

Missions Under National Action Plan On Climate Change (NAPCC)- Indian Perspective



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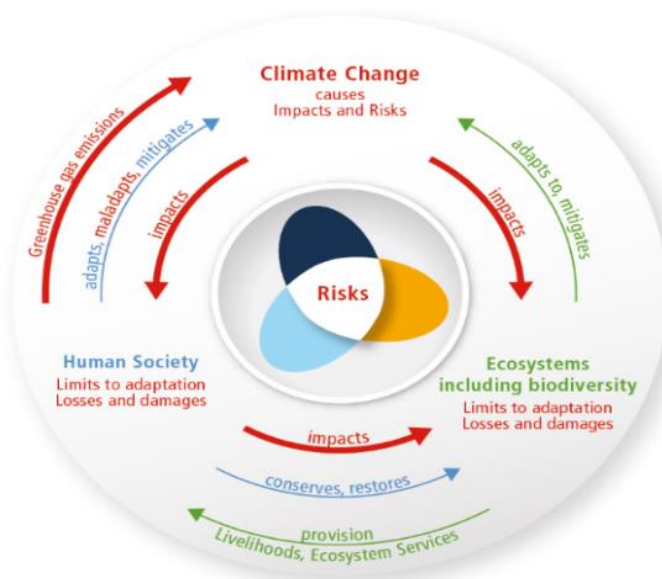
UN/Austria symposium **"Space for climate action: experiences and best practices in mitigating & adapting to climate change & supporting sustainability on Earth."**

IPCC-6th Assessment Report, 2022

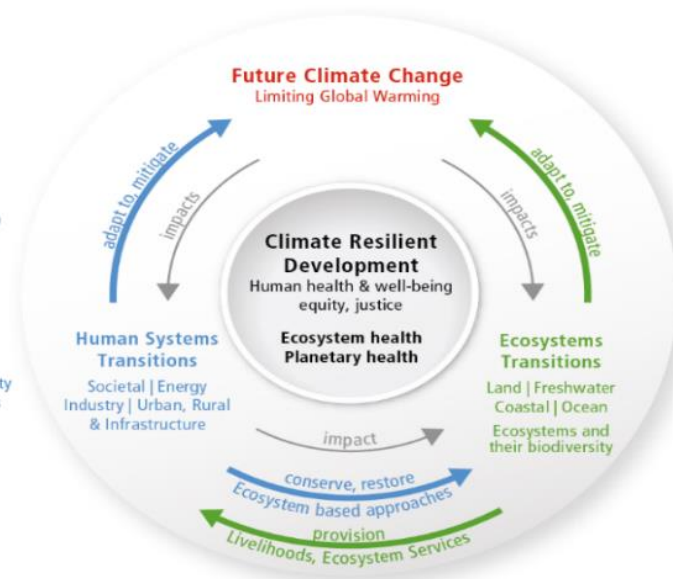
Ecosystem-based adaptation can reduce climate risks that many people already face —droughts, extreme heat, floods and fires — while also delivering co-benefits for biodiversity, livelihoods, health, **food security** and carbon sequestration

From climate risk to climate resilient development: climate, ecosystems (including biodiversity) and human society as coupled systems

(a) Main interactions and trends



(b) Options to reduce climate risks and establish resilience



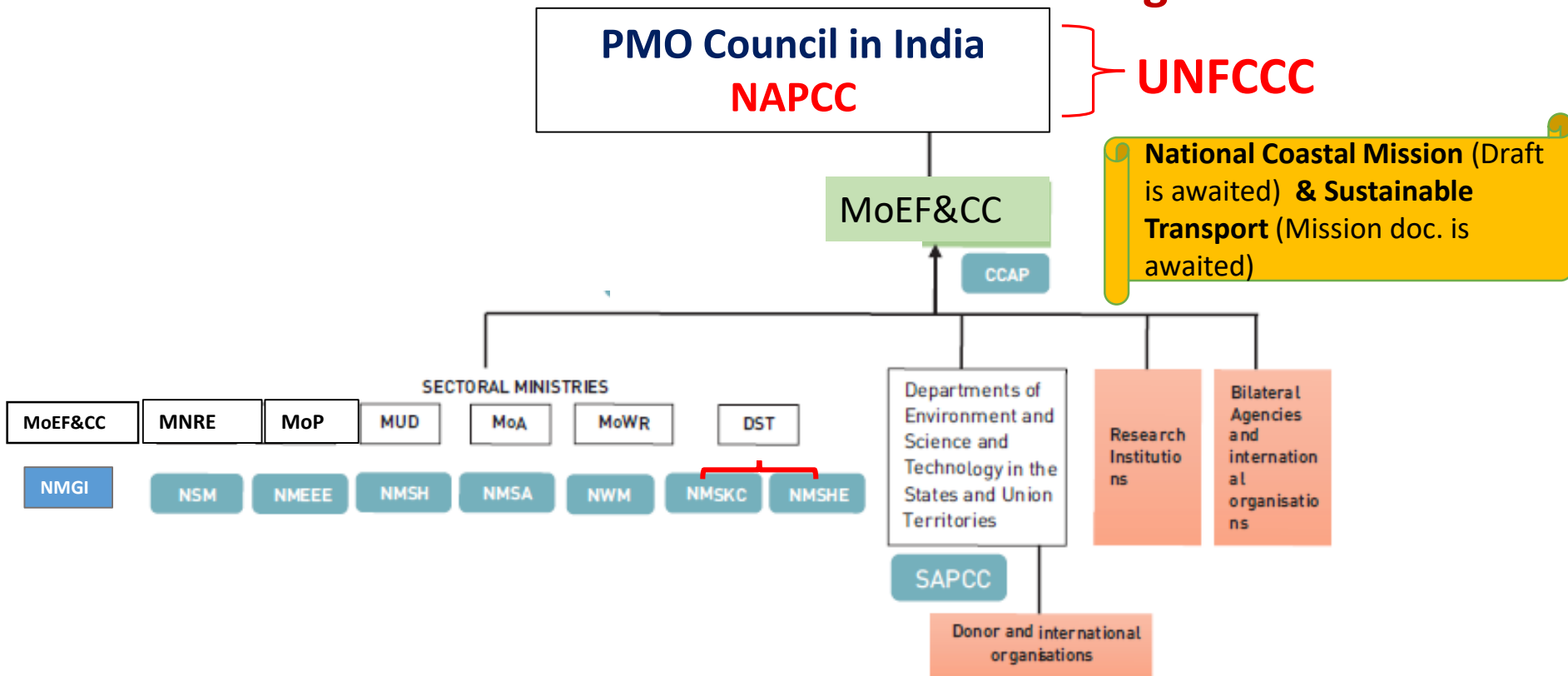
From urgent to
timely action

Governance
Finance
Knowledge and capacity
Catalysing conditions
Technologies

The risk propeller shows that risk emerges from the overlap of:



Institutional Framework for Climate change in India



National Coastal Mission (Draft is awaited) & Sustainable Transport (Mission doc. is awaited)

MOEF Ministry of Environment, Forest and Climate Change
MF Ministry of Finance
MEA Ministry of External Affairs
MoP Ministry of Power
MNRE Ministry of New and Renewable Energy
MUD Ministry of Urban Development
MoA Ministry of Agriculture
MoWR Ministry of Water Resources
MST Ministry of Science and Technology

NSM National Solar Mission
NMEE National Mission on Enhanced Energy Efficiency
NMSH National Mission on Sustainable Habitat
NMSA National Mission on Sustainable Agriculture
NWM National Water Mission
NMSKC National Mission on Strategic knowledge for Climate Change
NMSHE National Mission on Sustaining the Himalayan Ecosystem
NMGI National Mission for a Green India
CCAP Climate Change Action Programme
NAPCC National Action Plan on Climate Change
SAPCC State Action Plan on Climate Change
CCFU Climate Change Finance Unit
EPLCSIG Executive Panel on Low Carbon Strategy for Inclusive Growth
NMHS National Mission on Himalayan Studies

Jawaharlal Nehru National Solar Mission

Objective: To establish India as a global leader in solar energy



Key achievements

- Installed 2,970 MW of grid-connected solar generation capacity
- Installed 364 MW of off-grid solar generation capacity
- Installed 8.42 million sq m of solar thermal collectors

National Mission on Sustainable Habitat

Objective: To promote sustainability of habitats by improving energy-efficiency in urban planning



Key achievements

- Energy Conservation Building Code 2007 made mandatory for new as well as old buildings
- Long-term transport plan for cities prepared
- Sanctioned 760 water supply projects

National Mission for Sustaining the Himalayan Ecosystem

Objective: To safeguard the Himalayas and attempt to address impacts of climate change on Himalayan glaciers, biodiversity and wildlife conservation



Key achievements

- Established 6 new centres relevant to climate change in existing institutions in Himalayan states
- Created an observational network to monitor health of the Himalayan ecosystem

National Mission for Enhanced Energy Efficiency

Objective: To achieve growth with ecological sustainability by devising cost-effective, energy-efficient strategies



Key achievements

- Distributed 2.58 million LED bulbs (7 watts); cost of an LED bulb down from ₹500 to ₹204
- Super-efficient ceiling fans to be introduced this year

National Water Mission

Objective: To conserve water, minimise wastage and ensure equal distribution both across and within states through integrated water resources development



Key achievements

- Revised National Water Policy (2012) adopted by National Water Resources Council
- Created 1,082 new Ground Water Monitoring Wells

National Mission for Sustainable Agriculture

Objective: To transform agriculture into an ecologically sustainable climate-resilient production system and ensuring food security



Key achievements

- Developed 11,000 hectares of degraded land
- 1 million hectares brought under micro-irrigation to promote water efficiency
- Created 5.4 million tonne agricultural storage capacity

National Mission on Strategic Knowledge for Climate Change

Objective: To identify challenges and responses to climate change through research and technology development; ensure funding of high-quality and focused research



Key achievements

- Established 12 thematic knowledge networks
- Developed 3 regional climate models
- Trained 75 high-quality climate change professionals

8 Major National Missions of GoI Under NAPCC

By DST, GoI

1- NMSHE

2- NMSKCC

- Building national S&T capacities in the area of climate change

- Research & Adaptation to Climate change

Geospatial technique under NMSHE/NMSKCC are used for:

- Database Creation
- Vulnerability Assessment
- Modelling and Simulation
- Adaptation planning

- ❖ Glaciers
- ❖ Agriculture
- ❖ Biodiversity
- ❖ Wildlife
- ❖ Disaster Management
- ❖ Coastal Region
- ❖ Climate & Health

Glacial Lakes of Sikkim Himalaya

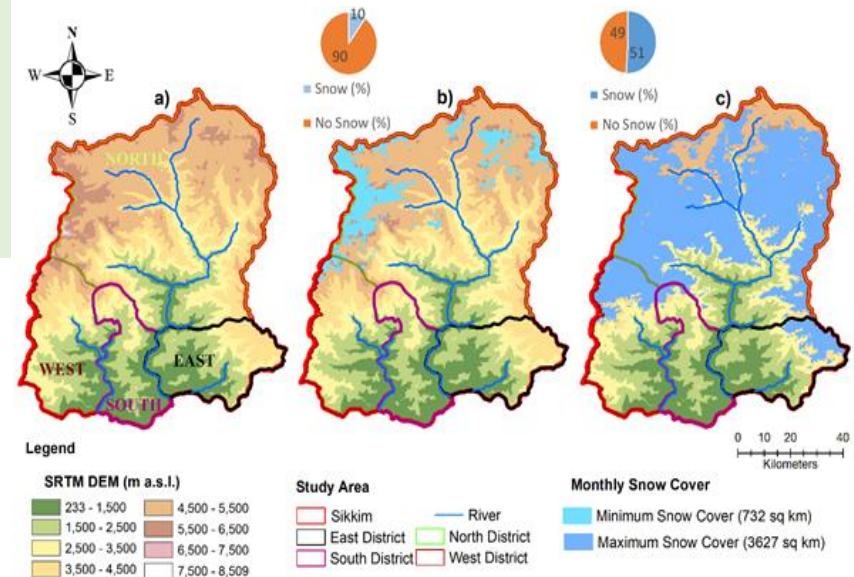
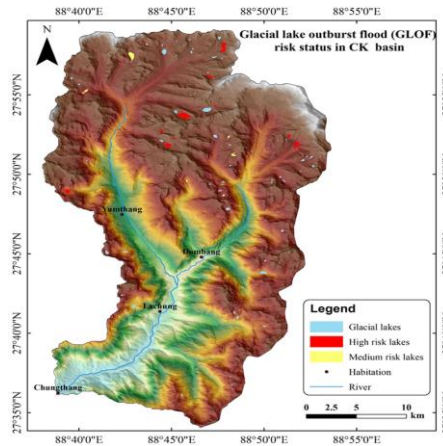
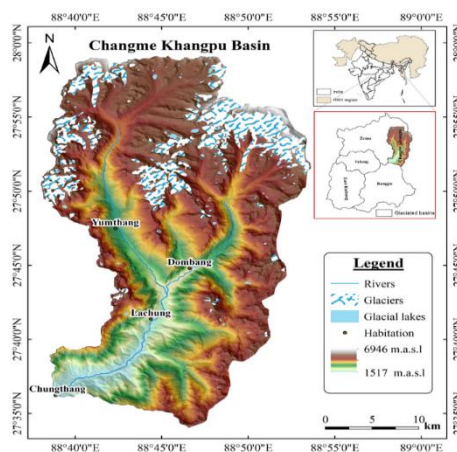
- Snow cover area assessment using MODIS data showed **decrease in snow cover** for the period 2000 to 2020
- **14 glacier lakes** were categorized as potentially **high risk in Changme Khangpu basin**
- Updated **glacial lake inventory** for Sikkim Himalayas and 738 lakes were mapped for the year 2020.
- Identification of glacial **lakes prone to Glacial Lake Outburst Floods (GLOF)** in Changme Khangpu Basin in North Sikkim



Jakthang Glacier, Nov 2021, May 2022



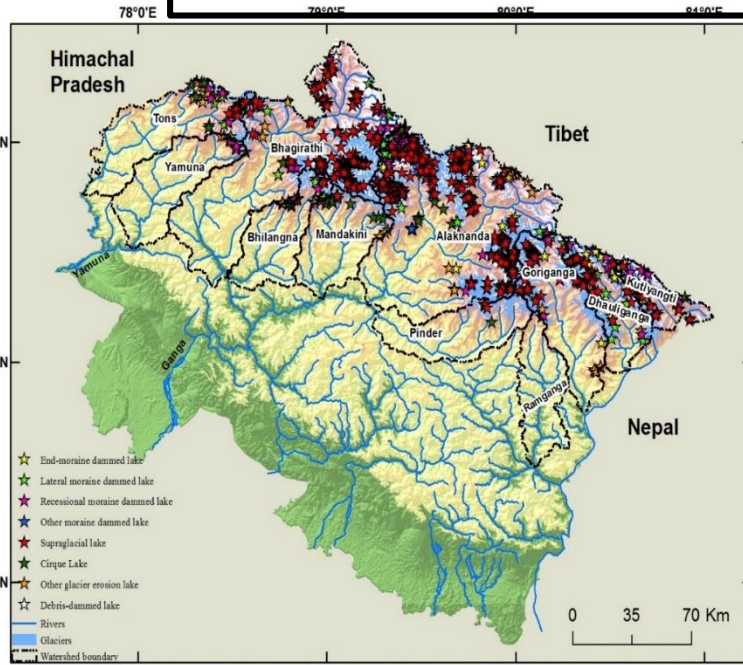
BC monitoring at Yumthang



Maps showing (a) topographic variation, (b) monthly minimum snow-cover area, and (c) monthly maximum snow-cover area of Sikkim Himalaya.

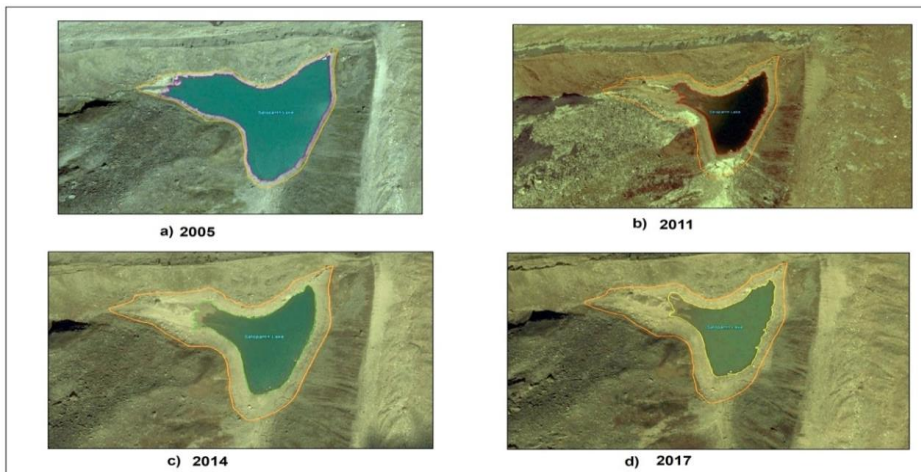
Glacial Lake Inventory of Uttarakhand

Total No. of Lake : 1266
Total area : 7594871m²



Main type	Sub type	Total number	%	Total area (m ²)	%	Mean area (m ²)
Moraine- dammed lake	End moraine-dammed lake	44	3.5	1596367	21.0	36281
	Lateral moraine-dammed lake	67	5.3	652054	8.6	9732
	Recessional moraine-dammed lake	214	16.9	1589375	20.9	7427
	Other moraine-dammed lake	4	0.3	98143	1.3	24536
Ice-dammed lake	Supra-glacial lake	809	63.9	2000524	26.3	2473
Glacier erosion lake	Cirque lake	48	3.8	1174222	15.5	24463
	Other glacial erosion lake	77	6.1	466491	6.1	6058
Other glacial lake	Other glacial lake	3	0.2	17695	0.2	5898
Total		1266		7594871		

Spatio-temporal area change (shrinkage) of the Satopanth Lake (2005-2017)



Maize crop Suitability

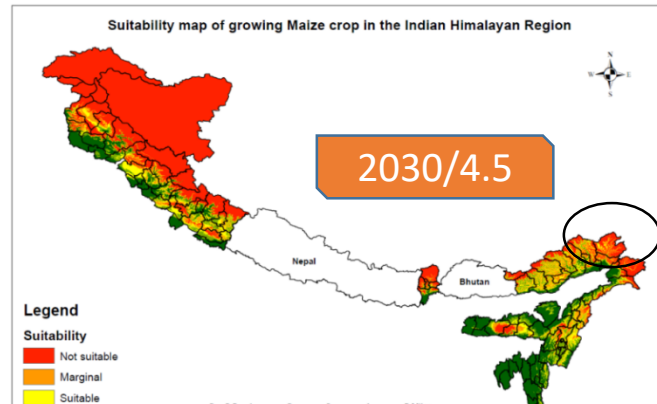
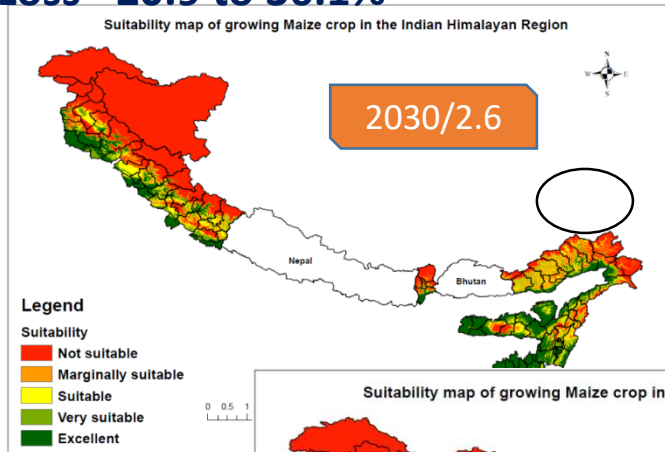
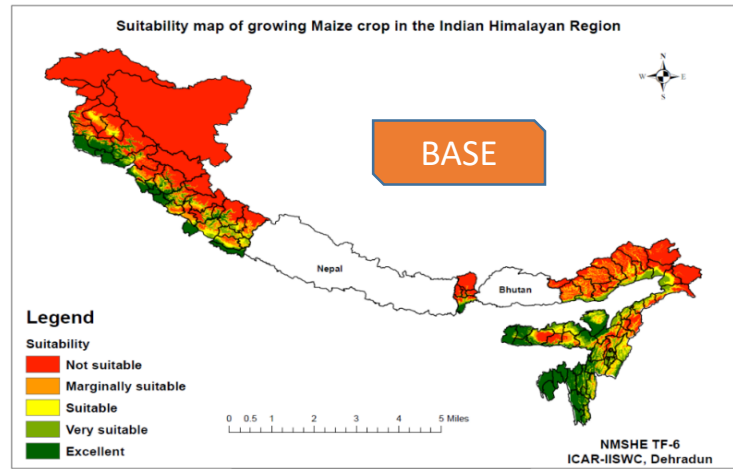
Enabling Crop Planning

Projecting suitability of growing maize crop in IHR (4 RCPs of the year 2030, 2050 and 2080) was done in 12 states

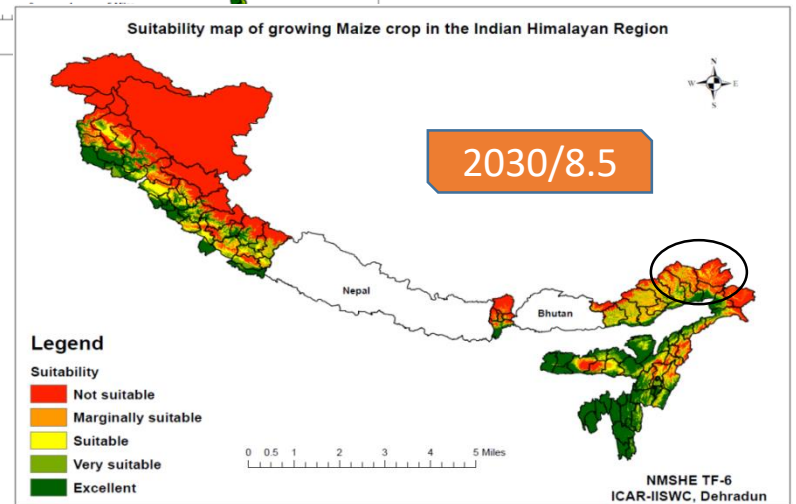
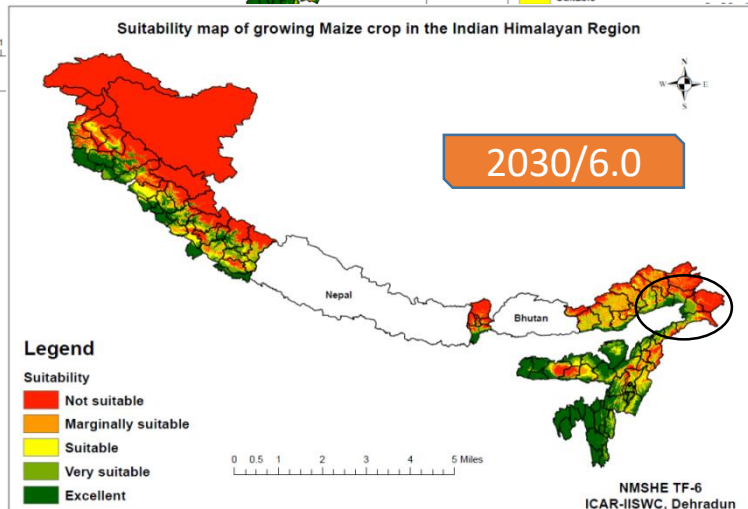
Gain = 2.3 to 3.8%

No change= 62.2 to 76.7%

Loss= 20.9 to 36.1%



Evaluating
the
Prospects

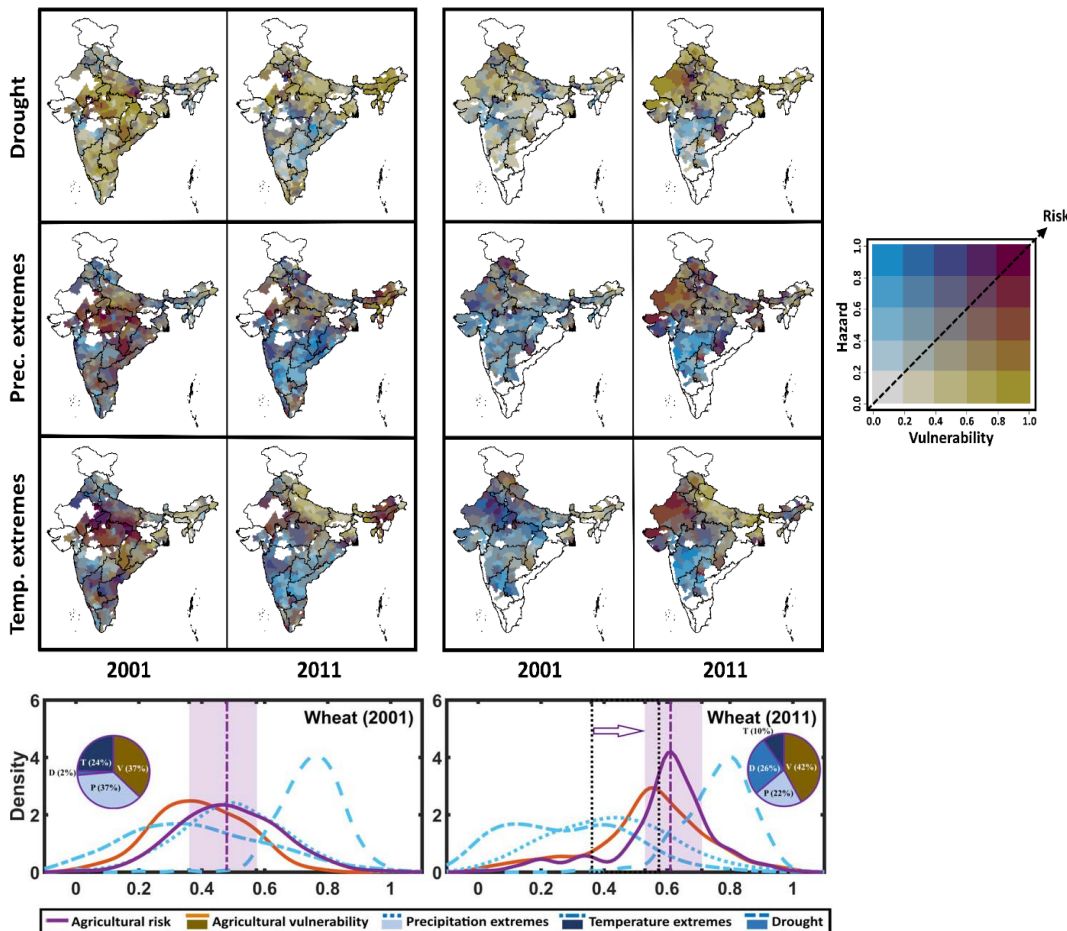


Agricultural risk map: Cartographic products at National-scale

Agricultural risk map based on AR5, IPCC

Rice

Wheat



- A novel unified country-level framework to quantify and map the decadal agricultural vulnerability and risks for entire India derived from multiple hydro-meteorological exposures and adaptive consequences
- developed using only the observed datasets procured from publicly available government data portals, such as Col, IMD, CGWB, etc., and synthetically generated or simulated datasets were deliberately avoided
- Will benefit existing initiatives by the Government of India (GoI)
- Can provide invaluable information pertaining to agriculturally vulnerable hotspots to implement evidence-based coordinated actions
- Risk Classifier with choropleth as an open tool

Sharma et al. (2020), ERL

Climate change Impacts and adaptation gains

Under RCP (2.6, 4.5, 6.0, 8.5 RCPs) in 2020, 2050 and 2080 scenarios

Without adaptation, climate change is projected to **affect all India productivity of**

Kharif irrigated maize (-9 to -27%)

Mustard (-9 to -29%)

Potato (-2 to -25%)

However, crops such as

Kharif sorghum

pearl millet (-2 to +3%)

soybean (+2 to +11%)

Kharif ground nut (up to +17%)

chick pea (-2.5 to +12%)

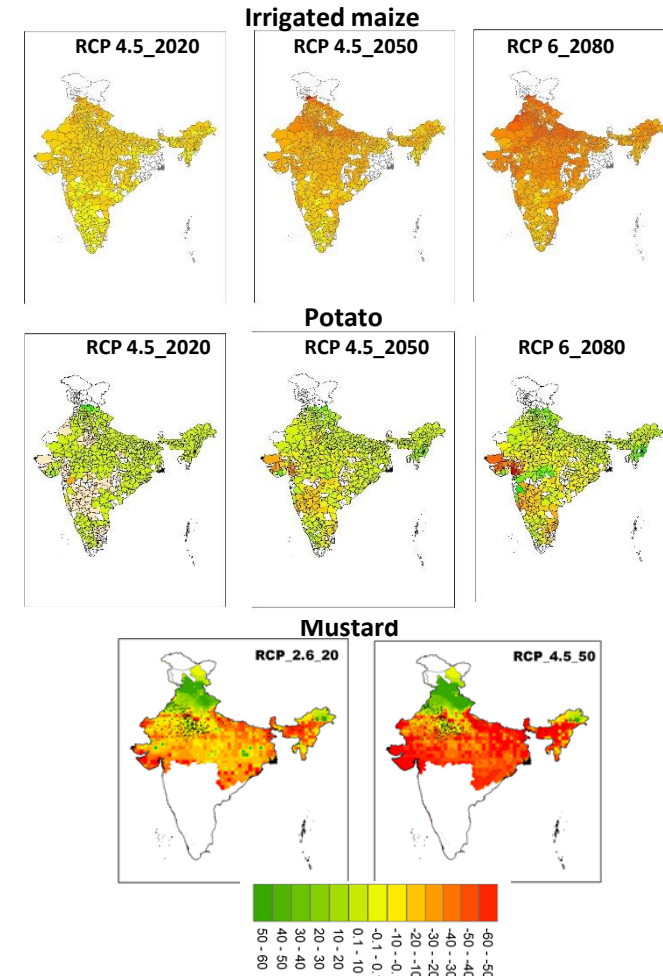
pigeon pea (up to +37%)

and cotton are projected to have **marginal mixed**

impacts

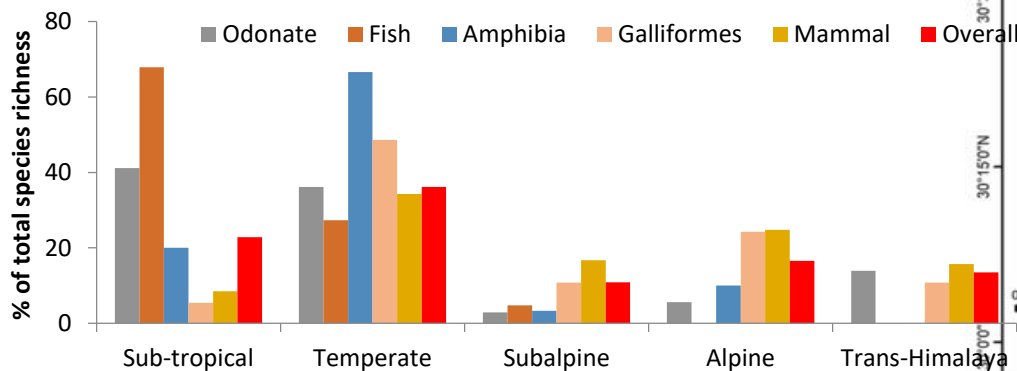
All these impacts are projected to have significant spatio-temporal and inter-annual variations

Low-cost adaptation strategies such as change in sowing time, variety, FYM, and irrigation and nitrogen management can improve the yield up to 40% in many parts

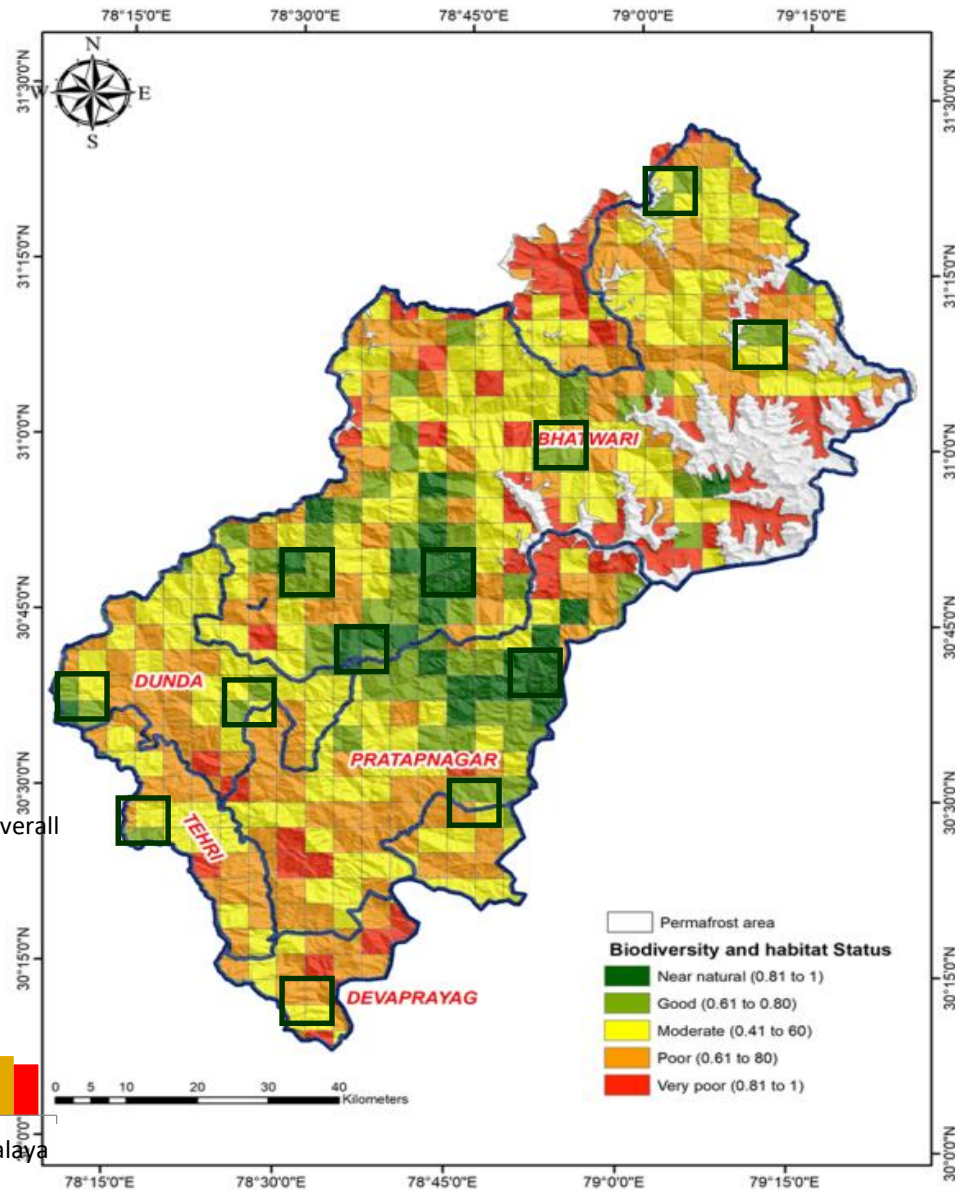


Status of Ecosystem Health in Bhagirathi Basin (4 x 4 km grids)

- Landscape level new knowledge about health status and biodiversity
- Long term monitoring of identified grids for periodic ecological health assessment and climate impact on long term basis
- **Target areas for better climate-wildlife related management and planning**

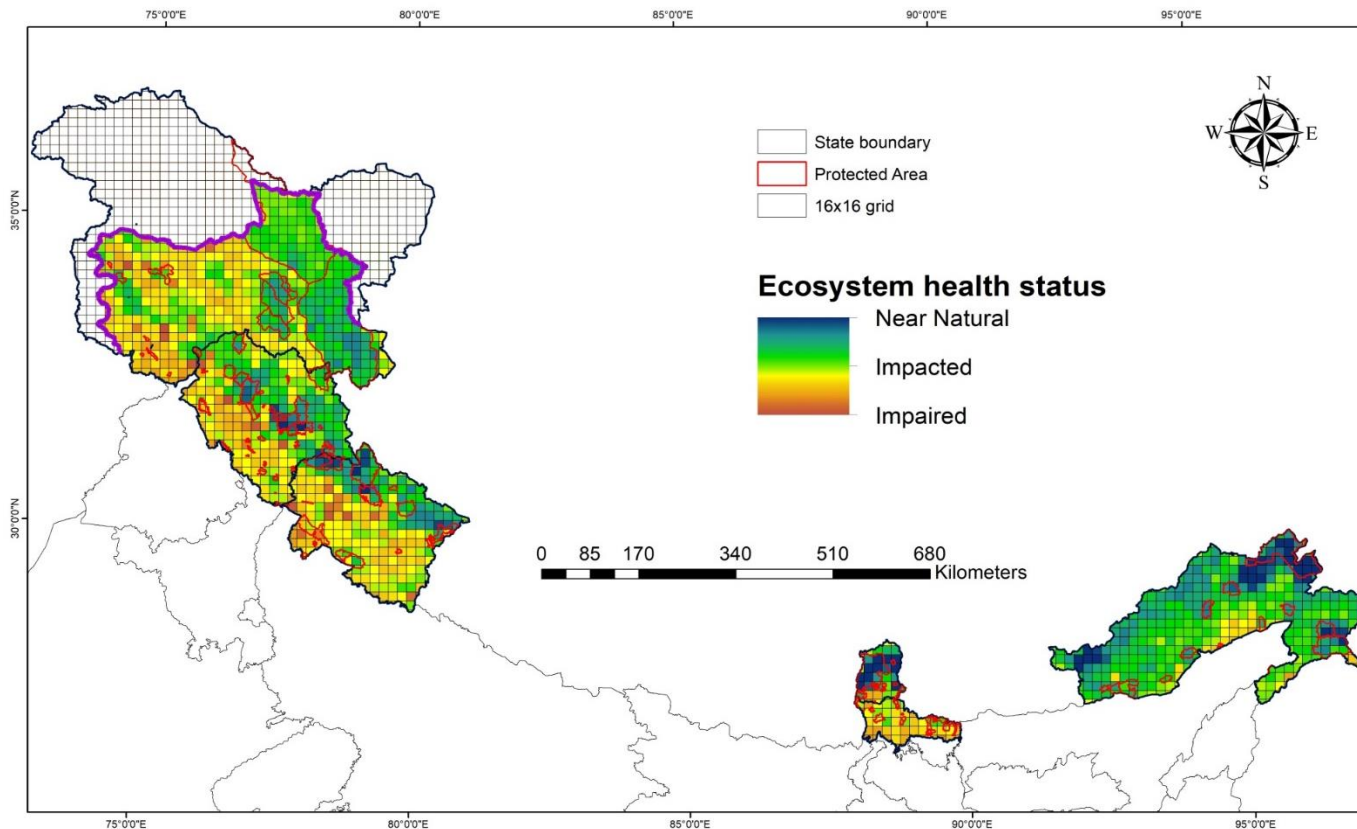


Species richness (%) in total and for different taxonomic groups in different eco-climatic zones of Bhagirathi Basin



Overall status of biodiversity and habitat (%) of Bhagirathi Basin, and long term monitoring grids

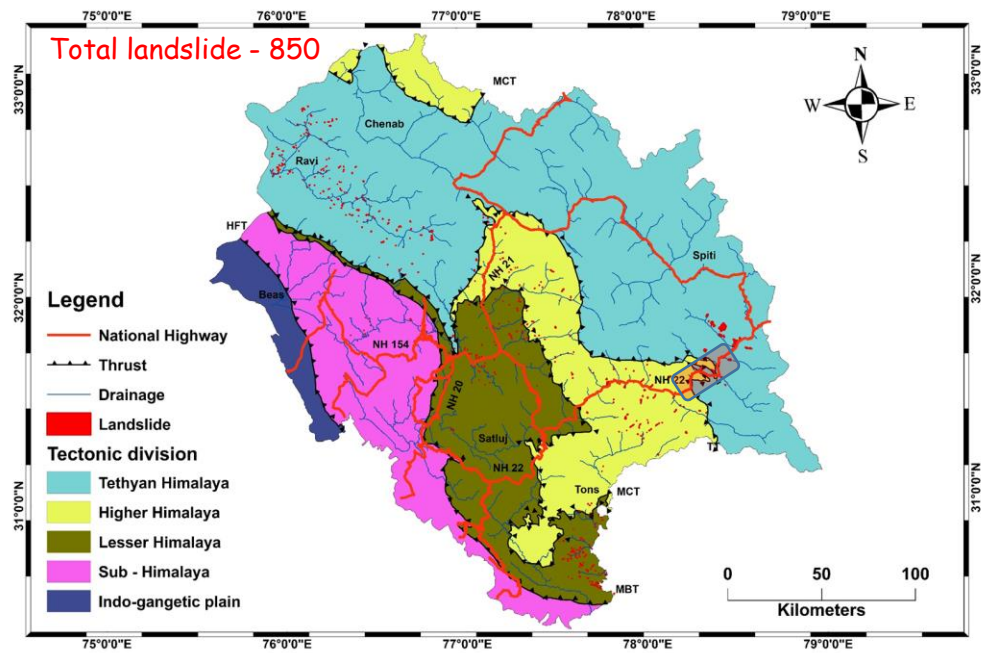
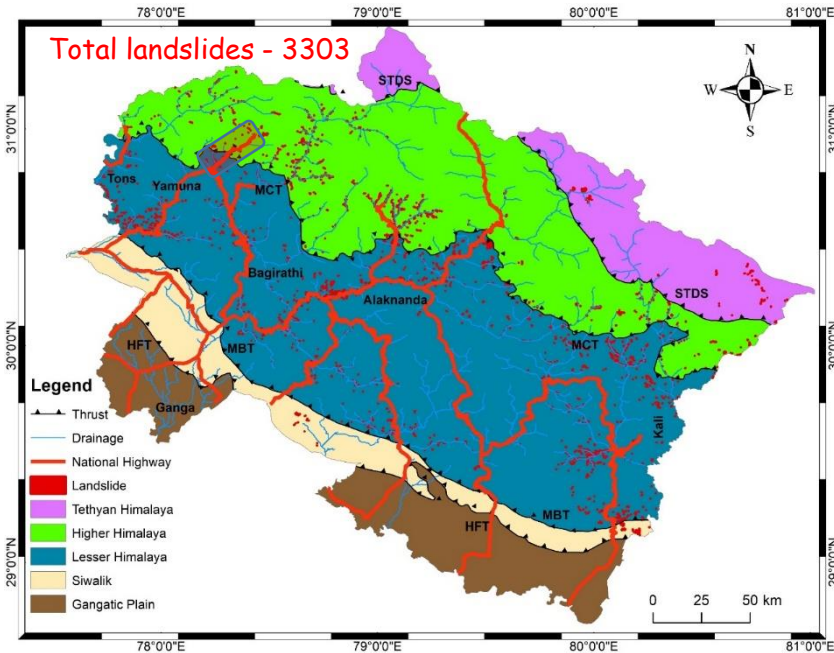
Novel information generated on taxa-specific species distribution, habitat and ecosystem health status of wildlife in the IHR



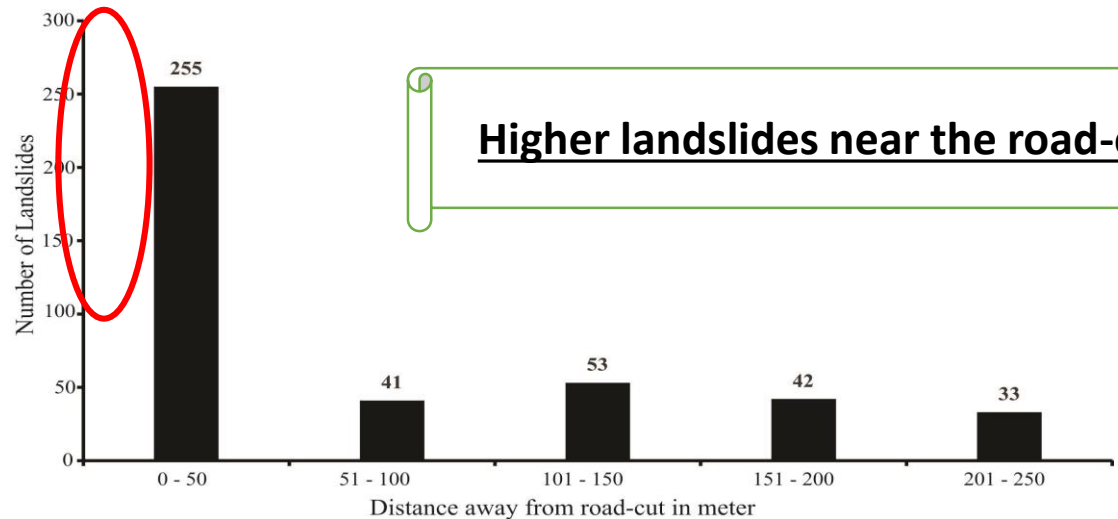
- The database generated would be updated temporally
- The information is currently being used to develop species distribution models

Overall ecosystem health status in different 16x16 km grids of Indian Himalayan Region (the pink line is denoting Line of Control and Line of Actual Control, grids beyond this line are not considered for analysis)

Inventory of landslide for Uttarakhand and Himachal Pradesh



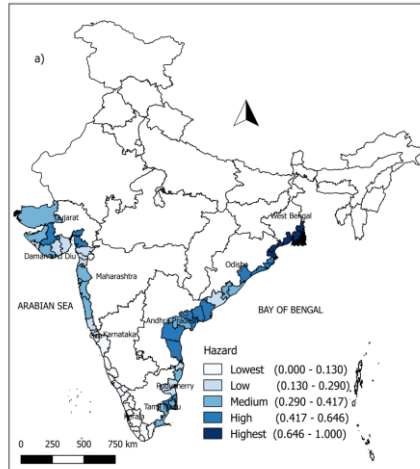
Tectonic Division	No. of landslides	
	UK	HP
Siwaliks	56	36
Lesser Himalaya	2173	283
Higher Himalaya	976	232
Tethyan Himalaya	98	299



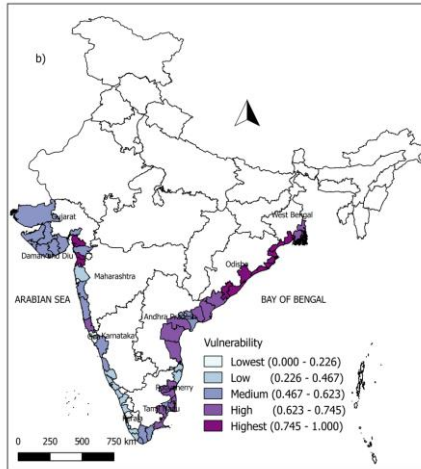
Higher landslides near the road-cut

Coastal Risk Maps: Cartographic products at National-scale

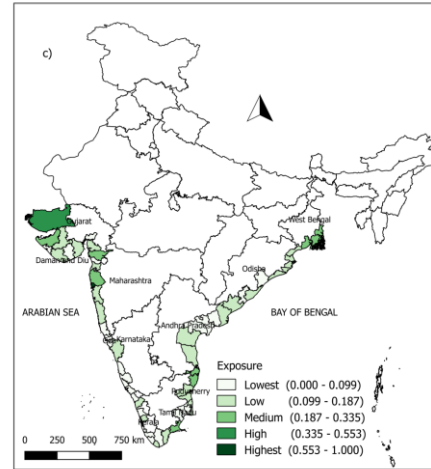
Coastal Risk Maps (following AR5 framework)



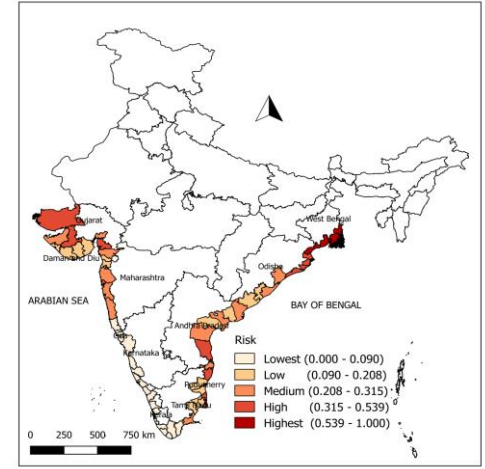
Hazard



Vulnerability



Exposure

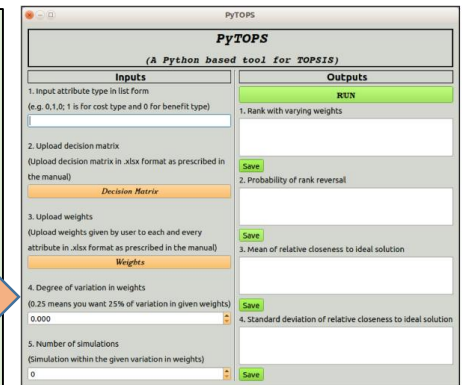


Risk

The developed coastal risk index (aggregating hazard, vulnerability and exposure following IPCC AR5) will lead to identification of factors which influences the risk and vulnerability of the coastal districts of India.

Malakar et al. (2021), JEM Strategic Knowledge

- Cartographic products for **76 coastal districts of India**
- Most districts of the eastern coast have higher risk indices (hazard-driven) compared to those in the west, and the risk has increased since 2001
- Python-3 based open tool PyTOPS for multi-attribute decision making (implementing TOPSIS) was developed for comprehensive indicator-based vulnerability analysis.

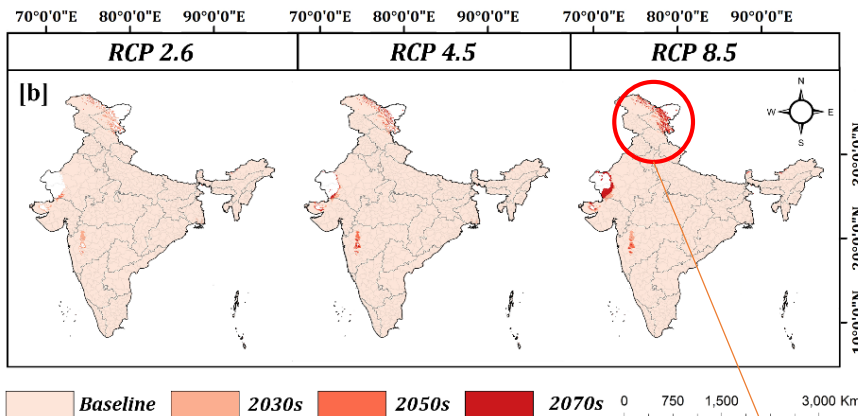
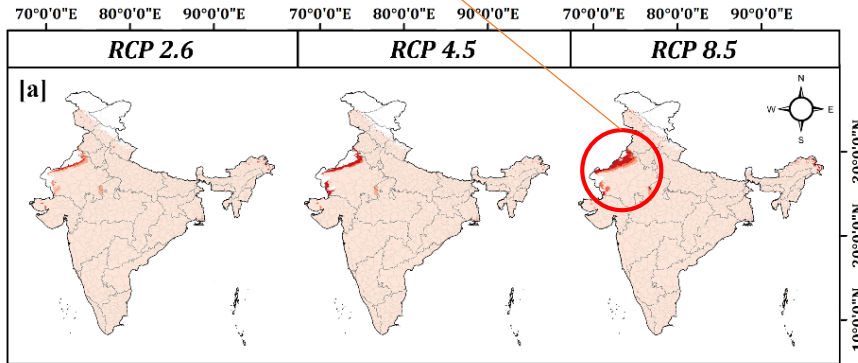


DST-CoECS, IIT Bombay

Source: IIT, Bombay

Present and Future Distribution of Dengue Vectors

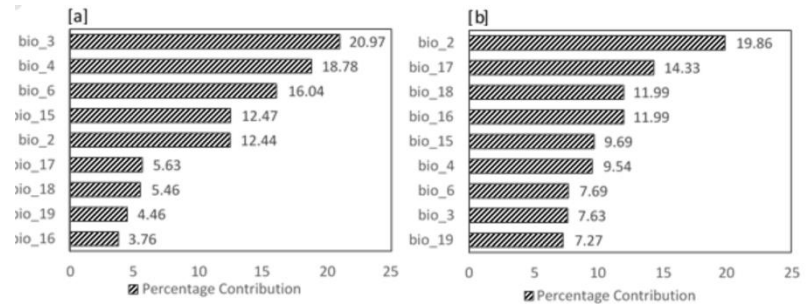
Expansion of range of *Ae. aegypti* in the arid regions of Rajasthan



Expansion of range of *Ae. albopictus* in colder regions of the Himalayas

Results Published in : Hussain SSA, Dhiman RC (2021) - GeoHealth

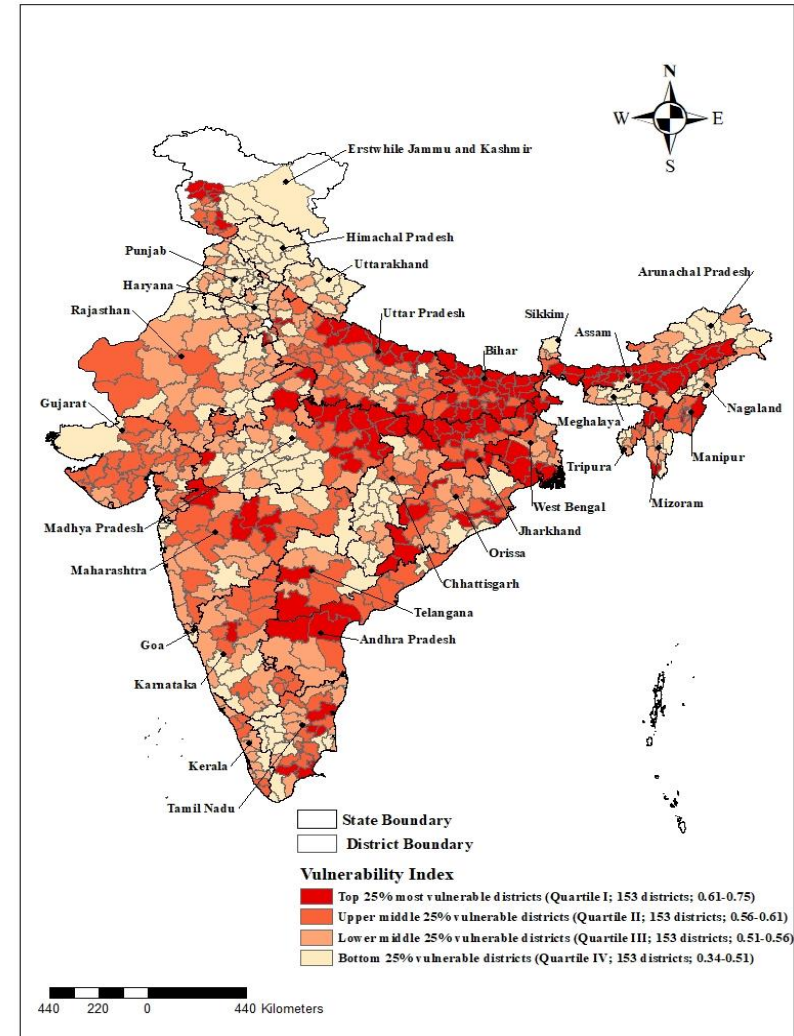
Variable	Ae. aegypti		Ae. Albopictus	
	Coeff.	Sd	Coeff.	Sd
AUC	0.94	0.01	0.95	0.04
TSS	0.77	0.04	0.84	0.11
Jaccard	0.80	0.03	0.85	0.09
Sorensen	0.89	0.02	0.92	0.05



Temp. based factors contribute to *Ae. Aegypti* prevalence, whereas precipitation related factors contribute to prevalence of *Ae. albopictus*.

District-Level Vulnerability Assessment for 690 districts in the country

- ❖ All the districts are vulnerable
- ❖ 100 most vulnerable districts in India are in the states (13) of Assam, Bihar, Jharkhand, Odisha, Madhya Pradesh, Maharashtra, West Bengal, Jammu and Kashmir, Tamil Nadu, Mizoram, Manipur, Haryana, Telangana
- ❖ Nearly 90% districts in Assam, 80% in Bihar, and 60% in Jharkhand are highly vulnerable



Priority Areas Identified for Next 5 Years of DST's CCP

◆ Urban Climate

- ✧ Expanded National network Programme on Urban Climate
- ✧ A CoE on Urban climate

◆ Climate Modeling

- ✧ Community Earth System Modeling Network

◆ Extreme Events

- ✧ A National Network Programme on CC & Extremes events
- ✧ A CoE on floods/water resource studies
- ✧ A CoE on CC Impact on Monsoon

◆ Himalayan Studies

- ✧ HICAB for IHR (6-8 CoEs, 20 MRDPs, 13 State Networks)

◆ Glaciology

- ✧ National Initiatives on Glaciology Research and Training

Thanks !!

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