South Asia's Hotspots: The Impact of Temperature and Precipitation Changes on Living Standards

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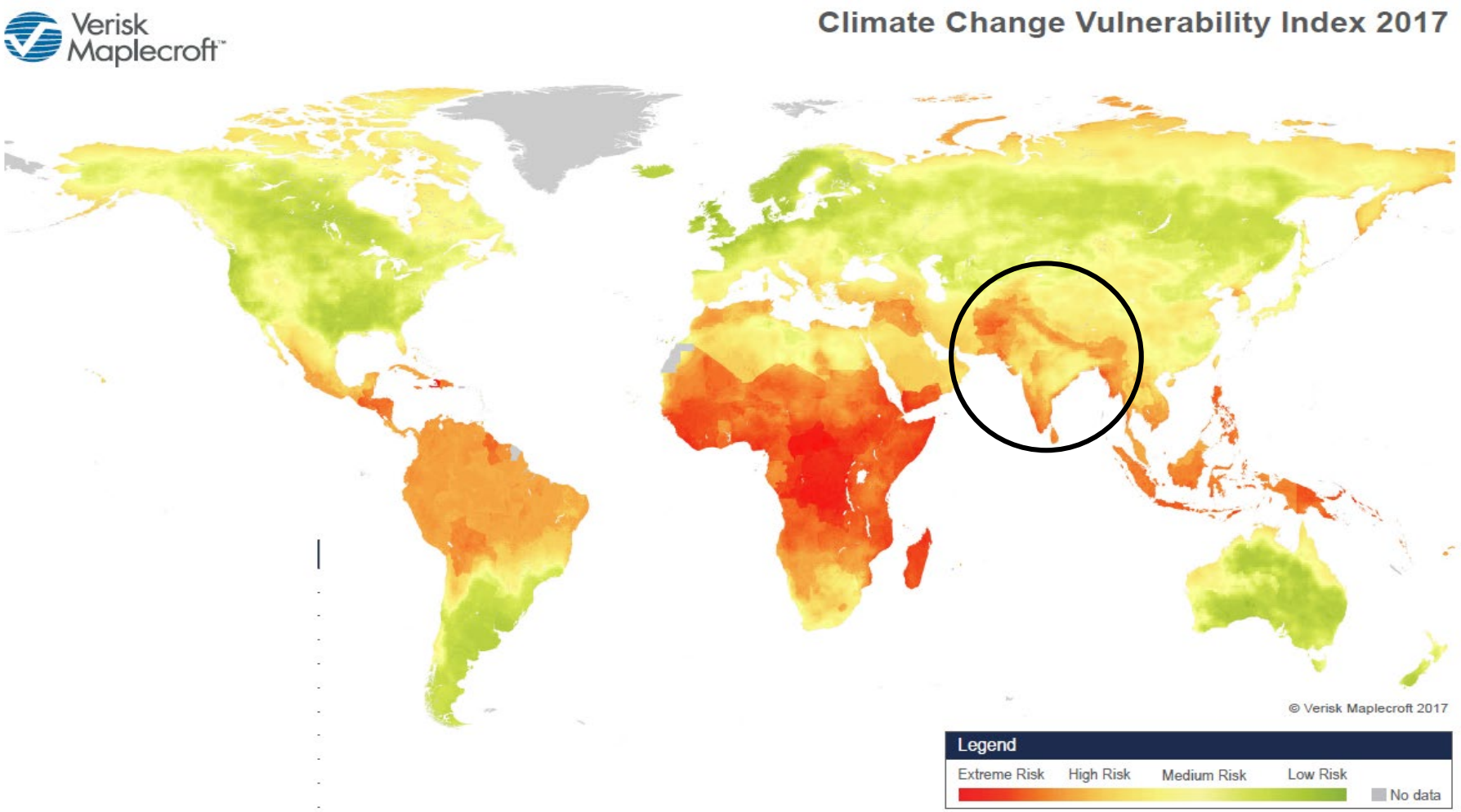
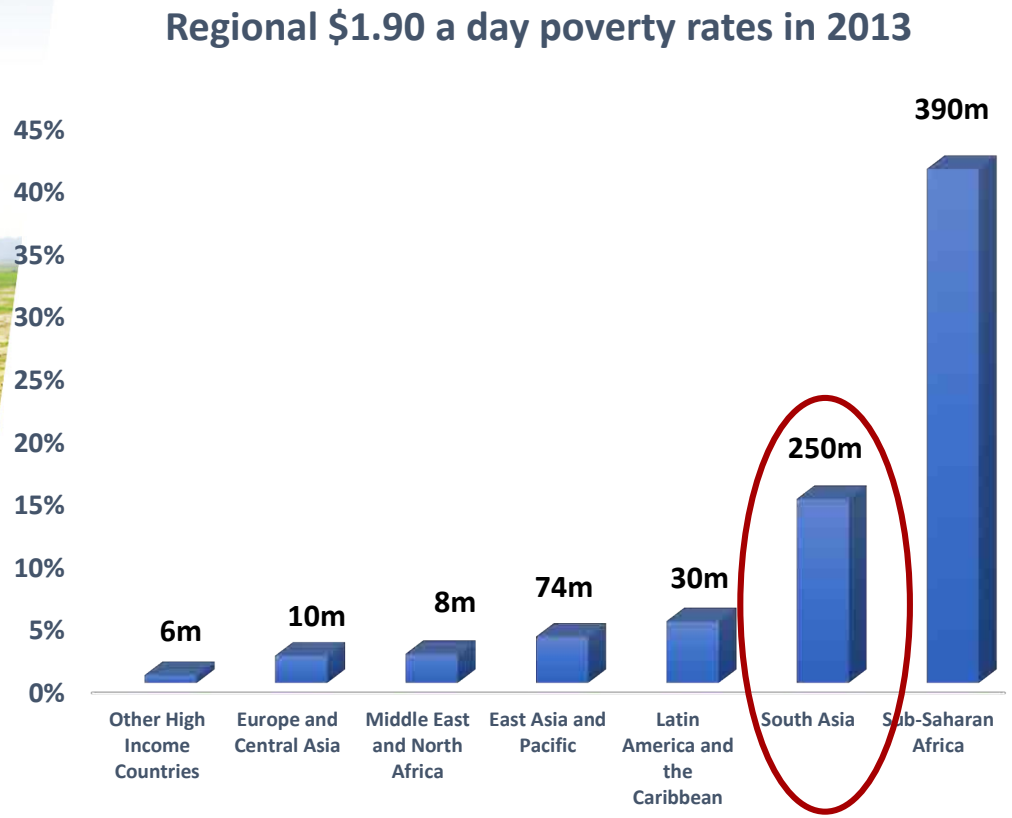
World Bank

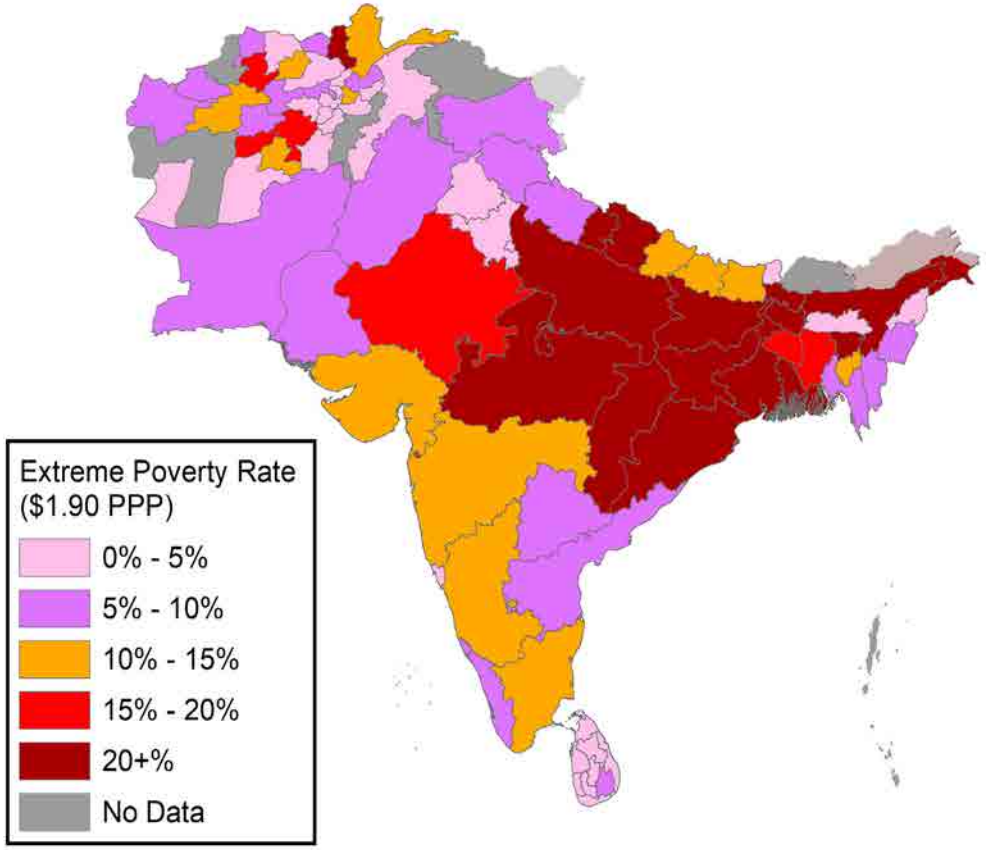
South Asia is highly vulnerable to climate change



One of world's poorest regions

(in spite of significant recent gains)





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Countries are taking action…

Bangladesh Climate Change Strategy and Action Plan

Bhutan National Adaptation Plan

India National Action Plan on Climate Change, State Action Plans

Maldives Strategic National Action Plan for Disaster Risk Reduction and Climate Change Adaptation

Nepal National Framework on Local Adaptation Plans for Action

Pakistan National Climate Change Policy

National Adaptation Plan for Climate Change Impacts in Sri Lanka

Intended Nationally Determined Contributions

But there are challenges…

Costs

Trade-offs

Where?

When?

How much?

Information

Economic Rationale

Prioritization

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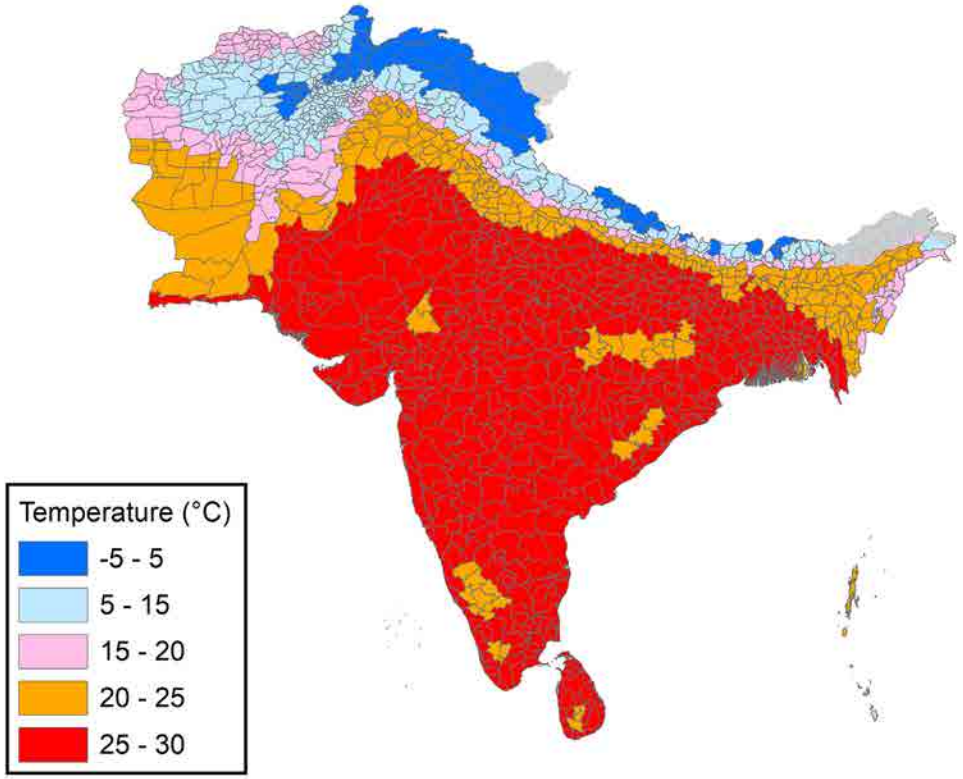
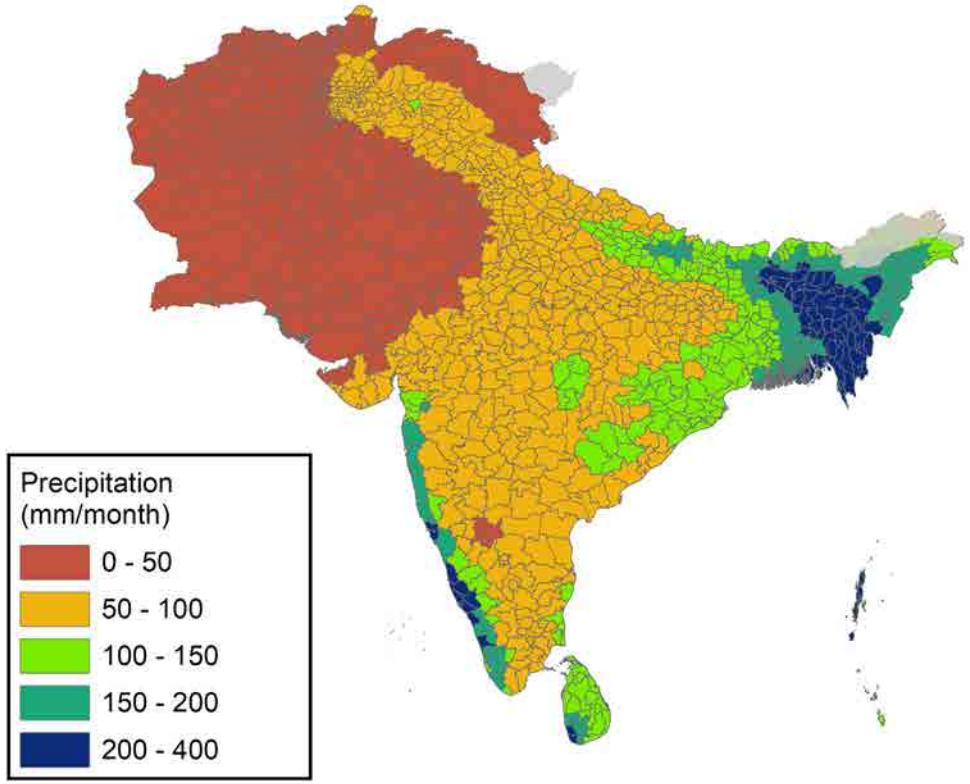
South Asia's climate is highly diverse

Average Annual Temperature (1981-2010)



Average Monsoon Precipitation (1981-2010)



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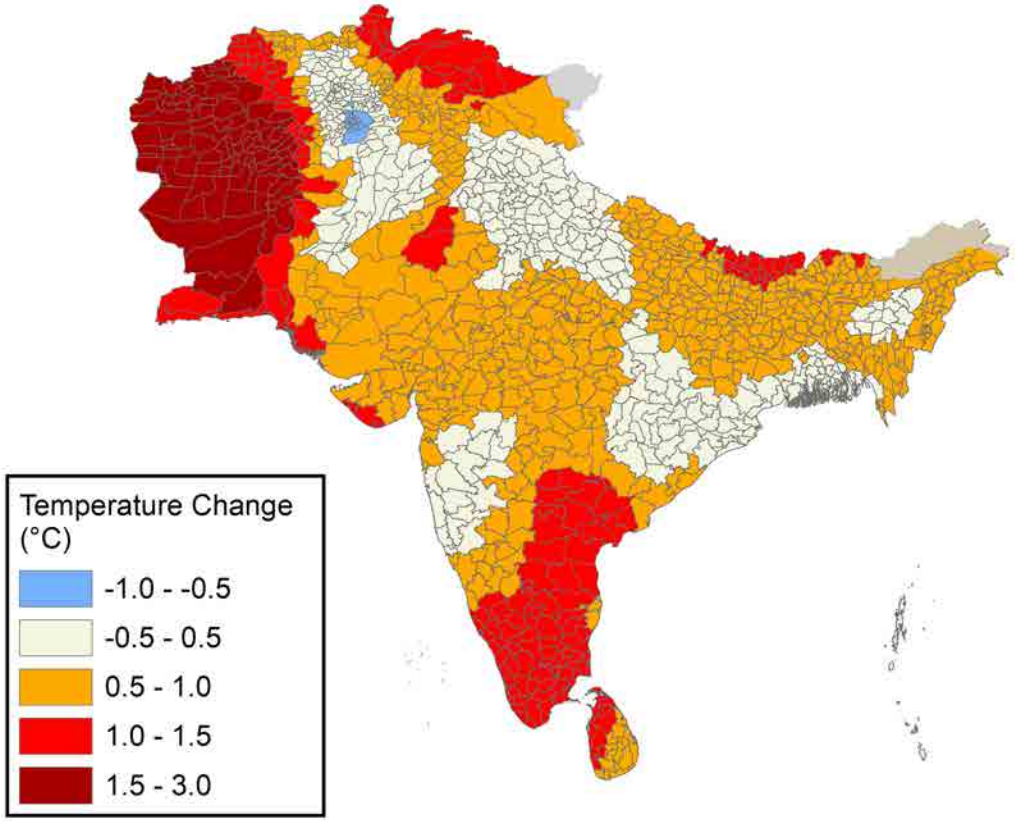
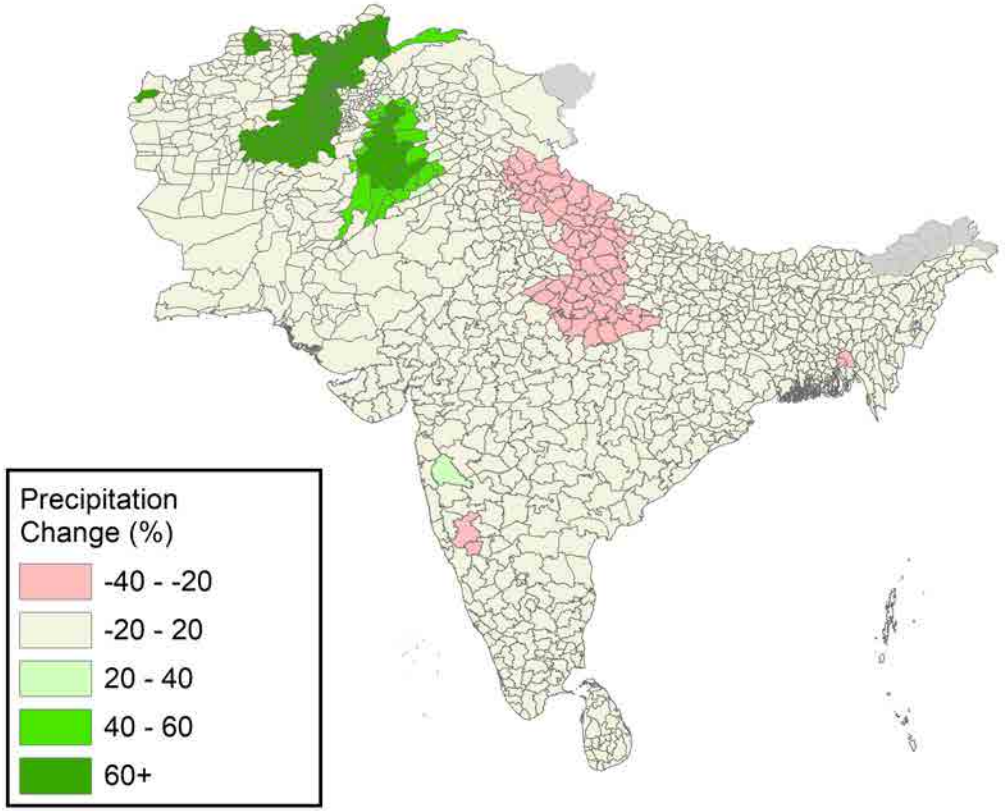
Unambiguous temperature increases (less so for precipitation)

Change in Annual Temperature (1951-2010)



Change in Monsoon Precipitation (1951-2010)



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3 manifestations of climate change

Changes in characteristics of extreme events

Loss of property, assets and human life (analyzed in *Turn Down the Heat* and *Unbreakable*, World Bank)

Sea-level rise

Coastal erosion and flooding, asset damage and habitat loss (analyzed in *Turn Down the Heat*, World Bank)

Changes in temperature and precipitation

Impacts on agriculture productivity, health, labor productivity, and migration

Knowledge Gap
(analyzed in *South Asia's Hotspots*)

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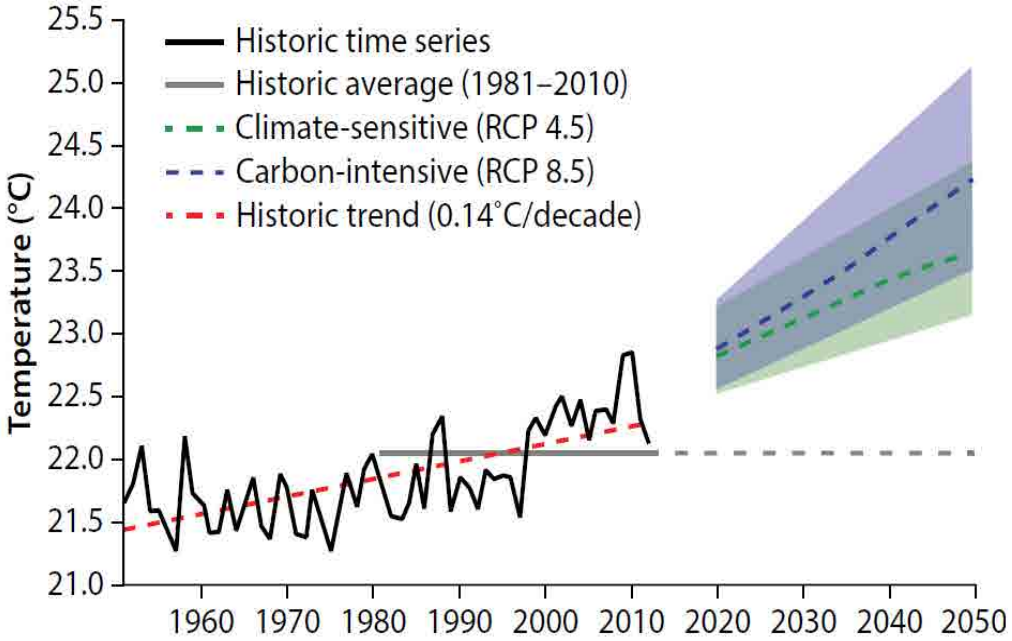
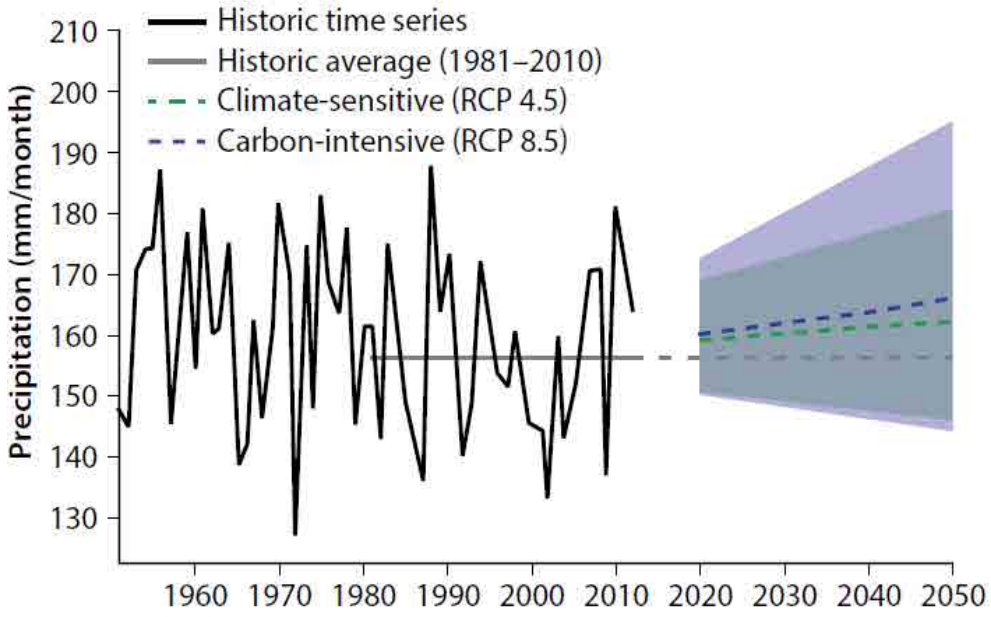
Questions that the report addresses

- Where will average climate changes occur most?
- Who will be the impacted by these climate changes?
- What needs to be done to build resilience?

Where will average climate changes occur?

Temperatures projected to increase but Monsoon precipitation projections are uncertain…





- 11 climate models that provide best fit for South Asia
- Project climate changes under two scenarios:
  - Climate-sensitive (RCP 4.5)
  - Carbon-intensive (RCP 8.5)

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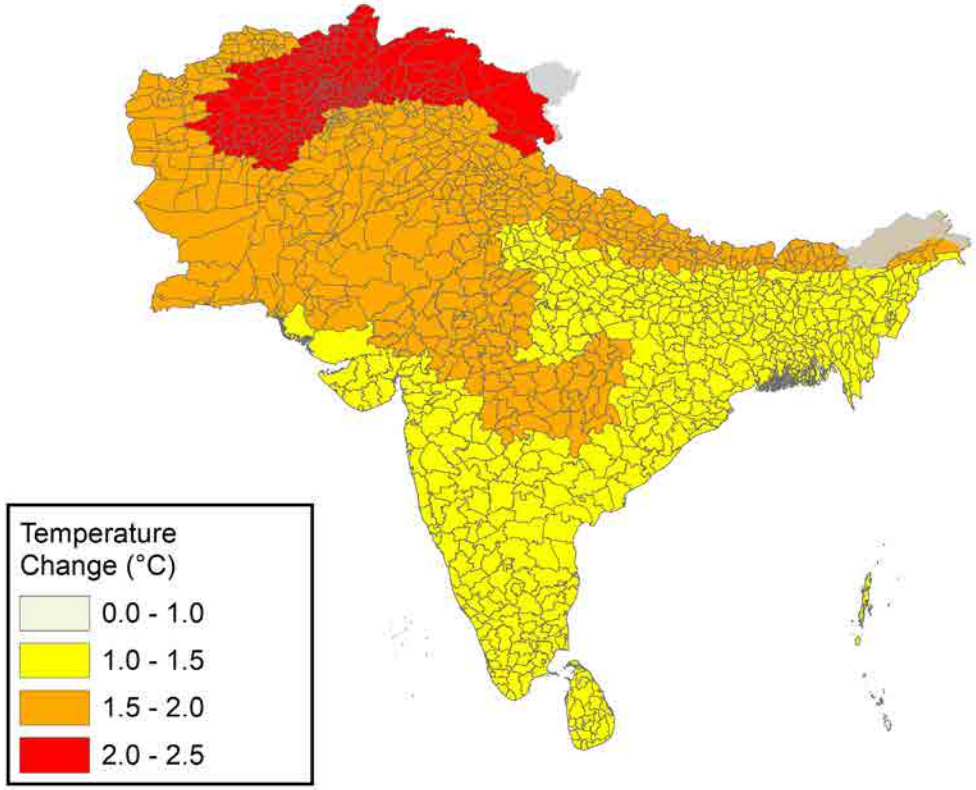
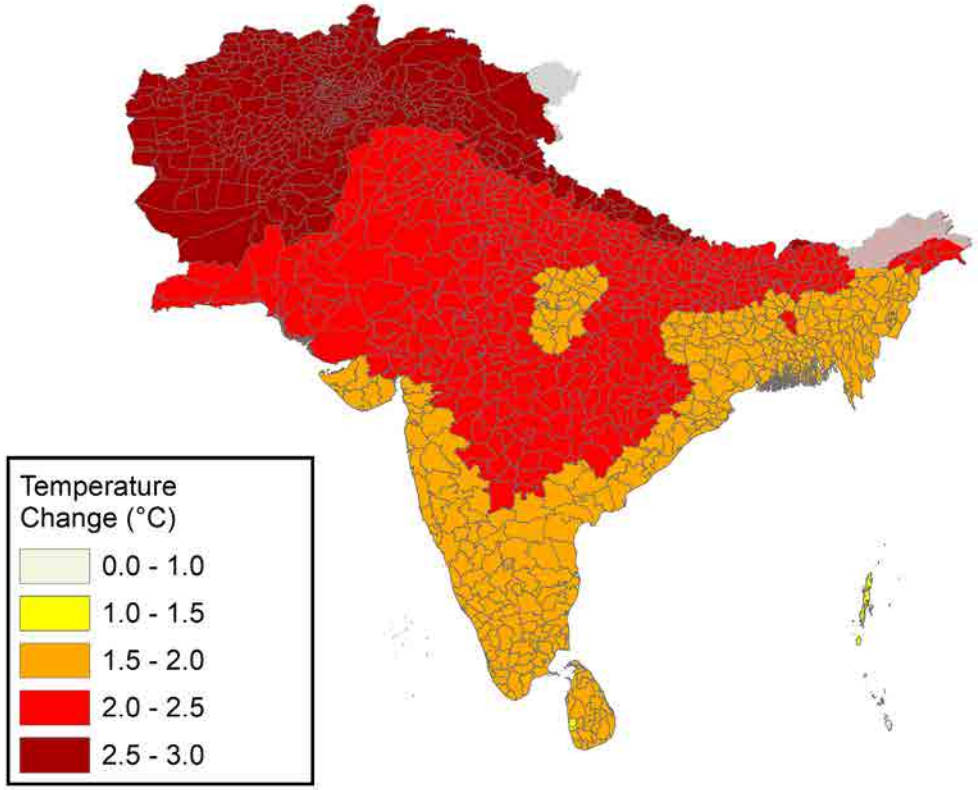
Temperature increase will vary by location

Climate-sensitive (RCP 4.5)



Carbon-intensive (RCP 8.5)



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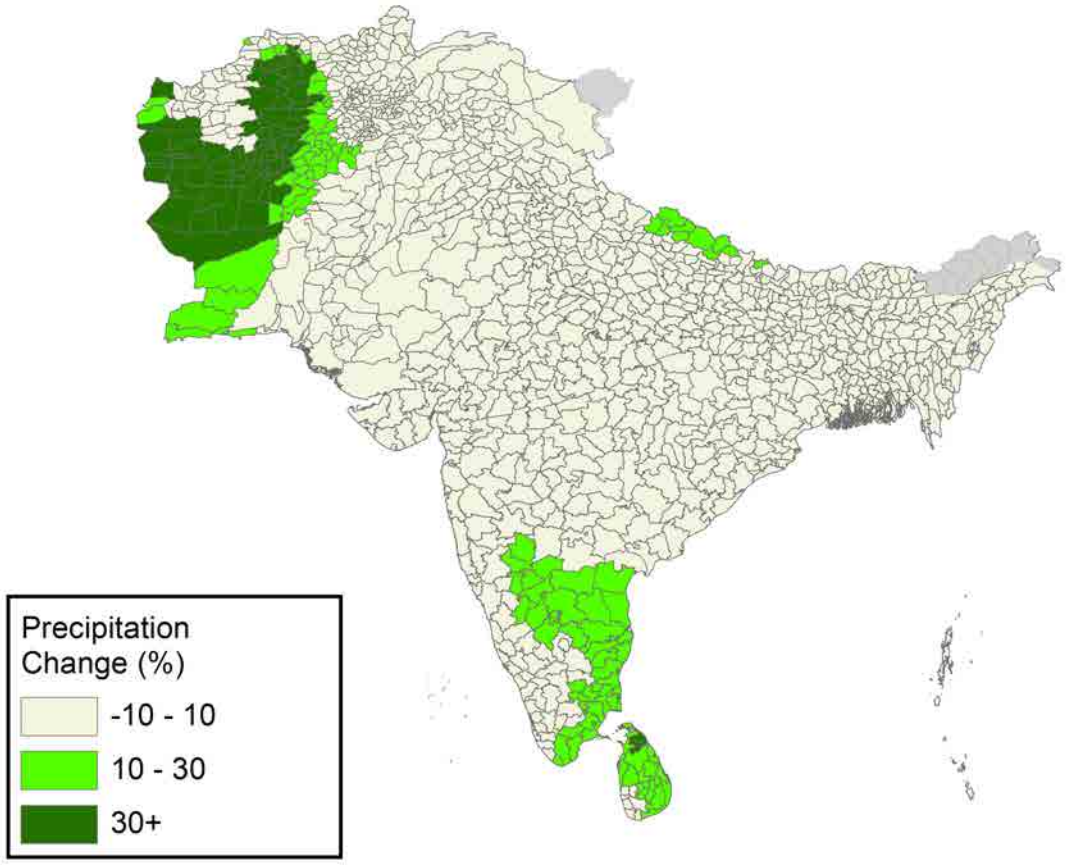
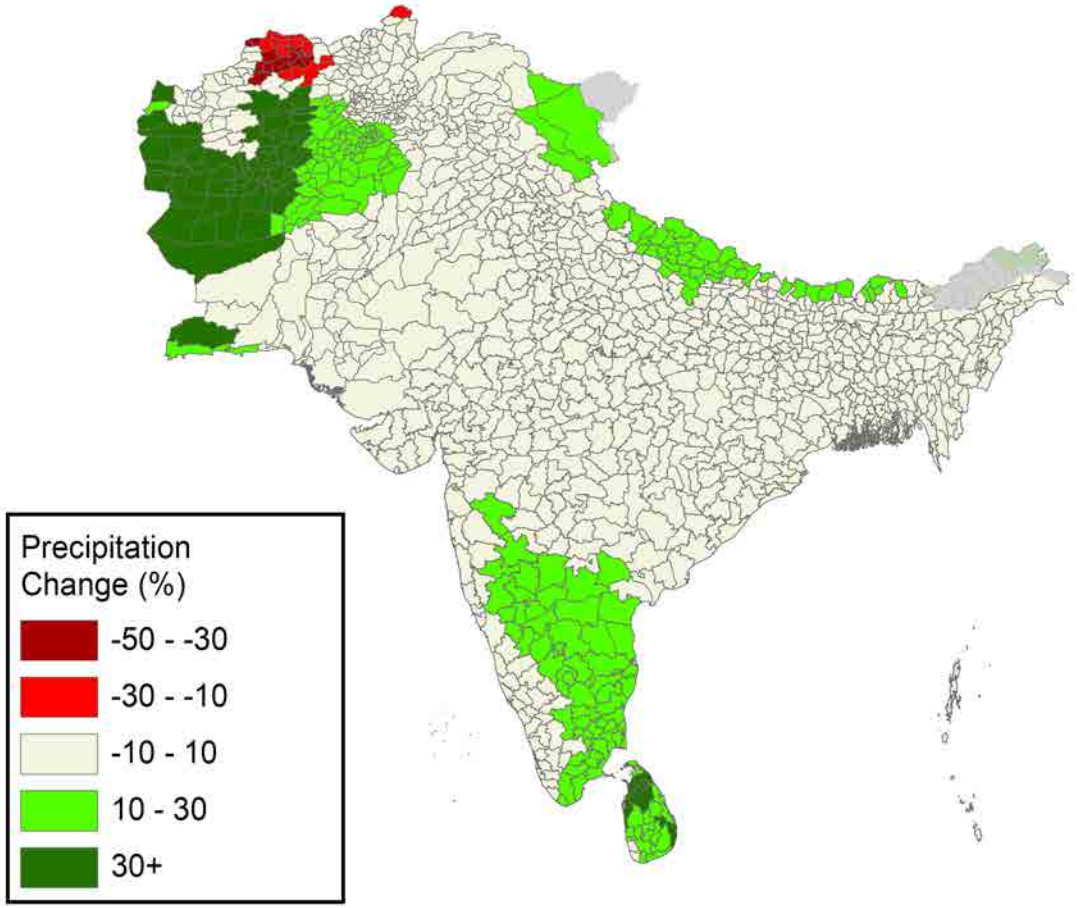
Monsoon precipitation may also change in few locations

Climate-sensitive (RCP 4.5)



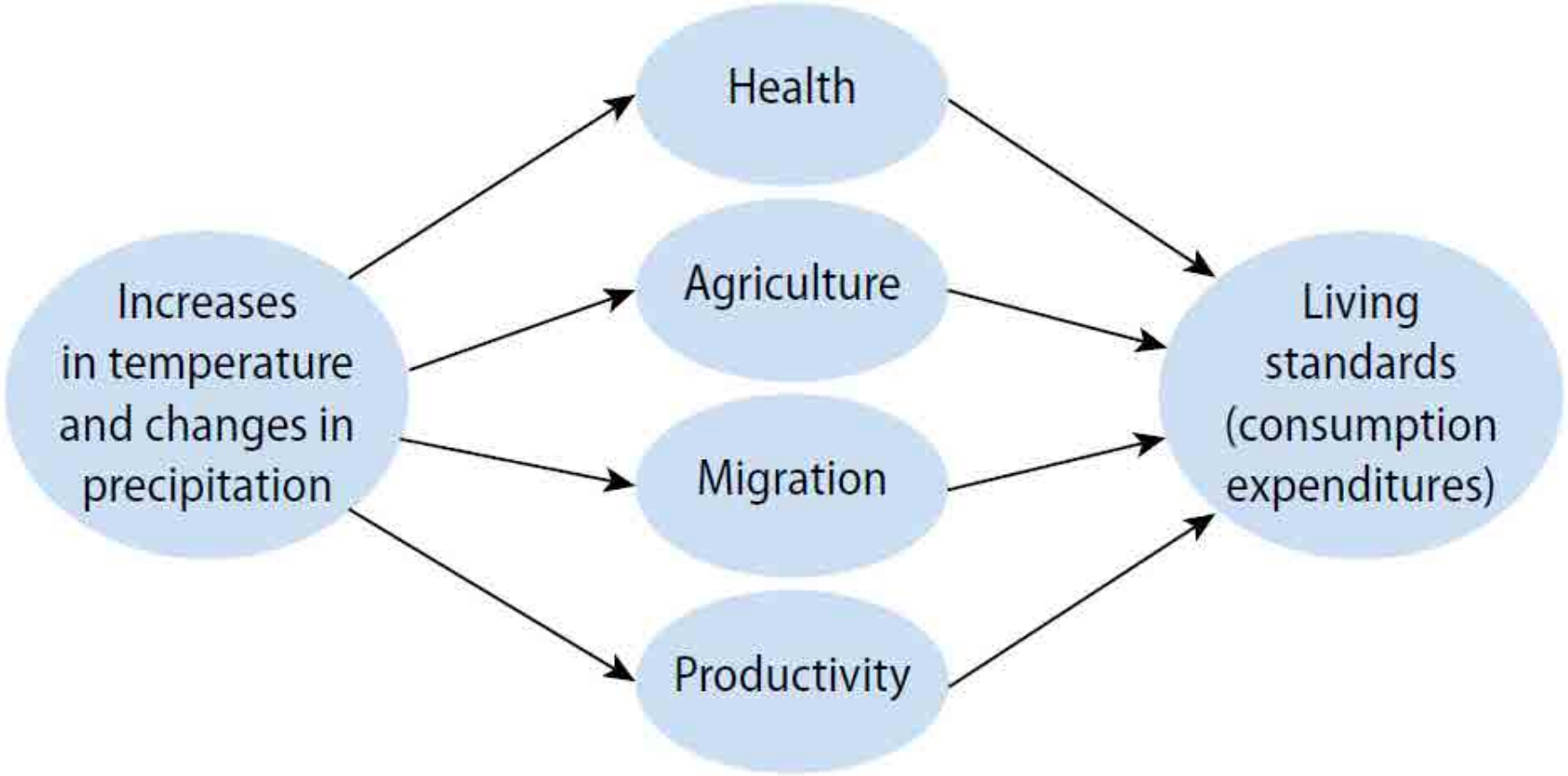
Carbon-intensive (RCP 8.5)



Hotspots

Who will be the *most* impacted by average climate change?

Climate change impacts living standards through many pathways



Extensive household-level survey data for each country

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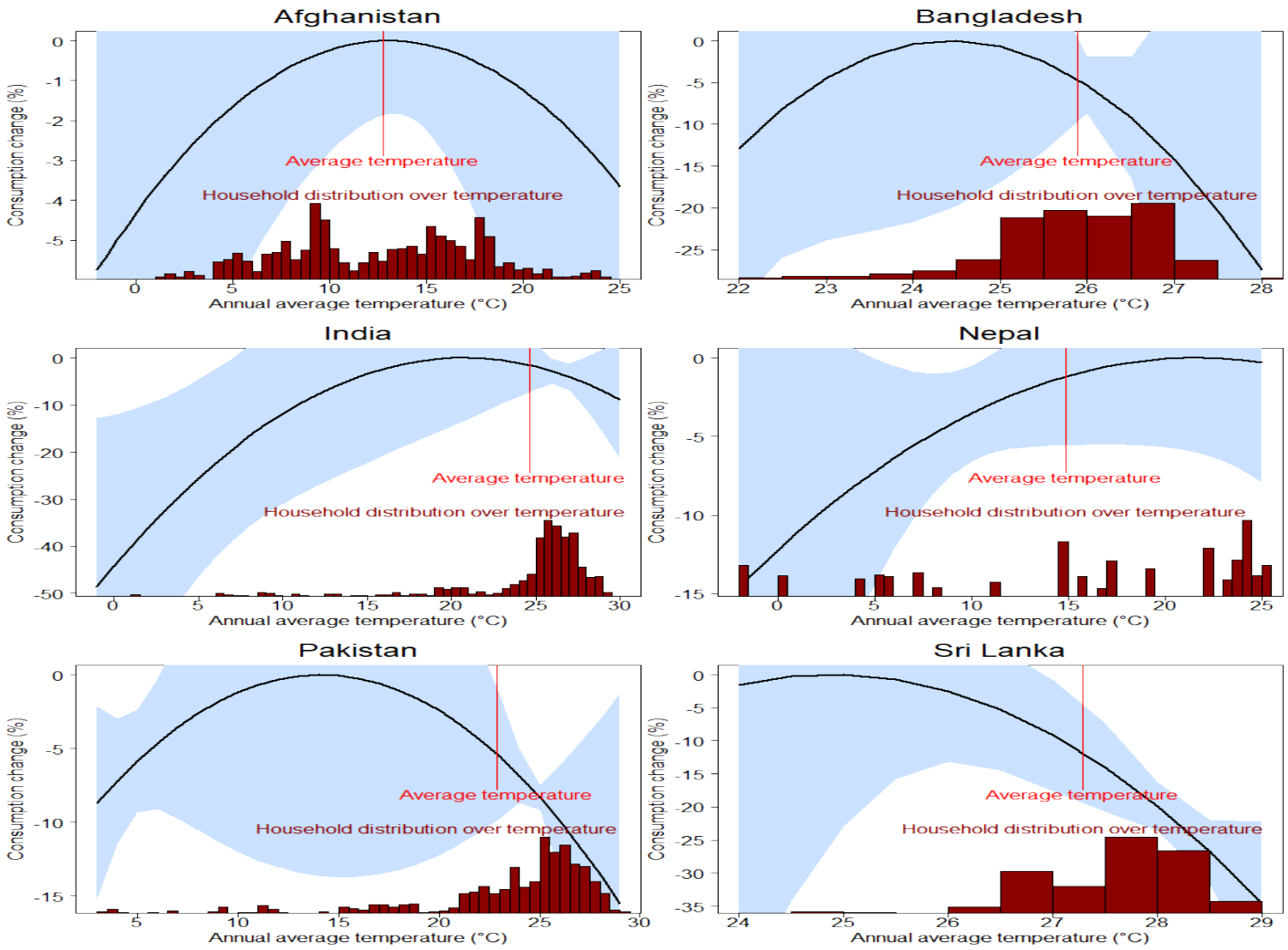
Where are the temperature-living standards tipping points?



Most countries will experience a decline in living standards under both scenarios

Timeframe	2050	
Scenario	Climate-Sensitive (RCP 4.5)	Carbon-Intensive (RCP 8.5)
Afghanistan	8.3	11.9
Bangladesh	-2.9	-6.7
India	-2.0	-2.8
Nepal	3.2	4.1
Pakistan	-2.0	-2.9
Sri Lanka	-4.9	-7.0

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What are Hotspots?

- Areas where living standards will be most impacted by average changes in temperature and precipitation

Severe	Living standards loss of more than 8%
Moderate	Living standards loss of 4% to 8%
Mild	Living standards loss of less than 4%

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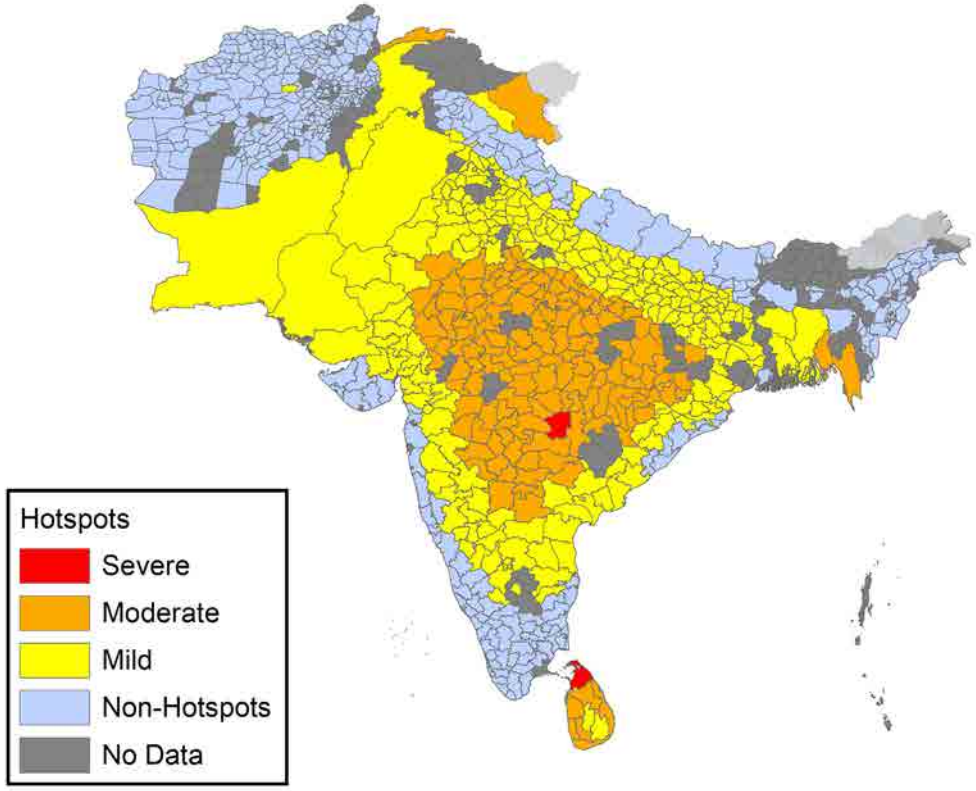
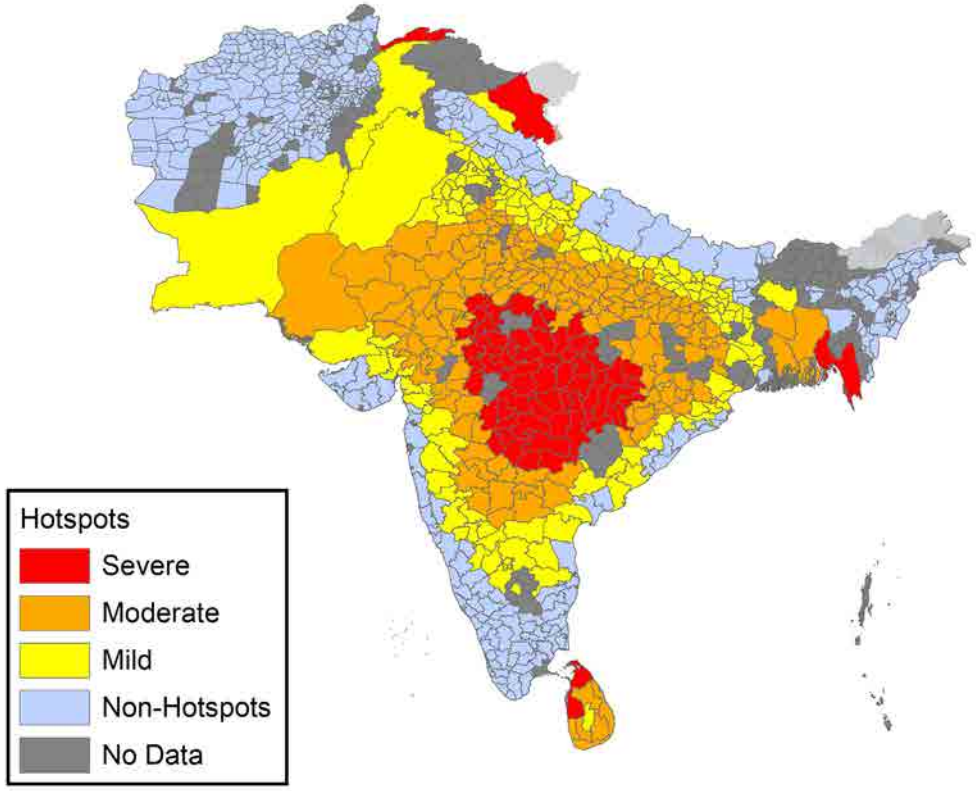
Severe hotspots emerge under carbon-intensive development scenario by 2050

Climate-sensitive (RCP 4.5)



Carbon-intensive (RCP 8.5)



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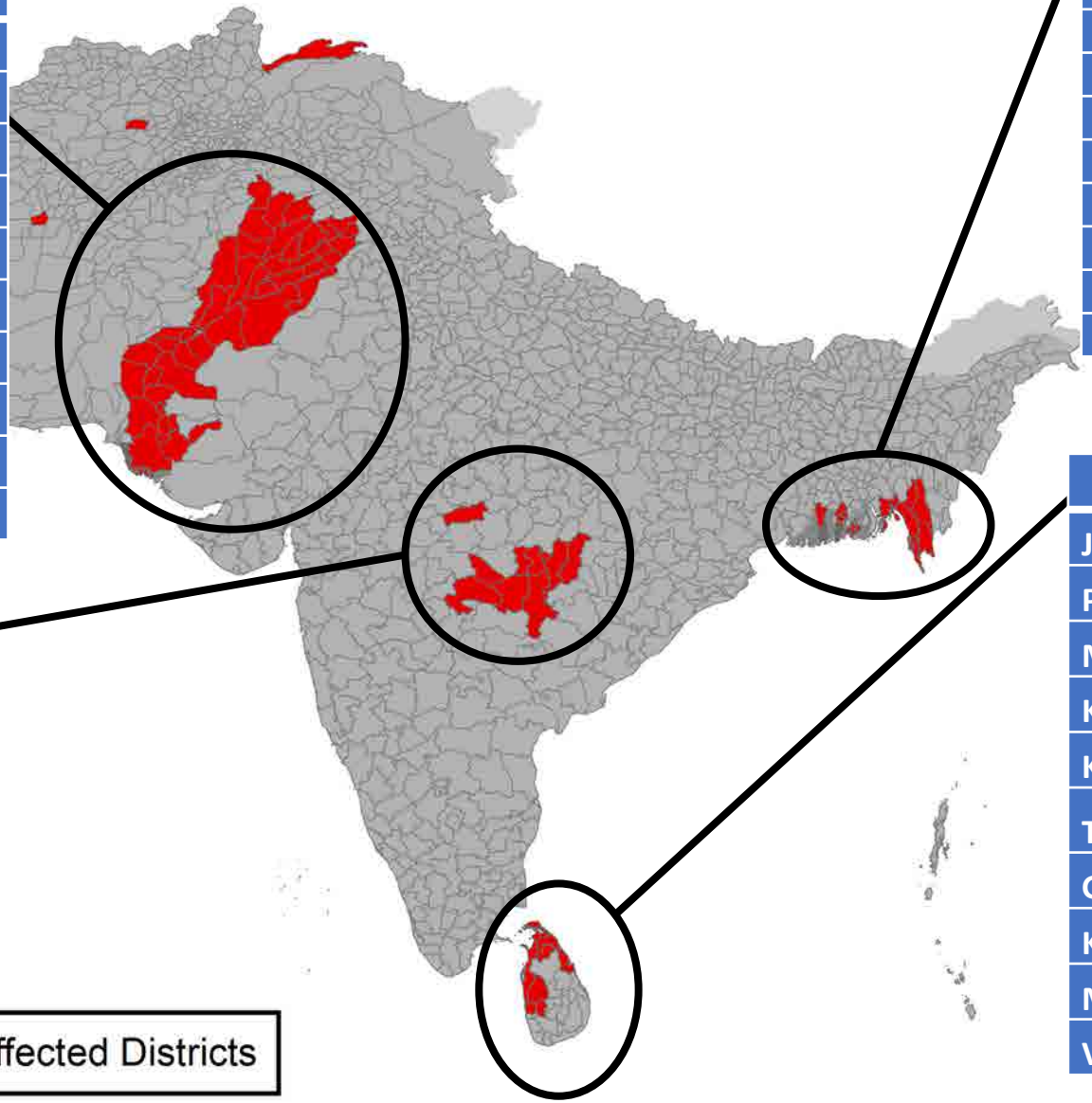
Most Affected Districts

Pakistan
Hyderabad
Mirpur Khas
Sukkur
Larkana
Bahawalpur
Faisalabad
Lahore
Multan
Dera Ghazi Khan
Sargodha

India
Chandrapur
Bhandara
Gondiya
Wardha
Nagpur
Raj Nandgaon
Durg
Hoshangabad
Yavatmal
Garhchiroli



Bangladesh
Cox's Bazar
Bandarban
Chittagong
Rangamati
Noakhali
Feni
Khagrachhari
Barguna
Bagerhat
Satkhira

Sri Lanka
Jaffna
Puttalam
Mannar
Kilinochchi
Kurunegala
Trincomalee
Gampaha
Kegalle
Mullaitivu
Vavuniya

Central India will be most impacted

State	Change in Living Standards (%)	Average Length of Road (km/10 km²)	Average Population Density (per km²)	Travel Time to Market (hours)	Water Availability[a]	Female Household Head (%)	Agriculture Head (%)	Years of Education	Electricity (%)
Overall	−2.8	1.6	840.7	2.7	2.0	10.8	39.8	5.7	79.8
Chhattisgarh	−9.4	1.0	212.7	2.9	0.3	6.3	60.7	5.5	89.5
Madhya Pradesh	−9.1	1.0	237.0	2.6	0.4	6.0	48.5	5.4	88.4
Rajasthan	−6.4	0.7	229.4	2.6	0.1	9.4	36.8	4.8	82.7
Uttar Pradesh	−4.9	1.4	801.3	1.9	0.9	10.5	42.9	5.1	51.7
Maharashtra	−4.6	1.0	325.6	2.7	0.4	9.4	40.3	7.1	94.2
Jharkhand	−4.6	1.6	482.4	2.0	3.5	8.2	30.6	5.2	74.3
Haryana	−4.3	2.3	480.5	2.6	0.2	7.4	36.2	6.6	96.6
Andhra Pradesh	−3.4	2.1	1,831.3	2.6	2.3	14.3	41.2	5.2	98.2
Punjab	−3.3	2.1	464.6	3.5	0.2	12.4	23.5	5.7	98.6
Chandigarh	−3.3	5.1	4,529.6	1.5	0.1	6.2	0.2	8.9	97.9

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7 out of top ten districts in Maharashtra

District	State	Change in Living Standards (%)	Average Length of Road (km/10 km²)	Average Population Density (per km²)	Travel Time to Market (hours)	Water Avail-ability[a]	Female House-hold Head (%)	Agricul-ture Head (%)	Years of Educa-tion	Elec-tricity (%)
Overall		−2.8	1.6	840.7	2.7	2.0	10.8	39.8	5.7	79.8
Chandrapur	Maharashtra	−12.4	1.2	161.6	1.7	3.1	8.7	50.6	6.8	84.6
Bhandara	Maharashtra	−11.9	0.8	219.7	2.5	0.3	5.3	51.9	7.2	93.1
Gondiya	Maharashtra	−11.8	0.8	215.9	2.5	0.2	9.5	51.2	7.0	96.6
Wardha	Maharashtra	−11.8	0.5	172.0	2.6	0.1	9.8	53.1	8.3	93.6
Nagpur	Maharashtra	−11.7	0.2	379.9	2.3	0.1	7.7	17.7	8.8	97.2
Raj Nandgaon	Chhattisgarh	−11.4	1.5	153.0	3.8	0.1	1.8	59.2	4.4	98.0
Durg	Chhattisgarh	−11.4	0.5	314.4	2.3	0.2	10.6	43.7	7.1	94.3
Hoshangabad	Madhya Pradesh	−11.3	1.3	144.1	3.6	0.6	0.2	40.0	5.8	91.2
Yavatmal	Maharashtra	−11.1	0.3	169.3	2.3	0.1	4.4	67.7	5.4	83.0
Gadchiroli	Maharashtra	−11.1	0.8	61.8	2.5	7.7	9.1	74.0	5.1	81.1

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Vulnerable areas and vulnerable households (similarities)

Hotspots districts have:

- Less road density
- Poorer access to markets
- Water stressed

Households in hotspots are:

- Predominantly in agriculture
- Without electricity access in some cases

Vulnerable areas and vulnerable households (differences)

- Hotspots districts are not always rural

- Households in hotspots are not always agricultural
- Women-headed households are more resilient

Costs of inaction highest in severe hotspots

Countries with severe hotspots	Loss in GDP, entire country (%)	Loss in GDP, severe hotspots (%)	Loss in GDP, entire country (billions USD)	Loss in GDP, severe hotspots (billions USD)
Bangladesh	6.7	14.4	171.1	58.7
India	2.8	9.8	1,177.8	403.9
Sri Lanka	7.7	10.0	49.9	12.2

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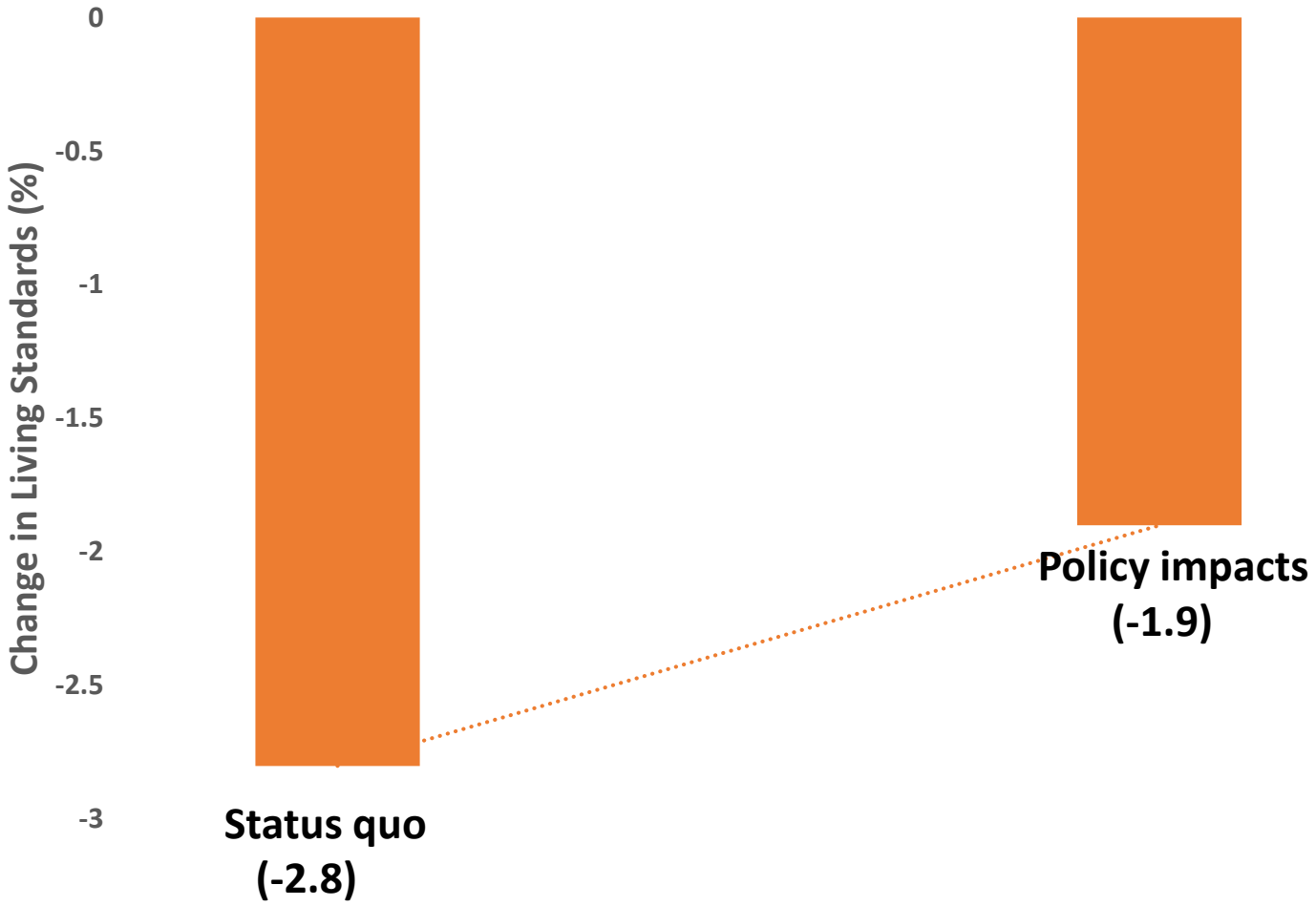
What makes households and communities resilient?

Impact of policies to improve climate resilience in India



- Creating nonagricultural jobs
- Reducing water stress
- Enhancing educational attainment

30 percent improvement

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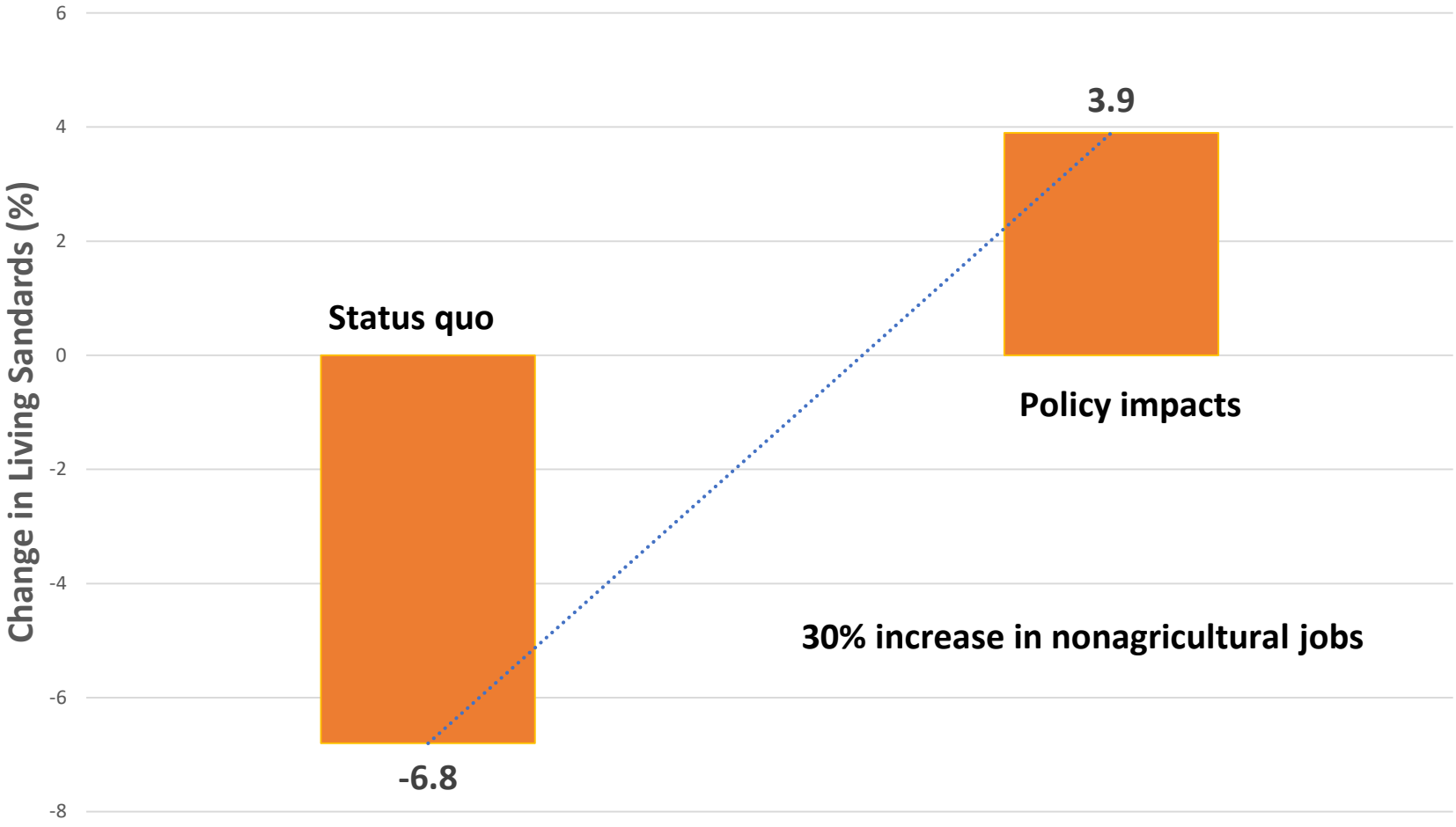
Impact of policies to improve climate resilience in Bangladesh



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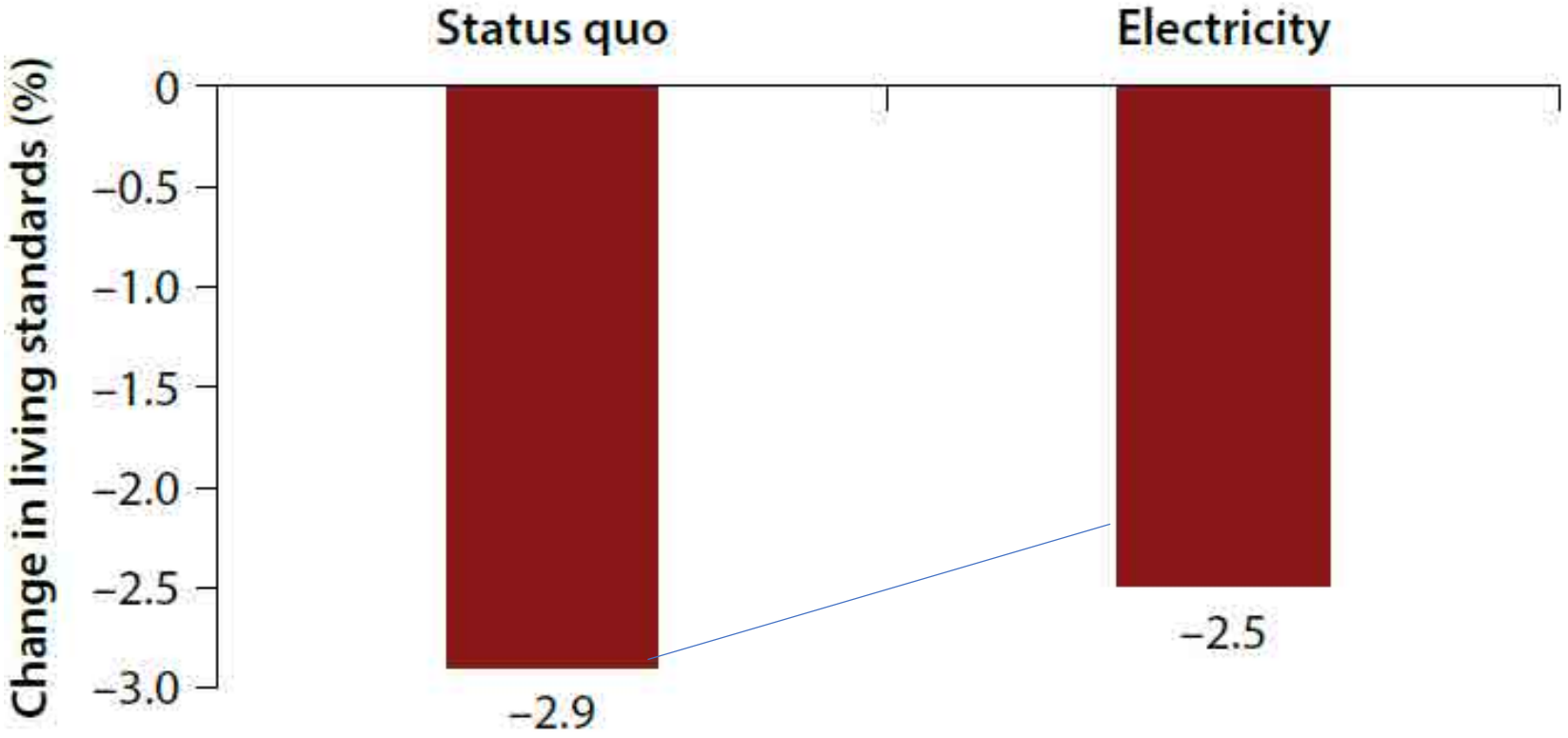
Impact of policies to improve climate resilience in Pakistan



30 percent improvement

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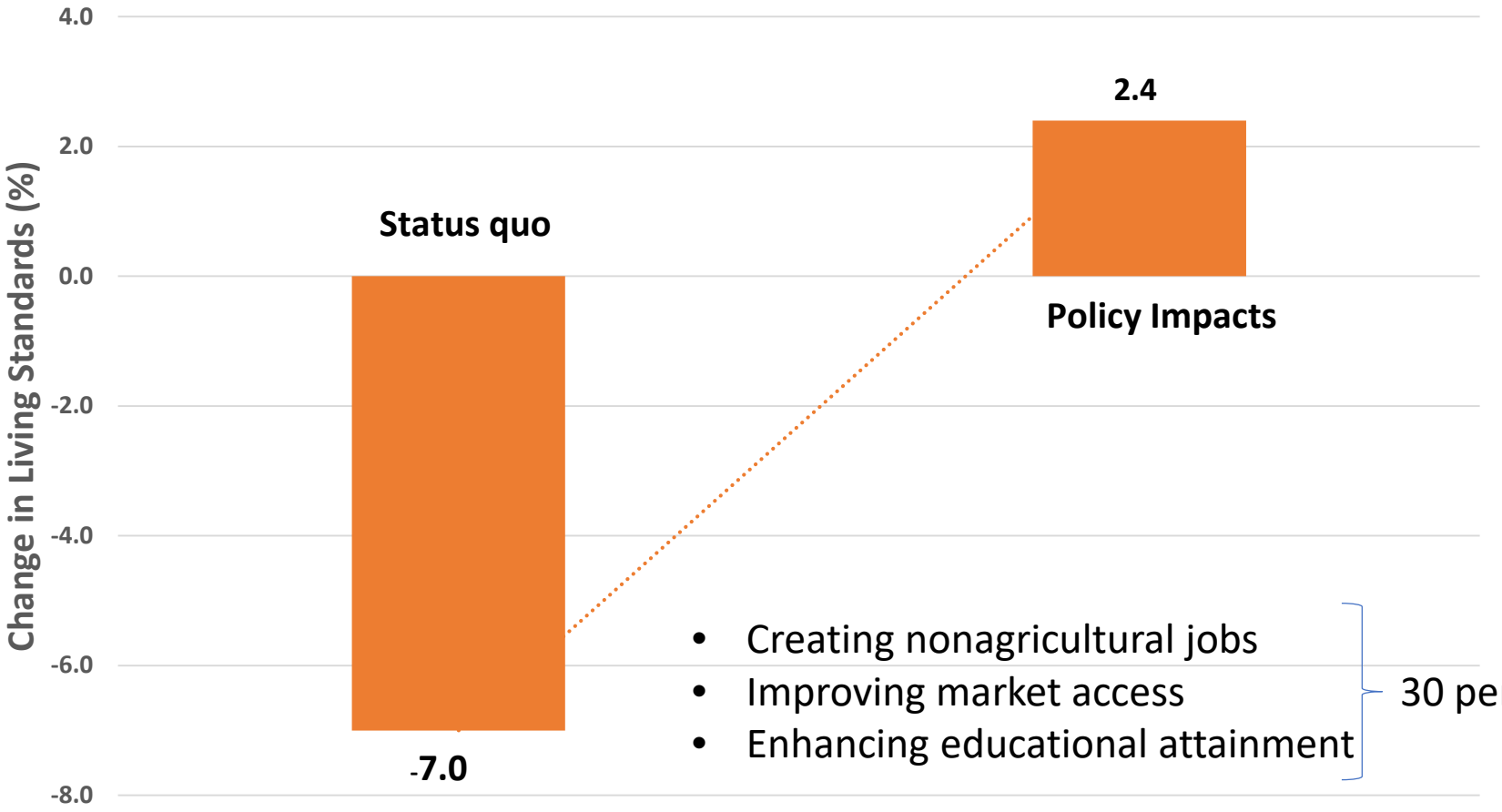
Impact of policies to improve climate resilience in Sri Lanka



- Creating nonagricultural jobs
- Improving market access
- Enhancing educational attainment

30 percent improvement

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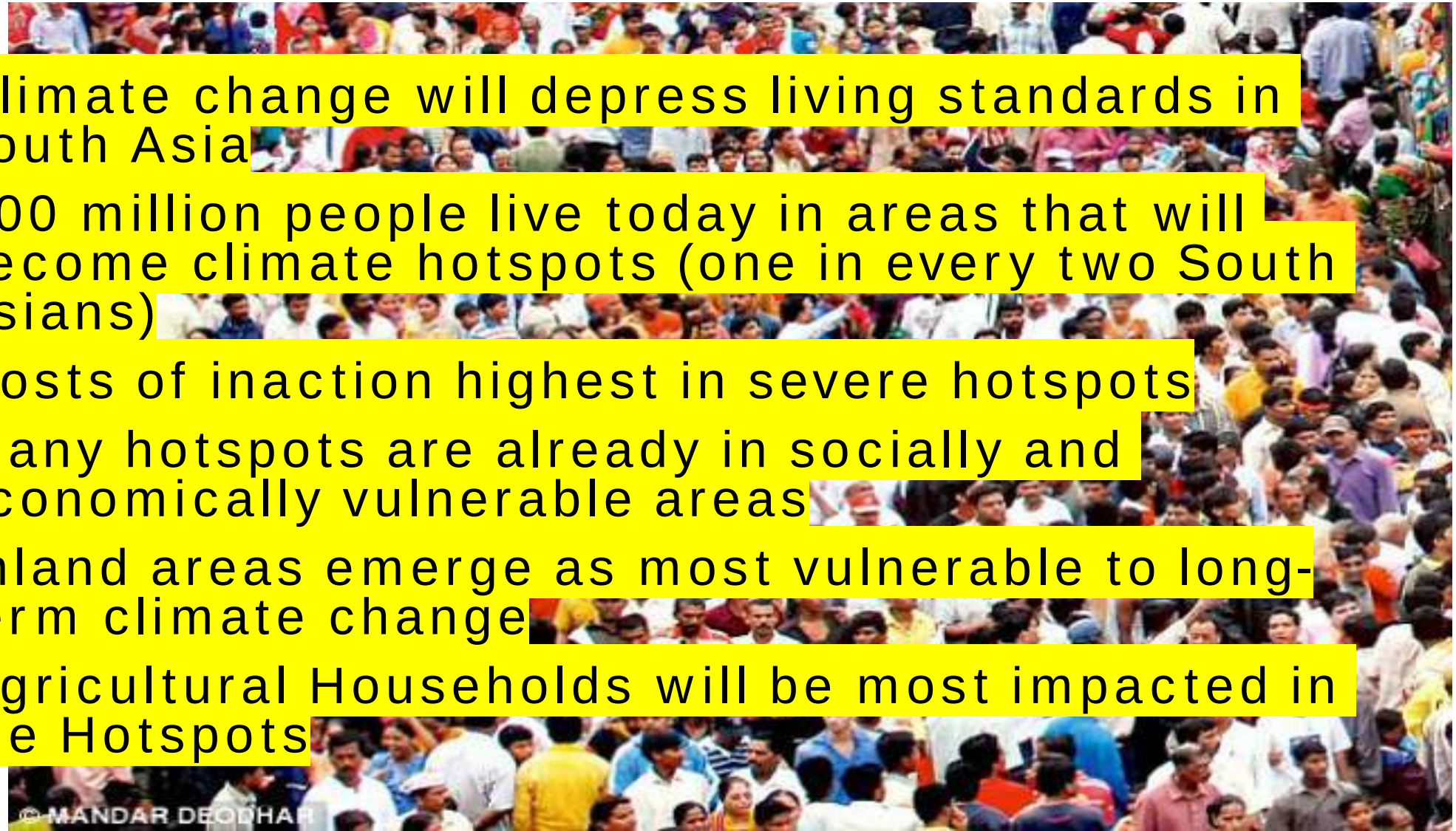
Key takeaways

- ✓ Climate change will depress living standards in South Asia
- ✓ 800 million people live today in areas that will become climate hotspots (one in every two South Asians)
- ✓ Costs of inaction highest in severe hotspots
- ✓ Many hotspots are already in socially and economically vulnerable areas
- ✓ Inland areas emerge as most vulnerable to long-term climate change
- ✓ Agricultural Households will be most impacted in the Hotspots



Thank you

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[Hotspots data on Climate Change Knowledge Portal]