

Bridging Science and Policy in India's State Action Plans on Climate Change

Case study of Uttarakhand

Jennifer Steeves, Acclimatise

8 March 2017

IITM, Pune

Today's presentation

- Current context of state climate plans in India
- Case study Uttarakhand (video)
- Agenda for Climate Action – snapshot of agriculture sector
- Next steps for Uttarakhand
- Key insights from VRA process

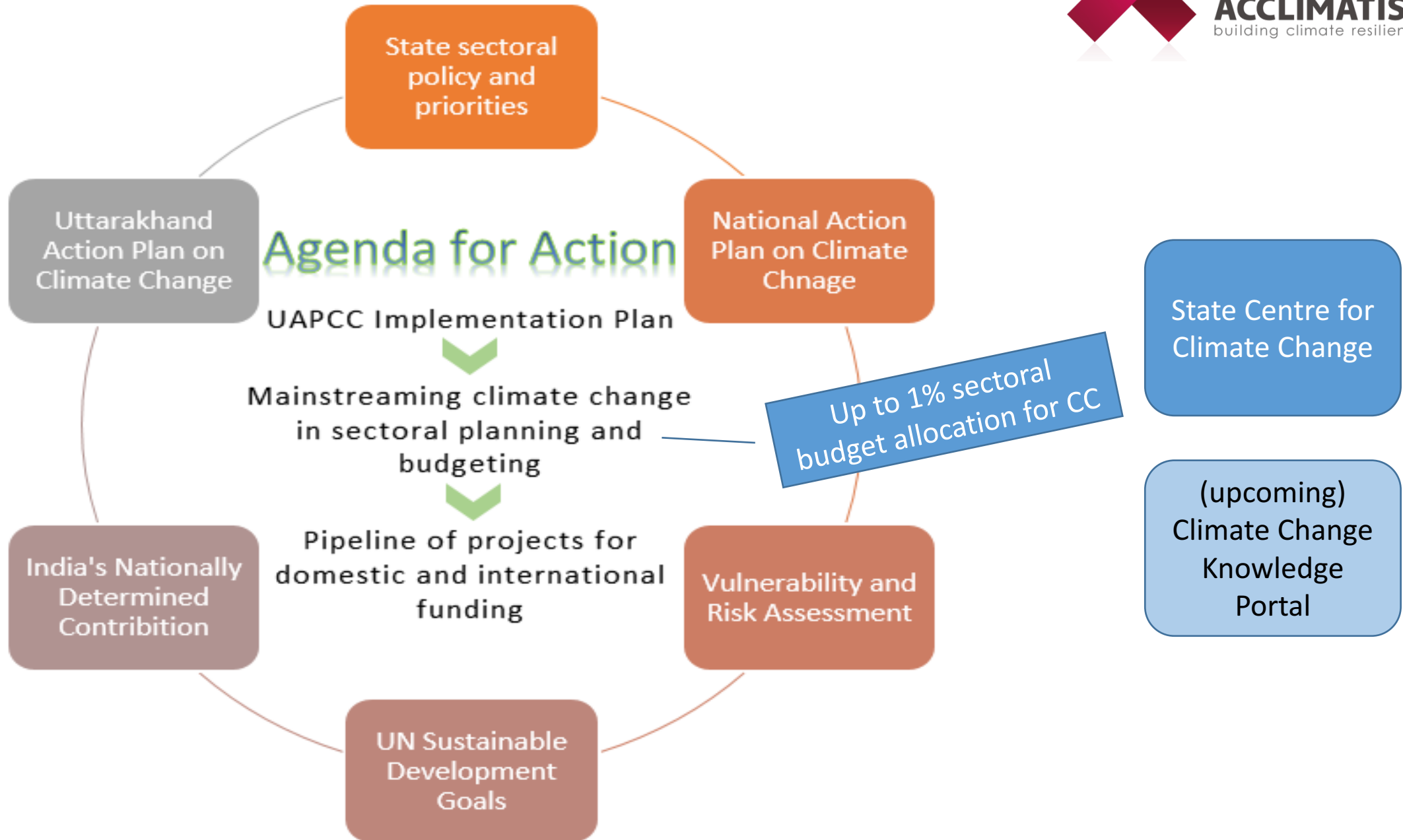
State Climate Plans in India: current context

- All states and UTs have drafted State Action Plans on Climate Change (SAPCCs)
- Currently focussing on
 - Vulnerability Risk Assessments (VRAs)
 - Prioritisation through implementation plans
 - Mainstreaming in priority sectors
 - Pipeline of projects for funding
 - Funding through existing schemes
- Next Steps
 - Find linkages with India's Nationally Determined Contributions and ongoing National Adaptation Plan



Video - Climate Change & Uttarakhand: The Road to Resilience

Mapping climate action in Uttarakhand



Agenda for Climate Action:

Bridging science & policy



Step 1 **VRA review**

Step 2 **Identification of climate impact areas**

Step 3 **Policy review**

- Review
- UAPCC
- State sector policies
- Uttarakhand Development Report
- Relevant missions under the NAPCC
- India's NDC

Step 4 **Participatory Rural Appraisal (PRA) review**

Step 5 **Development of Agenda for Climate Action**

Step 6 **Identification of co-benefits**

Step 7 **Policy Validation**

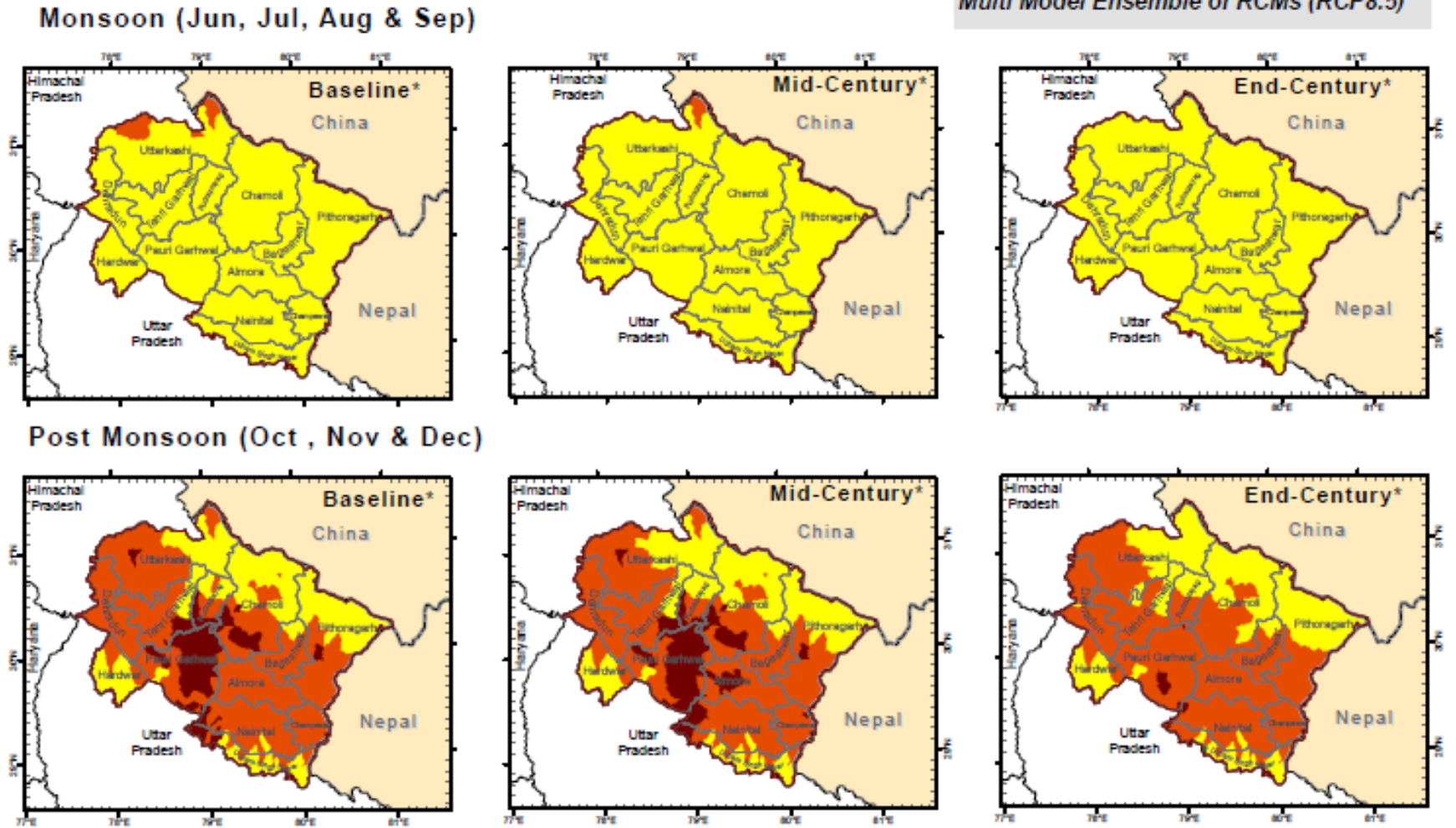
Agriculture

Seasonal Agriculture Water Stress for Uttarakhand

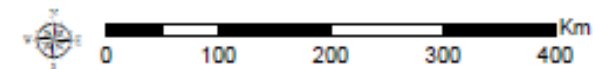
Multi Model Ensemble of RCMs (RCP8.5)[#]

Climate Impact Areas

1. Increased water stress
2. Increased risk of flooding
3. Changes in crop yields



Agriculture Water Stress Scale



*Source: *Cordex South Asia* daily weather datasets provided by the Indian Institute of Tropical Meteorology, Pune
 MultiModel Ensemble of CSIRO-CCAM-1391M, SMHI-RCA4 and MPI-CSC-REMO2009
 Baseline (1981-2010), Mid-Century (2021-2050), End-Century (2071-2100)

Ratio of Actual Evapotranspiration to Potential Evapotranspiration

Analysis & Layouts prepared by INRM Consultants, New Delhi! <http://www.inrm.co.in>

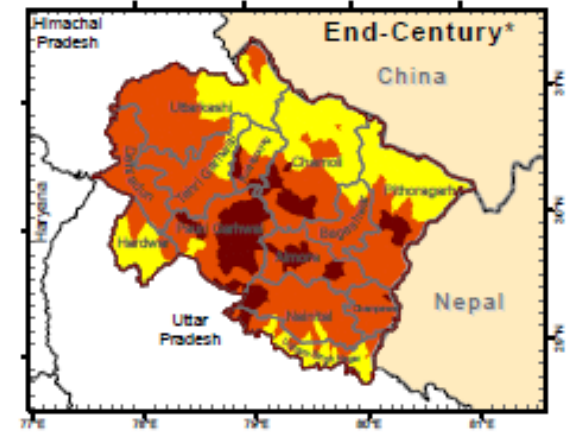
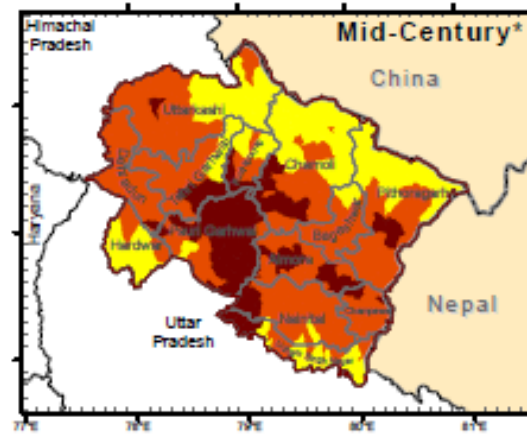
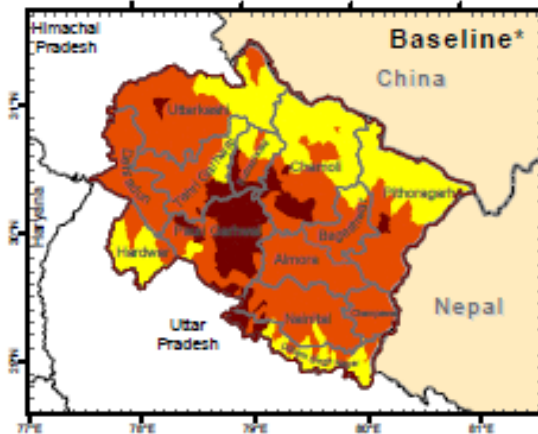
Seasonal Agriculture Water Stress for Uttarakhand

Multi Model Ensemble of RCMs (RCP4.5)[‡]

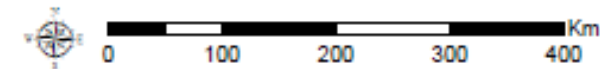
Monsoon (Jun, Jul, Aug & Sep)



Post Monsoon (Oct, Nov & Dec)



Agriculture Water Stress Scale



[‡]Source: Cordex South Asia daily weather datasets provided by the Indian Institute of Tropical Meteorology, Pune
MultiModel Ensemble of CSIRO-CCAM-1391M, SMHI-RCA4 and MPI-CSC-REMO2009
Baseline (1981-2010), Mid-Century (2021-2050), End-Century (2071-2100)

Ratio of Actual Evapotranspiration to Potential Evapotranspiration

Analysis & Layouts prepared by INRM Consultants, New Delhi <http://www.inrm.co.in>

Agenda for Climate Action

AGRICULTURE



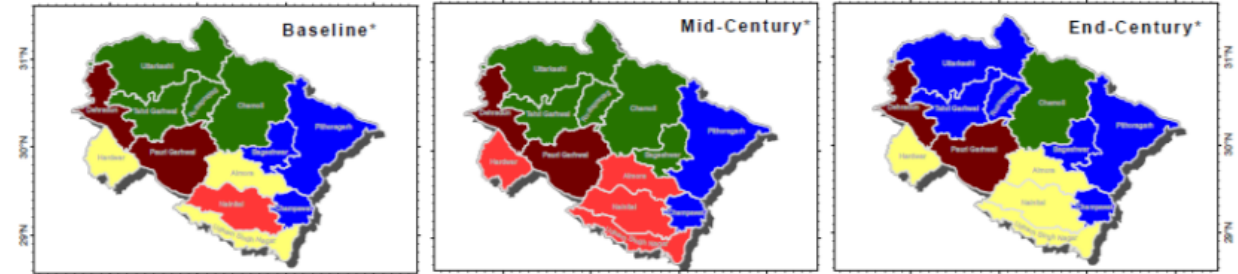
IMPACT AREA	ACTION
Increase in water stress	<ul style="list-style-type: none">• Re-evaluate guidelines for irrigation practices in line with the VRA findings• Promote climate smart agricultural technologies
Increased risk of flooding	<ul style="list-style-type: none">• Raise awareness of insurance schemes at the farm level• Link the VRA findings with weather-based index insurance by Agriculture Insurance Company of India
Changes in crop yields	<ul style="list-style-type: none">• Assess irrigation strategies and conduct studies on crop yields in line with the VRA findings• Conduct supply chain and market analysis for opportunities for new agricultural enterprises
Climate change can undermine development goals	<ul style="list-style-type: none">• Focus on an overarching agriculture policy, linking current state objectives and climate vulnerabilities• Build capacity of agriculture extension teams to integrate climate risks and opportunities• Link climate data with Uttarakhand's Agro-Climatic Planning and Information Bank (APIB).

Water

Climate Impact Areas

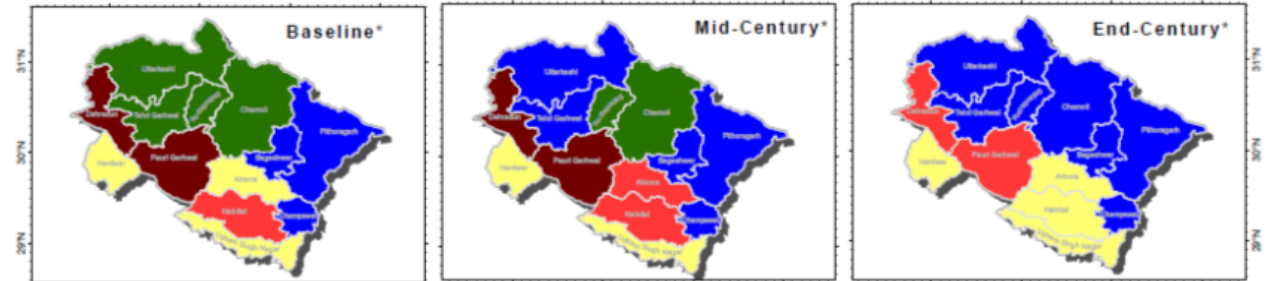
1. Seasonal changes in water availability
2. Increased risk of flooding
3. Potential improved stream flow
4. Implications for management of dam infrastructure

Water



RCP 8.5

Water



Vulnerability Scale



The figure shows the current and projected vulnerability of the State's districts based on a number of water-related factors including water availability and extreme events of flood and drought. As seen, Pauri Garhwal and Dehradun are currently the most vulnerable due to less surface water and ground water availability per capita in monsoon and non-monsoon months and high crop water stress in the non-monsoon (rabi) season. Champawat, Bageshwar and Pithoragarh are relatively the least vulnerable due to factors such as maximum availability of surface and ground water per capita and less crop water stress in monsoon as compared to other districts.

Agenda for Action



WATER

IMPACT AREA	ACTION
Seasonal changes in water availability	<ul style="list-style-type: none">• Map the availability, supply, and demand of water resources at the basin level• Focus on participatory Irrigation Management (PIM) techniques at the Gram Panchayat level• Promote water saving and re-use schemes
Increased risk of flooding	<ul style="list-style-type: none">• Prepare flood plain maps and inundation maps for flood-prone areas guided by the VRA• Assess feasibility of structural and non-structural measures for flood management guided by the VRA
Changes in stream flow	<ul style="list-style-type: none">• Use the VRA findings on stream flow dependability to guide investments in run-of-the-river, hydropower, drinking water, and irrigation projects
Implications for dam infrastructure	<ul style="list-style-type: none">• Re-assess the design of current water infrastructure in light of the increasing probability of large magnitude flood events, as noted in the VRA• Re-evaluate the Central Water Commission (CWC) criteria for new dams guided by VRA

Agenda for Climate Action



Agenda for Climate Action: Next steps for all sectors

- **On-ground research to validate VRA results**
- **Targeted impact assessments**
- **Review and update policy objectives, in line with climate evidence**
- **Further research in the areas of VRA limitations**
- **Use adaptive management, options flexible and robust against a range of future climate outcomes**

Decision-making in the face of uncertainty

- Focus on robustness to today's and tomorrow's potential **climate** – not necessarily the 'optimal' solution



(Wilby and Dessai, 2010)

Key insights

1. VRA results provide an **evidence base** to guide policy and planning, determine where to invest limited resources, support funding requests
2. VRA results require significant interpretation to be **useful to decision-makers** (Agenda for Climate Action)
3. Next step is **prioritization** of specific actions for implementation given limited resources -> co-benefits approach
4. **On-ground adaptation actions** cannot be directly derived from VRA results, at their current level of specificity
5. **Further research** is required to validate model-based results, overcome VRA limitations

International policy implications

- All states' VRAs do not follow a consistent framework, which presents a challenge in aggregating data and providing a standardized picture of vulnerability across the country
 - This creates a challenge for implementing India's Nationally Determined Contribution (NDC) – how to measure vulnerability reduction?

Questions for reflection

- How can we bridge the gap between VRA results and implementation of climate action on the ground?
- Is the evidence base produced by a VRA robust enough to support proposals for climate finance?

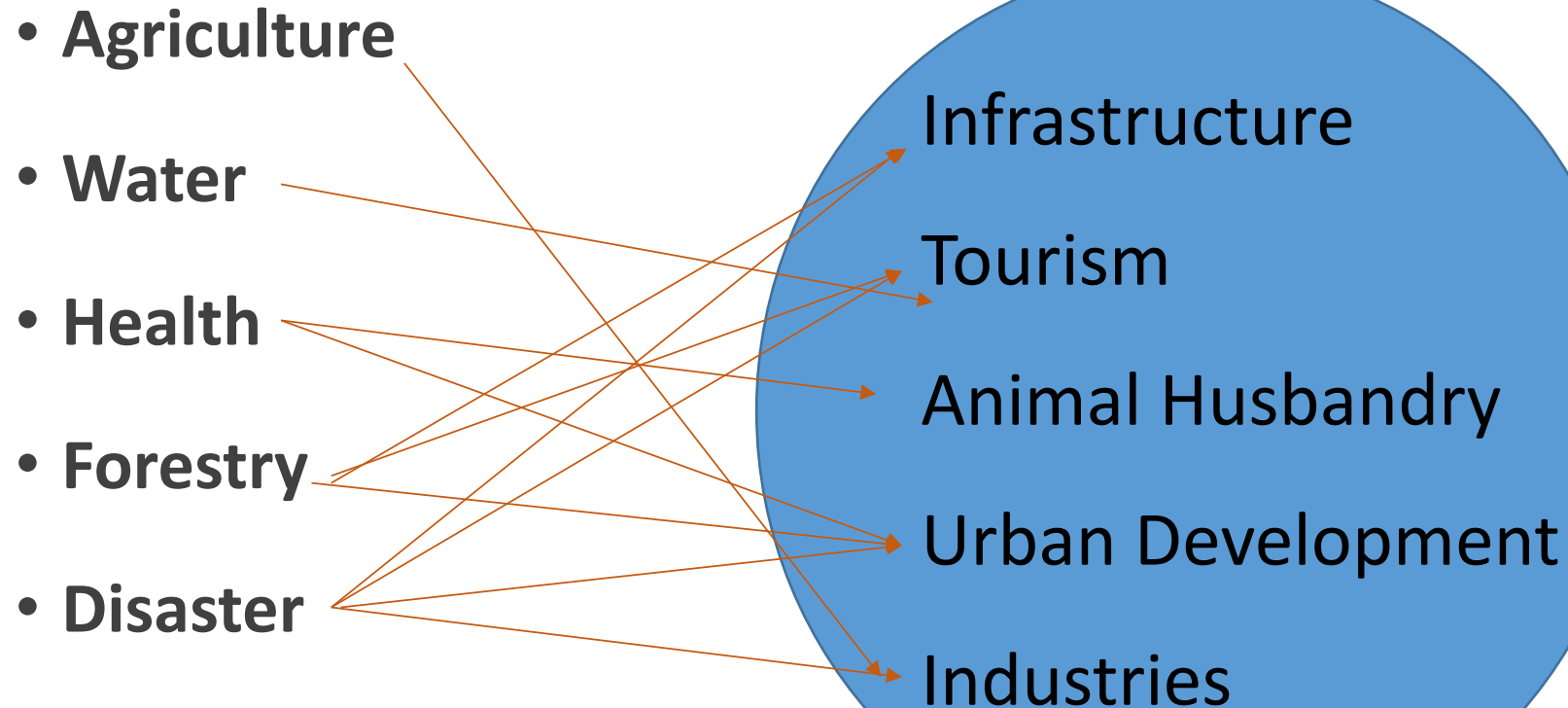


Thank you!

Backup slides



Sectors addressed by the VRA



State climate Plans: funding so far



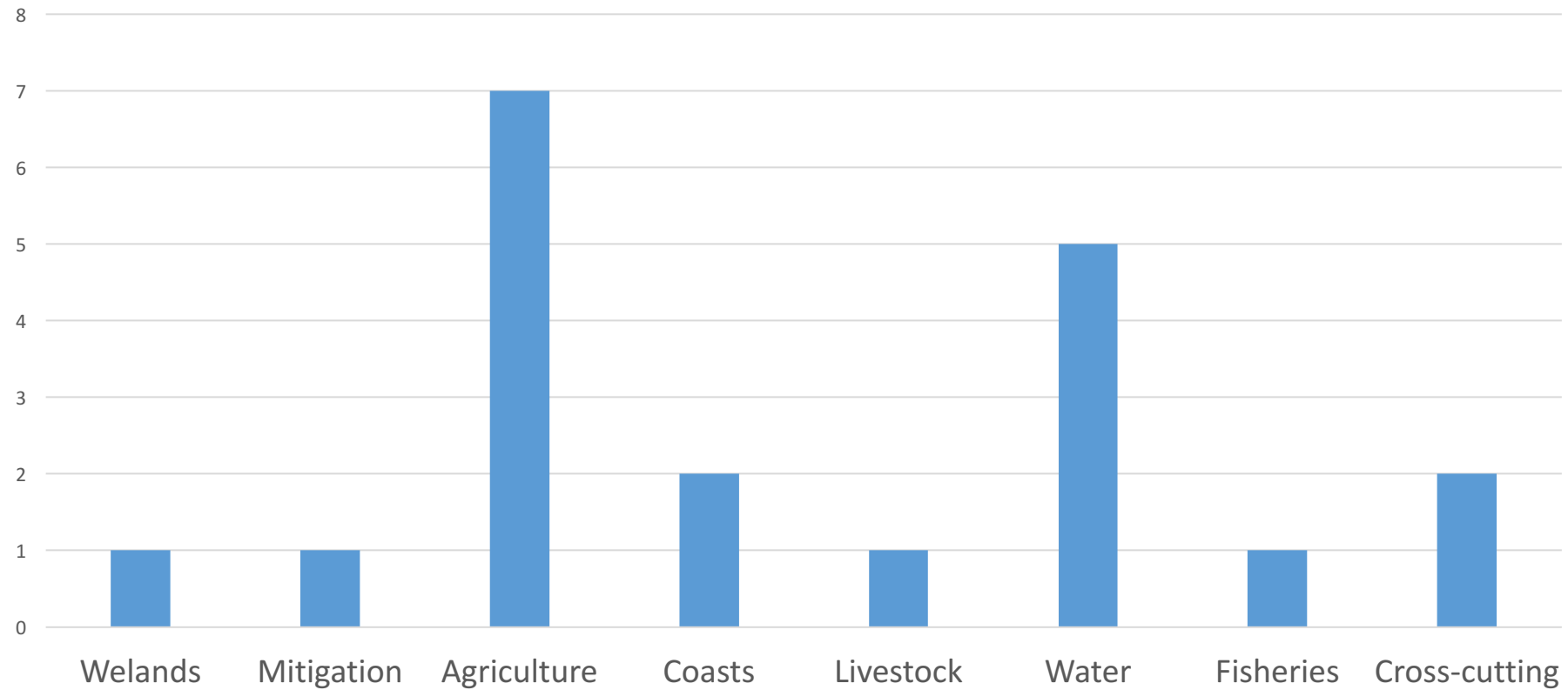
No.	National Adaptation Fund, Gol	State	Outlay (Cr Rs)
1	Climate Resilient Livestock Production System	Punjab	17.40
2	Management of run-off in the river basin in Nuapada	Odisha	20.00
3	Sustainable Livelihoods of Agriculture-Dependent Rural Communities in Drought Prone District of HP	Himachal Pradesh	20.00
4	Model Carbon Positive Eco-Village in Phayeng Of Manipur	Manipur	10.00
5	Management and rehabilitation of coastal habitats and biodiversity in Gulf of Mannar	Tamil Nadu	24.74
6	Promotion of Integrated Farming System of Kaipad and Pokkali in coastal wetlands	Kerala	25.00
7	Sustainable Agriculture Development through Expansion, Enhancement and Modelling	Mizoram	10.38
8	Climate Adaptation Strategies in Wetlands along Mahanadi River Catchment areas in Chhattisgarh	Chhattisgarh	21.47
9	Climate Resilient Sustainable Agriculture in Rain-Fed Farming (Kandi) Areas of J&K	Jammu and Kashmir	22.52
10	Spring-shed development works for rejuvenation of springs in the water stressed areas of Meghalaya	Meghalaya	22.92
11	Resilient Agricultural Households in Mahbubnagar District, Telangana	Telangana	24.00
12	Integrated surface Water Management through Rejuvenation of 20 tanks and 32 village ponds	Puducherry	16.76

No.	Adaptation Fund, UNFCCC	State	Outlay (USD Mn)
1	Conservation and Management of Coastal Resources for Sea Level Rise	Andhra Pradesh	0.69
2	Increasing Resilience of Small and Marginal Farmers in Purulia and Bankura Districts	West Bengal	2.51
3	Building Adaptive Capacities of Small Inland Fishermen Community	Madhya Pradesh,	1.79
4	Climate Proofing of Watershed Development Projects	Tamil Nadu and Rajasthan	1.344
5	Climate smart actions in north western Himalayan region for sustainable livelihoods of agriculture-dependent hill communities	Uttarakhand	0.969
6	Livelihoods and Ecological Security in the Kanha-Pench Corridor (PCN approved)	Madhya Pradesh	2.50

State Climate Plans in India: funding so far

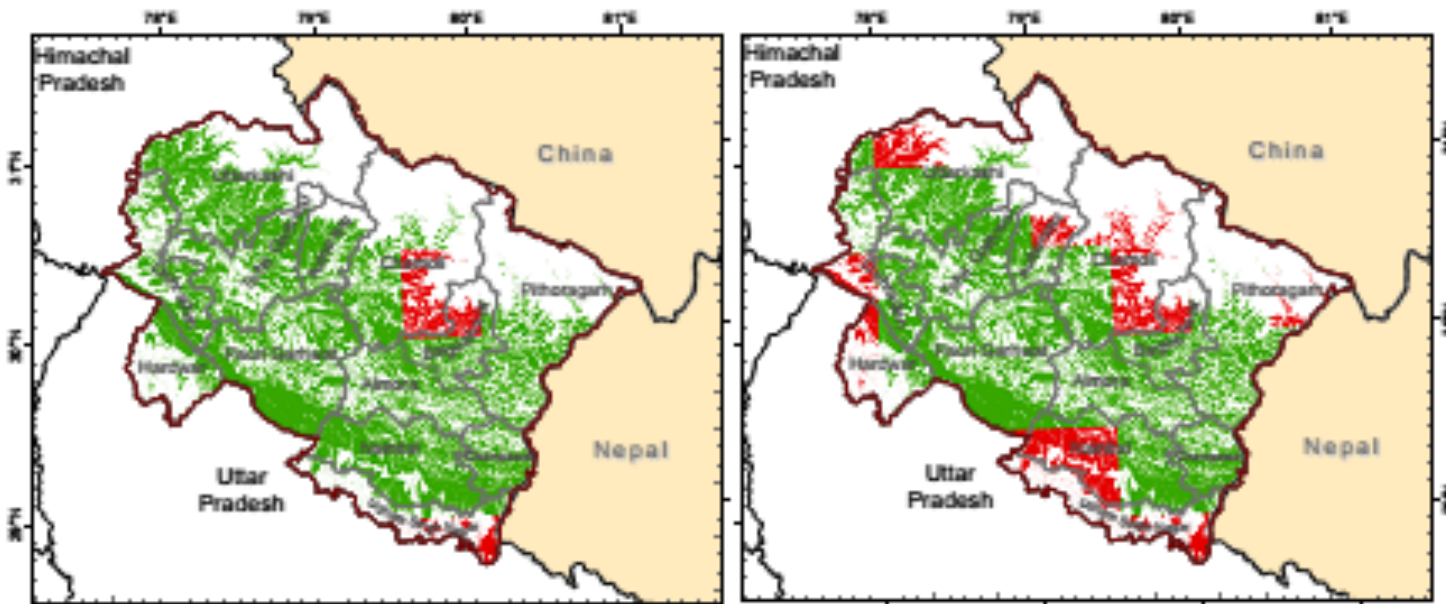


Sector-wise allocation of adaptation funding in India



Mid-Century

End-Century



RCP 4.5

Model Simulated Changes in Vegetation Distribution in the Forests of Uttarakhand

Forests



ACCLIMATISE
building climate resilience

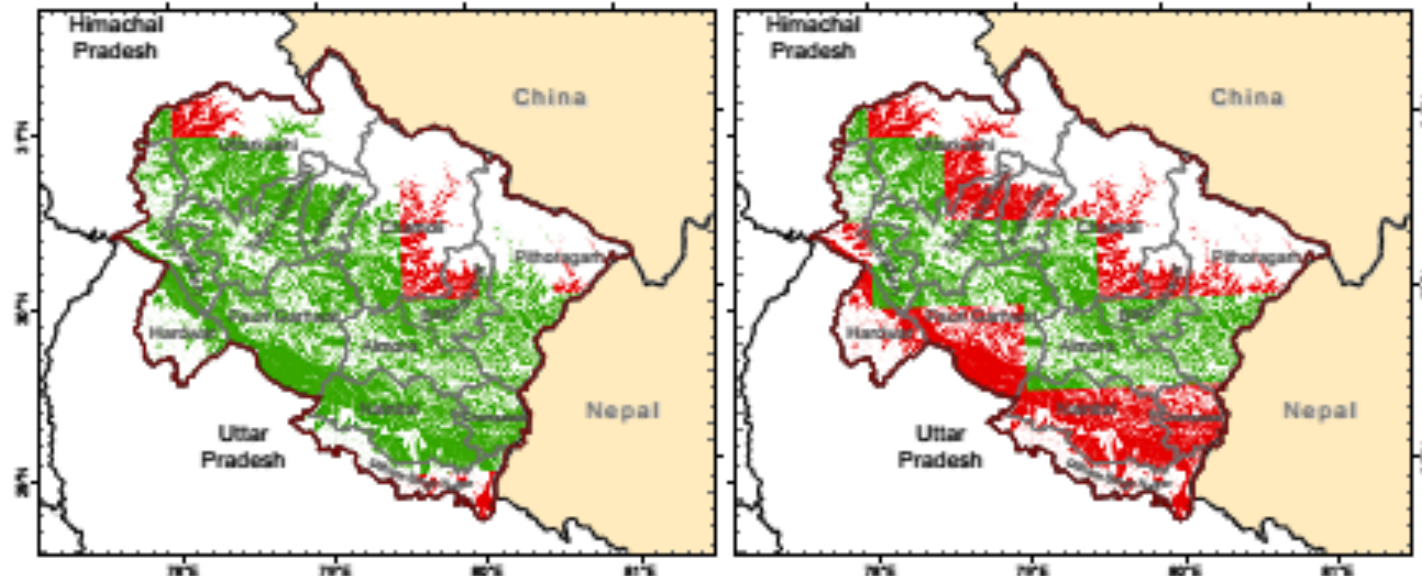
Climate Impact Areas

1. Changes and shifts in forest types
2. Uncertainty in biomass availability
3. Increase in forest fires
4. Loss of floral biodiversity

RCP 8.5

Mid-Century

End-Century



Legend



No Change Projected

Change Projected

Agenda for Action: Forestry

- Link VRA findings with specific policies governing NTFPs
- Strengthen existing systems to improve productivity, collection and market access for NTFPs
- Research in shifts in specific forest types and tree species
- Research on forest fires

Agenda for Action



FORESTS

IMPACT AREA	ACTION
Changes in forest types and their range	<ul style="list-style-type: none">• Link the VRA findings with conservation measures and state programmes to improve the quality of fragmented forests• Regulate invasive species
Uncertainty in biomass availability	<ul style="list-style-type: none">• Review and update the Uttarakhand Van Panchayat Rules in line with VRA findings• Improve mechanisms for better market access of Non Timber Forest Produce• Increase focus on short rotation forestry in line with the VRA findings
Increased risk of forest fires	<ul style="list-style-type: none">• Conduct on-ground research on forest fires• Assess regulatory factors governing the management of forest fires
Loss of floral biodiversity	<ul style="list-style-type: none">• Conduct research on changes in specific floral species based on historical trends and areas where vegetation changes are projected.

Projected Future Changes in Annual Max Temperature for Mid Century and End Century with respect to Baseline (1981 - 2010)

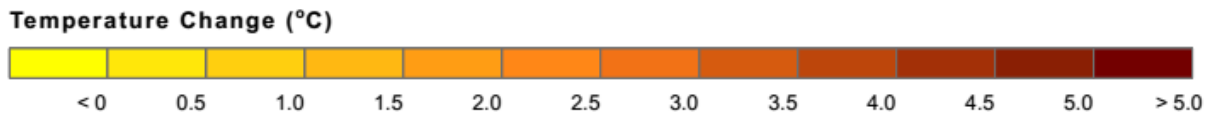
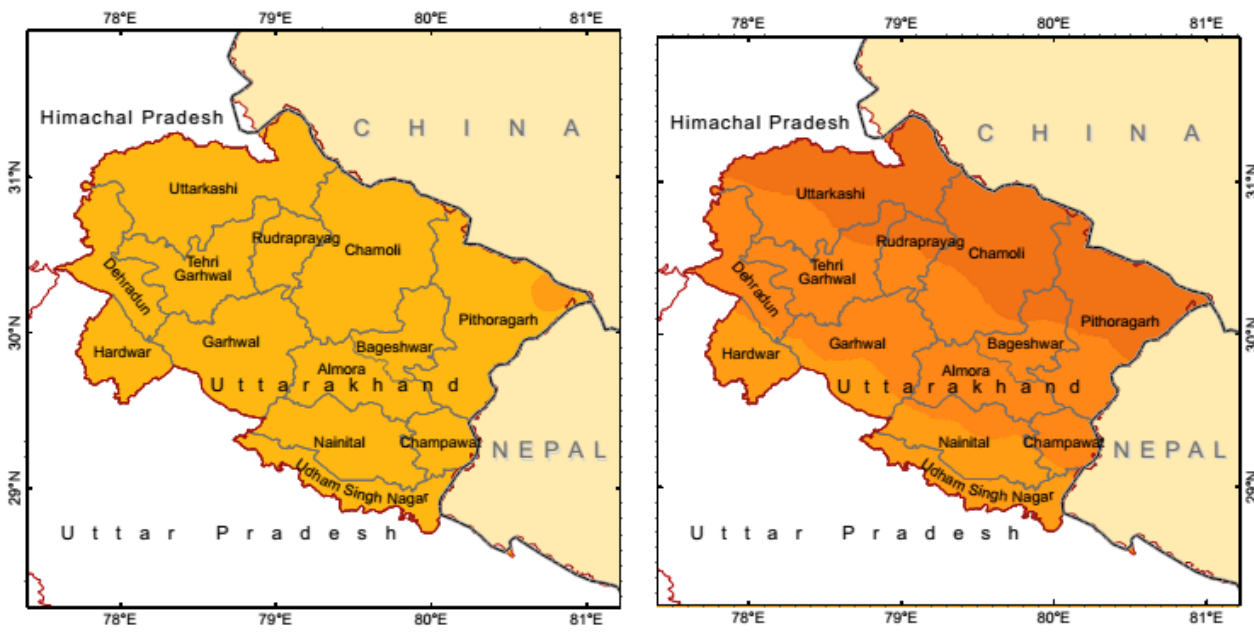


Climate Impact Areas

1. Increased heat stress
2. Increase in malaria and other vector borne diseases
3. Increased floods and landslides

Mid Century

End Century

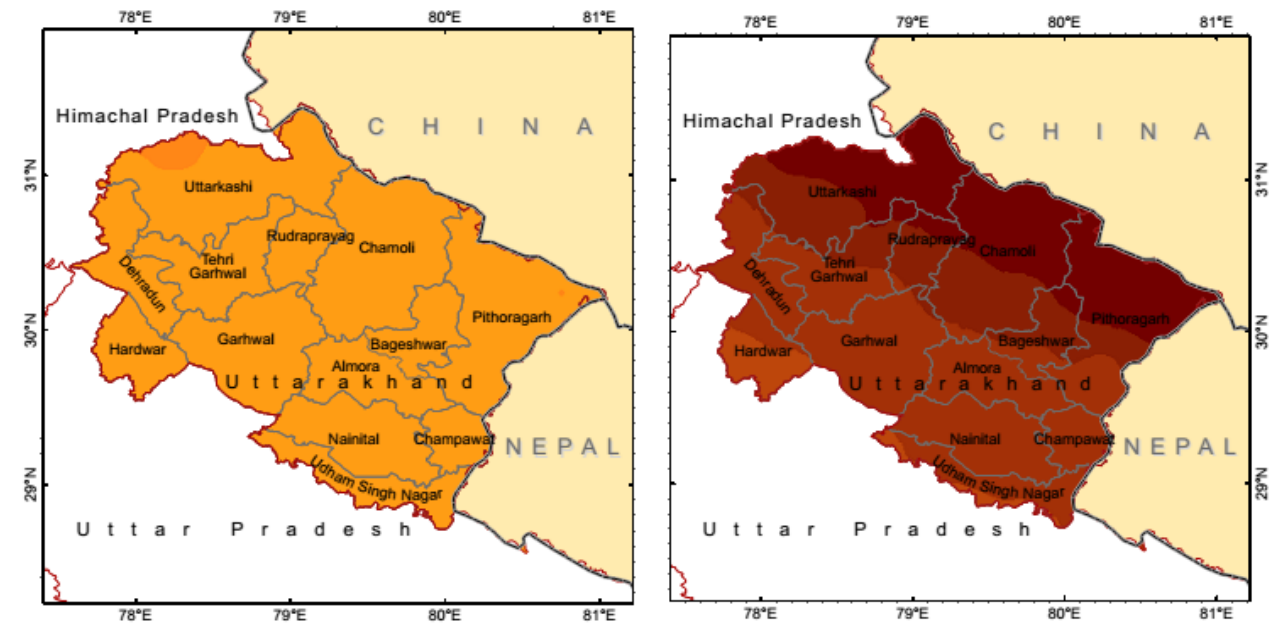


RCP 4.5

RCP 8.5

Mid Century

End Century



Monthly Variations in the Geographic Distribution of Adult Mosquito Occurrence

LIMATISE
| climate resilience

Health

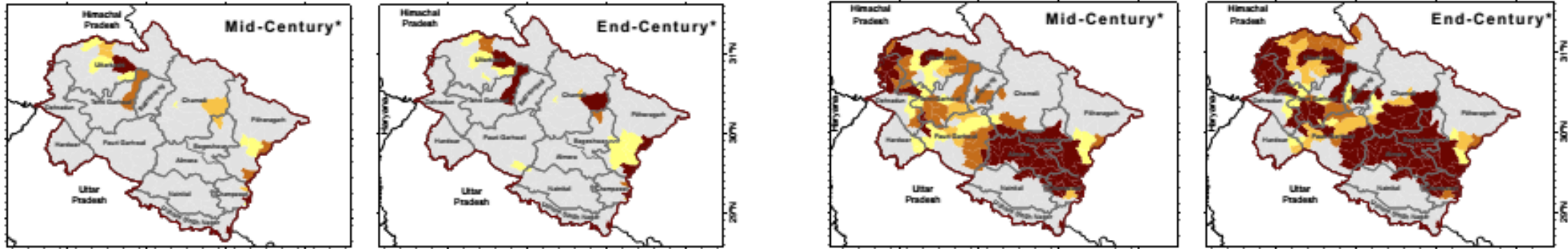
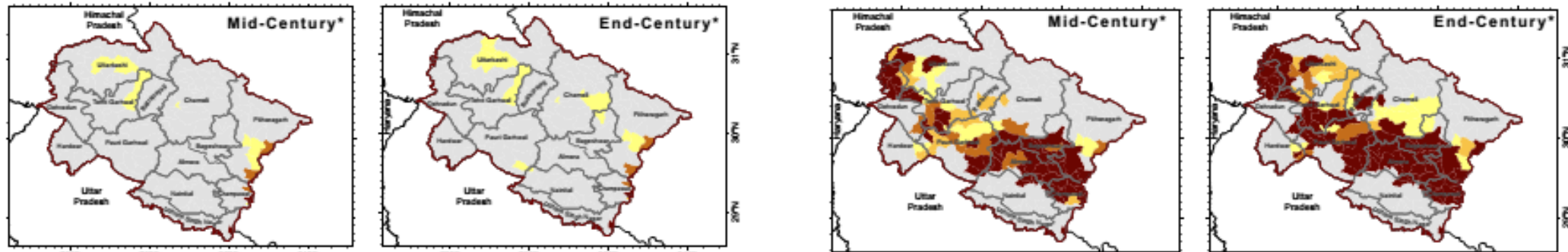
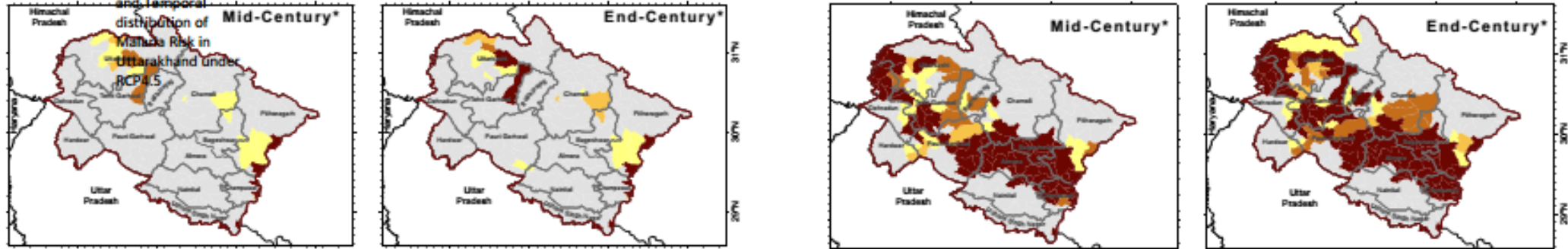


Figure 43 : Spatial and Temporal distribution of Malaria Risk in Uttarakhand under RCP4.5



RCP 4.5

% of Days in a Month

RCP 8.5



Agenda for Action: Health

- Factor heat stress as a health impact in current policies ~Heat Action Plan
- Review and strengthen programmes to tackle vector borne diseases: Focus beyond the current plain districts
- Undertake district level analysis of disaster prone regions
- Focus on cloud-bursts, assessment of water bodies and water surface temperatures

Agenda for Action



HUMAN HEALTH

IMPACT AREA	ACTION
Increase in heat stress	<ul style="list-style-type: none">• Examine capacities of districts to cope with heat stress in line with the VRA findings• Develop a state-level heat action plan based on guidelines by the National Disaster Management Authority• Strengthen State policies aimed at tackling diarrhoea and respiratory tract infections guided by the VRA
Increase in malaria and other vector borne diseases	<ul style="list-style-type: none">• Conduct district level studies to assess mosquito breeding patterns, levels of sanitation, and village level sensitisation strategies• Incorporate the VRA and on-ground findings in the annual state and district level anti-malaria action plans
Increase in floods and landslides	<ul style="list-style-type: none">• Undertake district-level analyses of disaster prone regions guided by the VRA• Conduct geographical mapping of populations at risk including road connectivity and gaps in critical infrastructure

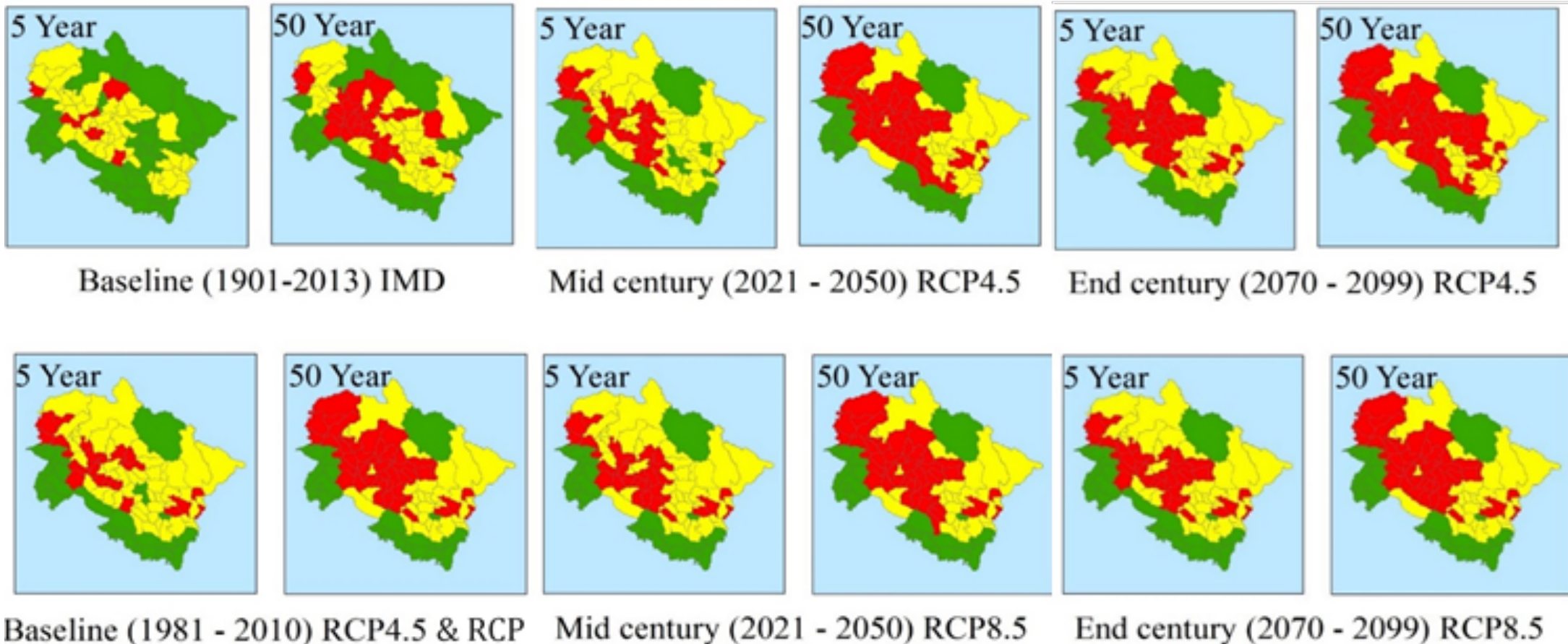
Disaster Risk

Climate Impact Areas

1. Worsening soil erosion and landslides
2. Floods and landslides increase vulnerability of local communities
3. Climate risks not linked to current disaster management policies
4. Risk of snow melt and GLOFs resulting in flash floods



Figure 1: Landslide risk Index at the Block Level in Uttarakhand in the current and future scenarios



Disaster Risk



Worsening soil erosion and landslides

- Incorporate landslide management techniques in all infrastructure development, with emphasis on road construction
 - Measures such as no habitation on quaternary deposits, little to no use of explosives in the hills, slope stabilization measures aligned with all slope modification works)
- Forest conservation and avoided deforestation measures in disaster prone regions linked to VRA findings

Disaster Risk



Climate risk not linked to current disaster management policies

- Review and update of state, districts and village disaster management plans linked to risk analysis report
- Re-examine critical infrastructure inventory (such as police resources, hospitals, Primary and community health care centres, helipads etc.) as detailed in the SNDP for vulnerable districts and blocks based on the risk analysis report

Snow melt and GLOFs resulting in flash floods

- Further research on model limitations
 - Temperature changes which can lead to snowmelt and Glacial Lake Outburst Floods (GLOFs) further exacerbating floods and landslides

Disaster Risk



Disaster risk can worsen current development objectives

- Mainstreaming DM & climate resilience in development programmes; ensuring programmes are sanctioned after conducting comprehensive climate and disaster risk assessments
- Ensuring each selected project or initiative has factored sufficient funds to deal with extreme events
- Comprehensive risk analysis as well as safety audits for all new and existing infrastructure based on risk analysis report and the VRA.
- Ensure incorporation of disaster resistant features in all new constructions as stipulated by national building codes & other Bureau of Indian Standards codes

DISASTER RISK

Agenda for Action



IMPACT AREA	ACTION
Increased risk of soil erosion and landslides	<ul style="list-style-type: none">• Incorporate landslide management techniques in all infrastructure development, focusing on roads• Undertake forest conservation and avoided deforestation measures in disaster prone regions guided by the VRA
Climate change not integrated with current disaster policies	<ul style="list-style-type: none">• Review and update state, district, and village disaster management plans linked to the VRA findings• Align the VRA findings with the World Bank supported 'Uttarakhand Disaster Recovery' project
Disasters increase the vulnerability of local communities	<ul style="list-style-type: none">• Strengthen community-based disaster management efforts• Aggregate research on available indigenous knowledge and technology to improve disaster resilience• Map infrastructure facilities either as disaster assets or liabilities
Risk of snow melt and GLOFs resulting in flash floods	<ul style="list-style-type: none">• Initiate research on temperature impacts on snowmelt and glacial lake outburst floods (GLOFs)
Development and economic goals compromised	<ul style="list-style-type: none">• Ensure programmes are sanctioned after conducting comprehensive climate and disaster risk assessments• Ensure projects have sufficient funds to deal with extreme events• Conduct comprehensive risk analysis and safety audits for all existing infrastructure guided by VRA.