S. Kadakkal		✓	✓	✓	✓	✓
Govt. U.P.S Pandalam	✓	✓	✓	✓	✓	✓
Govt.H.S.S. Thottakonam	✓	✓	✓	✓	✓	✓
Govt.L.P.S Kadakkad	✓	✓	✓	✓	✓	✓
Govt.L.P.S. Thottakonam	✓	✓	✓	✓	✓	✓
Govt.U.P.S Mangaram	✓	✓	✓	✓	✓	✓
Govt.U.P.S Poozhikkadu					✓	✓
M.S.M. L.P.S. Pandalam	✓	✓	✓	✓	✓	✓
M.T.L.P.S. Madhoorkonam	✓	✓	✓	✓	✓	✓
N.S.S. Boys H.S.S Pandalam	✓	✓	✓	✓	✓	✓
N.S.S. G.H.S Pandalam	✓	✓	✓	✓	✓	✓
Pandalam Thekkekara						
School						
Govt. L.P.G.S. Thattayil	✓	✓	✓	✓	✓	✓
Govt.L.P.S. Koombilel	✓	✓	✓	✓	✓	✓
S.V.L.P.S. Perumpulickal		✓	✓	✓	✓	✓
St. Paul'S HSS Nariyapuram	✓	✓	✓	✓	✓	✓
Thumpamon	✓	✓	✓	✓	✓	✓
Thumpamon						
School						
Govt. L.P.S. Muttom		✓	✓	✓	✓	✓
Thumpamon	✓	✓	✓	✓	✓	✓

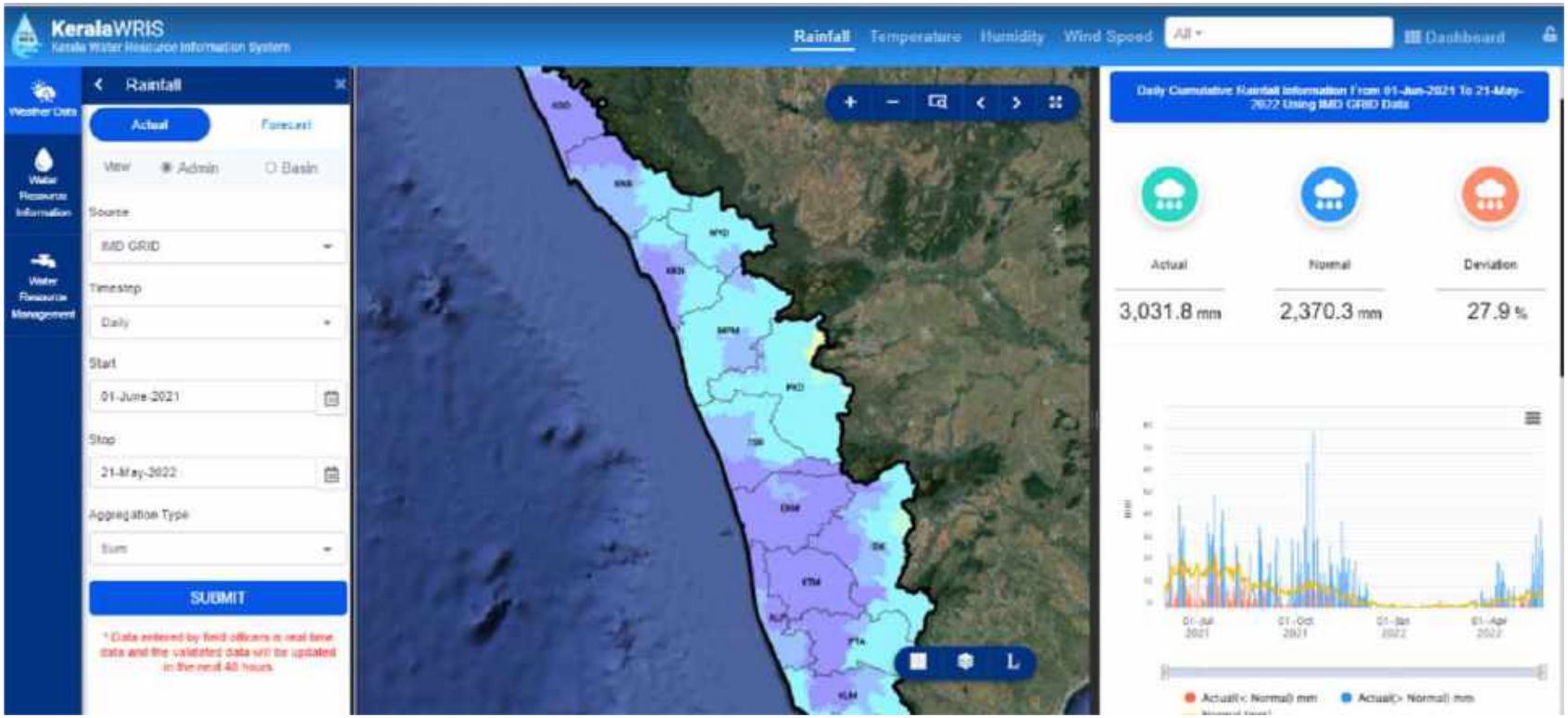
Monitoring systems

➢ Weather

- ❑ **100 AWS (IMD-KSDMA)**
  - Project conceived, site selection and land by KSDMA (Govt. of Kerala Ltr. No. DMA1/447/2018/DMD dated 6-10-2018; GO (Rt) No. 725/2019/DMD dated 18-10-2019)
  - Deployment of AWS and continued maintenance by IMD
- ❑ **100 AWS (Skymet)**
  - Data as a service model
  - Additional 4 AWS each deployed every year at sites recommended by KSDMA
- ❑ **30 ARG (IMD)**
- ❑ **13 AWS (Water Resources Department), 97 ARGs (Water Resources Department)**

Monitoring systems

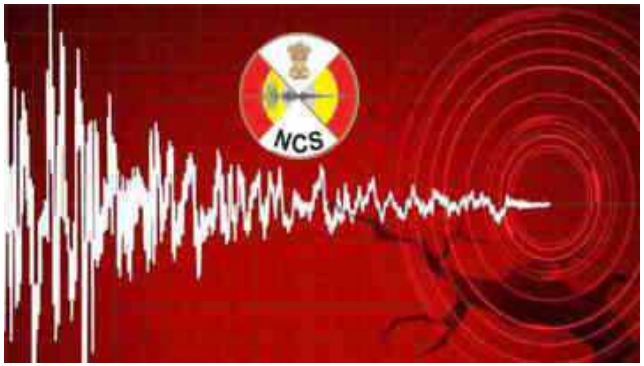
- **Water resources**

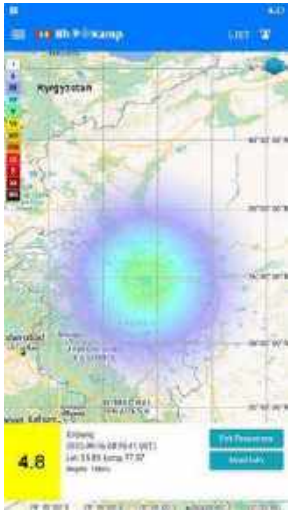


46 Automatic Water Level Recorders; 800 Ground Water Observation Wells

Monitoring systems

- **Seismic monitoring systems**





❑ National Seismic Centre

- **Entire India and Indian Ocean covered**
- **Data streamed through API to KaWaCHaM**

Warning systems

- **Weather forecasting**

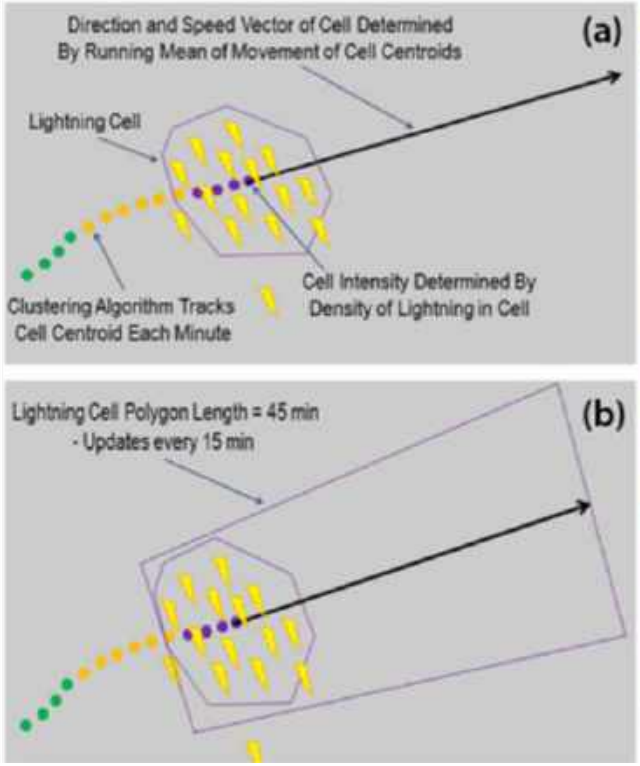
- IMD WRF
- IMD GFS

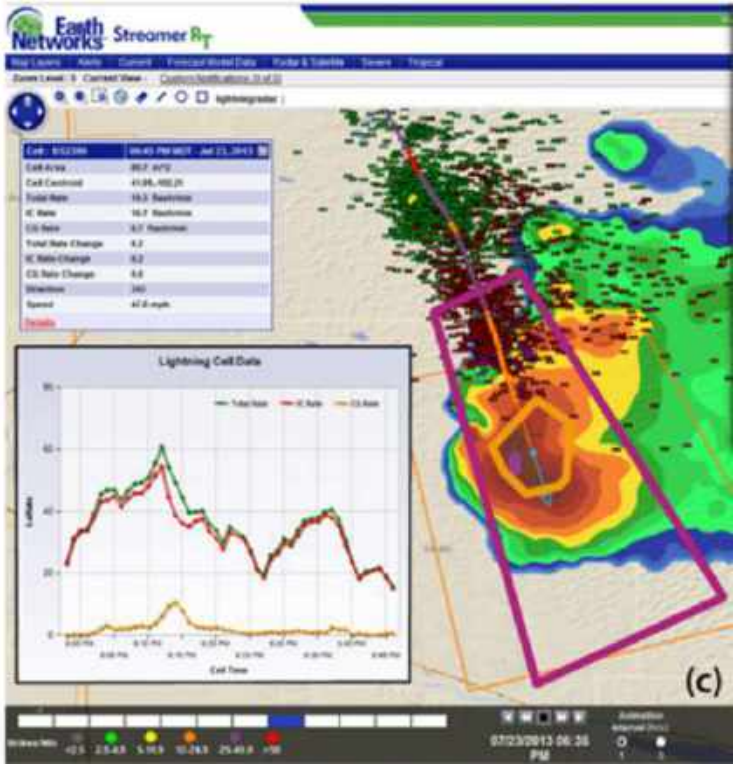
- NCUM

- GFS

Warning systems

- **Lightning forecast**





Warning systems

➢ Coastal hazard forecast

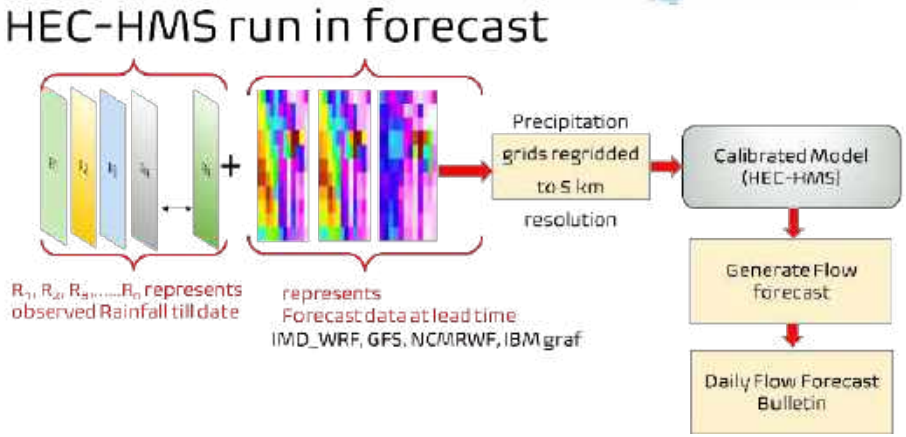
- Cyclone Forecast API
- Radar data streams

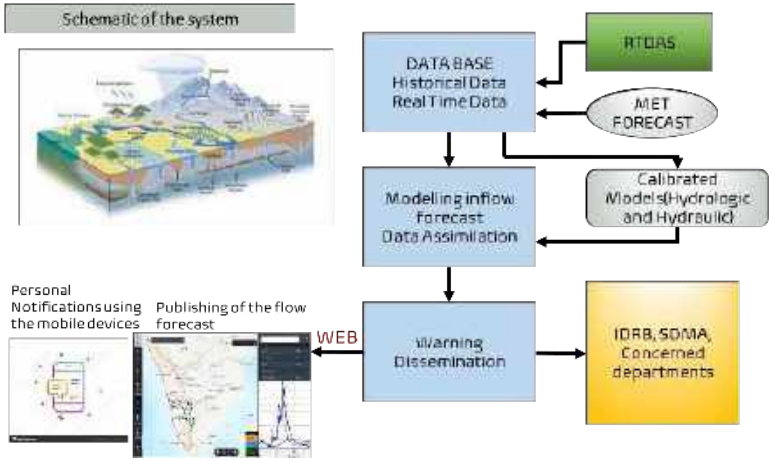
- Cyclone Forecast API

- ❑ Tsunami API
- ❑ Tidal (L & H) API
- ❑ High wave API

Warning systems

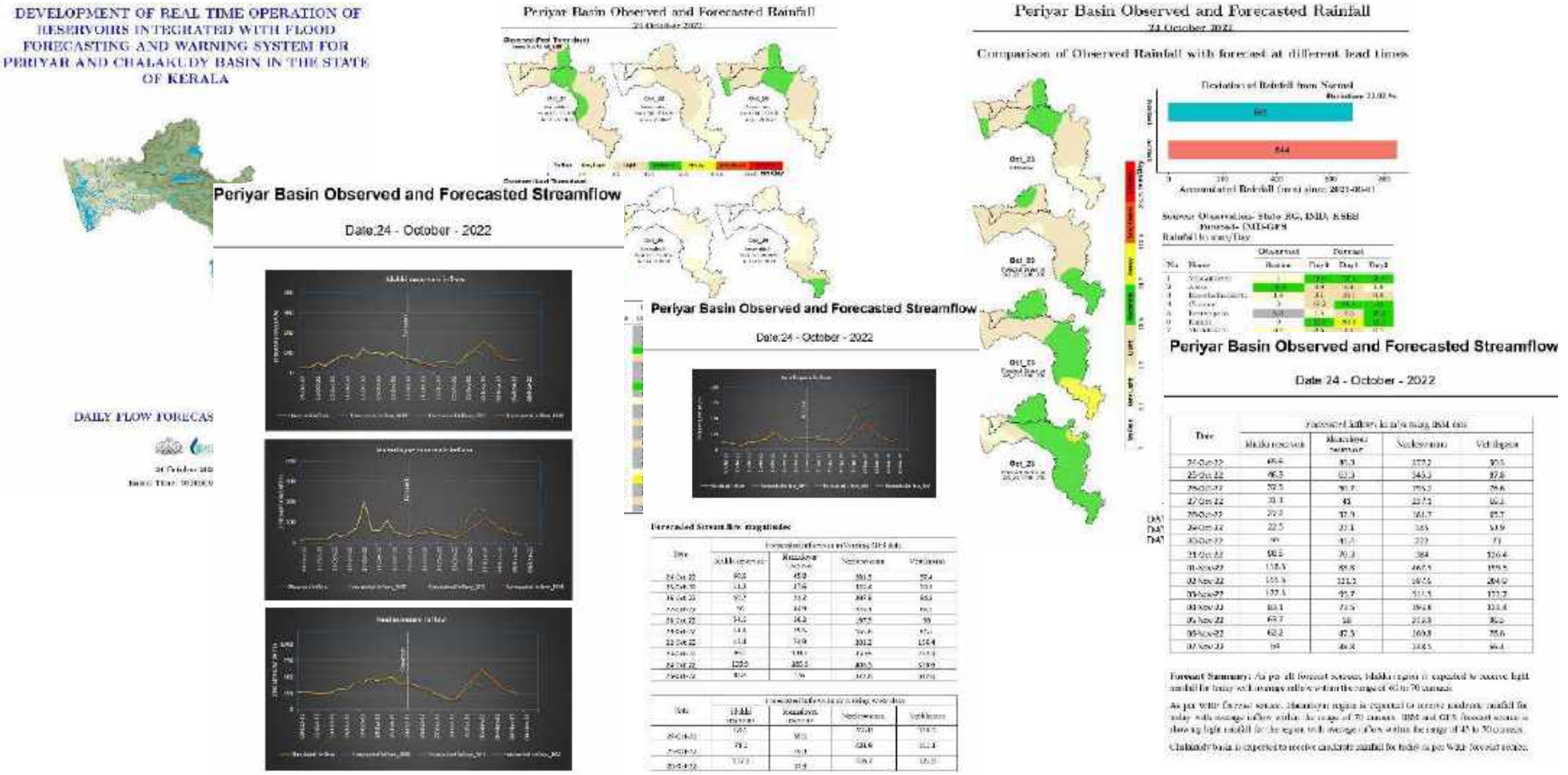
- **Periyar FEWS**





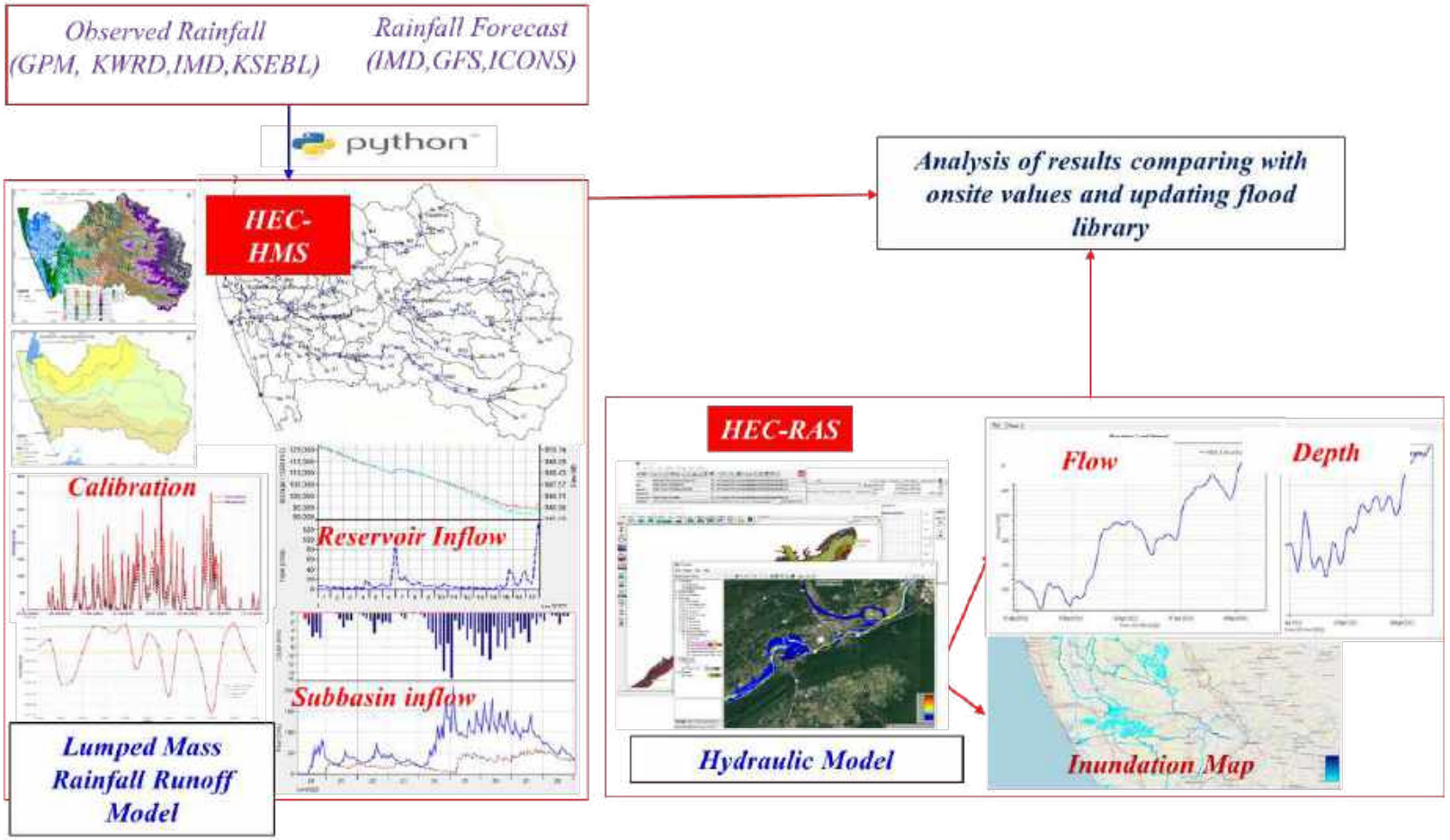
Warning systems

- **Periyar FEWS bulletins**



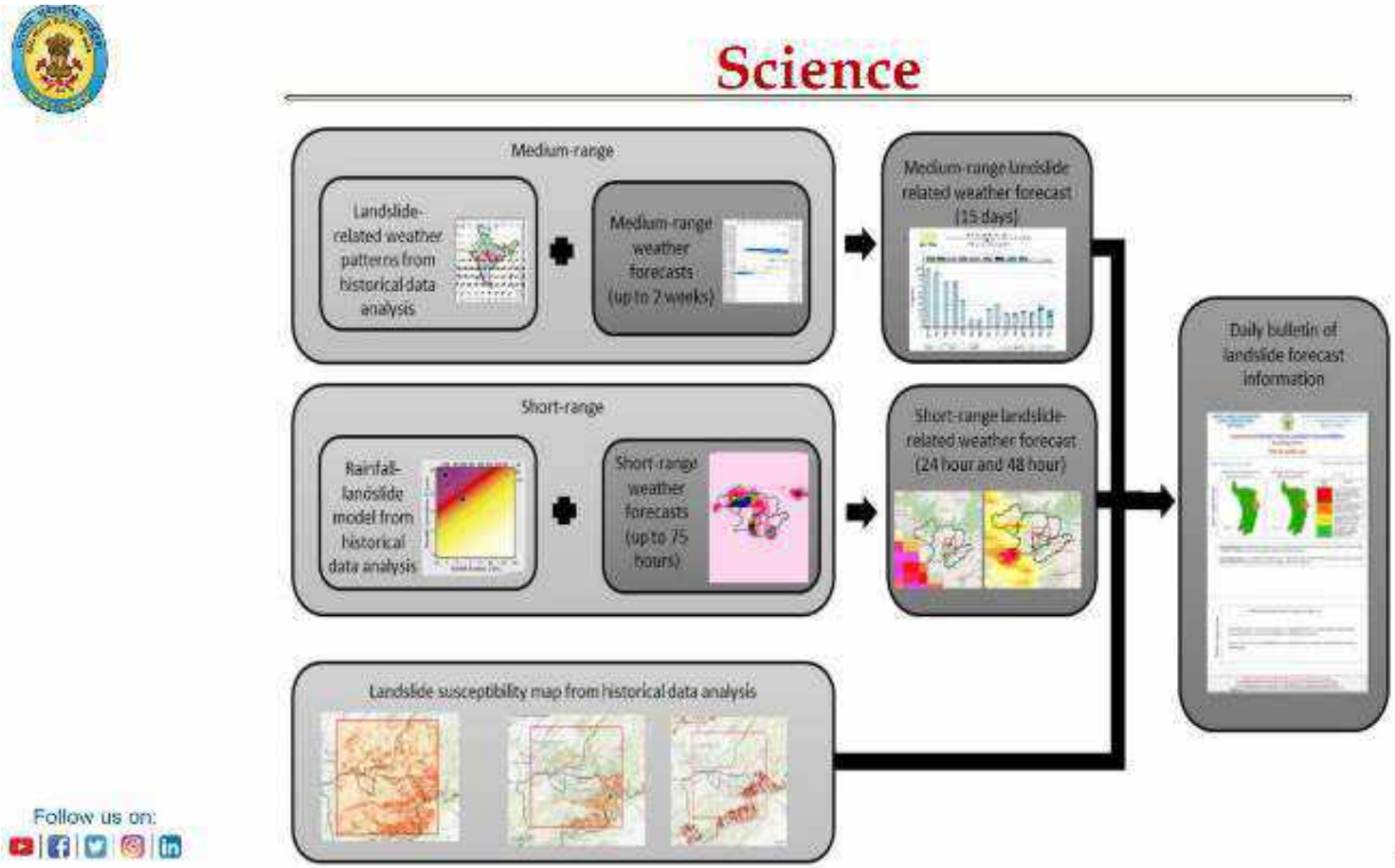
Warning systems

- **Pamba FEWS**



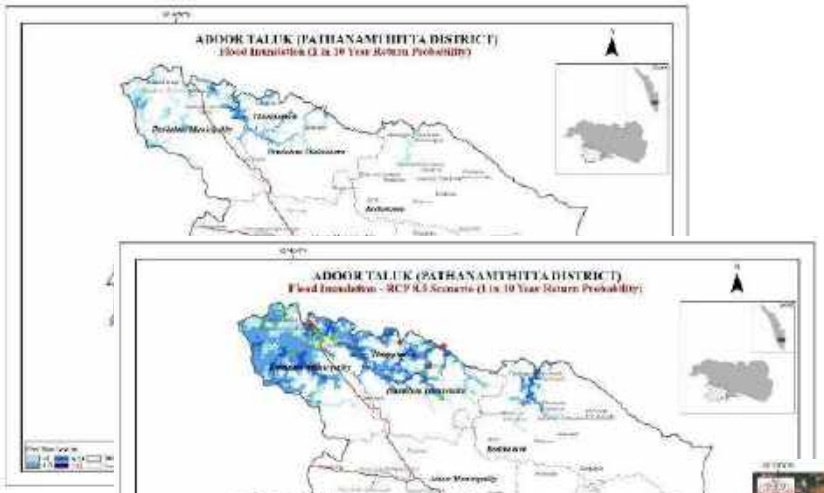
Warning systems

- **Landslide Early Warning System – development stage**



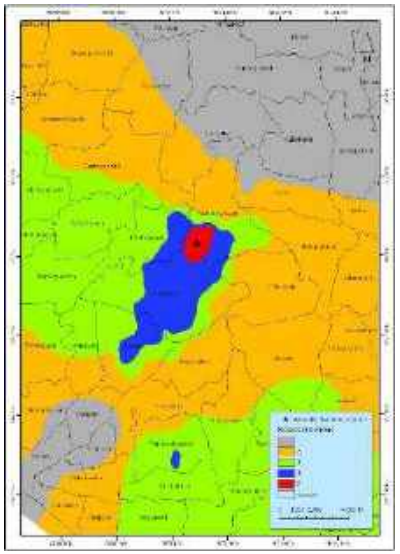
Warning systems

- **Impact forecast**



PATHANAMTHITTA DISTRICT
ADOOR TALUK

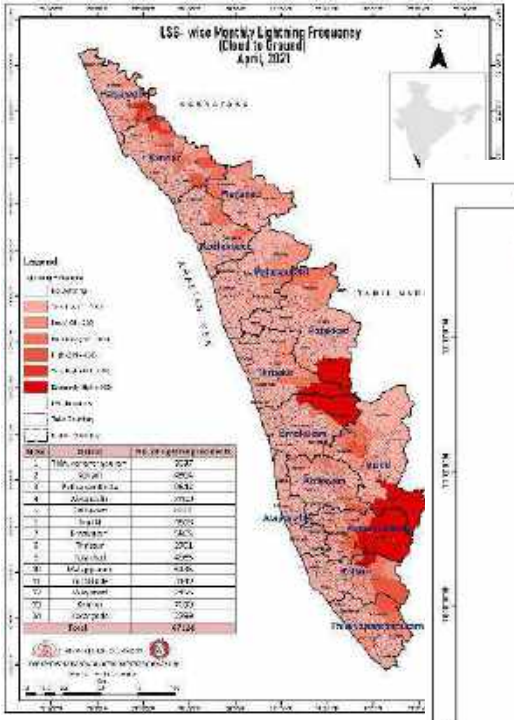
Name of exposed Hospital/School (LSGI)	Return Probability (Historic)					
	1 in 10 Year	1 in 25 Year	1 in 50 Year	1 in 100 Year	1 in 200 Year	1 in 500 Year
Erathu						
School						
Erathu	✓	✓	✓	✓	✓	✓
Ezhamkulam						
Hospital						
St Thomas Hospital, Melekara					✓	✓
School						
Ezhamkulam						✓
Pandalam Municipality						
School						
Govt. S.V.L.P.S Cherickal						✓
Govt U.P.S Mangaram						✓

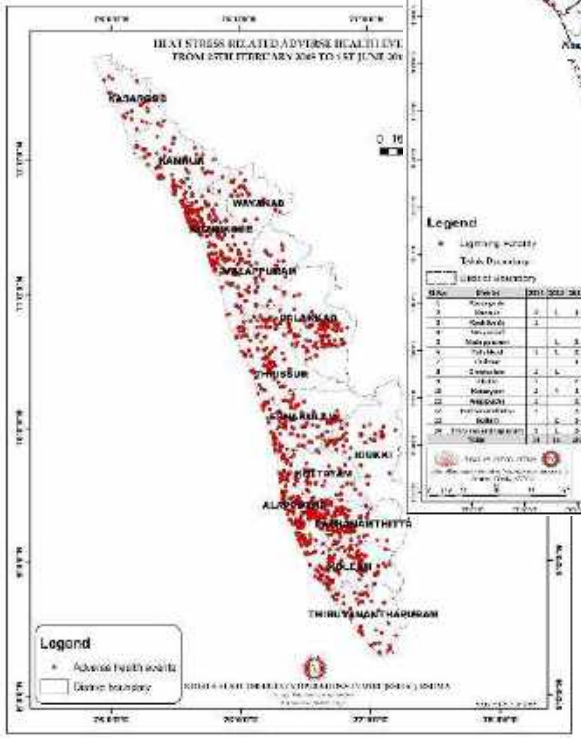


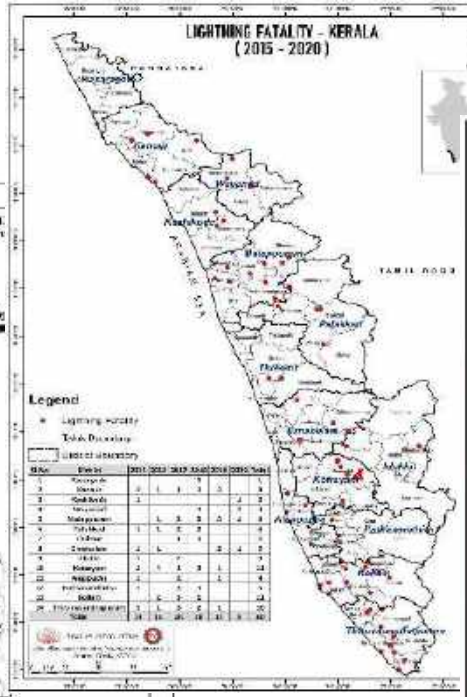
- **Scenario library – floods, cyclones**
- **Multi scenario assessment of impacts**
- **Major critical assets covered**
- **On-the-fly map outputs of critical assets**

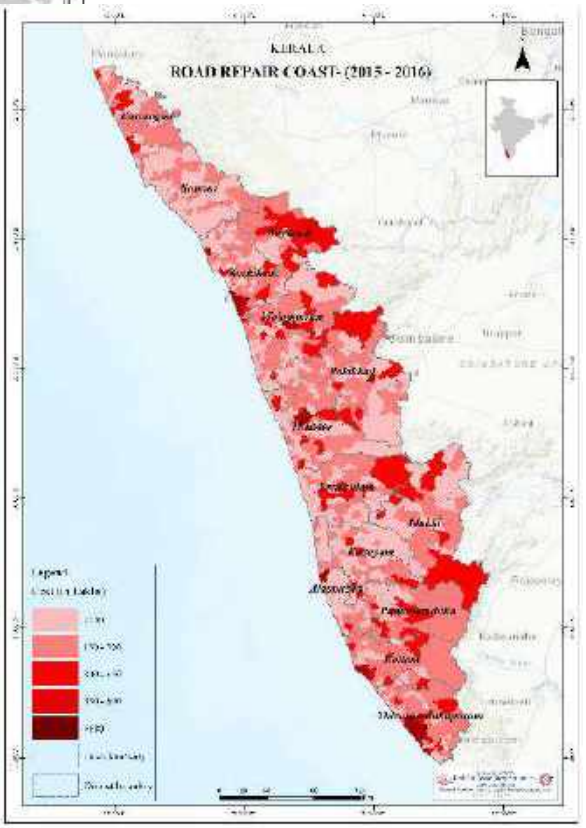
Warning systems

- **Impact monitoring**









Dissemination systems

➢ Sirens and strobe lights

- 126 sirens and strobe lights in towers and Govt. Buildings
- Pre-recorded voice & hooting incorporated for various warnings
- Connected through 2 wired and 2 wireless systems
- Activation from site and EOCs (State, District & Taluk)

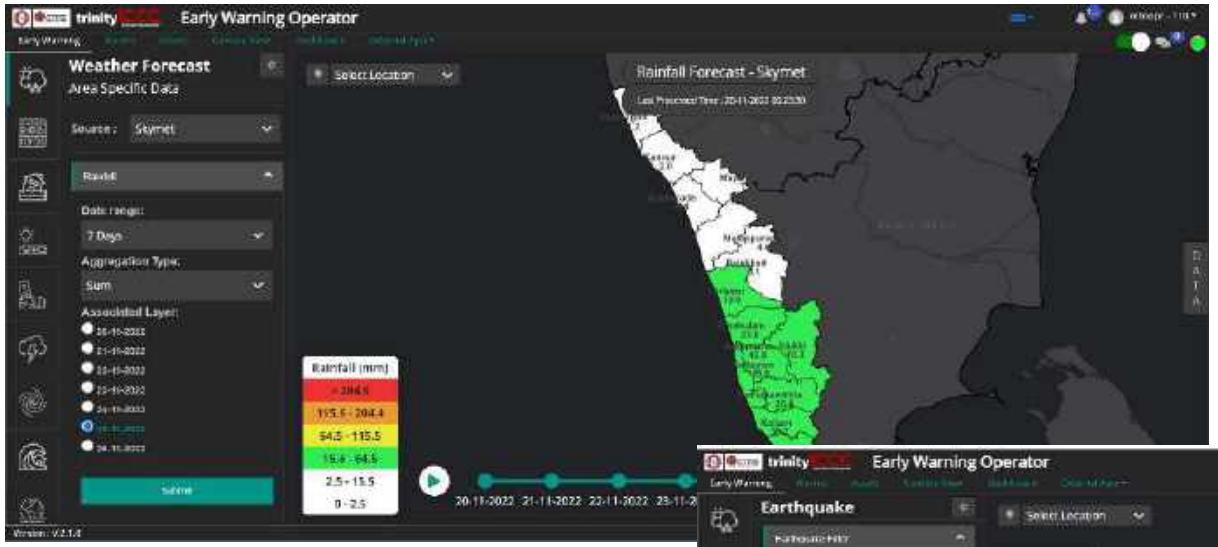
Dissemination systems

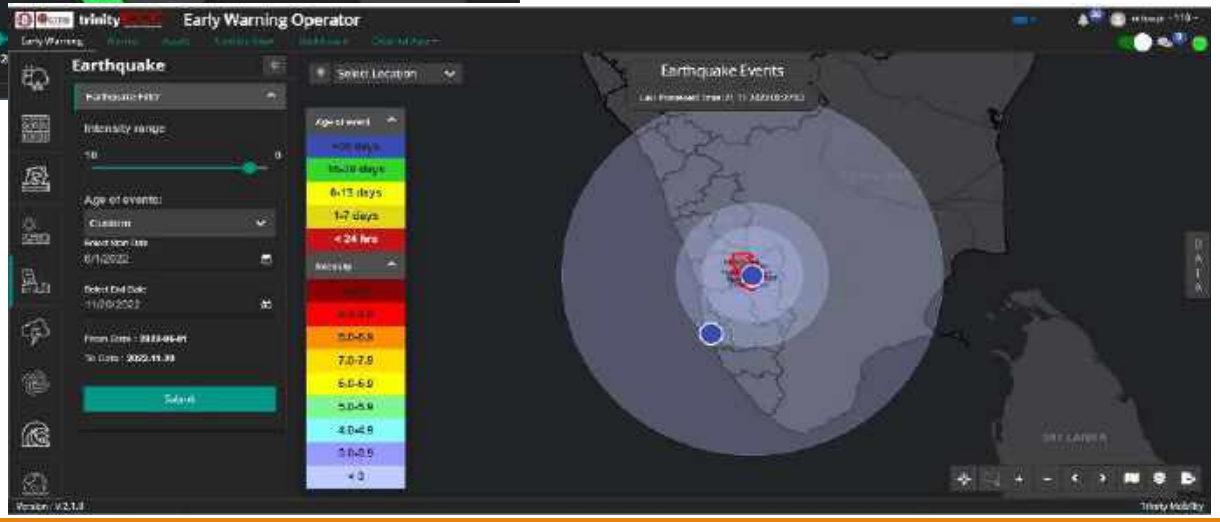
- **Telecommunication systems**

CAP integrated alerting

- Website, Google API
- WhatsApp Groups, Facebook, Twitter, GoKApp
- Emails
- Hotlines
- GSM Mobiles
- Digital Radio Mobiles
- Satellite-based mobile data voice terminals (SBMDVT)
- IMARSAT Satellite Phones
- Location based messaging services (LBMS)
- Print, Audio & Visual media

Decision support & dissemination systems



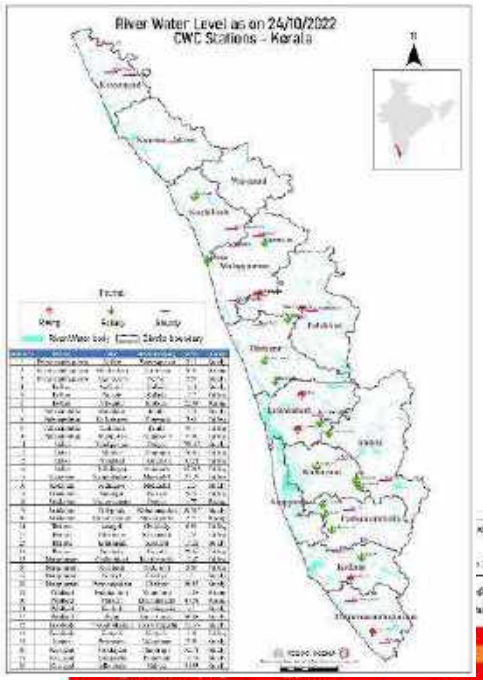


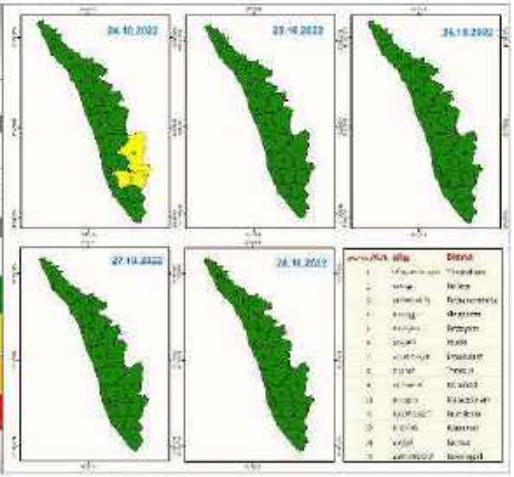
Warning systems

- **Emergency Operations Centres (126 EOCs)**

Communication

- **Customized in local language**





Response capability

- **Shelters**

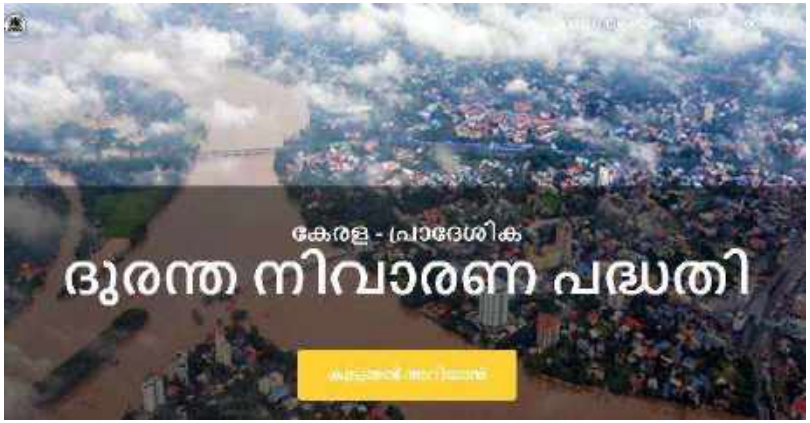



- 17 specialized shelters across Kerala
- 20,000 building with ability to house 400,000

Data accessible from https://sdma.kerala.gov.in/infrastructure-facilities/

Local Government Disaster Management Plans

- India’s first pan state Disaster Management Plans of all Local Governments
- Mainstreamed through allocation of own funds by LSGs
- Separate working group under Panchayathi Raj Act for DRR



https://dmp.kila.ac.in/

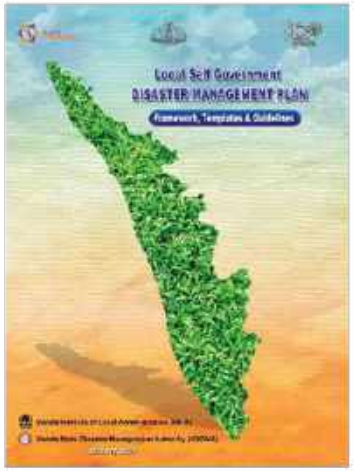
Local Government Disaster Management Plans – Capacity Building

- Several field level trainings
- Online trainings and open resource materials

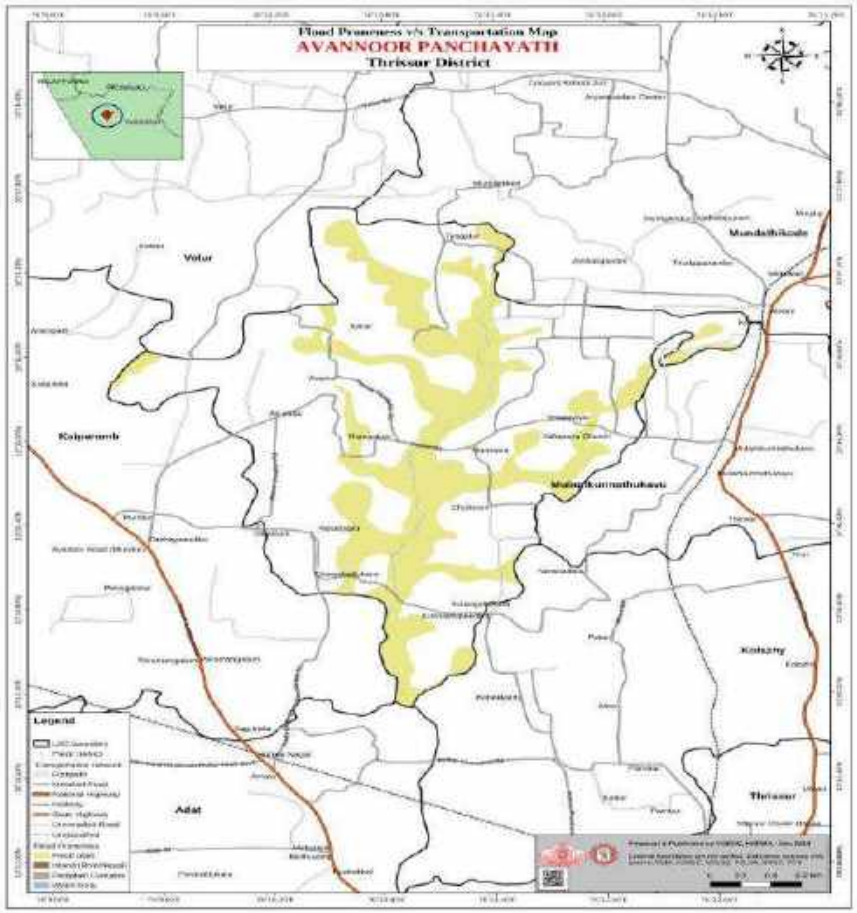
https://www.kila.ac.in/dmp/

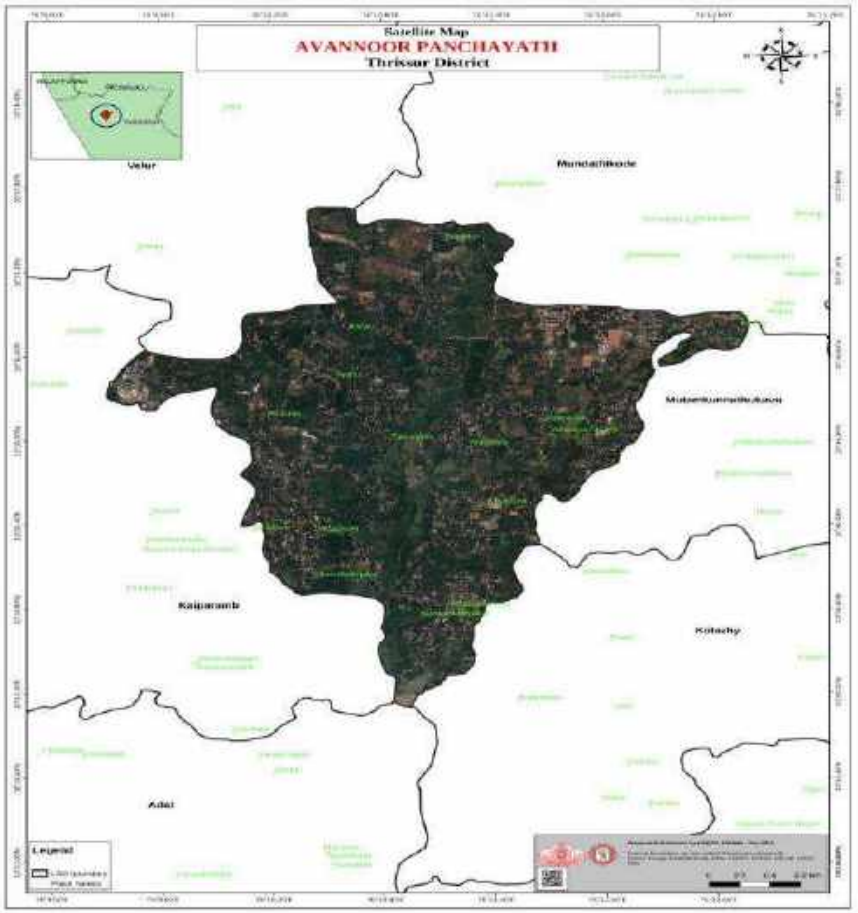
Local Government Disaster Management Plans - Contents

- **Chapter 1: General Information**
  - ✓ Information about LSG
  - ✓ Revenue Villages
  - ✓ Population Statistics
  - ✓ Number of Wards
  - ✓ Major Occupation
  - ✓ Altitudes and graticules
- **Chapter 2: Disaster Proneness & Analysis**
  - ✓ Disaster Prone areas
  - ✓ Maps
- **Chapter 3: Disaster Response Plan**
  - ✓ Emergency Response teams
  - ✓ Capacity Building
- **Chapter 4: Preparation, Mitigation & Social Empowerment**
  - ✓ Social assessment of possible mitigations solutions
  - ✓ Capacity building of local community
- **Chapter 5: Capabilities & Resources**
  - ✓ Emergency Response Tools
  - ✓ Human Resource
- **Chapter 6: Climate Change Adaptation, disaster reduction & projects**
  - ✓ Projects to support disaster Management
  - ✓ Mitigation
  - ✓ Adaptation
  - ✓ Suggestions to others and tiers
- **Chapter 7: Key Contacts**
  - ✓ Emergency response contact list

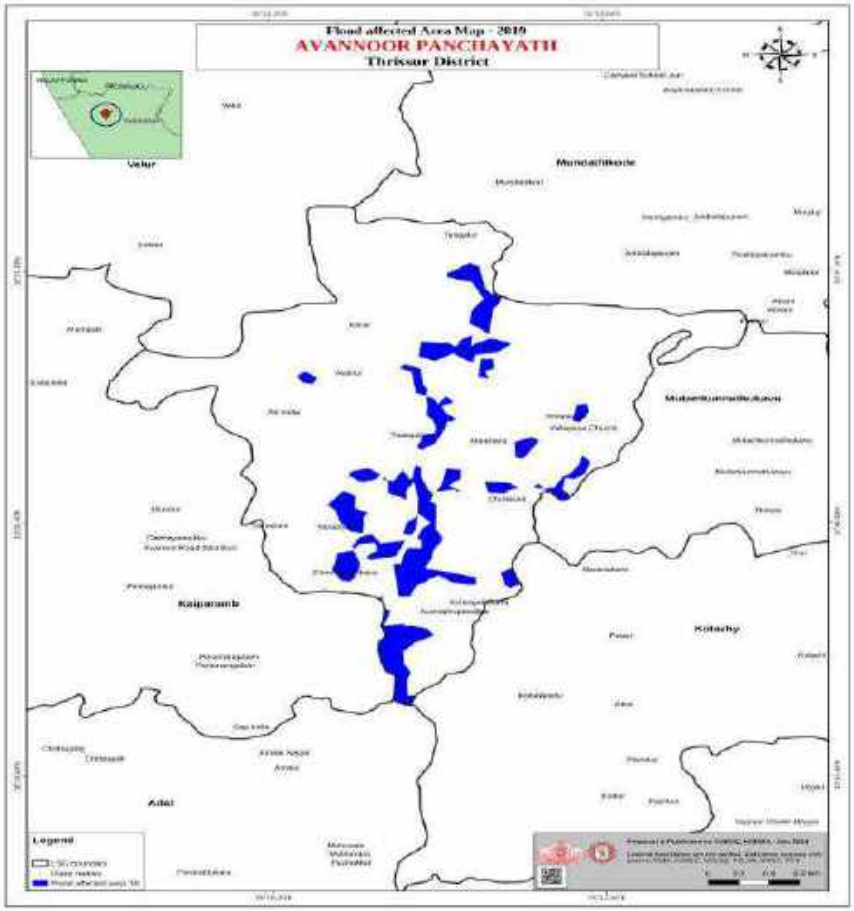


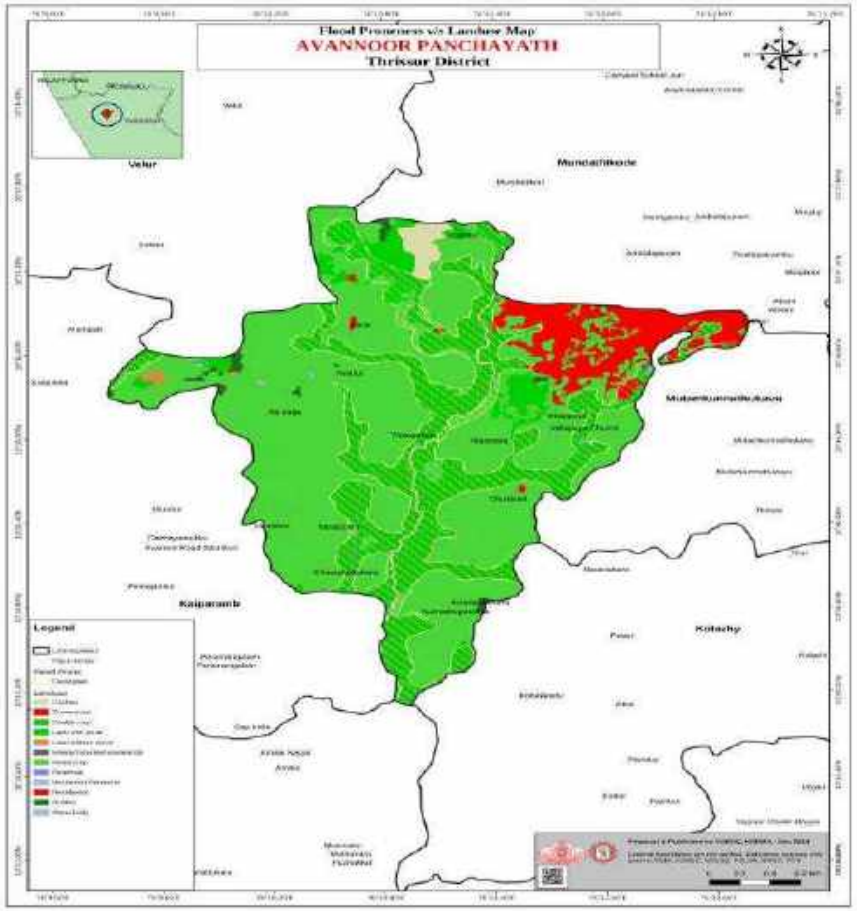
Local Government Disaster Management Plans - Maps





Local Government Disaster Management Plans - Maps





Local Government Disaster Management Plans

Received

941
Panchayats

87
Municipalities

6
Corporations

1034

Reviewed

District wise review
(14 LSG DM Plan Coordinators)-
100 % plans

Sector Wise Review
(5 sectors specialists)-
10% of plans

DRR interventions in Housing Sector

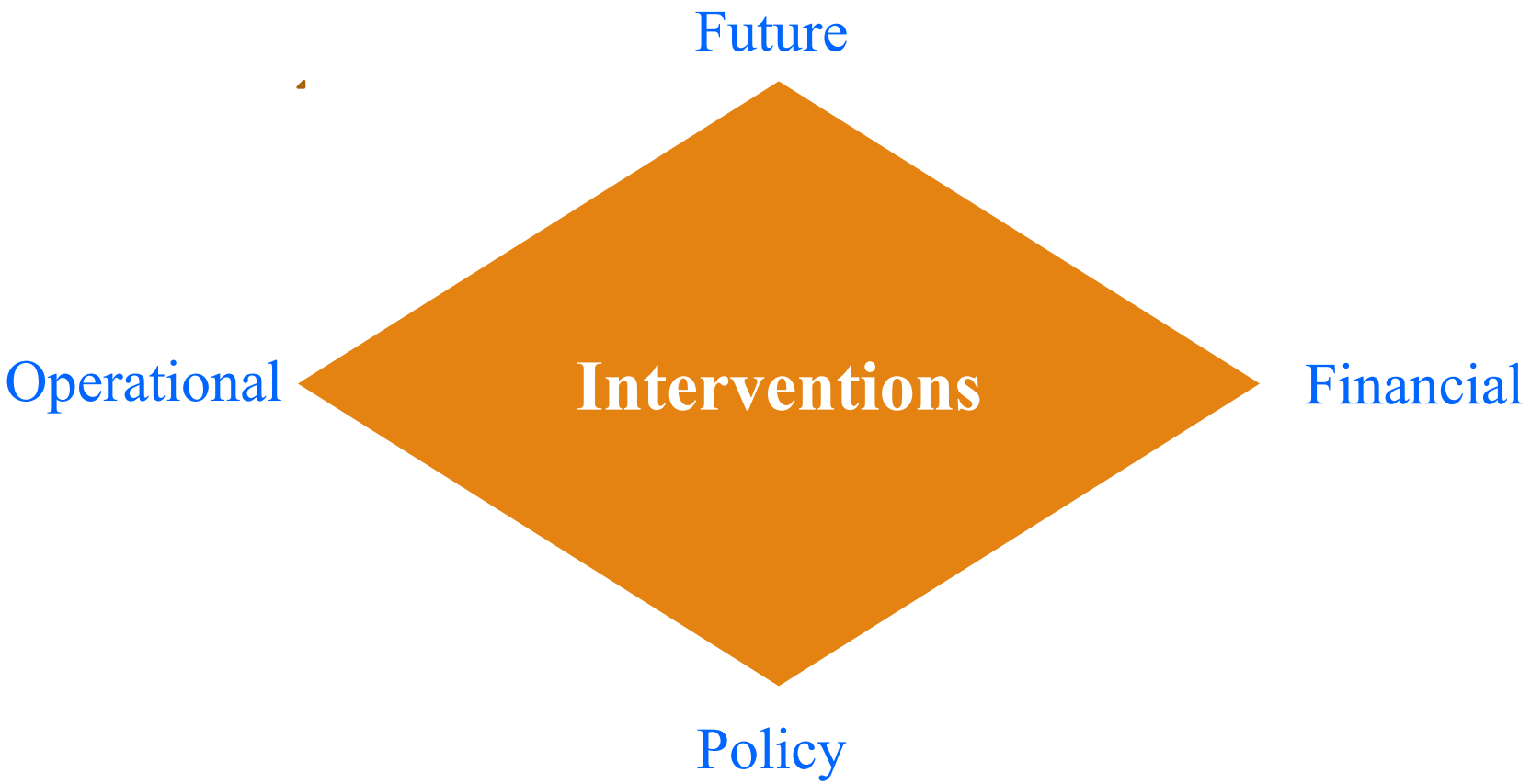
- Legislative

- Operational

- Future

BUILDING REGULATORY CAPACITY ASSESSMENT FOR KERALA
FINAL REPORT SUMMARY

DRR interventions in Housing Sector



Policy intervention – Amended Municipal Rules

Added Section 22 (4) to KMBR in 2019 – direction to Government under Section 64 of DM Act 2005

- "No construction shall be made to obstruct the natural drains and streams in a plot. Failure to comply with this instruction will invite penalization under Section 51 of the Disaster Management Act, 2005 (Central Act, 53 of 2005)"

കേരള ഗസറ്റ്

KERALA GAZETTE

അസാധാരണം

EXTRAORDINARY

PUBLISHED BY AUTHORITY

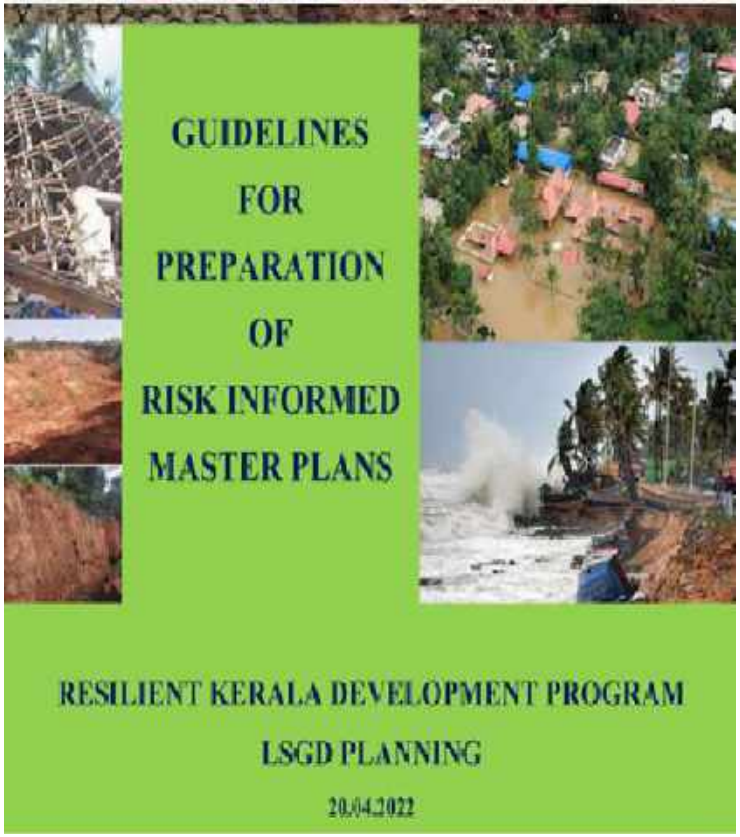
2691

GOVERNMENT OF KERALA

Local Self Government (RD) Department

NOTIFICATION

Policy intervention – Risk informed planning



- Mainstreamed Risk in development
- Legally adopted Risk Informed Master Plans
- Town & Country Planning Rules Amended
- GO (Ms) No. 120/2022/LSGD dated 9-6-2022

Policy interventions – Minimum standards notified

Section 19 of DM Act, 2005

- Damage in 5 percentage bands
- Relief amount will be proportionate to damage (SDRF + CMDRF)
- >75% damage (unliveable) = Fully damaged: ₹4,00,000/-
- House owners in untitled land (Purambok) eligible for assistance

FIRST PRIORITY - HOUSING

- Crowd sourced damage assessment and mapping of affected houses
- Owner driven reconstruction
- Damage magnitude linked cash grant of INR 400,000 to INR 10,000

Minimum standards – housing – relief

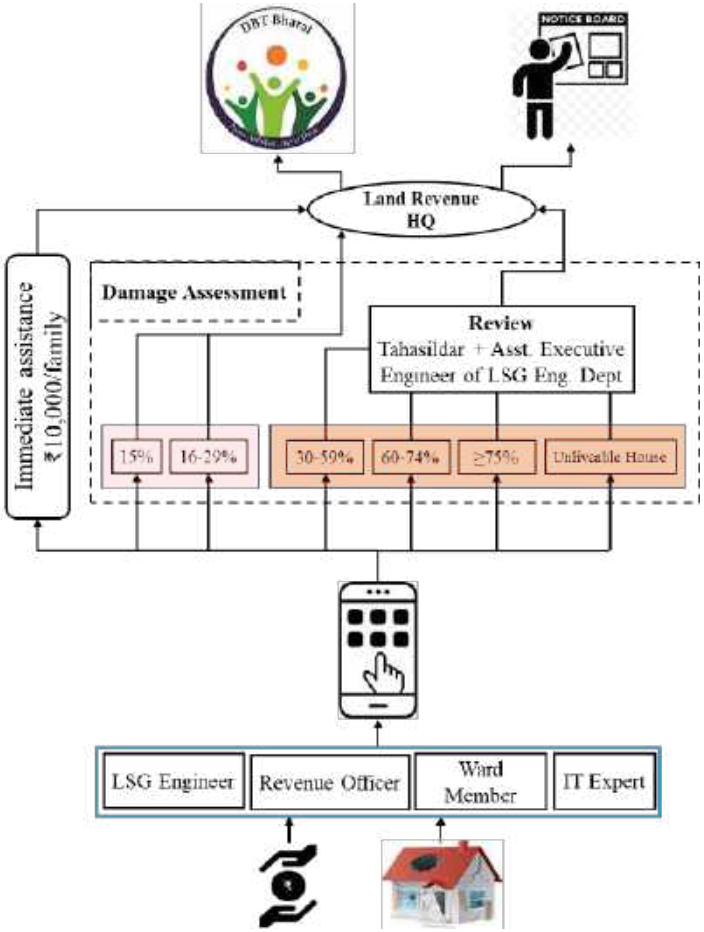
% damage	Hilly areas		Plains		Total
	SDRF	CMDRF	SDRF	CMDRF	
15	5,200	4,800	5,200	4,800	10,000
16-29	30,500	29,500	28,500	31,500	60,000
30-59	51,000	74,000	47,500	77,500	1,25,000
60-74	76,500	1,73,500	71,000	1,79,000	2,50,000
75-100	1,01,900	2,98,100	95,100	3,04,900	4,00,000
					In ₹

- CMDRF: Chief Minister's distress relief fund
- SDRF: State Disaster Response Fund

Minimum standards – damage assessment criteria

% damage	Criteria
15	Knee deep water inside the house with minor damages/10% or less damage to roof/Electrical or Plumbing damages/Household utensils damaged
16-29	Water damaged the flooring & electrical or plumbing damages/10-25% damage to roofing & electrical or plumbing damages/Debris accumulated inside house/50% damage to roofing
30-59	Cracks to wall/50% damage to roofing but no damage to the roof structure (for non-RCC roofs)
60-74	Structural damage to one or more walls but no damage to the roof structure (for non-RCC roofs)
75-100	Structural damage to the whole building with total damage to roof (including RCC roof structures)/Total damage to flooring/unliveable as certified by Engineer/Identified as in hazard susceptible area based on site investigation by a team of Geologist/Engineer, Soil Conservation Officer and Hazard Analyst

Damage assessment system

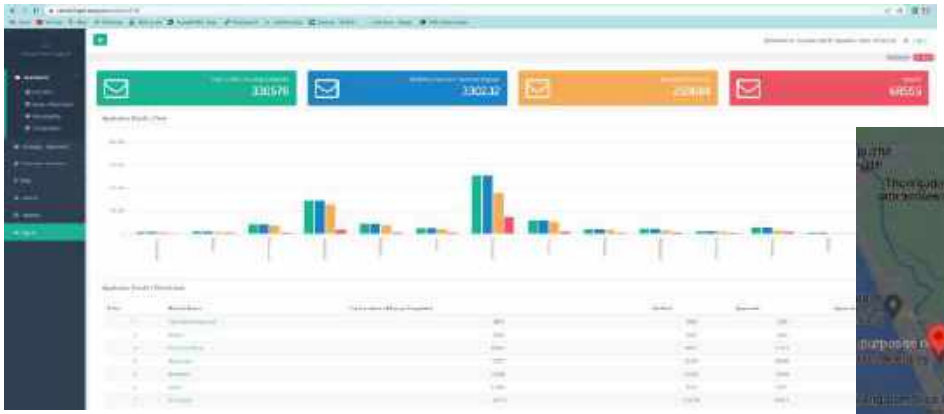


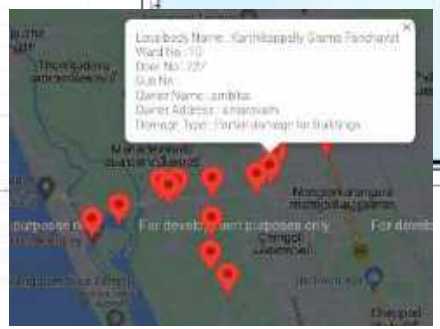
Damage assessment results

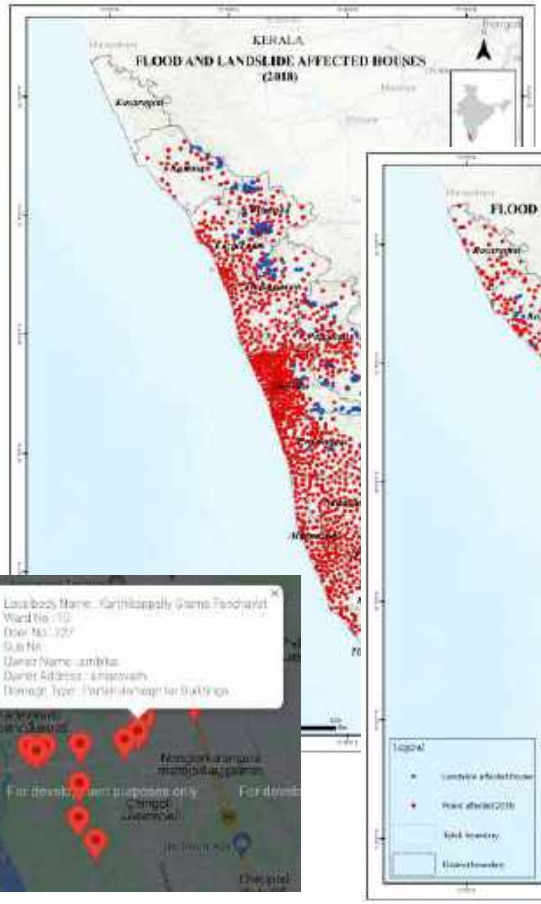
All data in public domain (2018-2019)

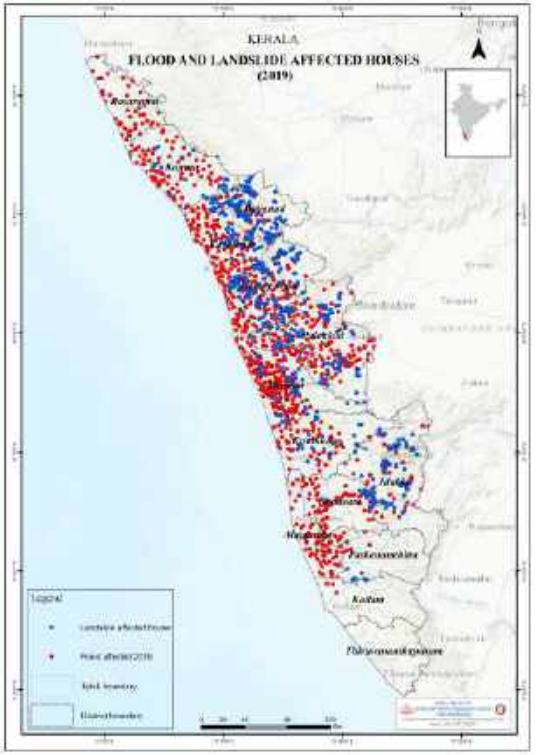
https://rebuild.lsgkerala.gov.in/

- Crowd sourced
- Open data









Policy: Hazard susceptibility linked relocation

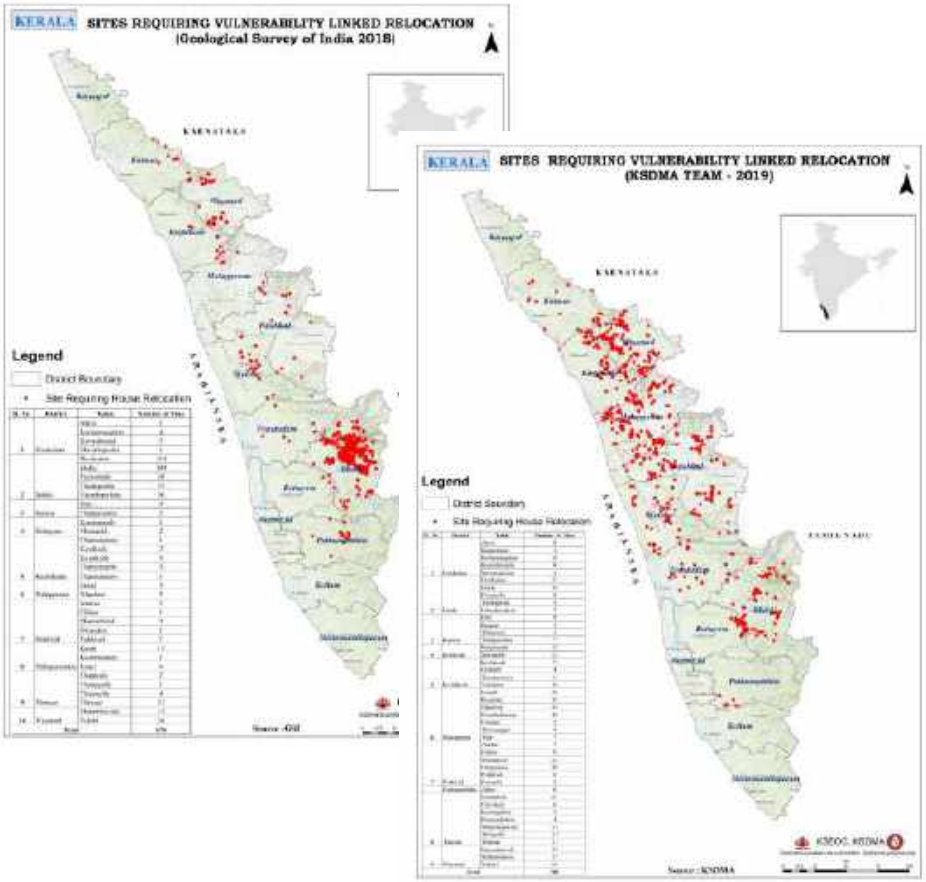
Section 19 of DM Act, 2005 – Minimum relief

- Houses in hazard susceptible sites - technical survey
- Standard checklist for technical survey
- Team: Geologists/Irrigation Engineers/LSG Engineer, Soil Conservation Officers, Hazard Analysts
- Land: ₹6,00,000 - minimum 3 cents (CMDRF)
- House: ₹4,00,000
- Emotional barrier: Need not surrender the old land
- Restriction:
  - No new construction permitted in susceptible land
  - House in susceptible land decommissioned
- Not compulsory to accept the scheme

Policy: Hazard susceptibility linked relocation

- 1376 sites with about 7000 houses identified to be in highly susceptible areas
- Notices issued
- More than 2000 families accepted

Sl. No.	District	2018 Floods	2019 Floods
1	Thiruvananthapuram	0	0
2	Kollam	2	0
3	Pathanamthitta	13	0
4	Alappuzha	10	2
5	Kottayam	26	0
6	Idukki	645	8
7	Ernakulam	2	0
8	Thrissur	127	0
9	Palakkad	123	58
10	Malappuram	31	78
11	Kozhikode	36	165
12	Wayanad	682	401
13	Kannur	8	1
14	Kasargode	4	9
Total		1709	722



Operational: Technical support

Shelter Hubs

40 shelter hubs in 12 districts with Engineers & Architects

- On-site technical assistance: 2,56,000 flood affected house owners
- Technical training: 1241 masons, 221 house owners, 60 contractors and 373 civil engineering diploma students
- Supported by UNDP CERF & Life Mission

Operational: Build Forward Inclusively

Build Back Better – Prathyudhanam

Additional Financial Assistance to the following vulnerable families
Rs 25,000/- each to 4400 families –
Jointly by Govt. of Kerala – KSDMA & UNDP

1. Families with Cancer patients
2. Families with patients undergoing dialysis
3. Families with bedridden intellectually impaired members
4. Families with widows as head of the family and the eldest child being a minor child

Operational: Build forward better

- Construction funded through SDRF & CDMRF

Financial: Relief Assistance – Housing sector

- Immediate relief (₹10,000): ~7,50,000 families
- House damage relief: ~4,50,000 houses
- Total Assistance paid: ~₹2500 crores

- 2500 houses: Primary Agriculture Cooperatives
- Own funds and SDRF

CARe KERALA
Cooperative Alliance to Rebuild Kerala

Future

BUILDING REGULATORY CAPACITY ASSESSMENT FOR KERALA
FINAL REPORT SUMMARY

Prepared By

GFDRR GeoHazards International GeoHazards Society

Final BRCA October, 2020

- Heat retarding
- Wind resistant
- Lightning resistant
- Merging with the terrain
- Carbon Neutral

Approach for Local-Level Customization of Building Regulations

Development Control Regulations (DCRs) at Local Level
Part of Master Plans and Detailed Town Planning Schemes

Hazard Maps at a Scale to Support Local Permit Approvals (1:10,000 or better)

Model DCRs for 3 Physiographic Zones: Coastal, Midlands, Highlands
Model DCRs addressing common hazards in each region

Minding Gaps in Disaster Management

Disability Inclusive

Transgender Inclusive

Palliative Care Inclusive

Indigenous People Inclusive

Minding Gaps – Inclusive DM programmes

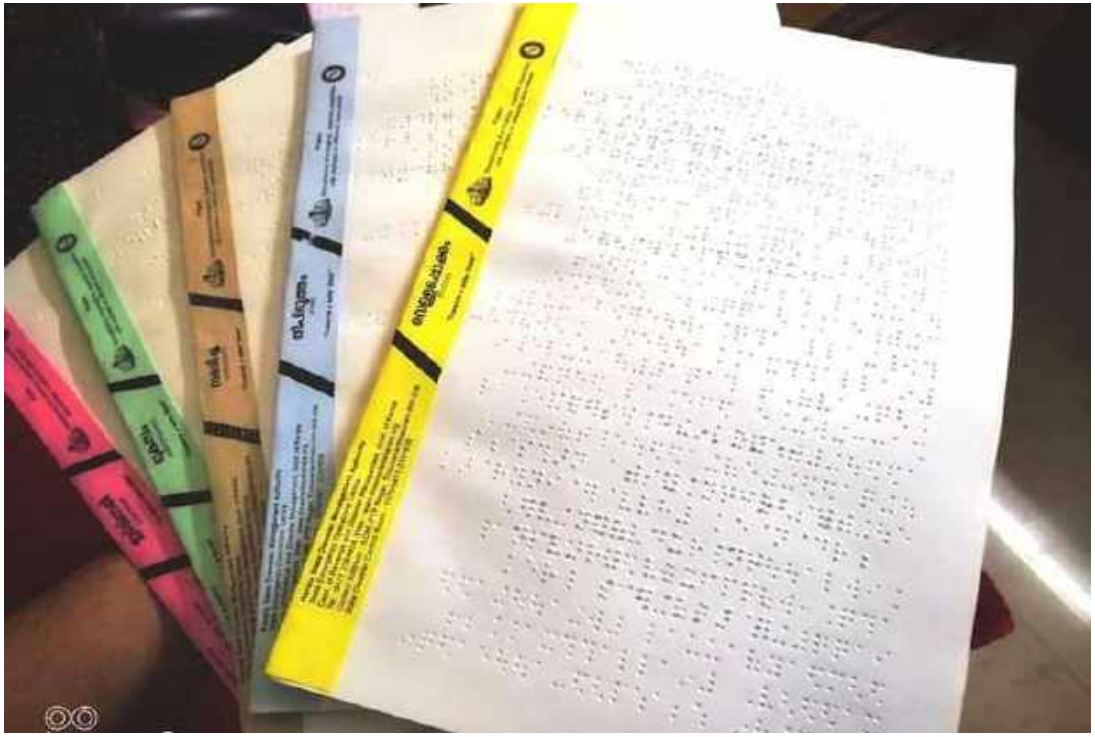
Disability Inclusive

Transgender Inclusive

Palliative Care Inclusive

Tribal DM Plans

Ensuring accessibility



Ensuring accessibility

Disability Friendly Language

Sign Language Videos

Disability Inclusive DRR – Recognition

"Kerala has done focused work on disability inclusive disaster risk reduction and the National Guidelines have been inspired by that work"

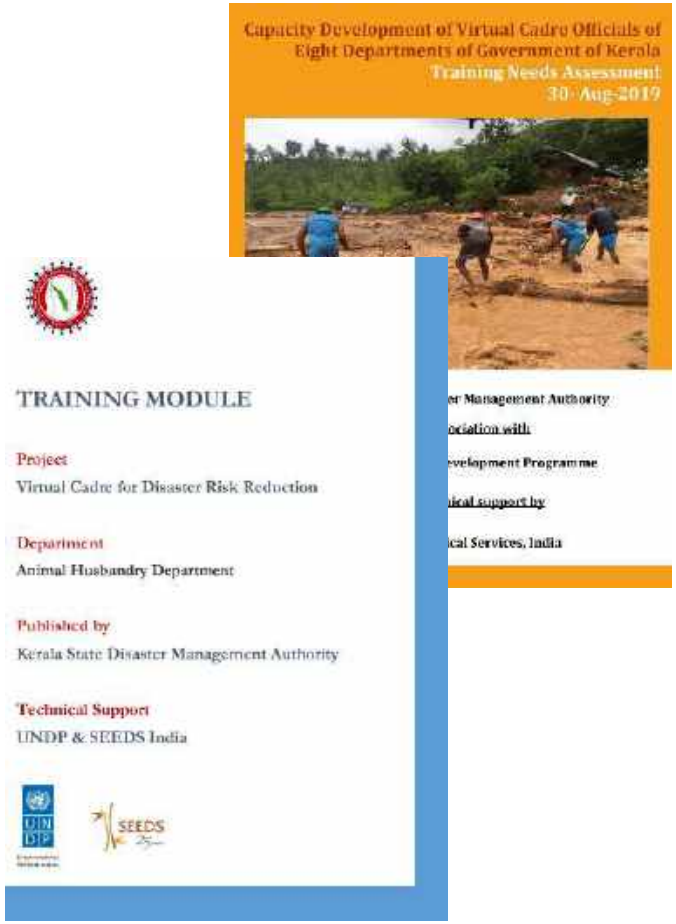
Dr. Kamal Kishore, Member Secretary, National Disaster Management Authority

"I am moved and touched deeply to see this Model Initiative of Kerala for considering Differently abled right from the preparedness stage"

Dr. Eddie Ndopu, UN Secretary General's SDG Advocate

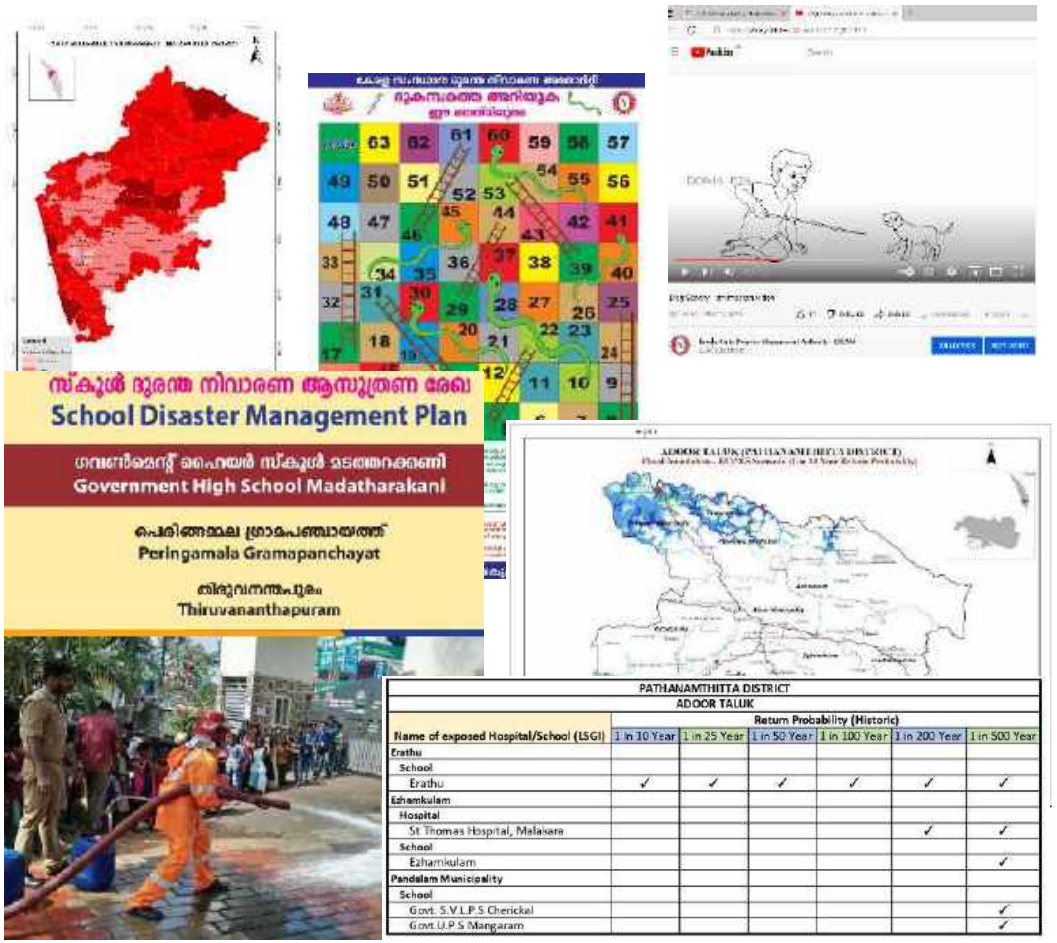
Virtual Cadre

- 7 officers per department (26 departments)
- Separate training programmes for the virtual cadre officers
- Legalised under DM Act 2005 vide GO (Rt) No. 56/2017/DMD dated 25-11-2017
- https://sdma.kerala.gov.in/virtual-cadre/



School Safety

- School safety committee constituted vide GO (Rt) No. 271/2018/DMD dated 11-05-2018
- Games, videos, Brochures
- Exposure assessment of schools to floods
- Child centric risk assessment
- School Safety App – USchool for School DM Plans



Hospital Contingency Plan - Guidelines


COMPENDIUM OF SAFETY PROTOCOLS FOR CONTAINMENT OF OXYGEN LEAKAGE IN HOSPITALS

3rd May, 2021

https://sdma.kerala.gov.in/guidelines/

Action Plans – Heat & Lightning

Trainings held for departments

Trainings held for LSGs

Linked to SDMF

Pluvial Flood Mitigation – Operation Anantha

Short- term Goals

- Cleaning and desilting of drains
- Shifting of KWA pressure pipes across canals
- Completion of box culvert at Thampanoor

Long- term Goals

- Restoration of water bodies
- Widening of railway culvert at Thampanoor
- Strengthening for solid waste management through Suchitwa mission in consultation with experts

Attakulangara right side Culvert- PWD

Aryasala

IN THE HIGH COURT OF KERALA AT ERNAKULAM

PRESENT:

THE HONOURABLE THE CHIEF JUSTICE MR.ASHOK BHUSHAN
&
THE HONOURABLE MR.JUSTICE A.M.SHAFFIQUE

TUESDAY, THE 5TH DAY OF APRIL 2016/16TH CHAITHRA, 1938

WA.No. 2745 of 2015 IN WP(C).26377/2015

AGAINST THE JUDGMENT IN WP(C) 26377/2015 DATED 23.09.2015

APPELLANTS/RESPONDENTS 1 TO 7 IN WPC.:

1. STATE OF KERALA
REPRESENTED BY ITS CHIEF SECRETARY TO GOVERNMENT,
GOVERNMENT SECRETARIAT, TRIVANDRUM-695 001.

Pluvial Flooding – Operation Breakthrough

Operation Breakthrough, 2019

- **Kochi City** was flooded due to improper urban drainage during the rainy spell of 21-10-2019. Critical assets including the main power sub-station and arterial roads were flooded.
- An urban flood mitigation project, Operation Breakthrough was launched following the best practices of Operation Anantha
- **Rs. 20 crores**

Drought Mitigation

Jalavarshini

The project funds are exclusively for restoration of ponds in the State

Some landmark outputs under the concept of this scheme are:

- ***Ente Kulam Ernakulam*, 2016:** Cleaned 51 ponds in various panchayaths of Ernakulam district with the help of **'Anbodu Kochi'**, a social media group of like-minded individuals. This may be the first scheme in the country which would have leveraged a social media group for disaster risk reduction

- ***Kulam Koru Biriyani Tharam* scheme of Kozhikode district, 2016:** Cleaned 26 ponds under this scheme.

Drought Mitigation

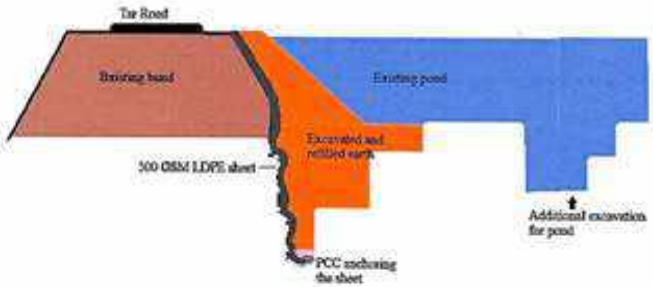
Water Kiosks

- Water supply through GPS monitored tankers
- This model offers the following advantages:
  - a) Reduce pilferage
  - b) Ensure transparency of water usage
- Total of 5000 such kiosks are there across the state

Drought Mitigation

Subsurface Dykes 2017

- Ozhalappathy in Vadakarapathy panchayath of **Palakkad** district is Kerala's most perennially drought prone.
- KSEOC supported Centre for Earth Science Studies in creating a model subsurface dyke in the temple pond of Mariyamman Kovil of Ozhalappathy. By this project, the non-perennial temple pond became perennial and holds 50,000 liters of water.



International Collaborations

Thank you