

Maiden Webinar on Climate Risk

4th December 2024

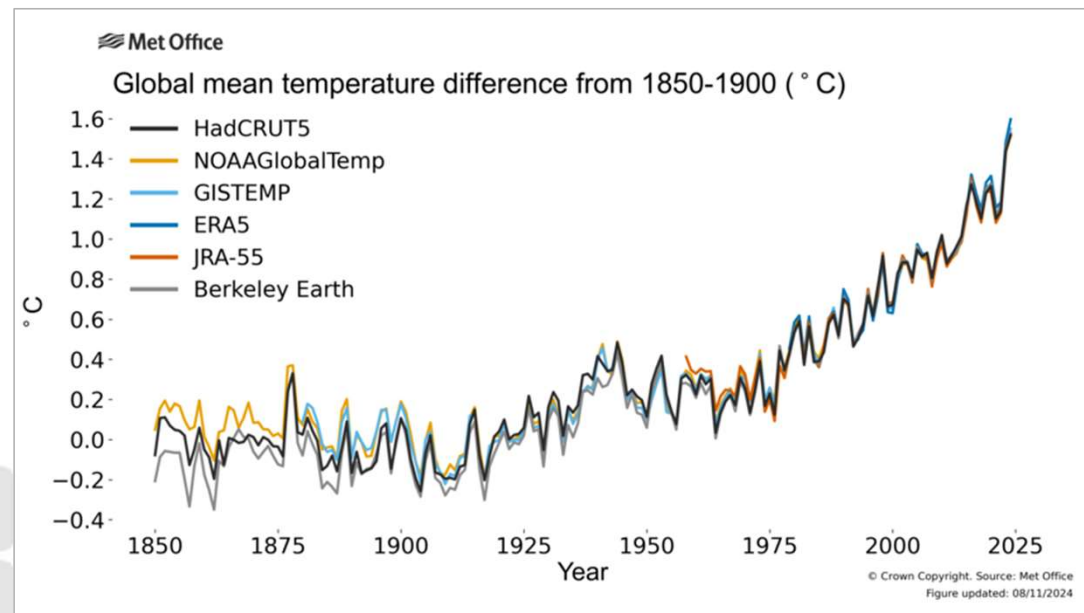
Climate Risk, Implications and Mitigation

Piyush Jain, Appointed Actuary, Kshema General Insurance Limited
Avanish Bankar, Business Actuary, Shriram Life Insurance Company Limited



Overview of Climate Change (1)

- What is Climate change
 - Climate change refers to *long-term shifts and alterations in temperature, precipitation, and weather patterns* on Earth.



Overview of Climate Change (2)

- Greenhouse effect
 - Climate change occurs due to greenhouse effect caused by excess carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) causing Earth's temperature to rise.



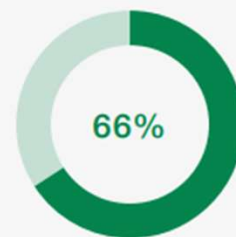
Overview of Climate Change (3)

- Highest ranked global risk:

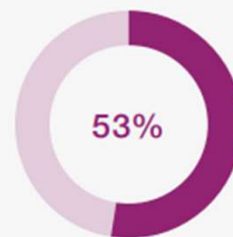


Risk categories

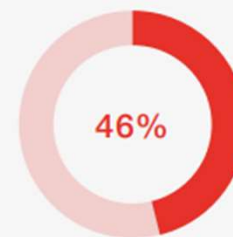
- Economic
- Environmental
- Geopolitical
- Societal
- Technological



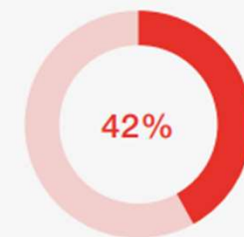
1st
Extreme weather



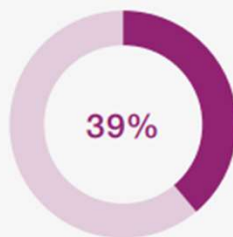
2nd
AI-generated
misinformation
and disinformation



3rd
Societal and/or
political polarization



4th
Cost-of-living crisis

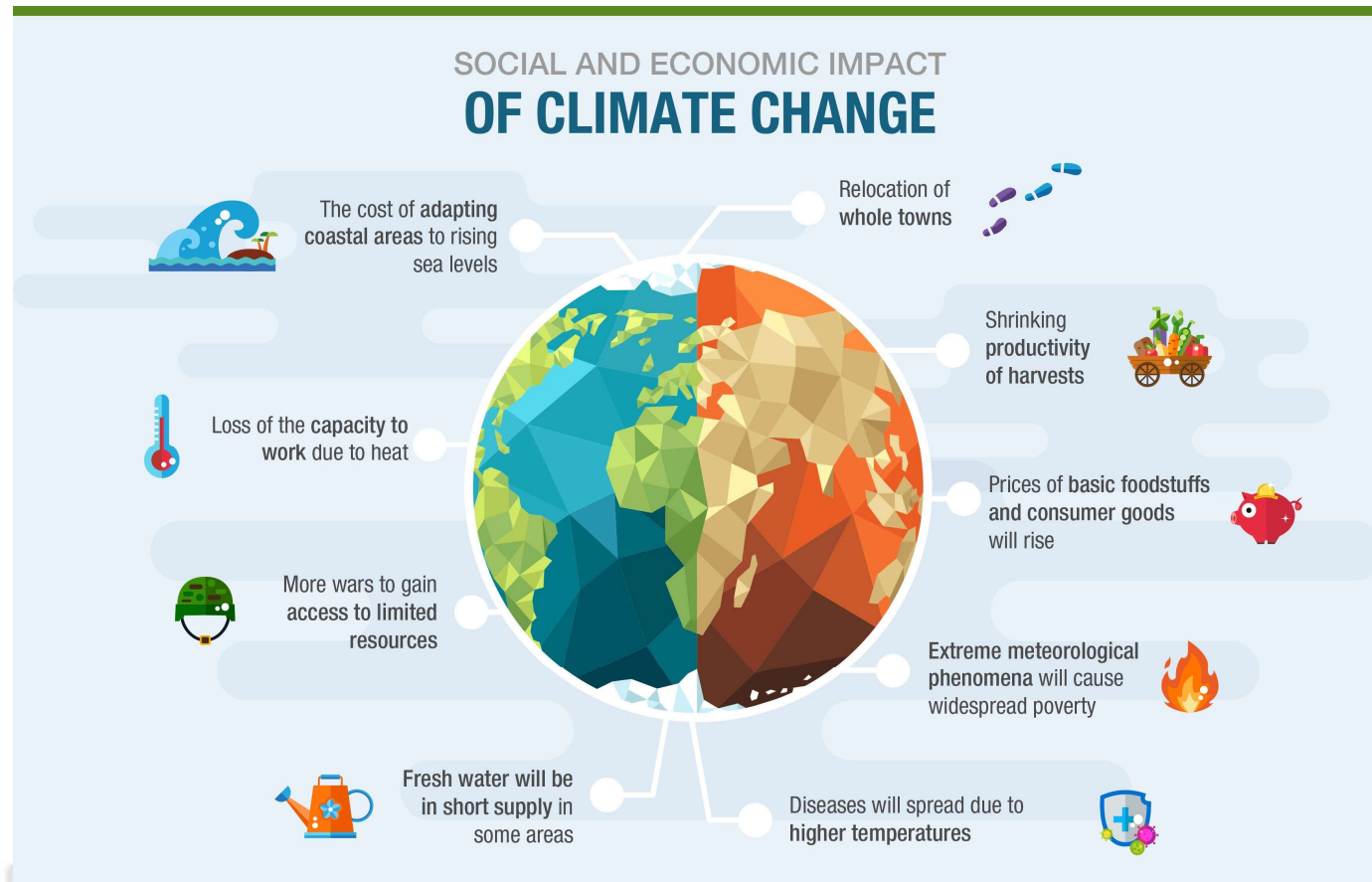


5th
Cyberattacks

Source

World Economic Forum Global Risks
Perception Survey 2023-2024.

Overview of Climate Change (4)



Source: Iberdola

www.actuariesindia.org

Overview of Climate Change (5)

- Unique Characteristics:

**Far-reaching
impact in breadth
and magnitude**

**Uncertain and
Extended time
horizons**

**Foreseeable
nature**

Irreversibility

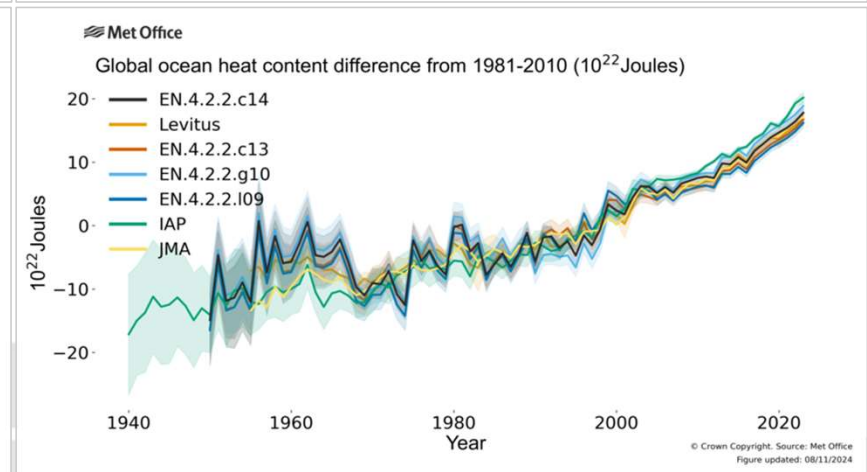
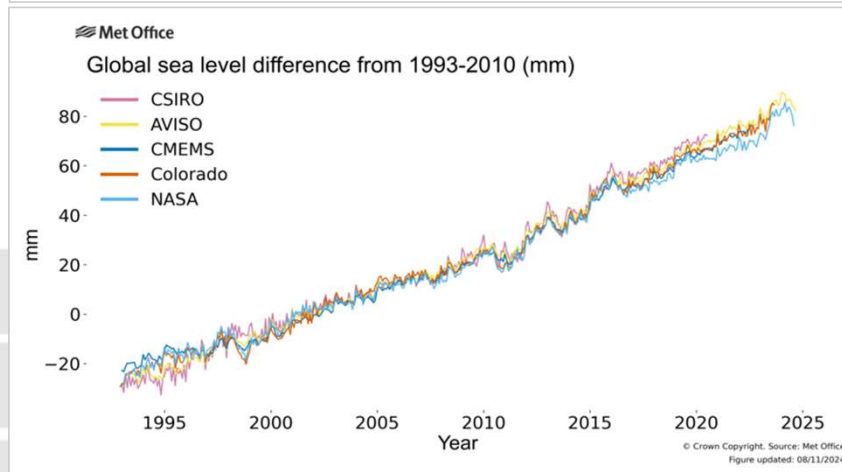
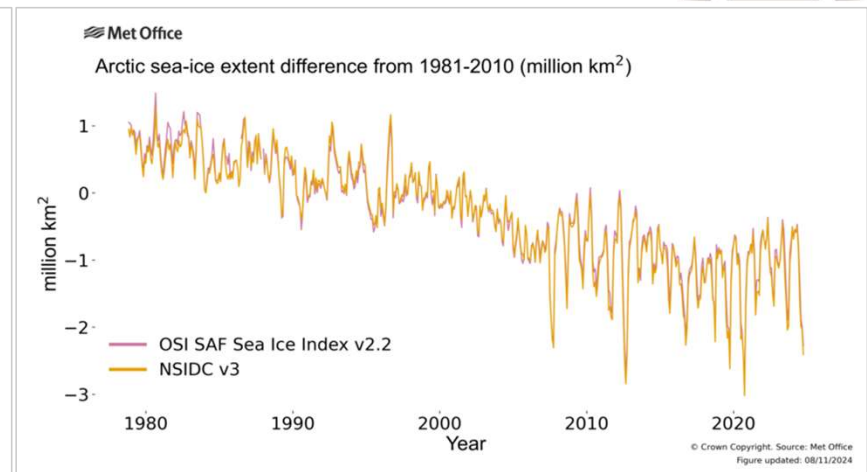
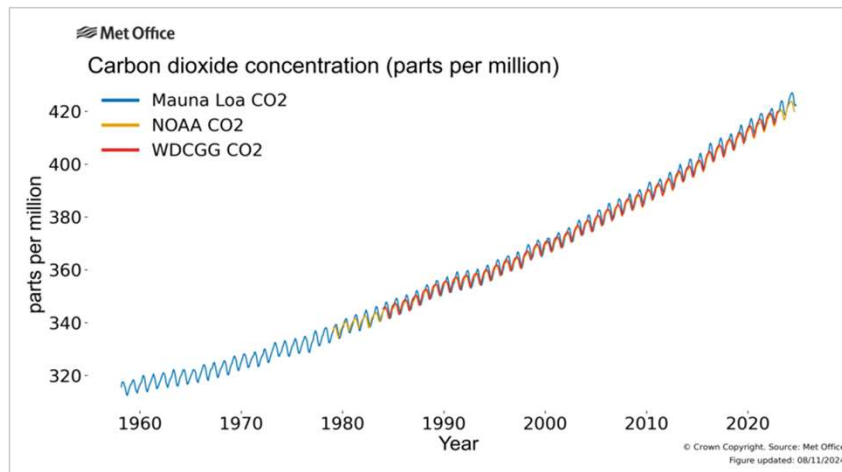
**Dependency on
short-term
actions**

Evidence of Climate Change (1)



- The past few decades have seen an increase in extreme weather events worldwide. Rising temperatures lead to:
 - melting ice caps,
 - rising sea levels, and
 - more frequent droughts, floods, and cyclones
 - Increased frequency of heatwaves, forest fire etc.

Evidence of Climate Change (2)



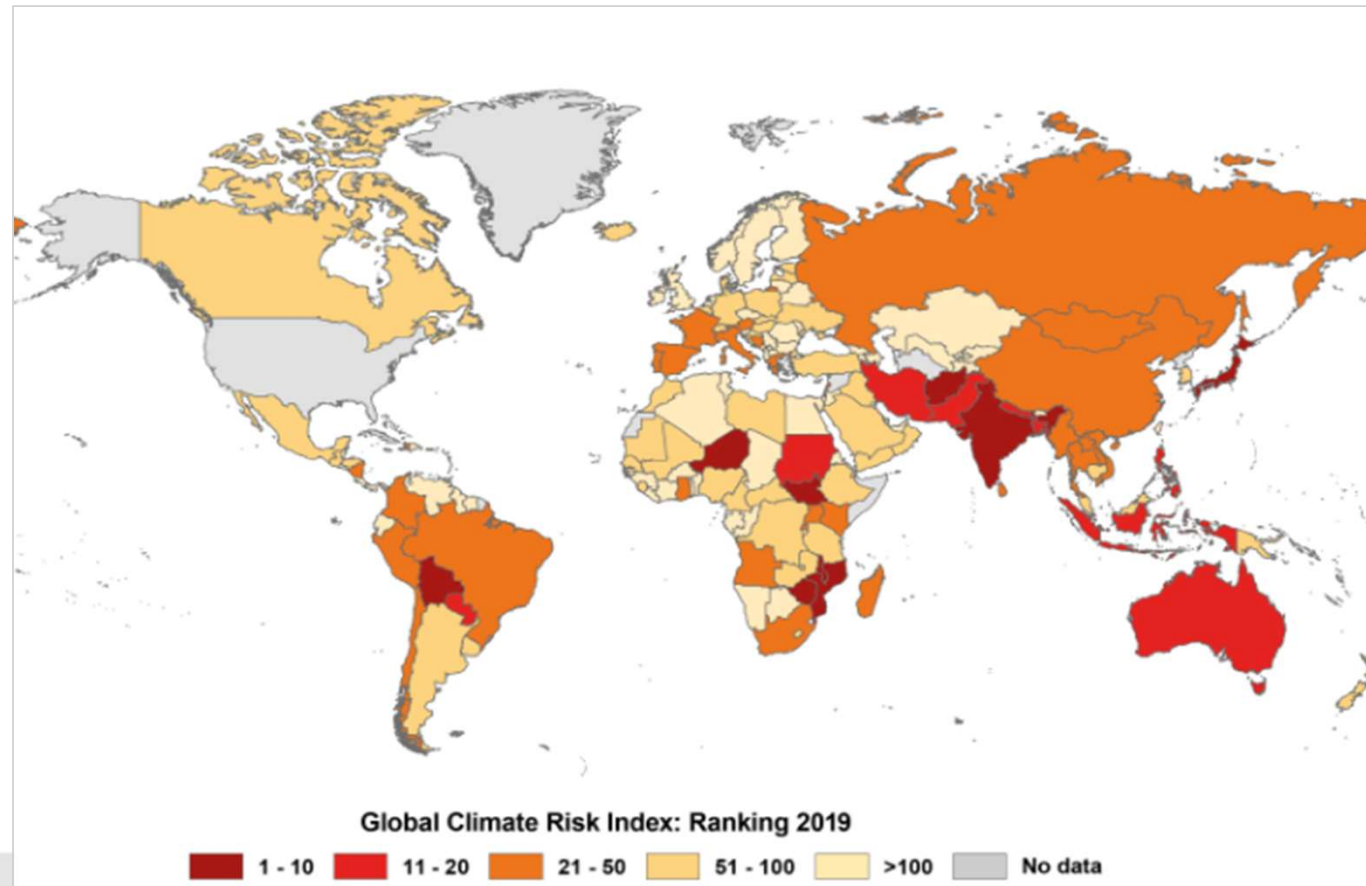
Evidence of Climate Change (3)

- Why Skepticism:

Boiling Frog Syndrome



Climate Change in India (1)



Climate Change in India (2)

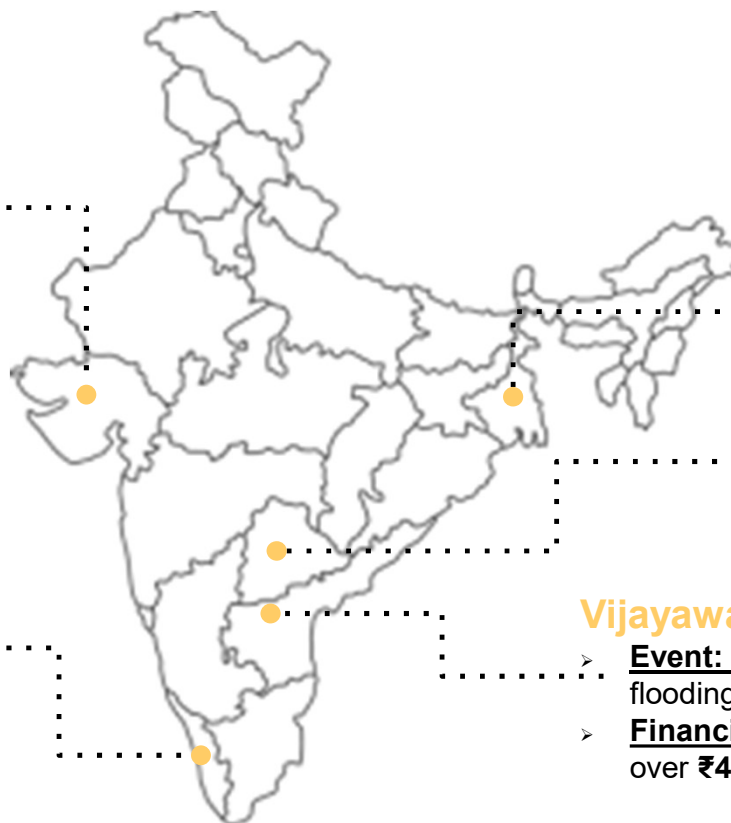


Gujarat

- **Event:** Cyclone Biparjoy
- **Financial Impact:** Estimated economic loss of ₹1,212.50 Cr in agriculture and horticulture crops

Kerala

- **Event:** Wayanad landslide
- **Financial Impact:** State incurred an estimated material loss of ₹281 Cr



West Bengal

- **Event:** Cyclone Amphan
- **Financial Impact:** 14,575 insurance claims, amounting to a gross value of ₹1,767 Cr

Telangana

- **Event:** The Telangana flood
- **Financial Impact:** Rs 330 crore claim — of which ₹151 Cr was realized

Vijayawada

- **Event:** Heavy rainfall and flooding
- **Financial Impact:** damages of over ₹4,000 Cr

India experienced extreme weather on 93% of the days during the first nine months of 2024 — 255 out of 274 days

Impact on Indian Agriculture (1)

- Agriculture contributes 18% to India's GDP and employs 50% of the workforce.
- Weather disruptions, like changes in temperature, precipitation and solar radiation, affect the agriculture ecosystem.

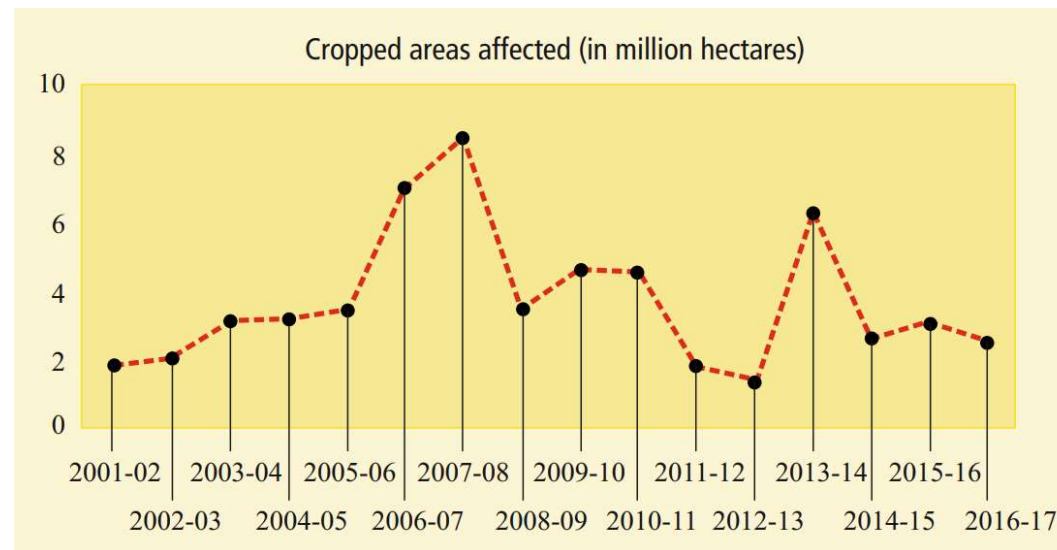


Figure: Year-wise damage due to natural extreme events in India

Impact on Indian Agriculture (2)

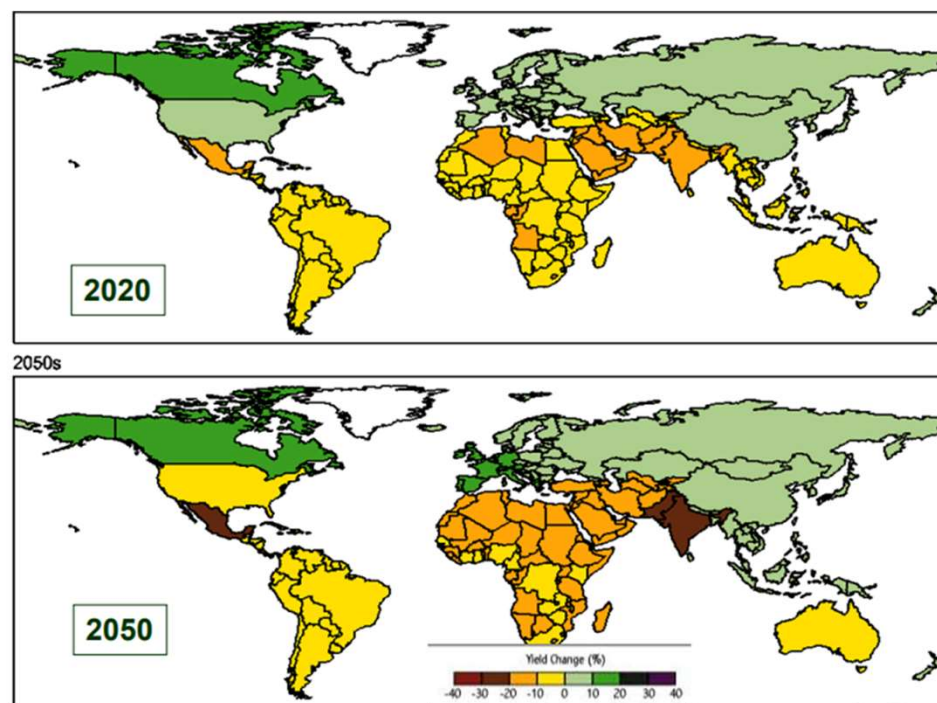


Figure: Projected crop yield loss across world

- Productivity of cereals would decrease (due to increase in temperature and decrease in water availability (especially in Indo-Gangetic plains)).

Impact on rainfall pattern (1)

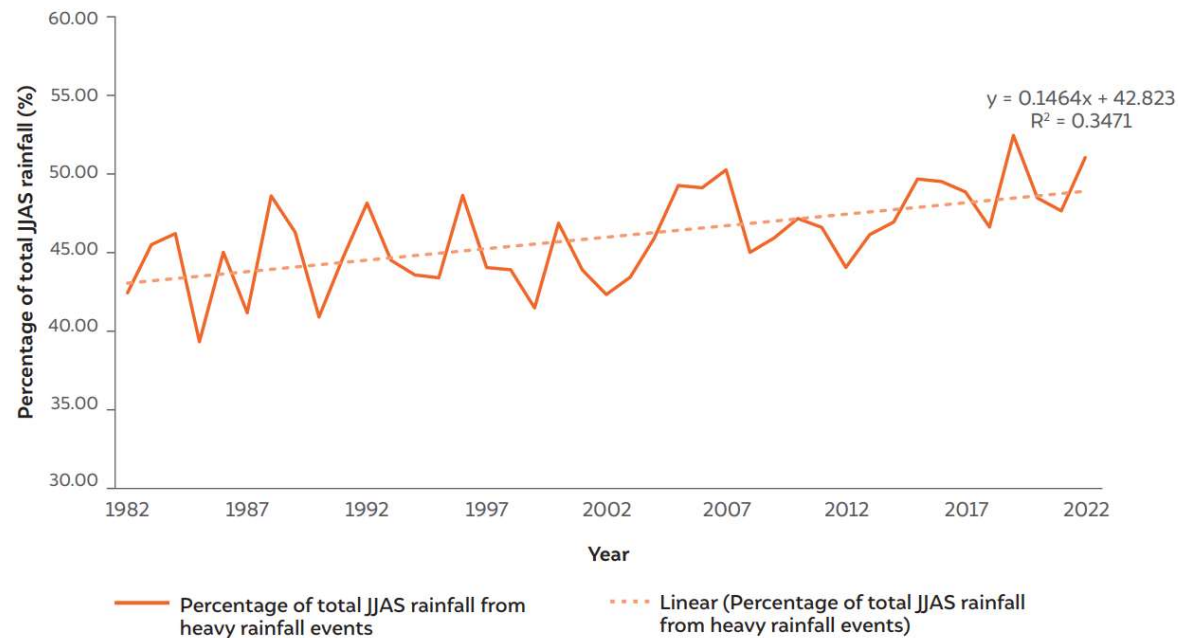
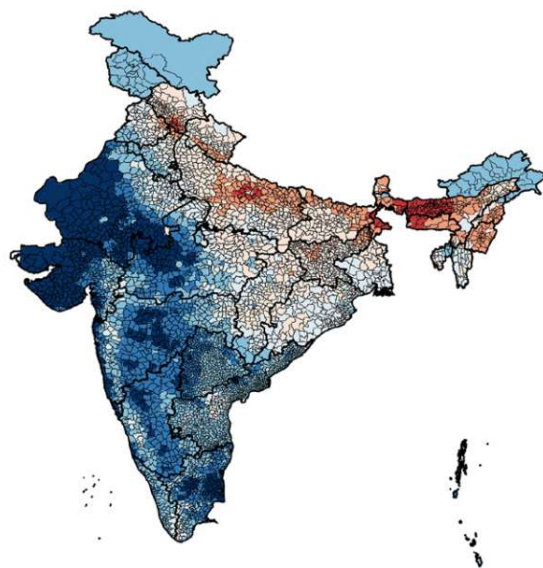


Figure : All-India averaged JJAS rainfall shows a slightly increasing trend at the rate of 3 mm/year

JJAS stands for June-July-August-September, which is the period of the Southwest Monsoon (receives around 76% of its total annual rainfall)

Impact on rainfall pattern (2)



Changes in last decade compared to baseline (%)

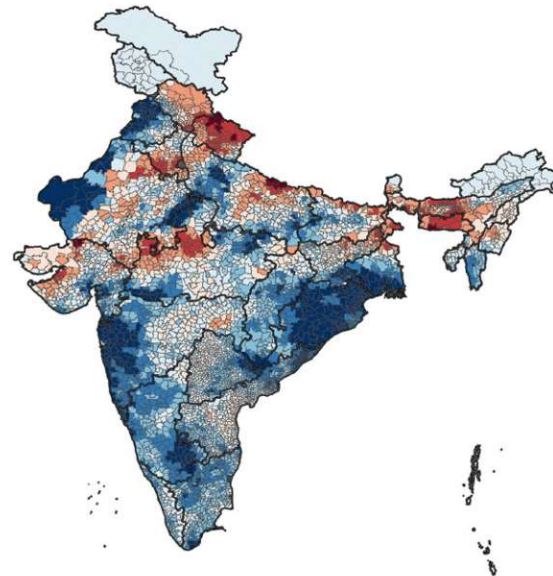
Color	Range (%)
Dark Red	>-30
Red	-30 to -20
Orange	-20 to -10
Light Orange	-10 to 0
Light Blue	0 to 10
Medium Blue	10 to 20
Dark Blue	20 to 30
Very Dark Blue	>30

Key observations:

- Western and Southern India (dark blue) saw significant rainfall increases (>30%)
- Indo-Gangetic plains, northeastern India, and Himalayan regions (red shades) experienced decreased rainfall
- Most of central India shows moderate increases (light blue)

Figure: Changes in **Southwest** Monsoon rainfall in last decade (2012-2022) compared to climatic baseline (1982-2011)

Impact on rainfall pattern (3)



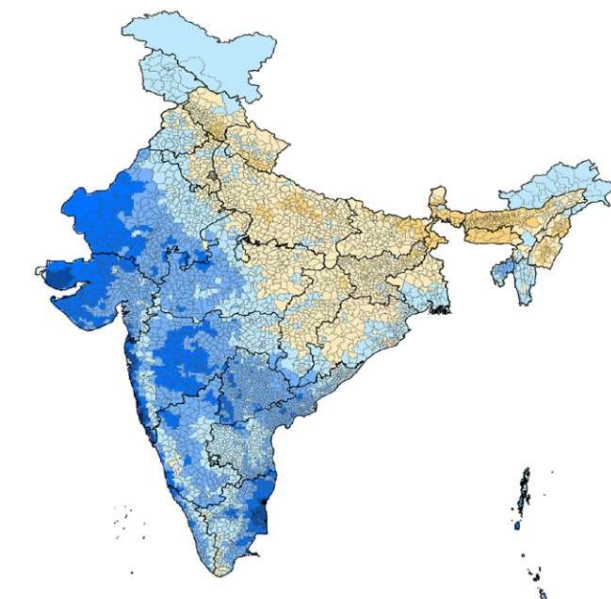
■ >-30 ■ -30 to -20 ■ -20 to -10 ■ -10 to 0 ■ 0 to 10 ■ 10 to 20 ■ 20 to 30 ■ >30

Key observations:

- Both western and eastern coastal regions show significant increases (blue shades)
- Parts of northern India, particularly some Himalayan regions, show decreases (red shades)
- Central India shows moderate increases (light to medium blue)

Figure: Changes in **Northeast** Monsoon rainfall in last decade (2012-2022) compared to climatic baseline (1982-2011)

Impact on rainfall pattern (4)



Change in frequency (no. of days/year)

Change in frequency (no. of days/year)
-5 to -3
-2 to 0
1 to 3
4 to 6
7 to 9
10 to 12

Key observations:

- Western and Southern regions (blue shades): Significant increase in heavy rainfall
- Northern regions (beige/yellow shades): Slight decrease in heavy rainfall
- Central India (light blue): Moderate increase

Figure: Changes in the frequency of heavy rainfall days in last decade (2012-2022) compared to climate baseline (1982-2011)

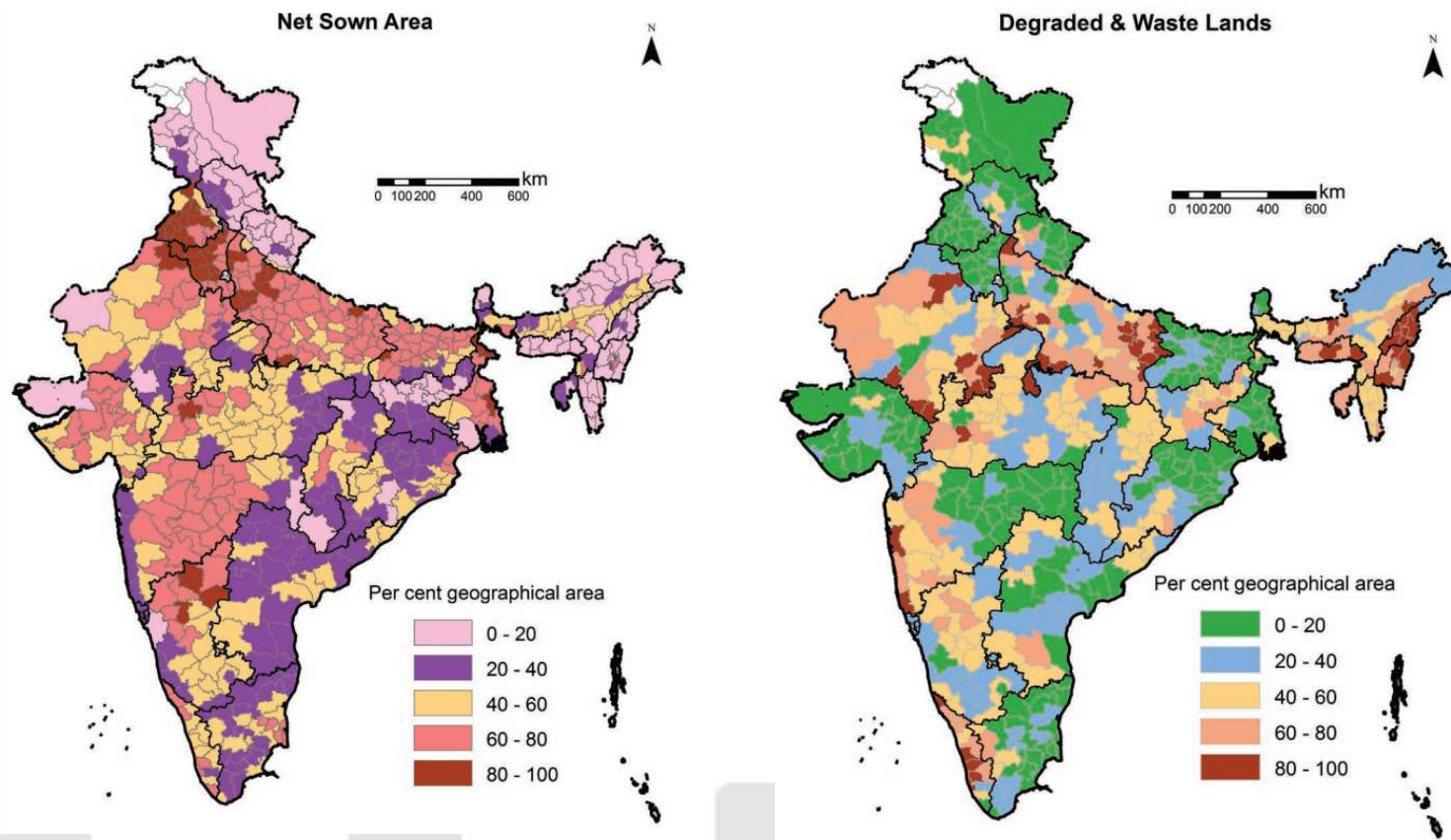
Impact on rainfall pattern (5)



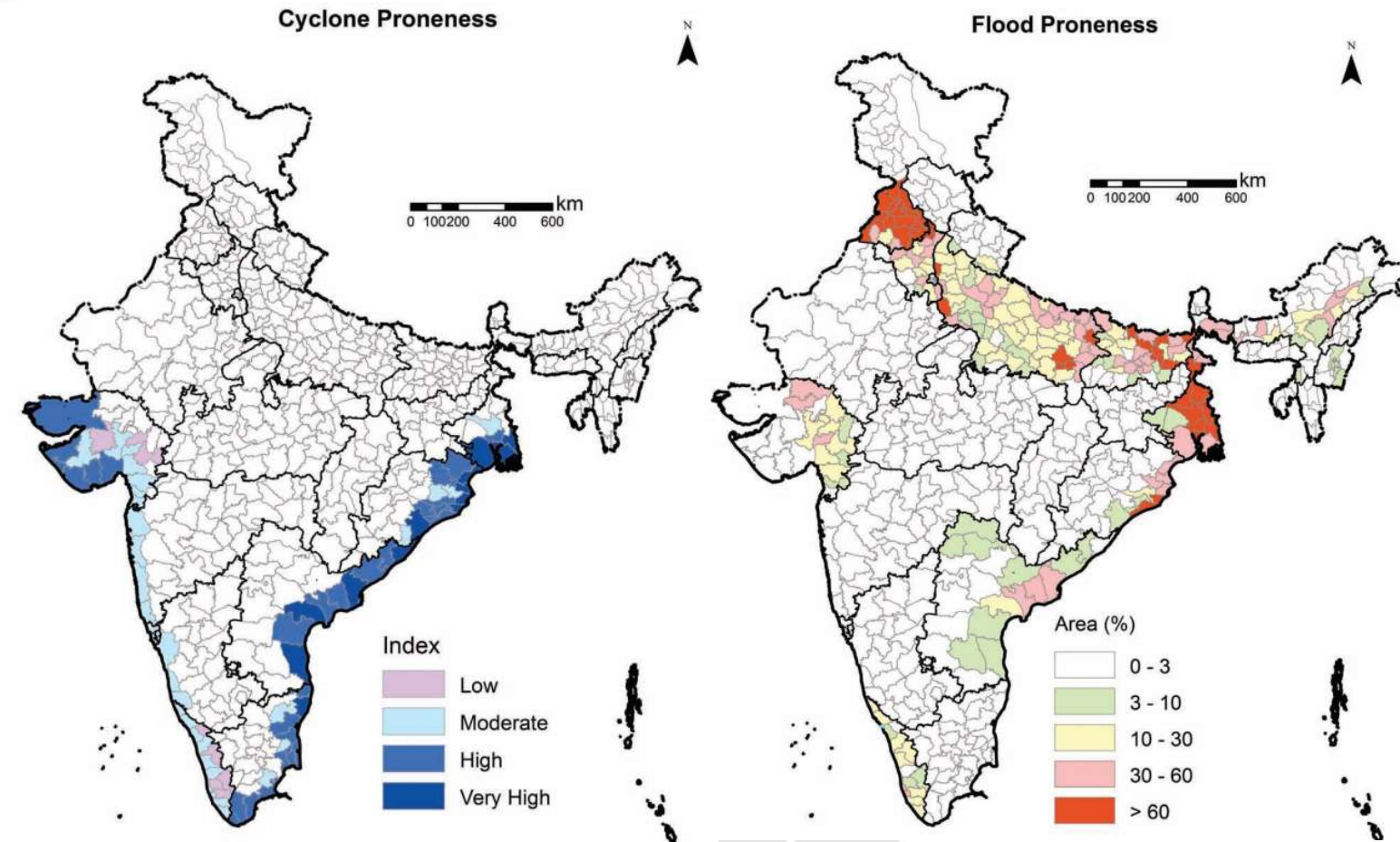
- Southwest Monsoon Changes:
 - Western/Southern India: Major increase in rainfall
 - Northern India: Decrease in rainfall (India's primary agricultural belt)
- Northeast Monsoon Changes:
 - Both western and eastern coasts: Increased rainfall
 - More scattered and localized changes
- Highest GDP states showing increased heavy rainfall:
 - Maharashtra, Tamil Nadu, Gujarat, Karnataka

Impact: Changing rainfall pattern will affect agriculture and water resources

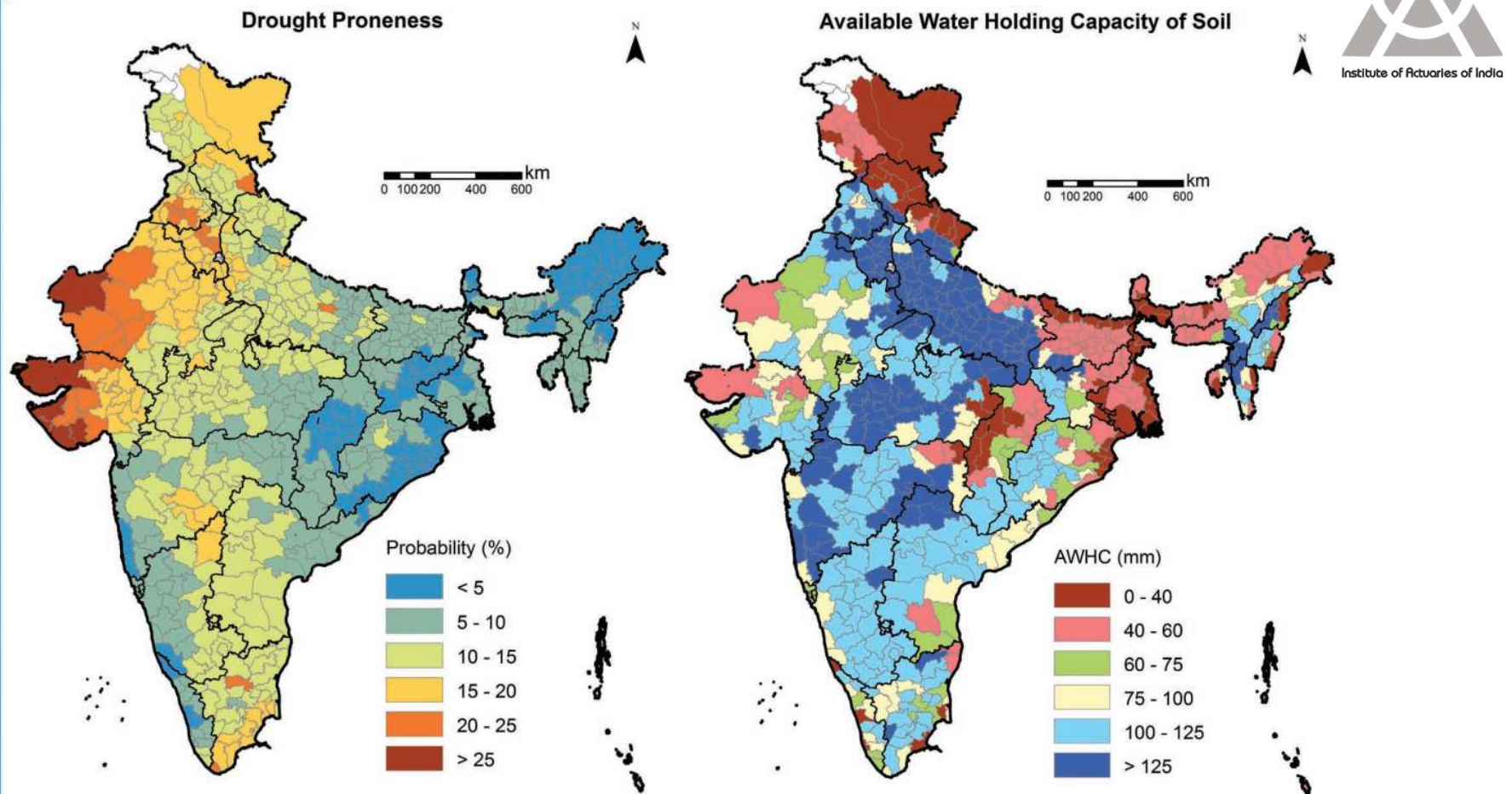
Agricultural Vulnerability (1)



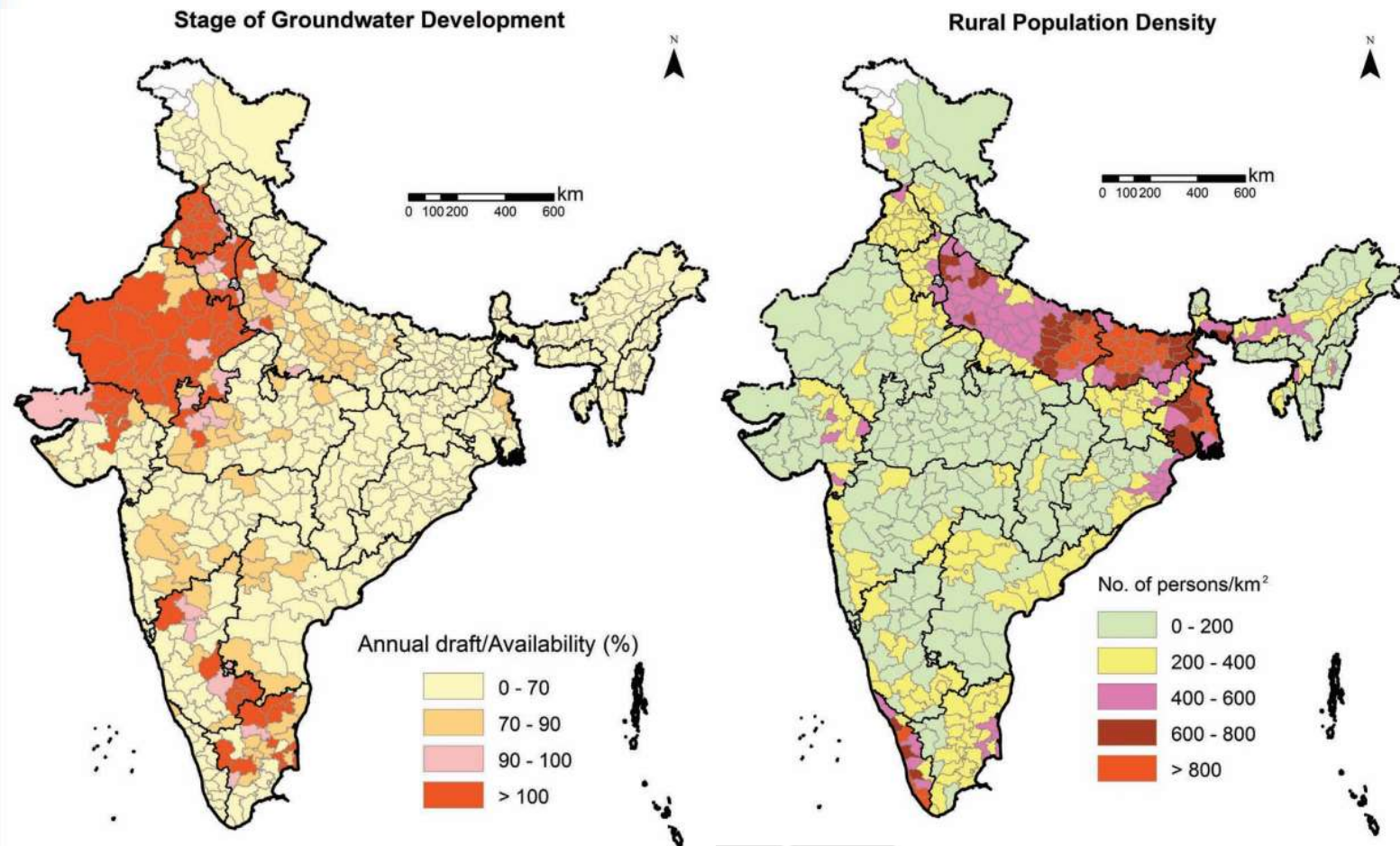
Agricultural Vulnerability (2)



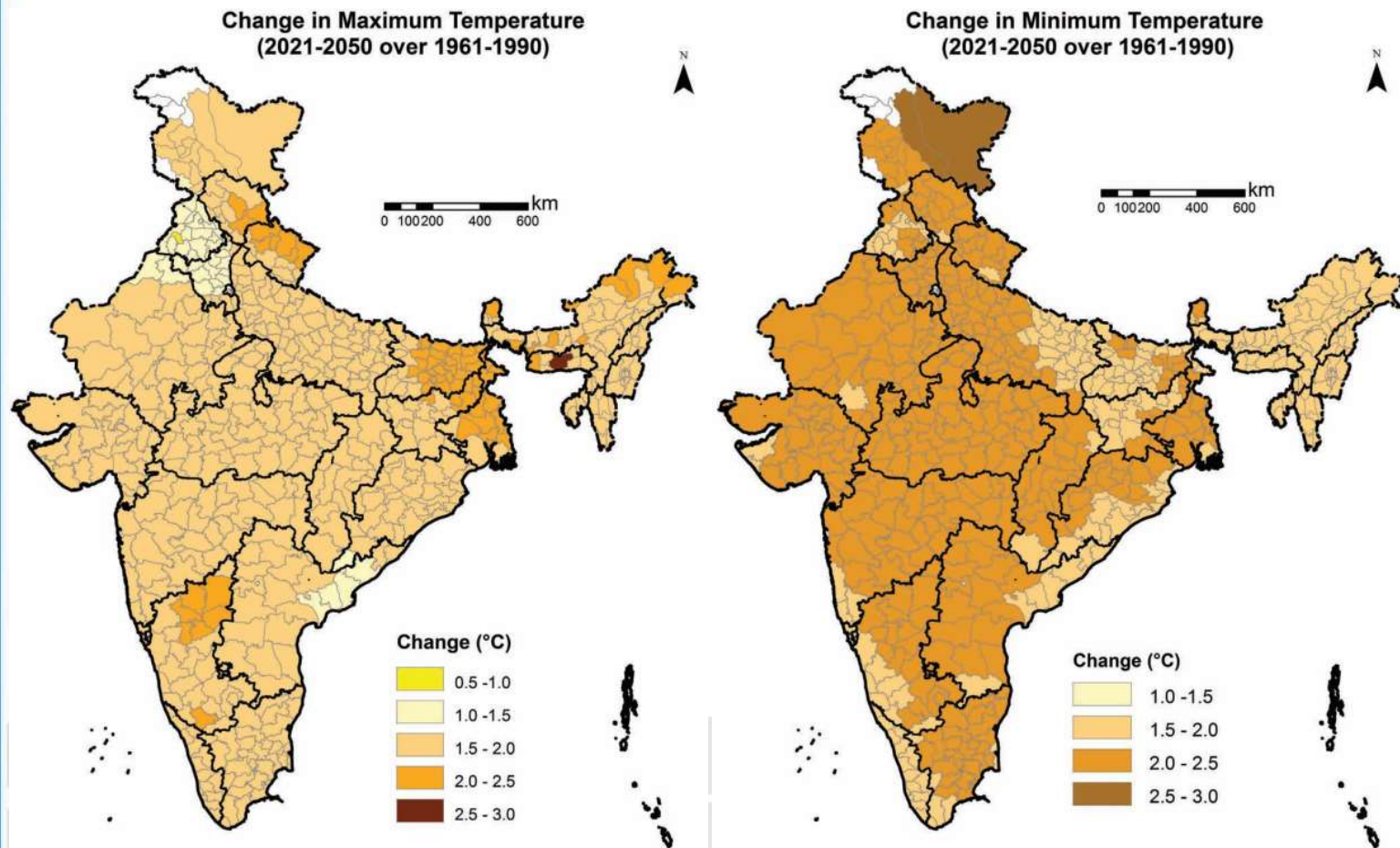
Agricultural Vulnerability (3)



Agricultural Vulnerability (4)

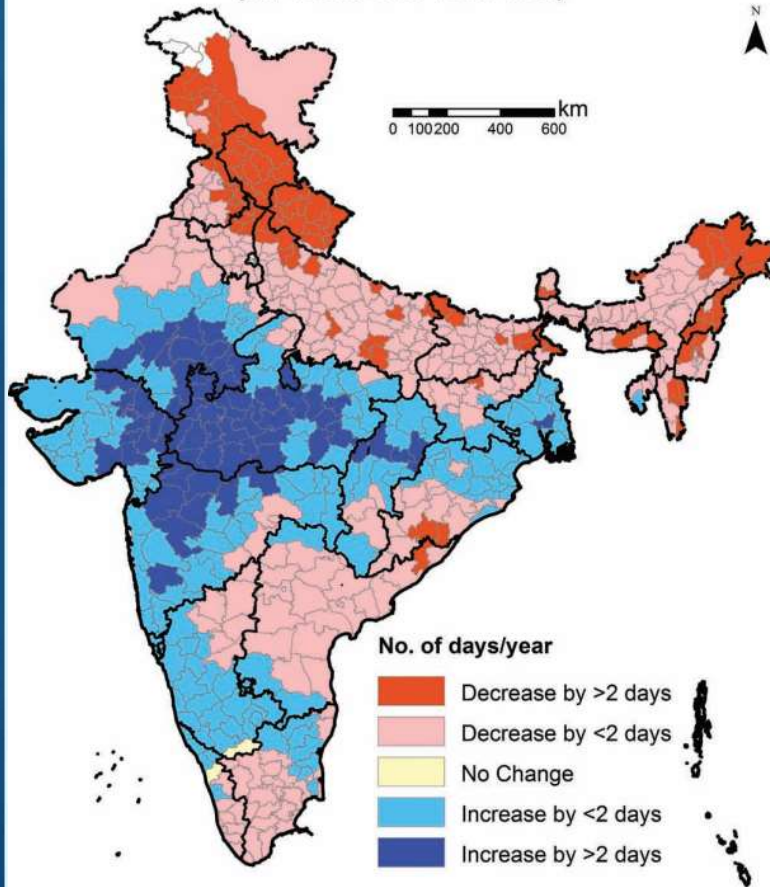


Agricultural Vulnerability (5)

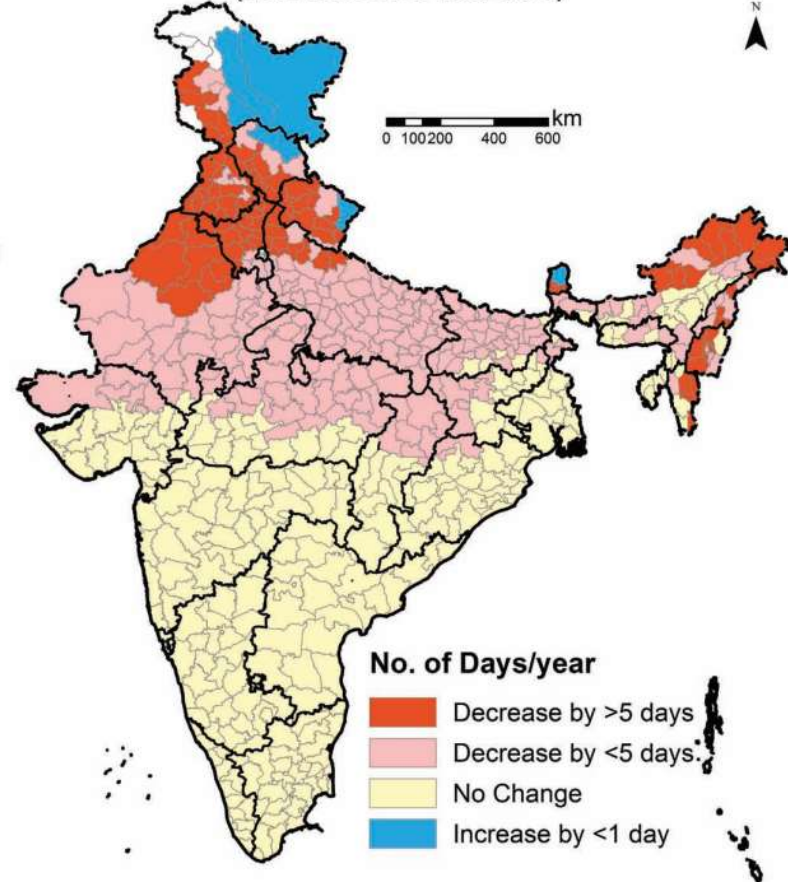


Agricultural Vulnerability (6)

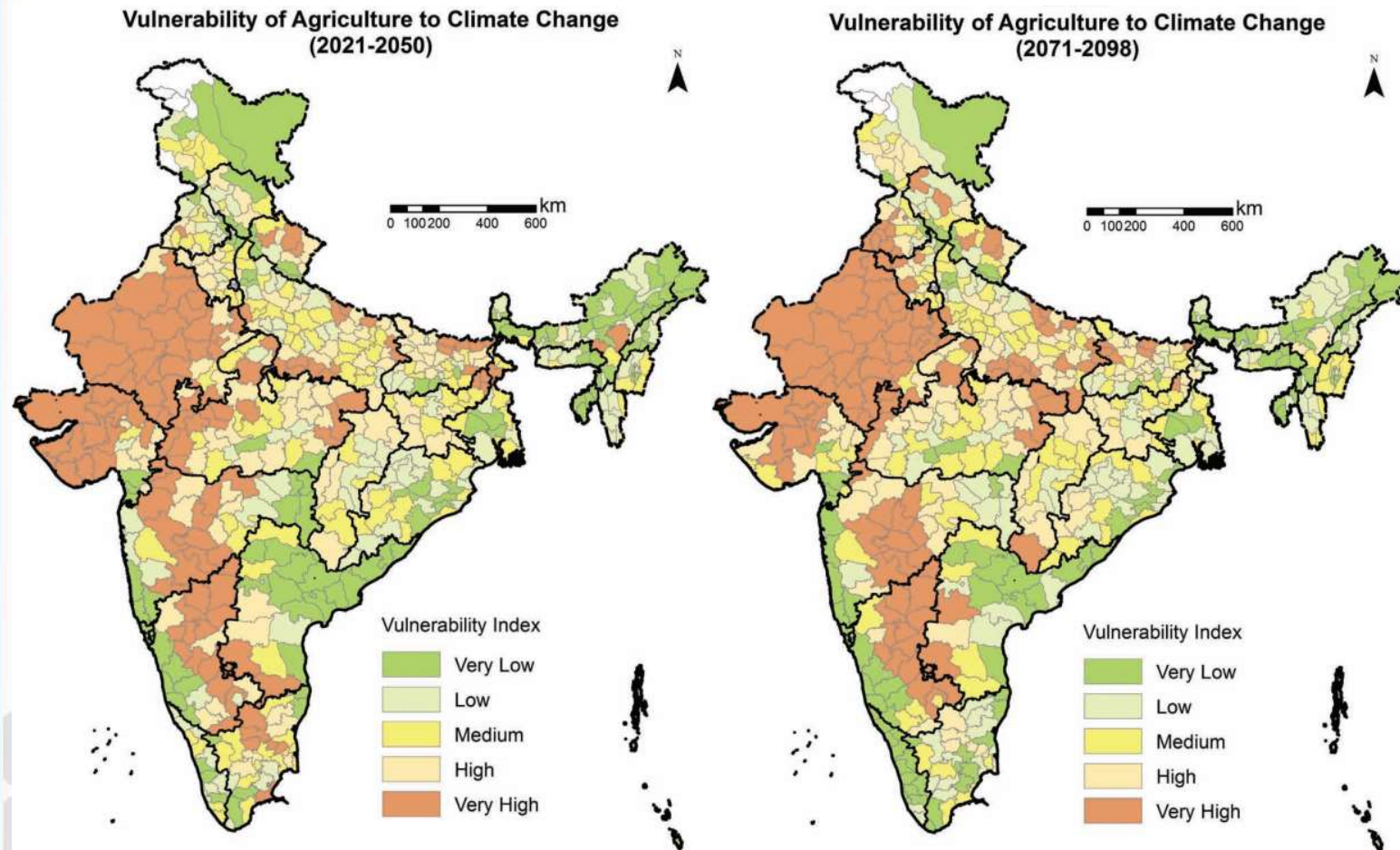
Change in Number of Cold Days during December - February
(2071-2098 over 1961-1990)



Change in Number of Frost Days during December - February
(2071-2098 over 1961-1990)



Agricultural Vulnerability (7)



Extreme Weather Events (1)



Figure: 2024 Vijayawada floods

- In early September 2024, Vijayawada, a city in Andhra Pradesh, India, experienced severe flooding triggered by exceptionally heavy rainfall that began on August 31, 2024.

Extreme Weather Events (2)



Figure: 2024 drought in Beed district in the state of Maharashtra

Socio Economic Impacts (1)

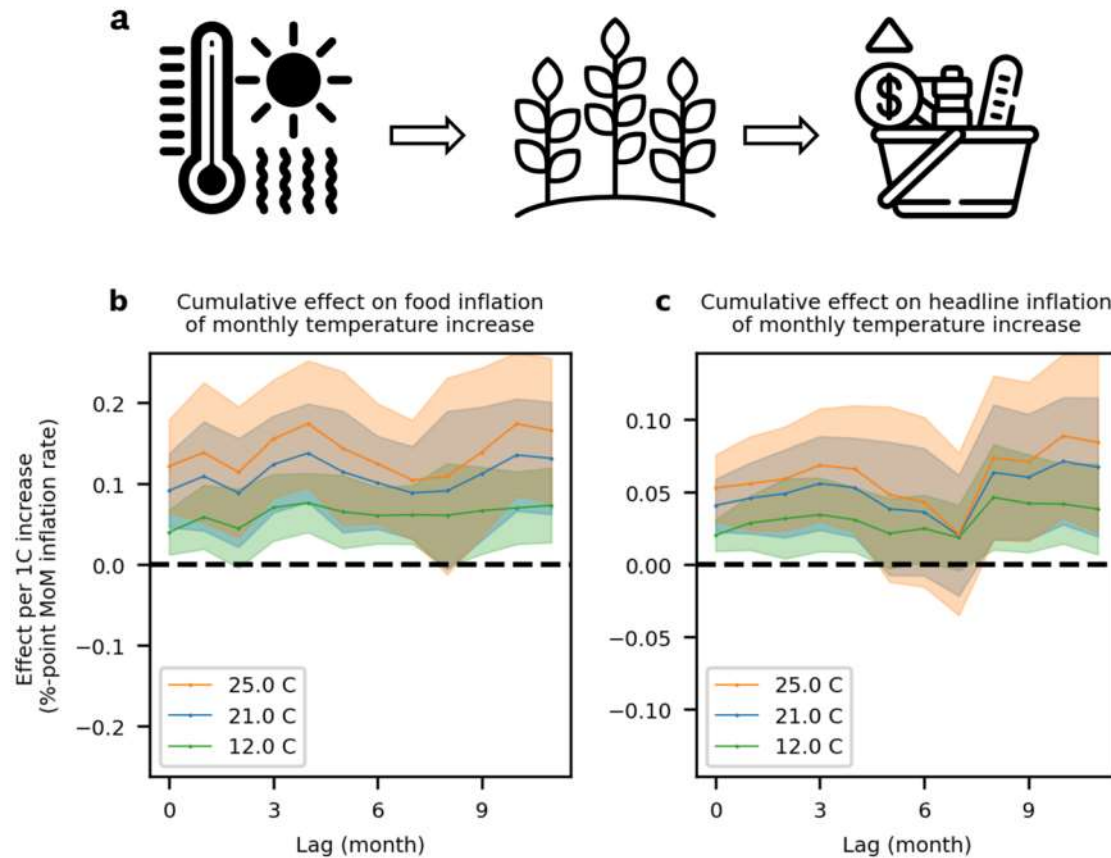


Figure: The cumulative marginal effect of temperature shocks on food and headline inflation

Socio Economic Impacts (2)

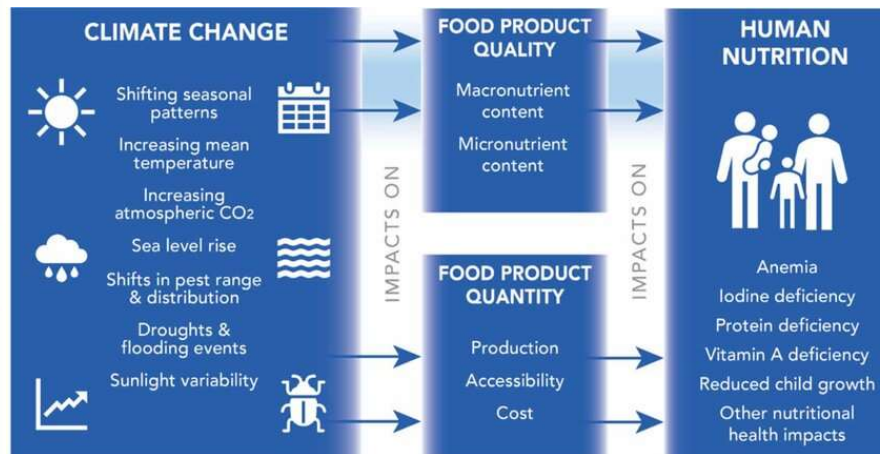
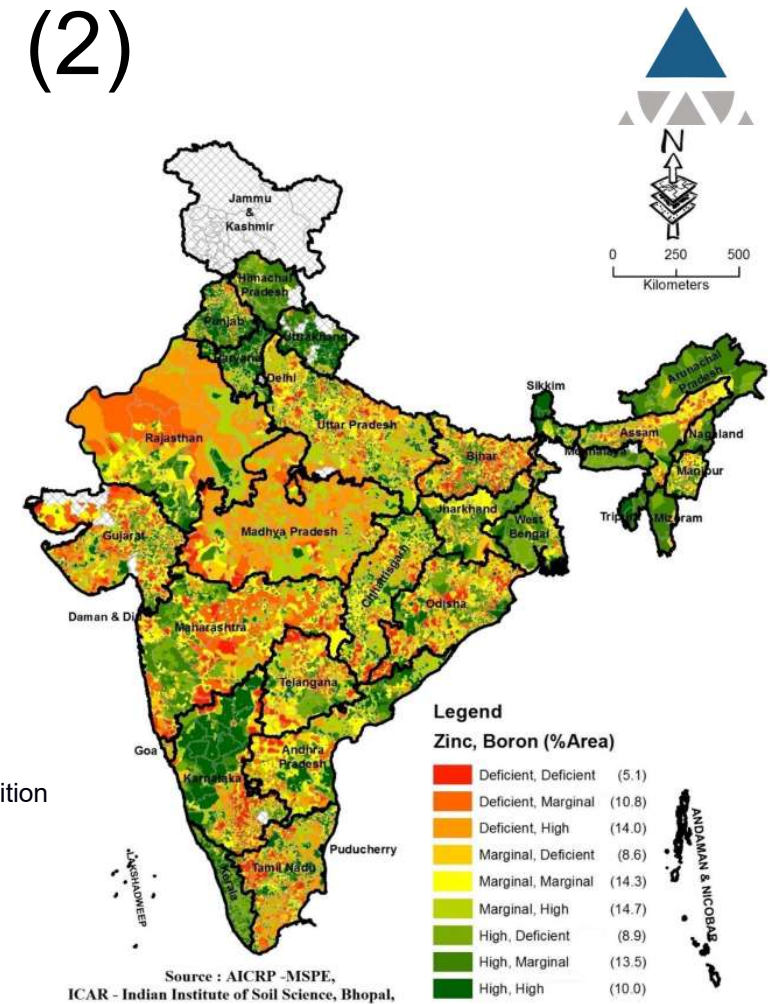
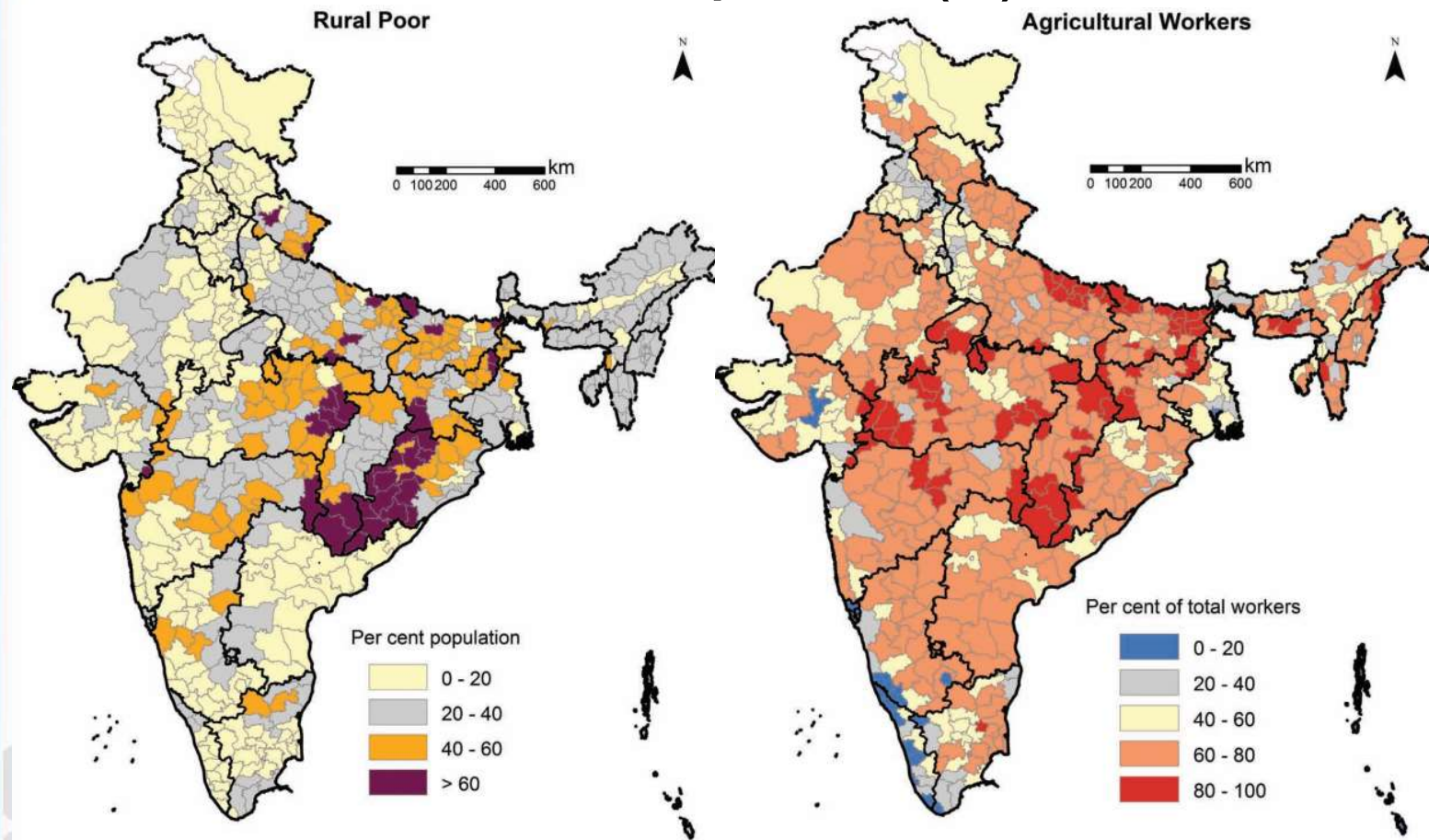


Figure: Climate change effect on human nutrition

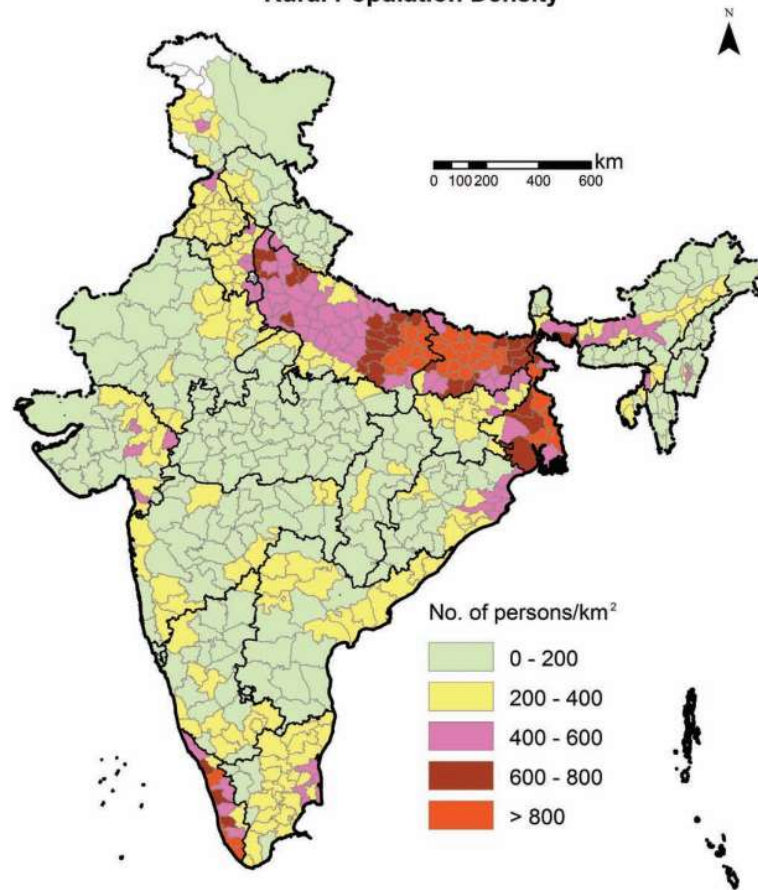


Socio Economic Impacts (3)

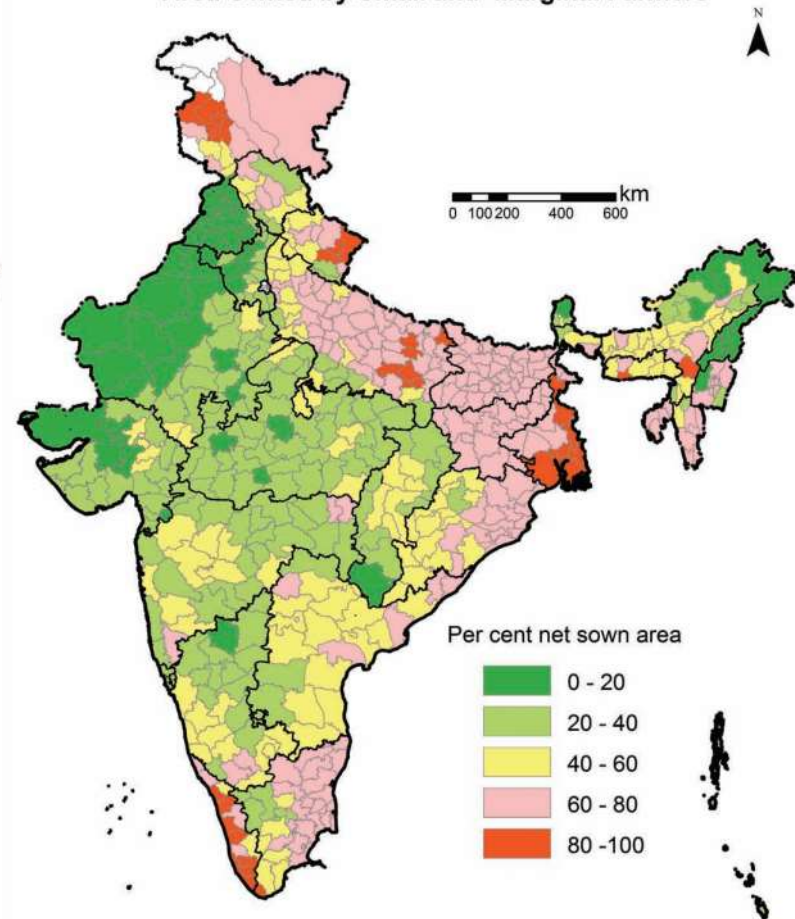


Socio Economic Impacts (4)

Rural Population Density

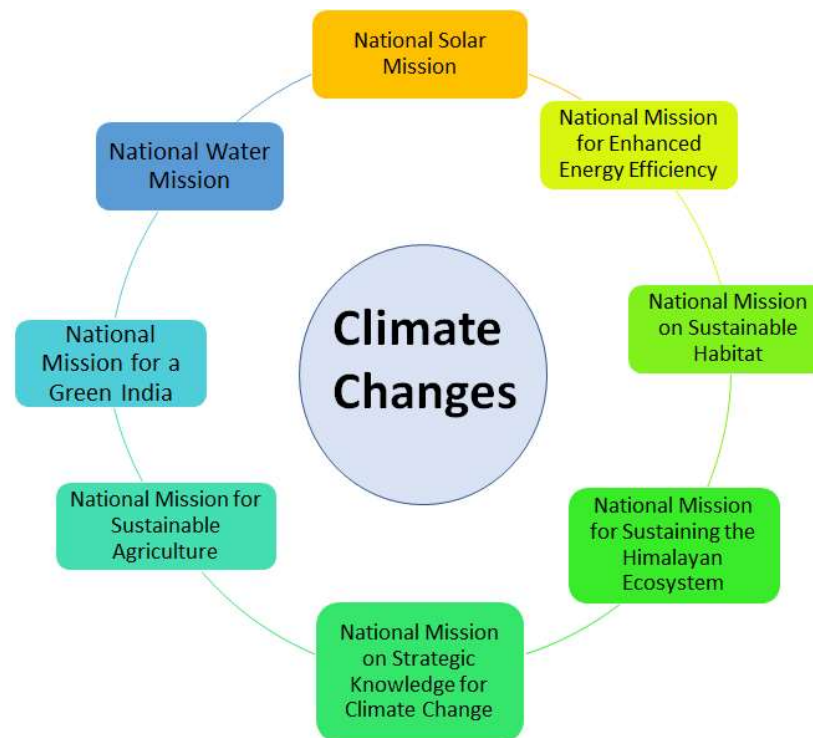


Area Owned by Small and Marginal Farmers



Adaption Strategies (1)

National Action Plan on Climate Change (NAPCC) is India's comprehensive framework for addressing climate change, featuring eight core missions focused on sustainable agriculture, enhanced energy efficiency, water conservation, and maintaining ecological balance.



Adaption Strategies (2)

National Mission for Sustainable Agriculture (NMSA) focuses on making Indian agriculture more climate-resilient through improved farming techniques, soil health management, and water conservation practices.



National Mission for Sustainable Agriculture
Department of Agriculture & Farmers Welfare
Ministry of Agriculture & Farmers Welfare, Government of India

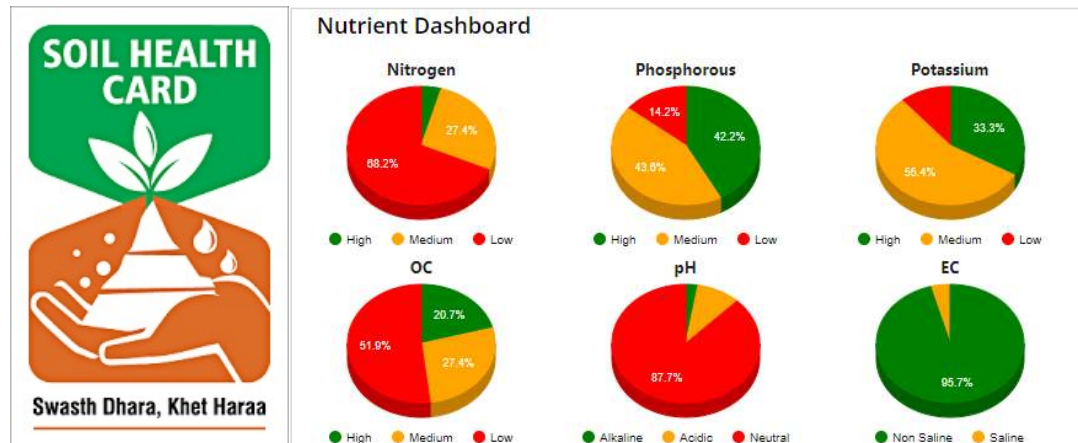


Pradhan Mantri Krishi Sinchai Yojana (PMKSY) is a centrally sponsored scheme that aims to expand irrigation coverage with the motto "Har Khet Ko Pani" and improve water use efficiency through precision irrigation technologies.



Adaption Strategies (3)

Soil Health Card Scheme provides farmers with detailed information about their soil's nutrient status and recommended fertilizer dosages.



Pradhan Mantri Fasal Bima Yojana (PMFBY) is a comprehensive crop insurance scheme that provides financial support to farmers in case of crop failure due to natural calamities, pests, and diseases, with low premium rates and quick claim settlements.



Pradhanmantri Fasal Bima Yojana

Mitigation Strategies (1)

Climate-resistant crops are specially developed varieties engineered to withstand environmental stresses like drought, floods, heat, and salinity, helping ensure food security in the face of climate change through enhanced adaptability and resilience.



Mitigation Strategies (2)

Water conservation encompasses efficient use and protection of water resources through methods like rainwater harvesting, watershed management, and recycling of wastewater to ensure sustainable water availability



Mitigation Strategies (3)

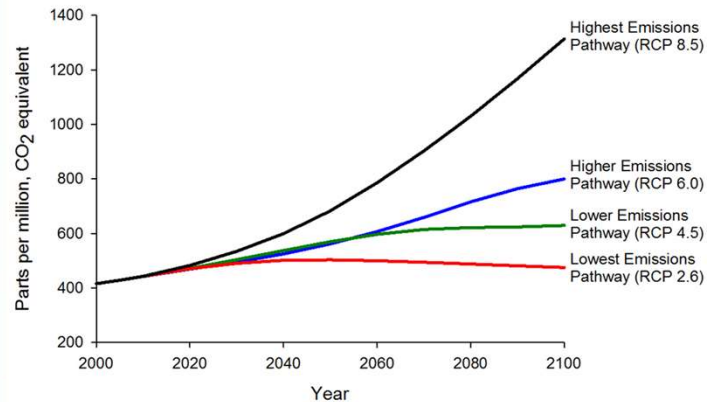
Organic farming helps combat climate change by sequestering carbon in soil through practices like crop rotation, composting, and avoiding synthetic fertilizers, while reducing greenhouse gas emissions associated with conventional agriculture.



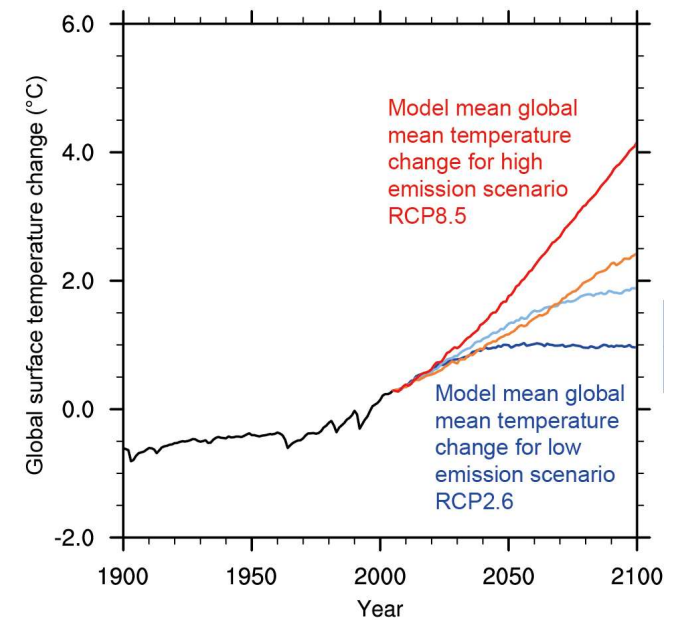
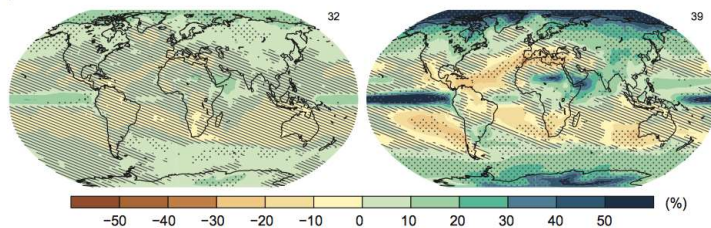
Sikkim is the first organic state in the world

Future Projections

Projected Atmospheric Greenhouse Gas Concentrations

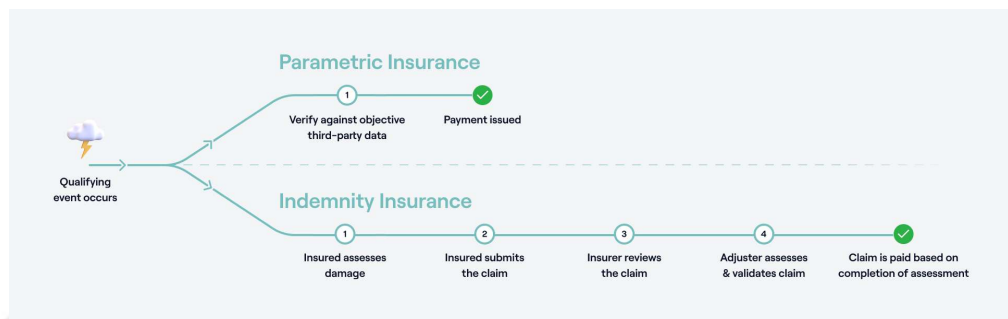


(b) Change in average precipitation (1986–2005 to 2081–2100)



Insurance Solutions

Parametric insurance is an innovative risk management tool that provides pre-specified payouts based on measurable parameters (like rainfall, river water depth, or wind speed) rather than actual losses, offering quick and transparent settlements without requiring loss assessment.



Insurance Solutions



Droughts

Financial support for farmers and water-dependent industries to manage crop loss and water scarcity.

Triggers could include:

- Soil moisture levels
- Temperature anomalies



Aviation

Pays when a predefined rainfall threshold exceeds, leading to:

- Landing delays
- Flight diversions
- Flight cancellations
- Additional fuel expenses



Heat Wave

Coverage against financial losses such as:

- Crop losses
- Business interruption
- Healthcare costs
- Infrastructure damages
- Livestock losses



Loan Portfolio

Protects those who lack sufficient collateral and are susceptible to climate shocks like:

- Floods
- Droughts
- Cyclones

Insurance Solutions



Agriculture

Risks covered could include:

- Unseasonal/Heavy rainfall
- Pest outbreaks
- Consecutive dry days



Warehouse

Enhances warehouse resilience by protecting against events like:

- Excess rainfall leading to non-utilization of warehouses
- Damage to stored goods



Wind Energy

Pays when Annual Energy Production (APE) is less than decided threshold per year, because of events like:

- Low wind speeds
- Extreme weather events
- Wind yield volatility



Floods

Payouts based on predefined parameters or indices like:

- river flow rates
- water levels
- Rainfall Levels

Thank You