OVERVIEW

SHOCK WAVES

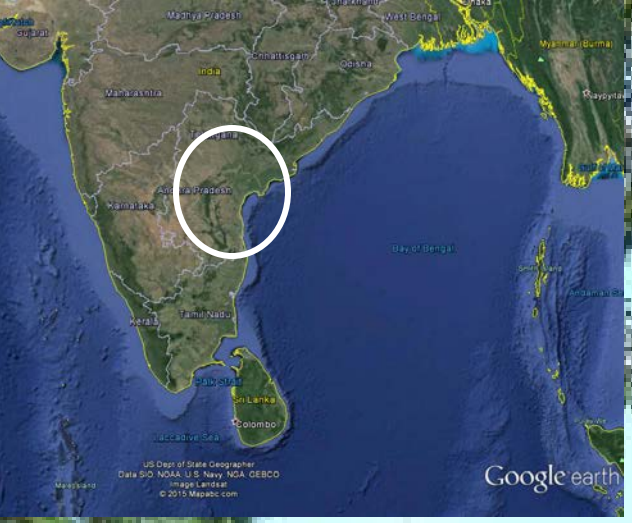
Managing the Impacts of Climate Change on Poverty

Stephane Hallegatte, Mook Bangalore, Laura Bonzanigo, Marianne Fay, Tamaro Kane, Ulf Narloch, Julie Rozenberg, David Treguer, Adrien Vogt-Schilb

Climate Change Cross-Cutting Solutions Area
The World Bank Group

Main Message #1

Climate-related shocks and stresses, **already a major obstacle** to poverty reduction, **will worsen** with climate change


Madhya Pradesh
West Bengal
Maharashtra
Odisha
Andhra Pradesh
Karnataka
Bay of Bengal
Tamil Nadu
Kerala
Sri Lanka
Colombo
Laccadive Sea
US Dept of State Geographer
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
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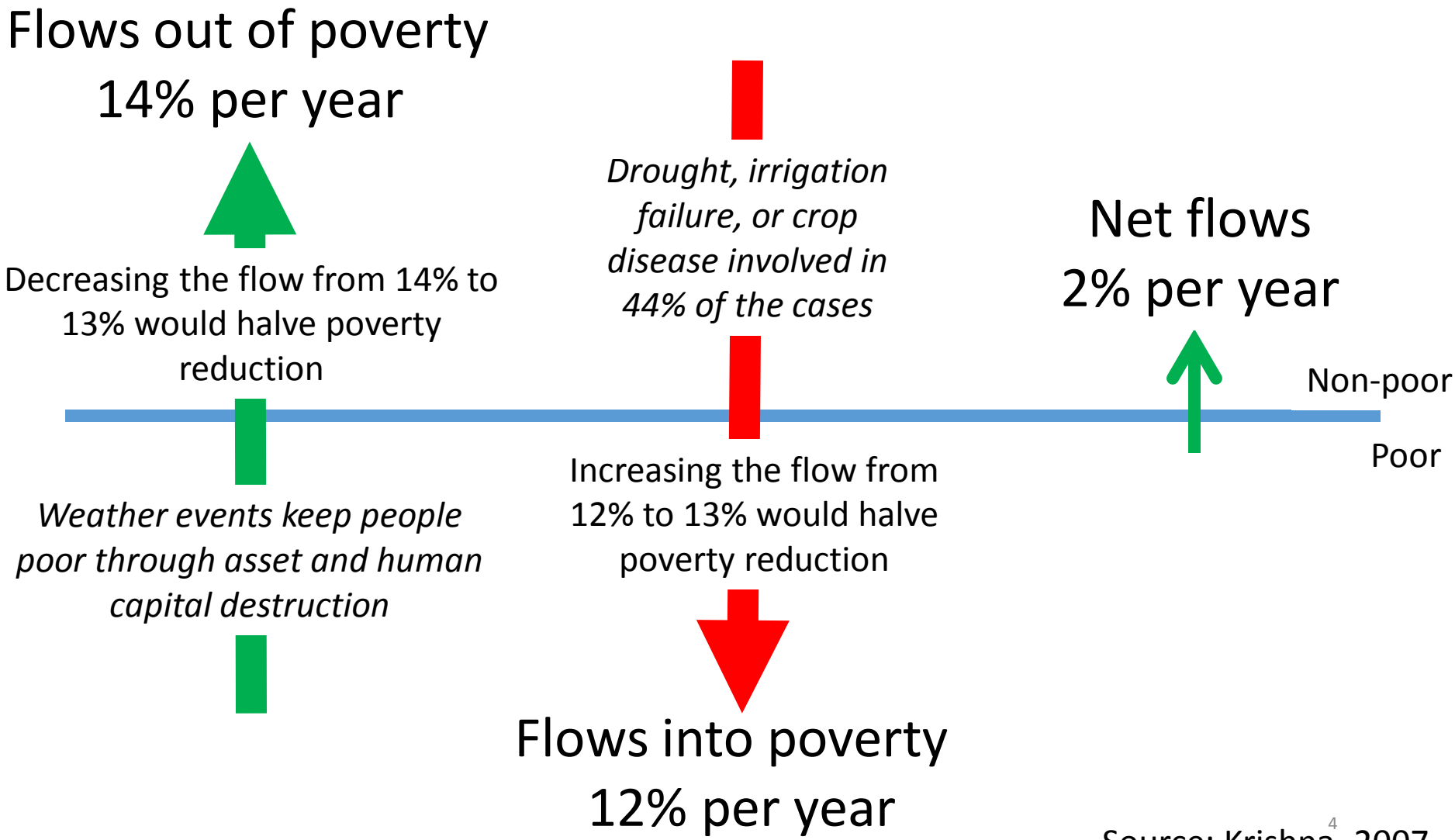
Google earth

Poverty dynamics
An example in India (Andhra Pradesh)



Source: Krishna, 2007

Common shocks that drive or keep people in poverty….

Spikes in food prices and shocks to agricultural or ecosystem-based income

Natural disasters such as droughts, floods, and storms

Disease and health shocks, such as malaria, diarrhea, stunting, and mental disorders

… will be worsened by climate change

Poor people are often more exposed to these shocks – take the case of Nigeria

Poor people are 50% more likely to be flooded

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Poor people are 50% more likely to be flooded

Poor people are 130% more likely to be affected by a drought

Poor people are often more exposed to these shocks – take the case of Nigeria

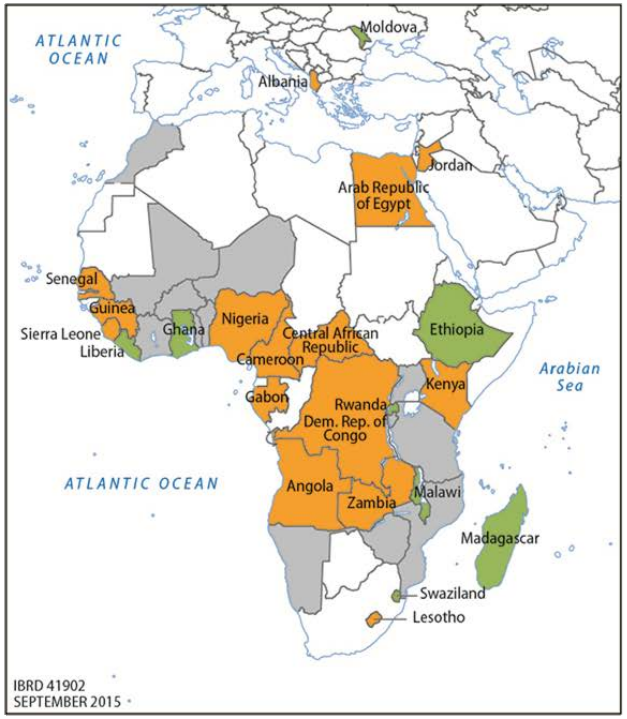
Poor people are 50% more likely to be flooded

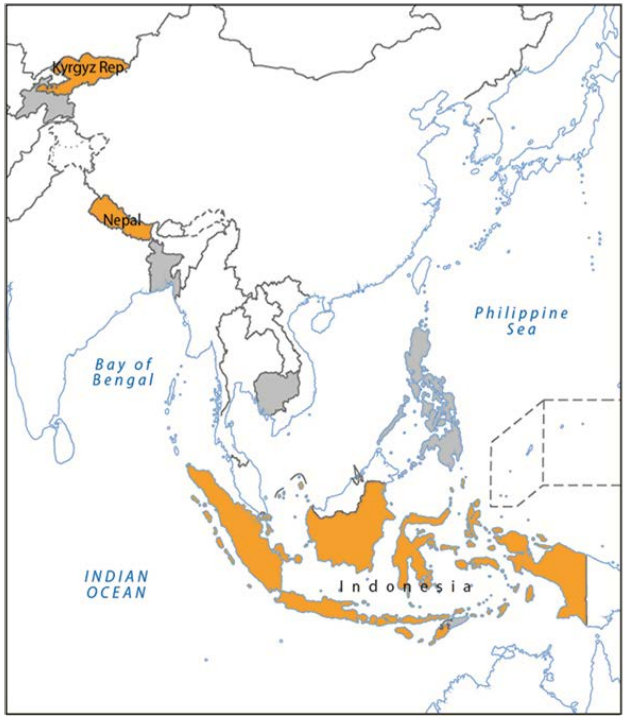
Poor people are 130% more likely to be affected by a drought

Poor people are 80% more likely to be affected by extreme heat

Poor people are often more exposed to these shocks – take the case of urban floods

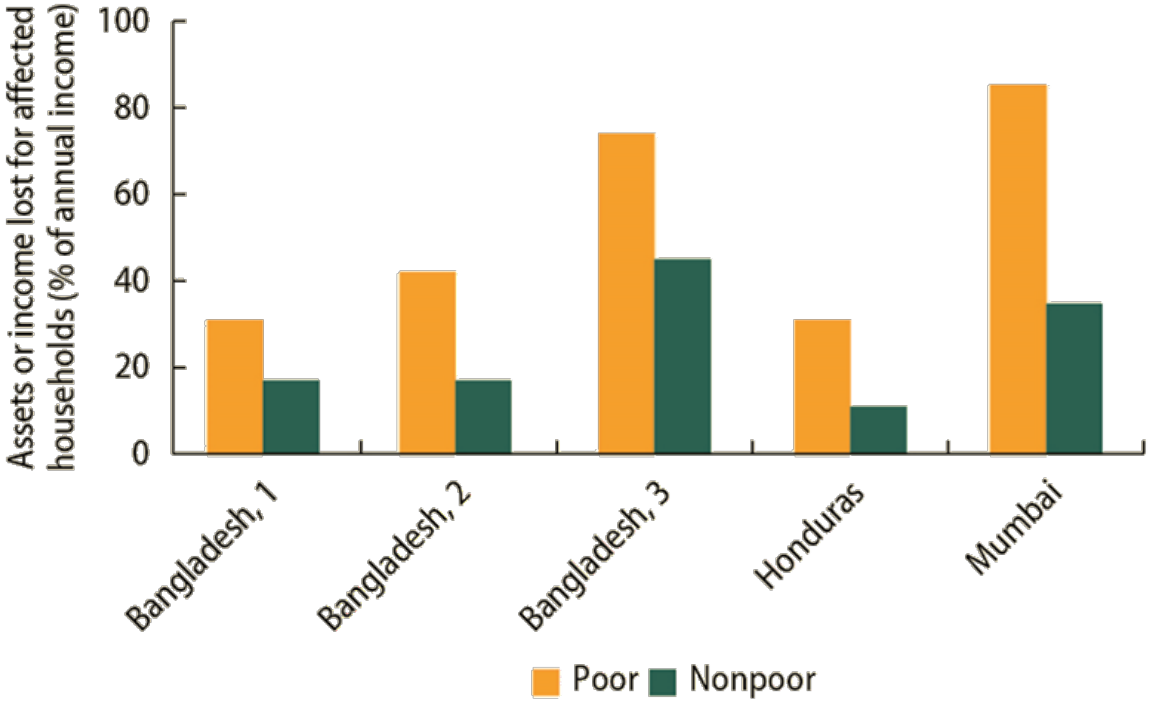
In most (but not all) countries, poorer urban dwellers are more likely to live in flood zones





based on Winsemius et al., forthcoming

Poor people are always much more vulnerable to natural hazards



Poor people have less access to support

		Saved at a financial institution	Average transfer from social protection
Indonesia	Poor	8%	$0.5/day
	Non-poor	21%	$2/day

Poor people have less access to support to cope and adapt

		Saved at a financial institution	Average transfer from social protection
Indonesia	Poor	8%	$0.5/day
	Non-poor	21%	$2/day
Malawi	Poor	4%	$0.05/day
	Non-poor	11%	$0.17/day

Effects on poverty depends on multiple factors, including existing inequalities and socio-economic capacity

Hazard

Exposure (poor people)

Exposure (non-poor people)

Vulnerability (Poor people)

Vulnerability (non-poor people)

Socio-economic capacity (poor people)

Socio-economic capacity (non-poor people)

ASSET LOSSES

WELFARE LOSSES = LOSSES IN TERMS OF WELL-BEING

(New paper on the definition of resilience indicator, applied in 90 countries)

$$\text{Socio-economic resilience} = \frac{\text{Asset losses}}{\text{Welfare losses}}$$

Main Message #2

Rapid, inclusive, and climate-informed development can **prevent most consequences of climate change** on poverty till 2030.

Absent such good development, climate change could add more than **100 million people** in extreme poverty by 2030.

In the absence of climate change, we can imagine two different ways for the world to evolve

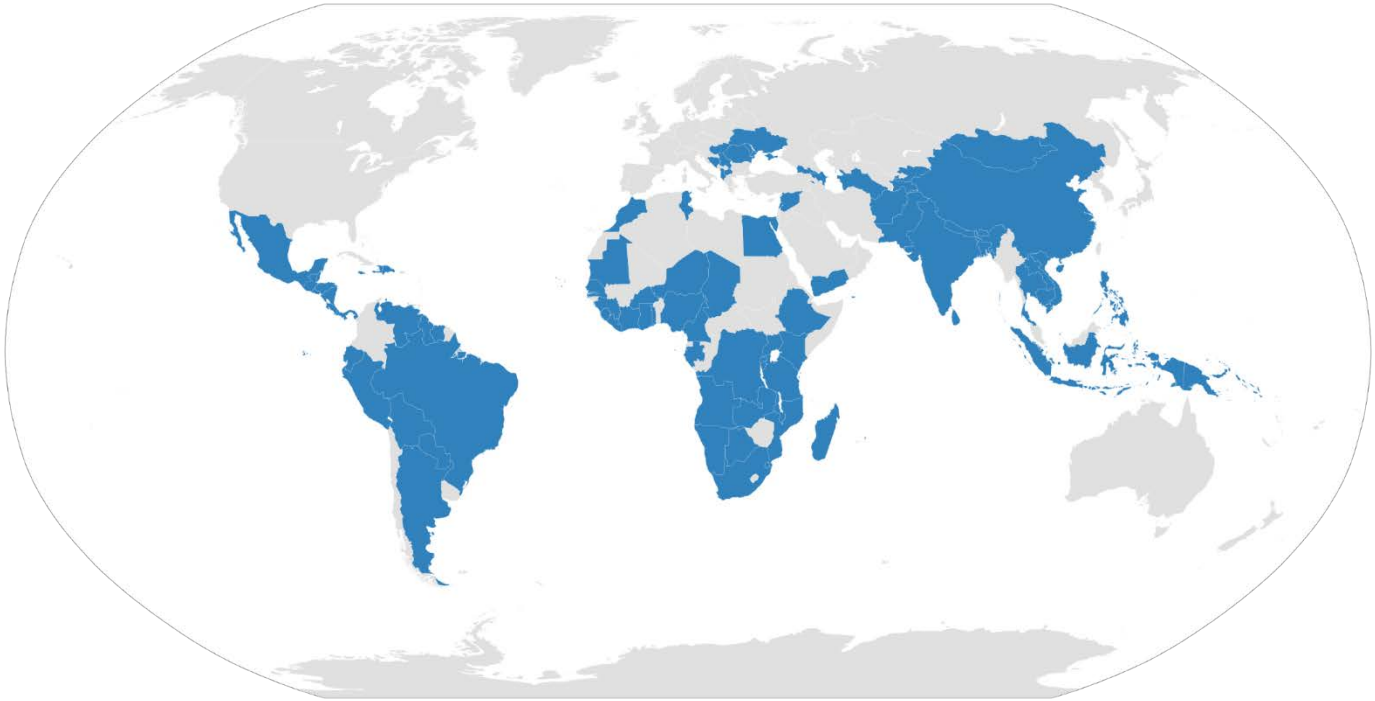
Prosperity
More optimistic on:
- Economic growth
- Poverty
- Inequality
- Basic services

Poverty
Less optimistic on:
- Economic growth
- Poverty
- Inequality
- Basic services

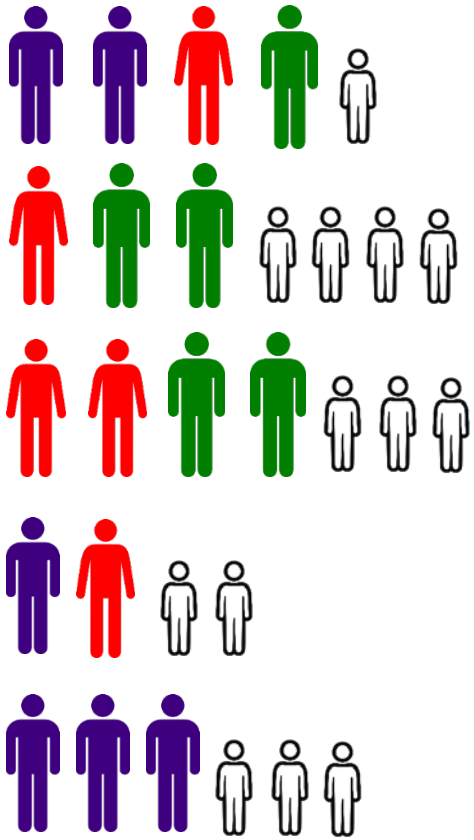
Then, we introduce climate change in these two scenarios.

And we explore what development can achieve to reduce future climate change impacts

We use a harmonized database of 92 household surveys

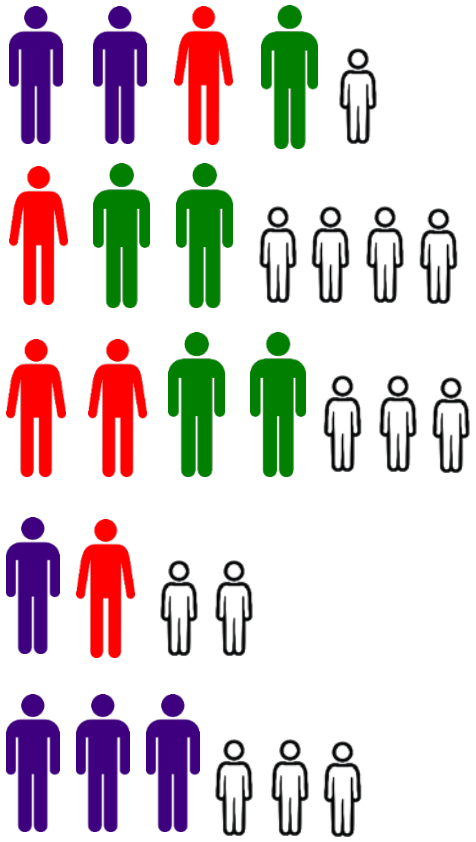


These surveys include a set of representative households…



Weight in 2007	Income in 2007
10,000	10
50,000	5
200,000	3
200	25
4,000	70

We use a micro-simulation model to “project” these households into 2030

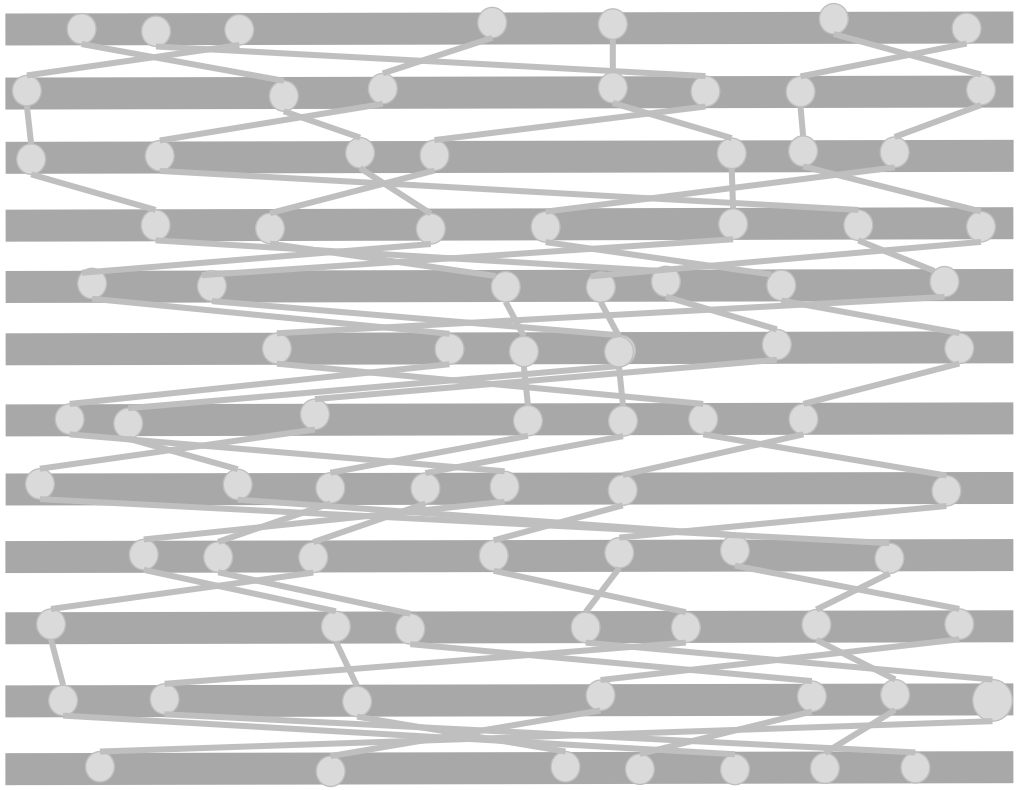


Weight in 2007	Income in 2007	Weight in 2030	Income in 2030
10,000	10	15,000	30
50,000	5	4,000	25
200,000	3	50,000	5
200	25	2,000	70
4,000	70	10,000	150

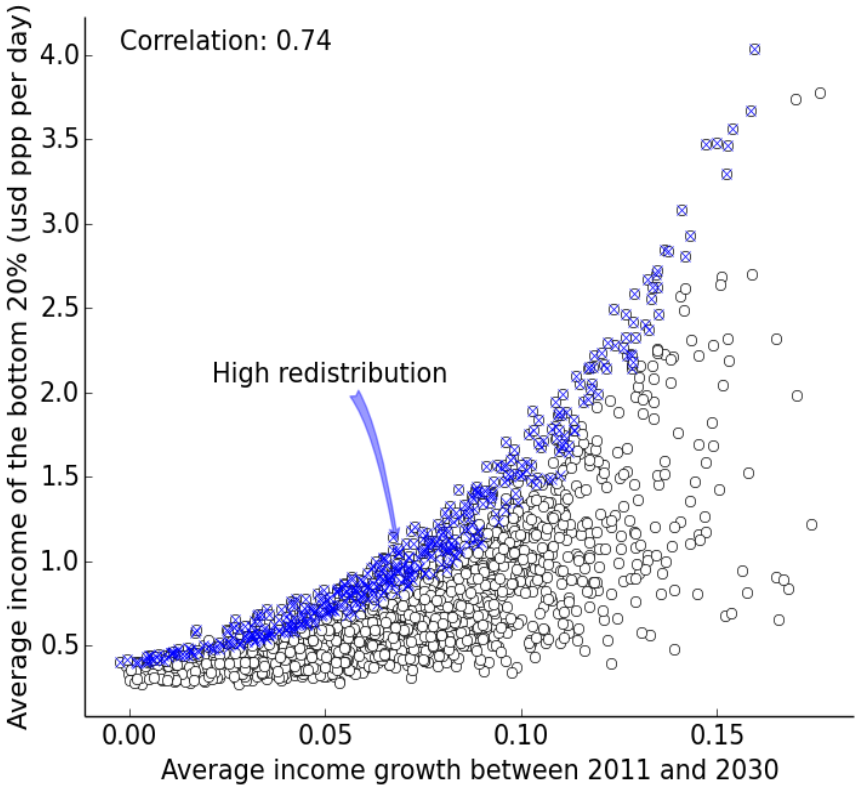
We systematically vary the parameters of the model

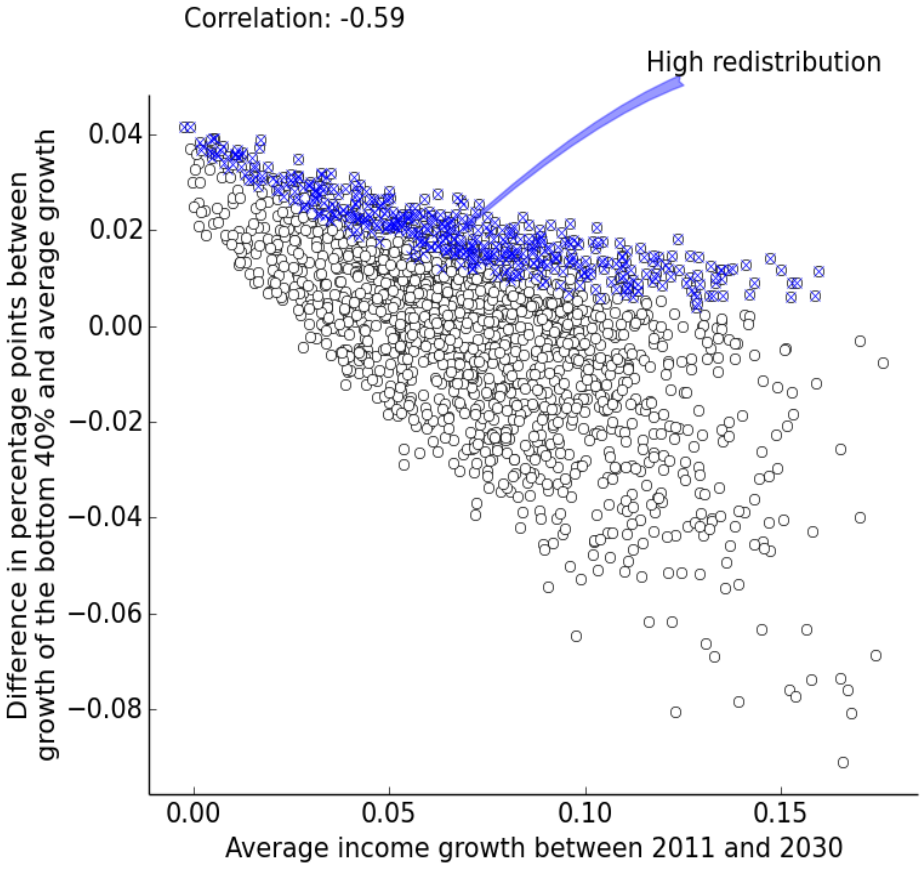
Boundaries are country specific

Productivity growth in agriculture	0%	6%
Productivity growth in manufacture	0%	6%
Productivity growth in services	0%	6%
Skill premium in agriculture	1	5
Skill premium in manufacture	1	5
Skill premium in services	1	5
Labor share of agriculture	40%	70%
Labor share of manufacture	20%	50%
Participation in labor force	60%	80%
Demography	ssp5	ssp4
Welfare transfers	0% GDP	15% GDP
Pensions	0% GDP	15% GDP

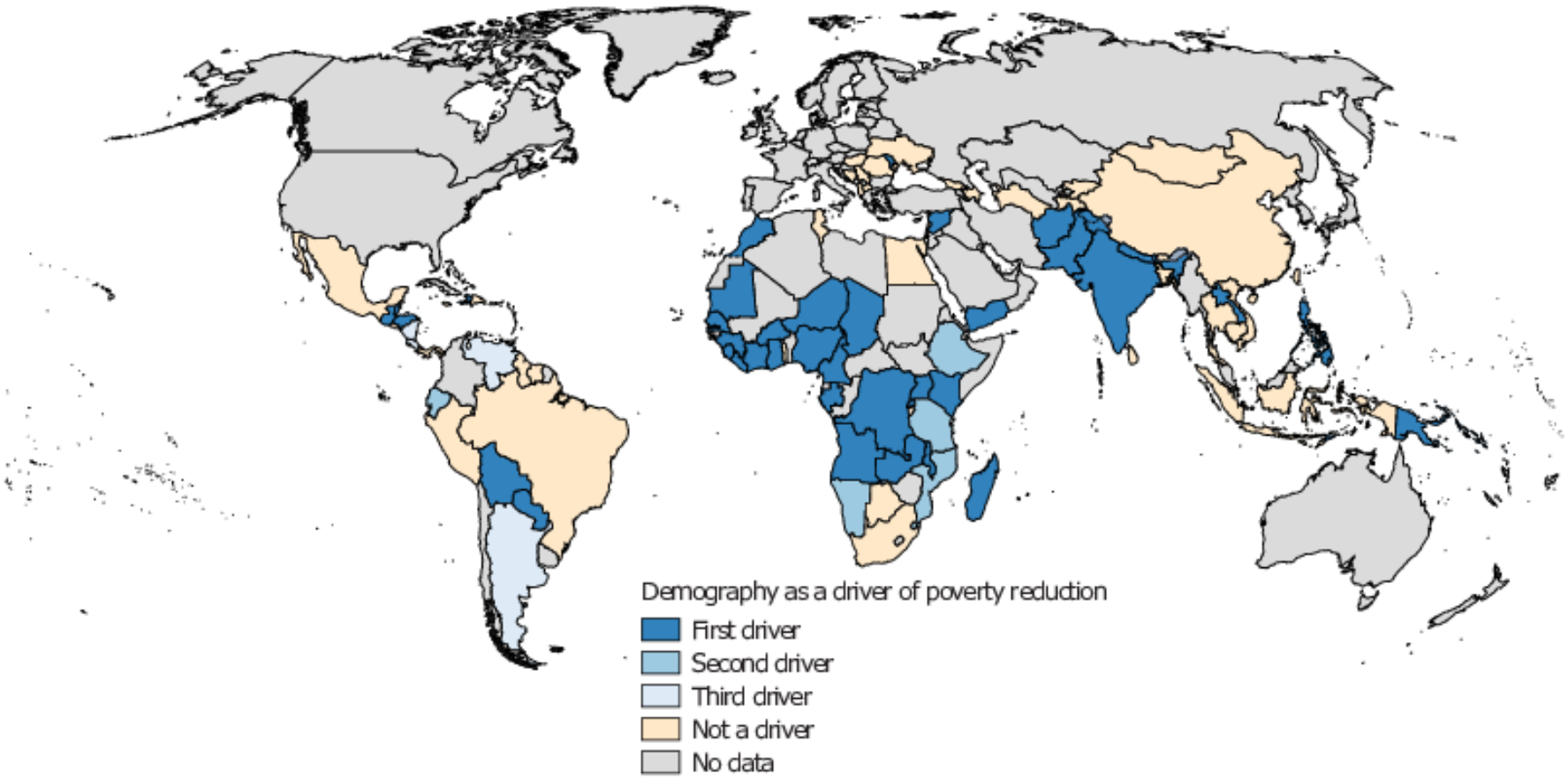


In each country, we create hundreds of scenarios to account for the large uncertainty. Example of Sierra Leone

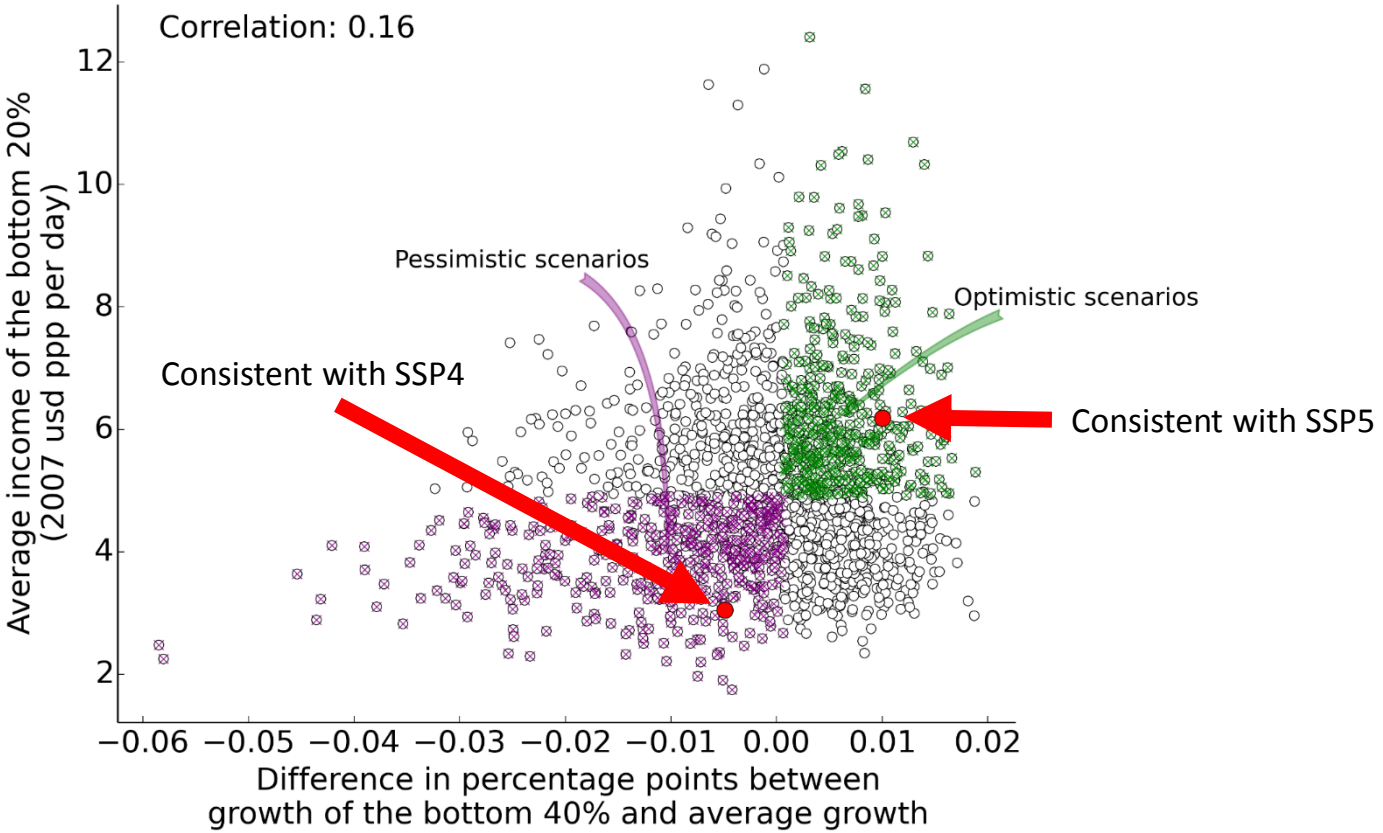




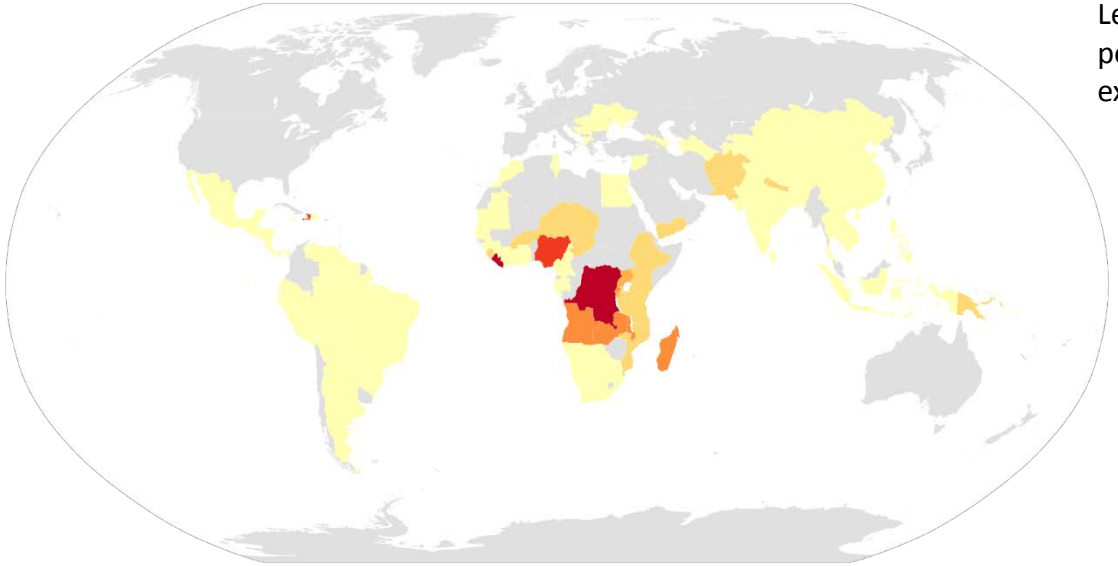
Identification of the main drivers of poverty reduction in each country



We identify two representative scenarios for each country (here, in Vietnam)



2 baseline scenarios

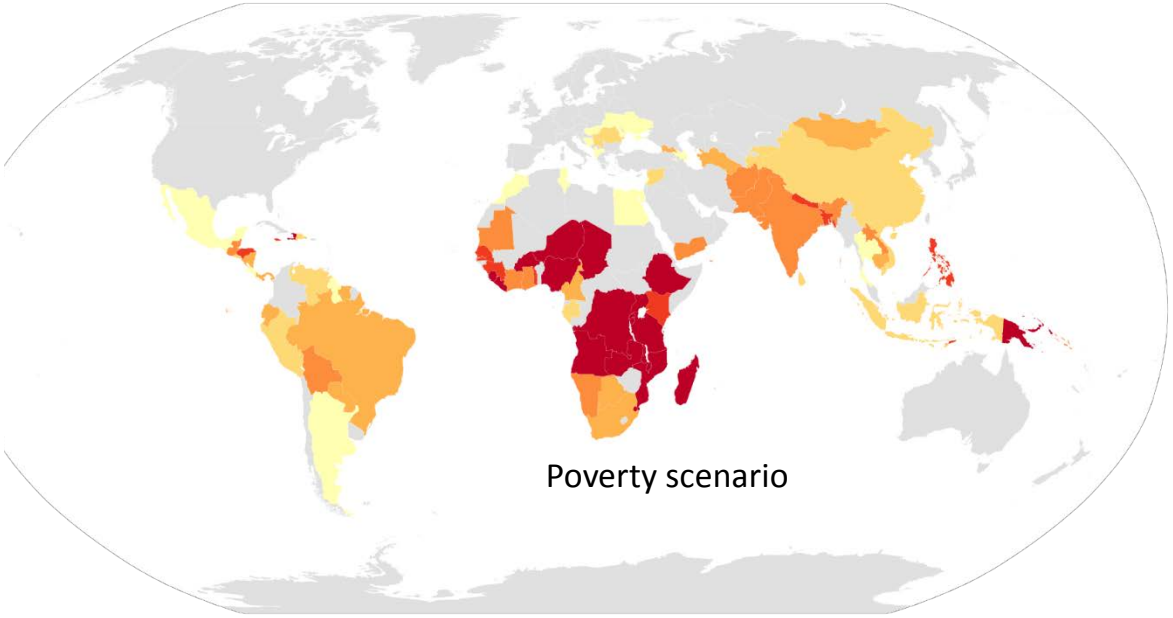


Less than 3% of global population below the extreme poverty threshold

Prosperity scenario

Share of population living with less than 1.25 usd per day in 2030

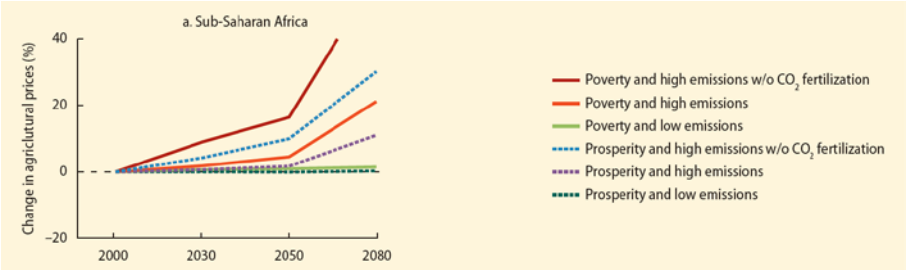
30.0 - 100 %
20.0 - 30.0 %
10.0 - 20.0 %
5.0 - 10.0 %
1.0 - 5.0 %
0 - 1.0 %



Poverty scenario

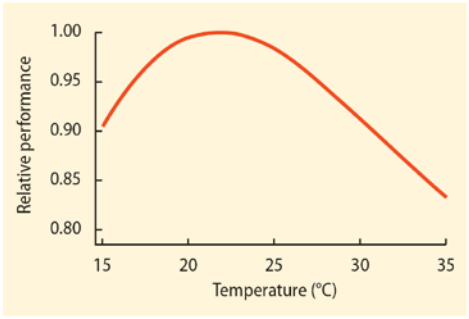
11% of global population below the extreme poverty threshold

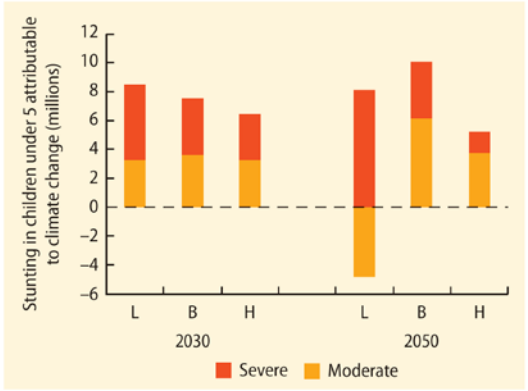
We add climate change impacts in 2030

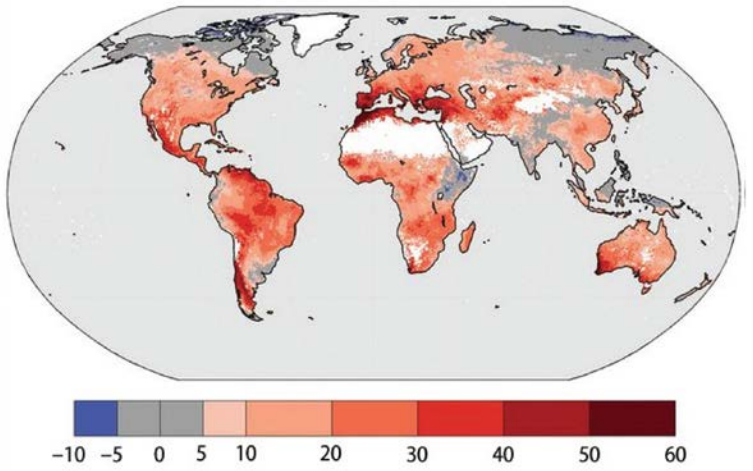


- Agriculture prices and productivity

  changes affect farmers income and everybody's consumption)
- Natural disasters affect income (floods, etc.)
- Health: stunting, malaria, diarrhea (cost of treatment, lost days at work, children development)
- Temperature impact on productivity

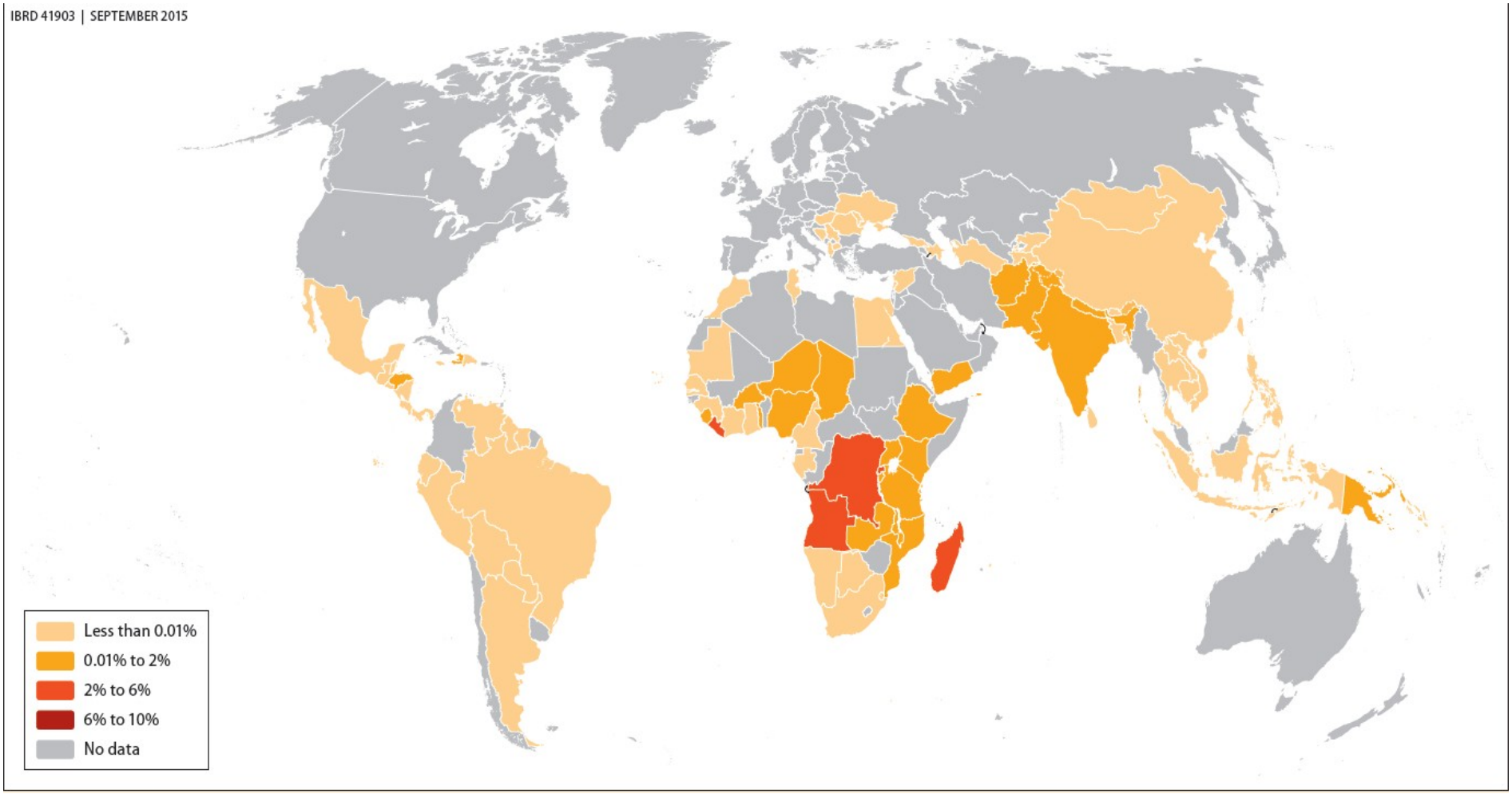






Good development – rapid, inclusive and climate-informed – can prevent most of the impact of climate change on poverty

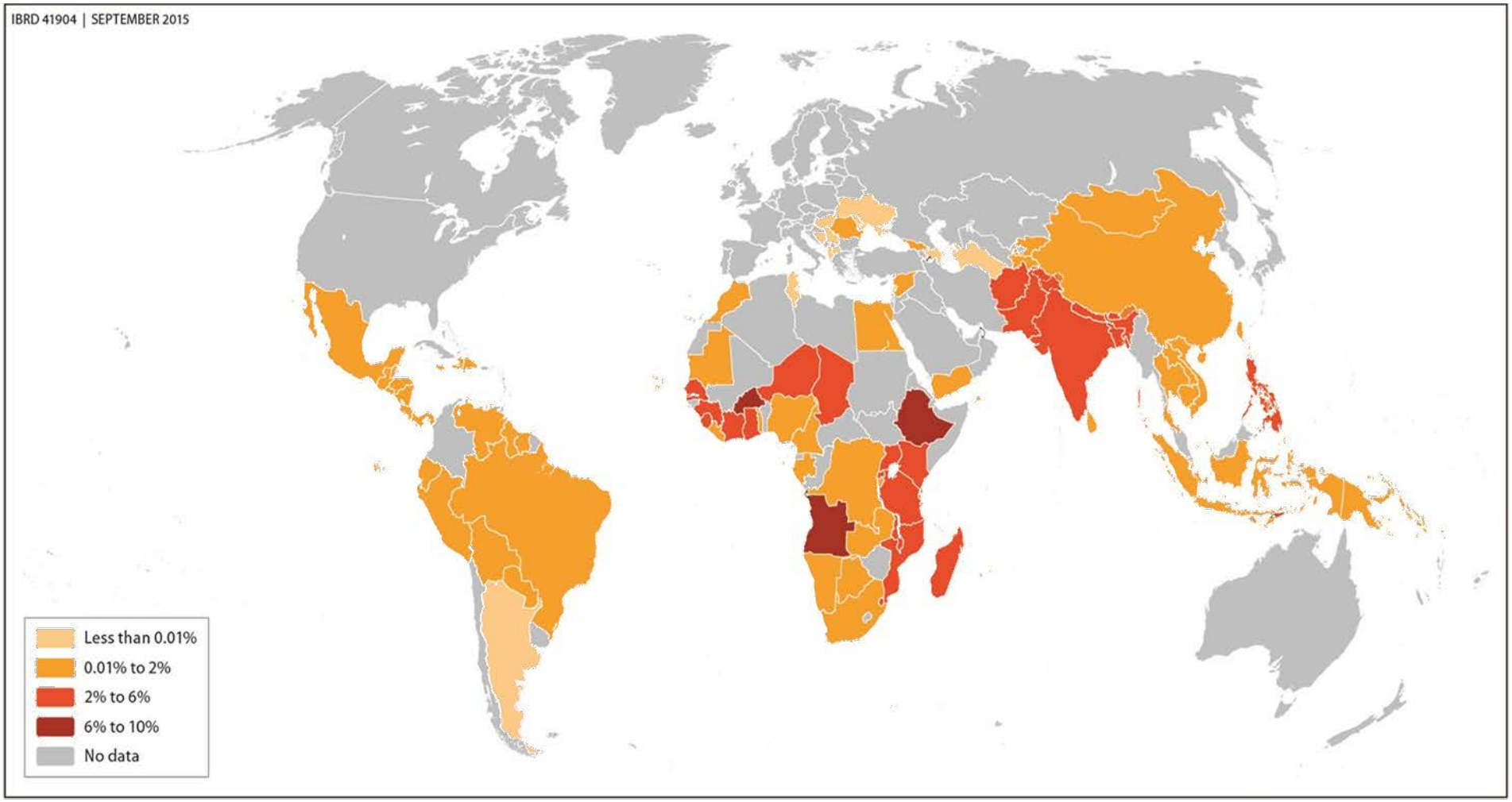
Prosperity Scenario



Up to 16 Million more people below the poverty line in 2030 due to climate change

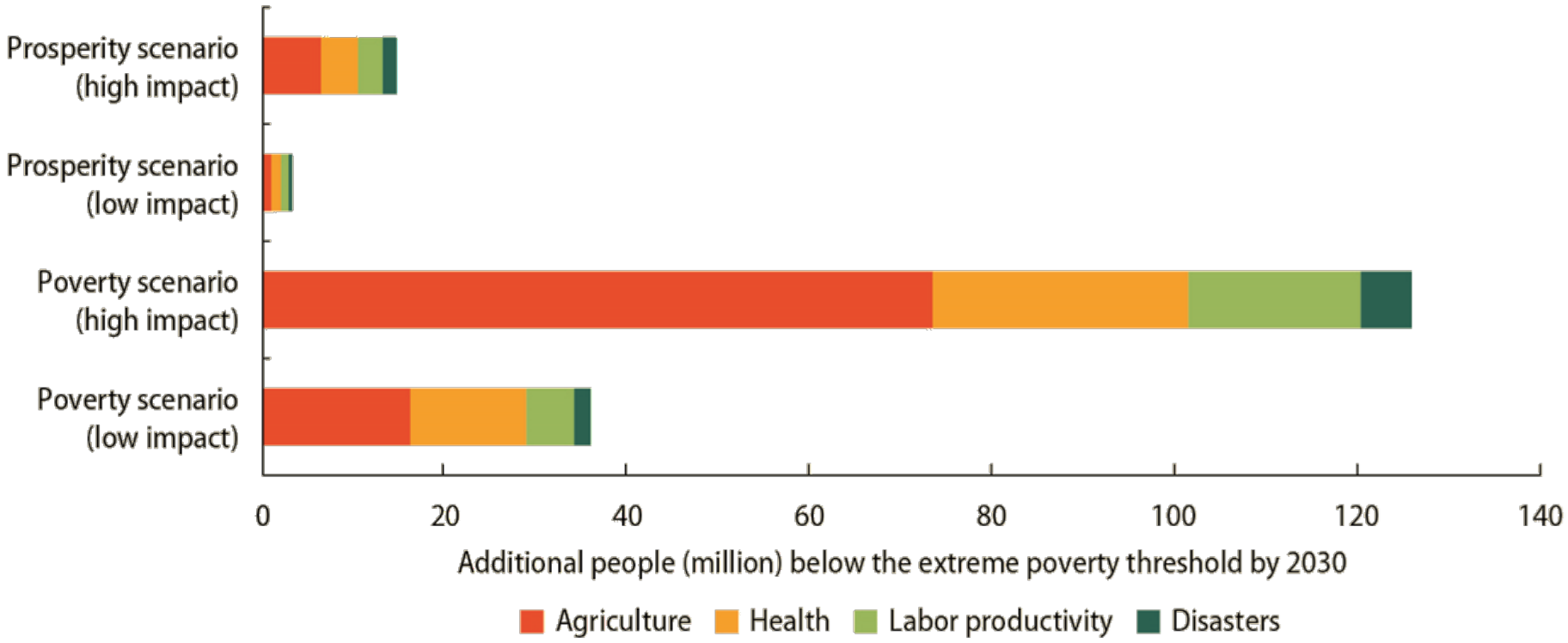
Absent good development, climate change could keep more than 100 million people in poverty, especially in Sub-Saharan Africa and South Asia

Poverty Scenario



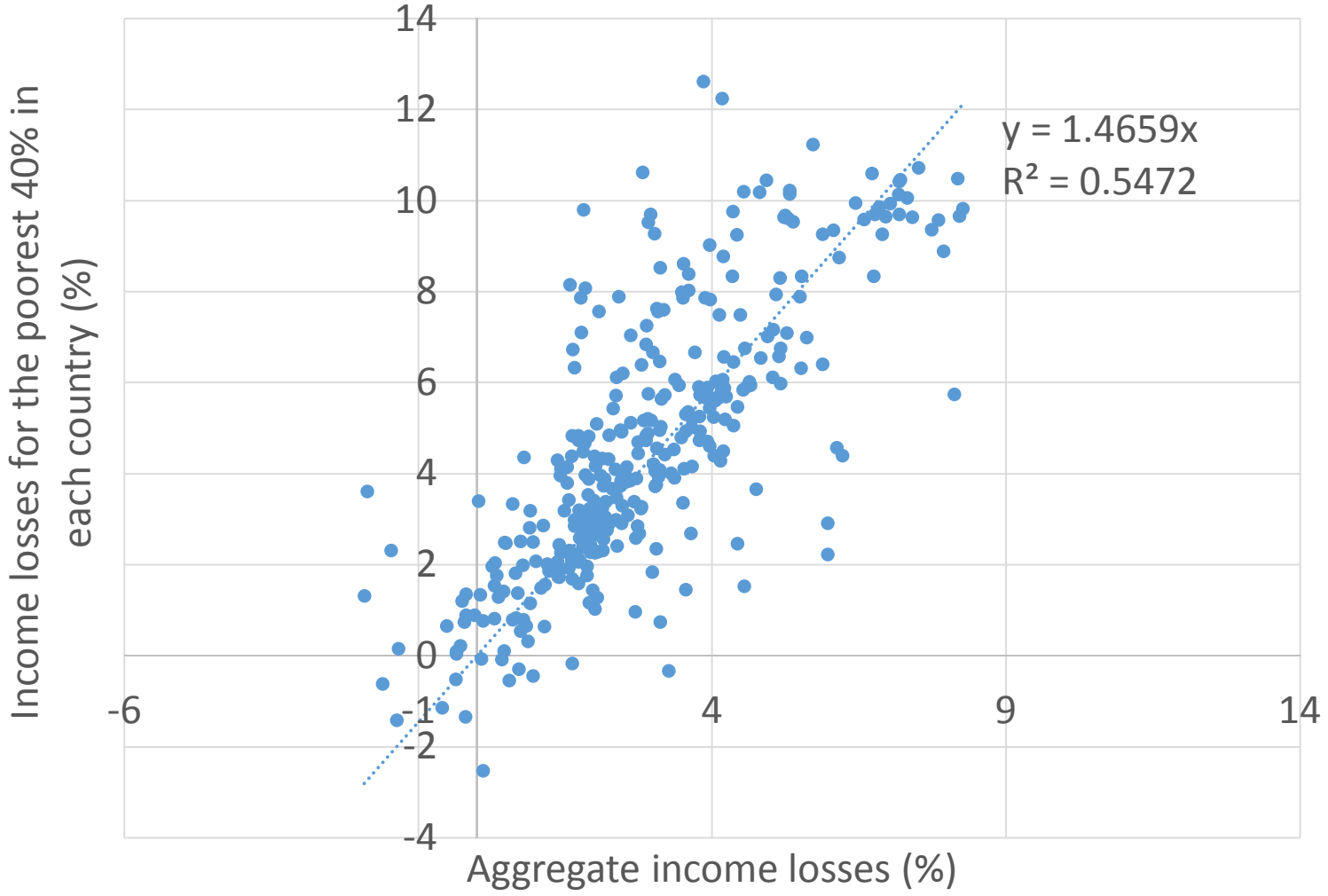
Up to 122 million more people below the poverty line in 2030 due to climate change

Agricultural impacts dominate at the global level



Overall, the negative impact of lower productivity on farmer incomes and higher prices on consumption dominate the positive impact of higher prices on farmer incomes

Climate change is likely to magnify pre-existing inequality



Much more work needed on natural disasters

- First question: how does natural risk affect investment and saving behaviors?

Effect of repeated capital losses on capital accumulation?

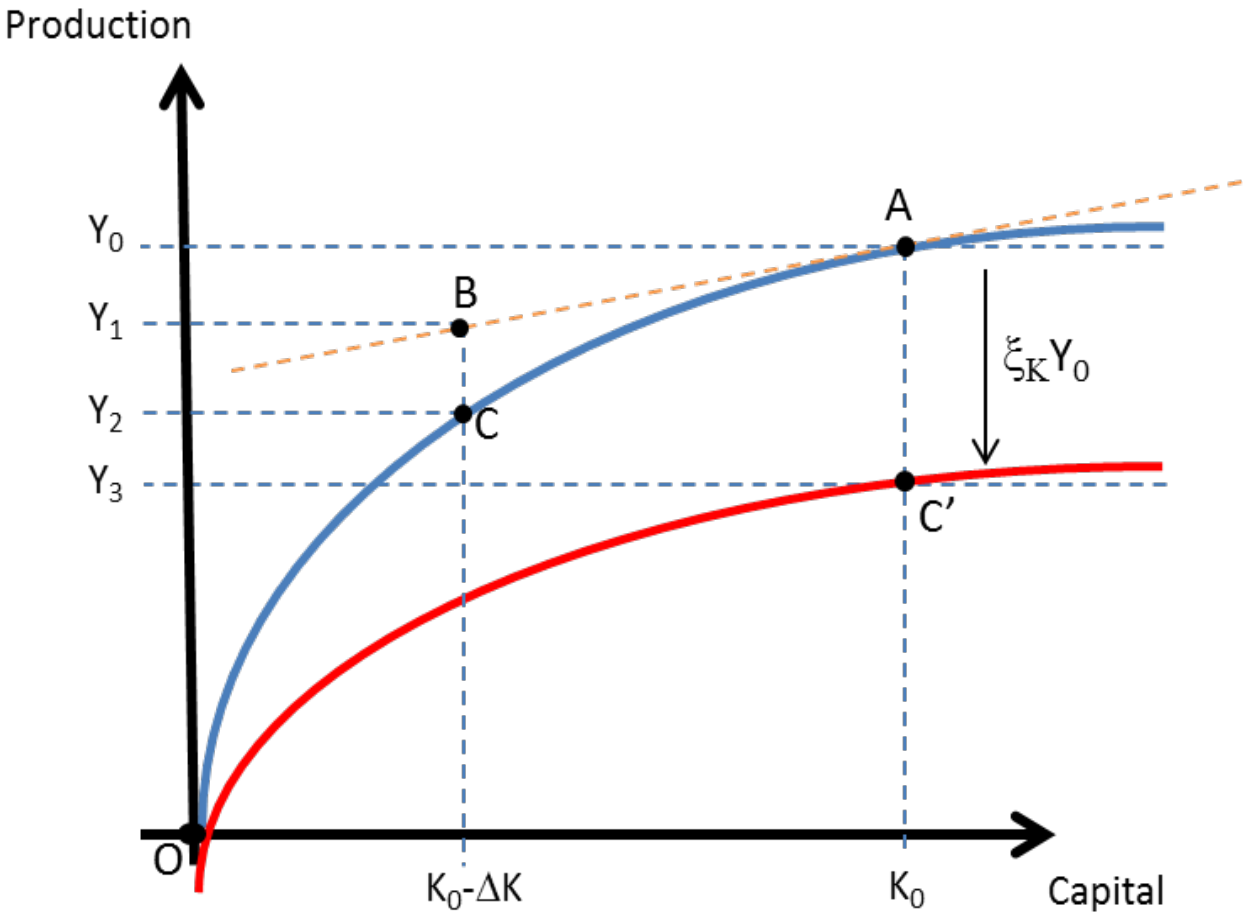
Effect of high natural risk on other forms of risk-taking?

Stress due to…	Average rank
Hectic life	1
Housing condition	2
Congestion	3
Transportation	3
Floods	3
Air pollution	5

In Mumbai (from *Archana Patankar)*

Much more work needed on natural disasters

- First question: how does natural risk affect investment and saving behaviors?
- Second question: how does capital destruction affects output and income?



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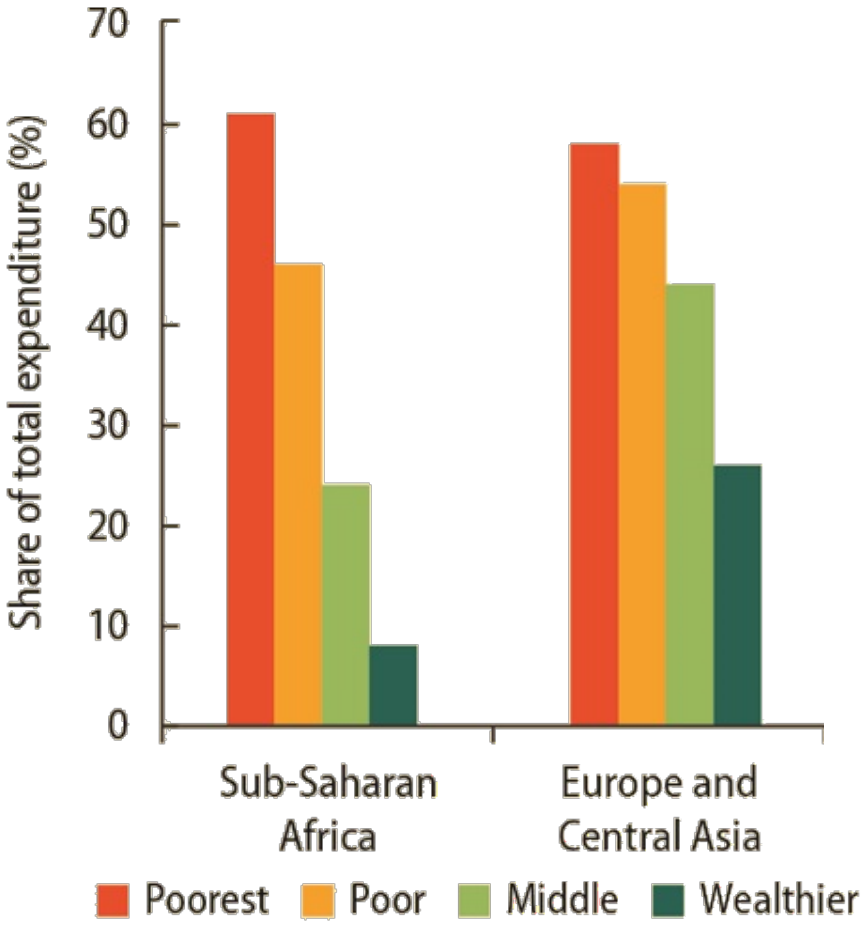
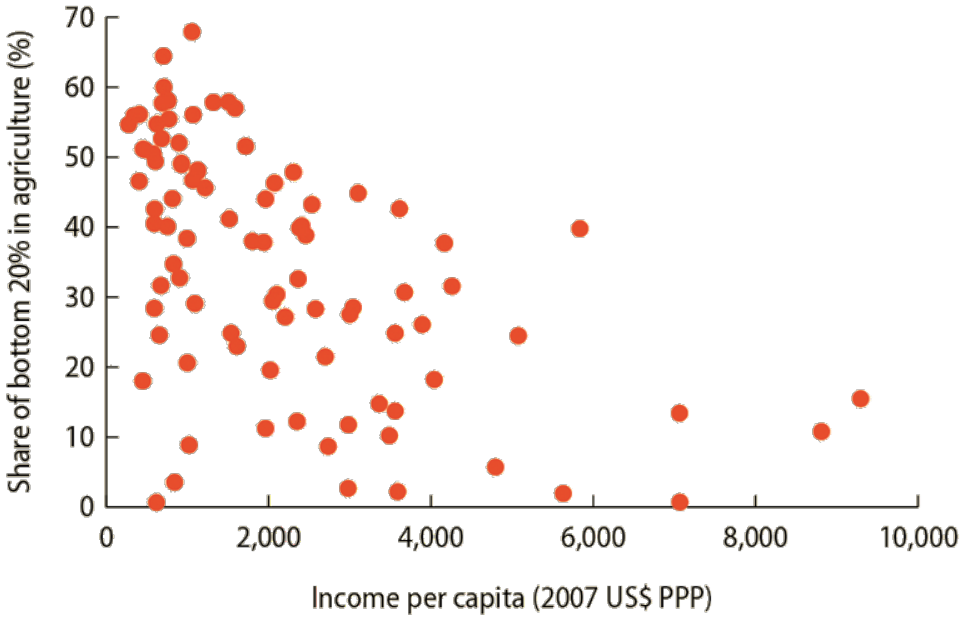
Poor people are more vulnerable to shocks to food prices or agricultural yields

They spend more on food



They depend more on agricultural income



Over-exposure of poor people is more visible at local scale

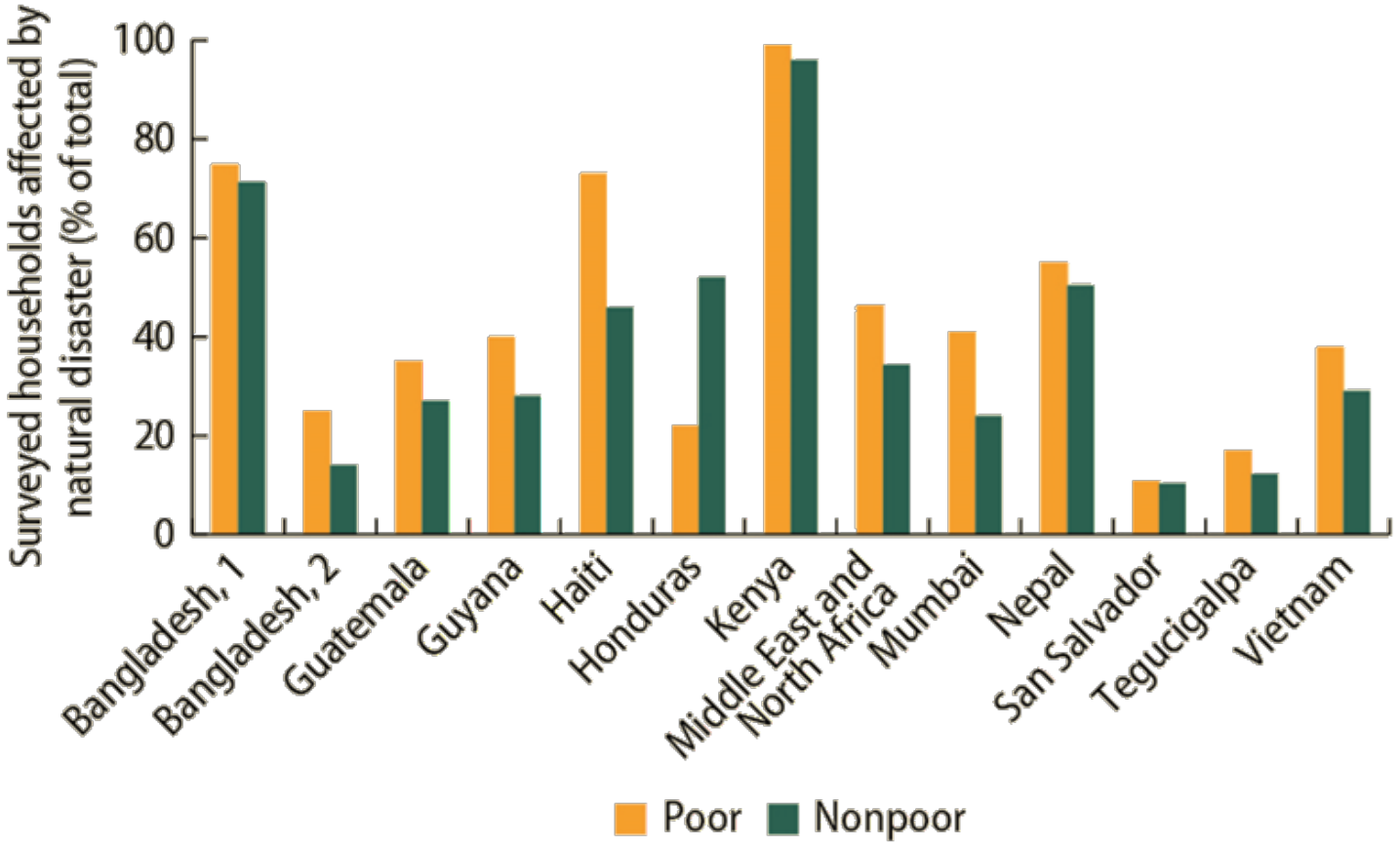
In the Mithi River Basin in Mumbai

Income (Rs. / month)	% of all HH (Greater Mumbai)	% Exposed to floods
<5,000	27%	44%
>20,000	6%	1%

Poor people are 10 times more likely to be exposed to floods

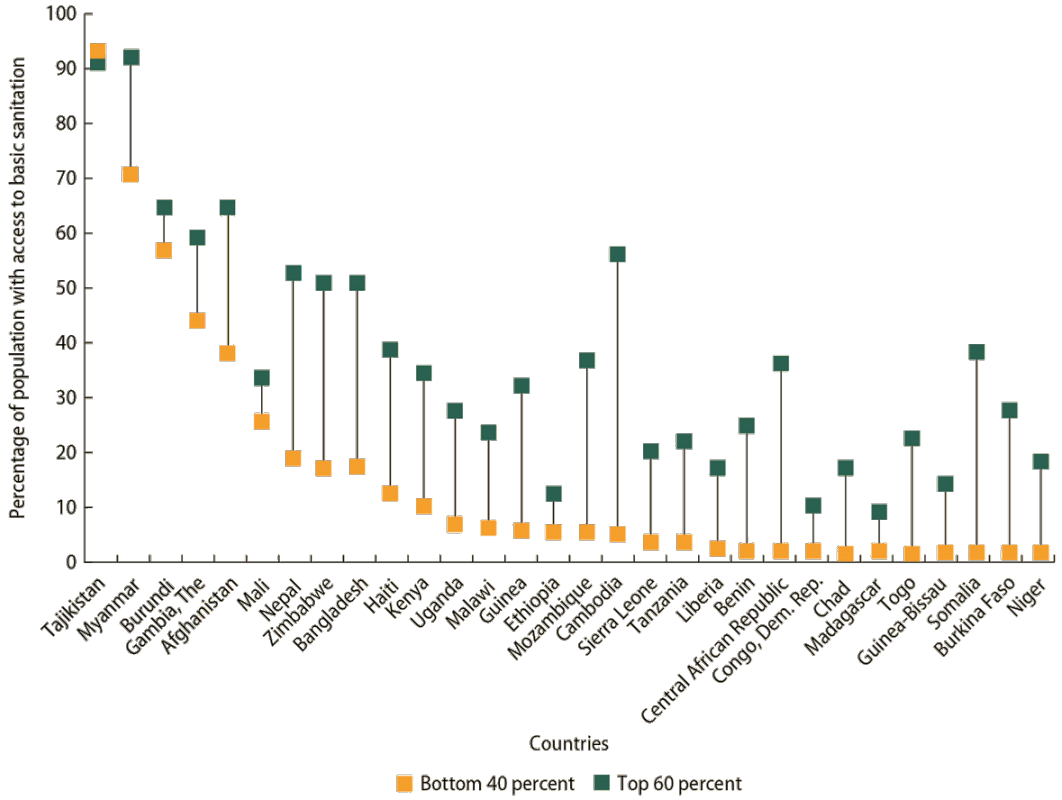
The richest do not live in flood zones

When disasters hit in the past, poor people were (slightly) more likely to be affected

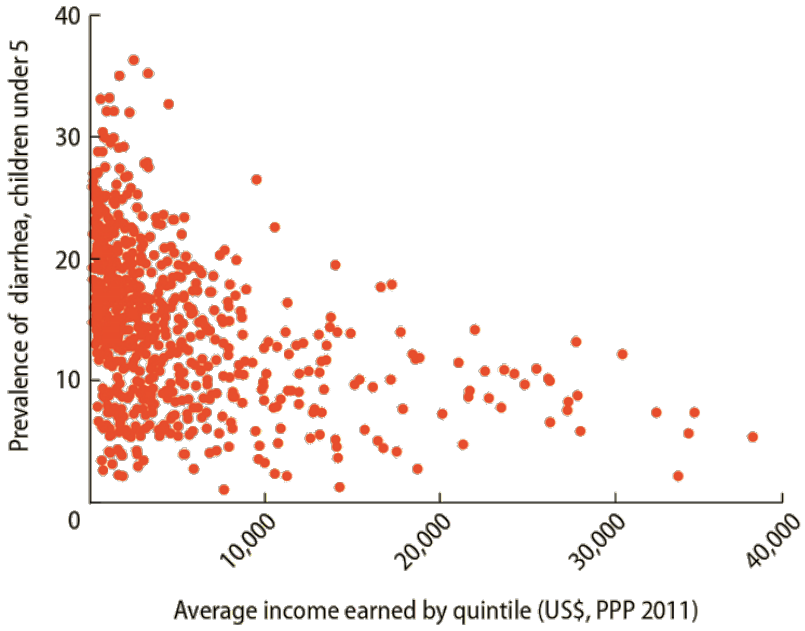


Poor people are more exposed to climate-sensitive diseases

With lower access to basic sanitation…

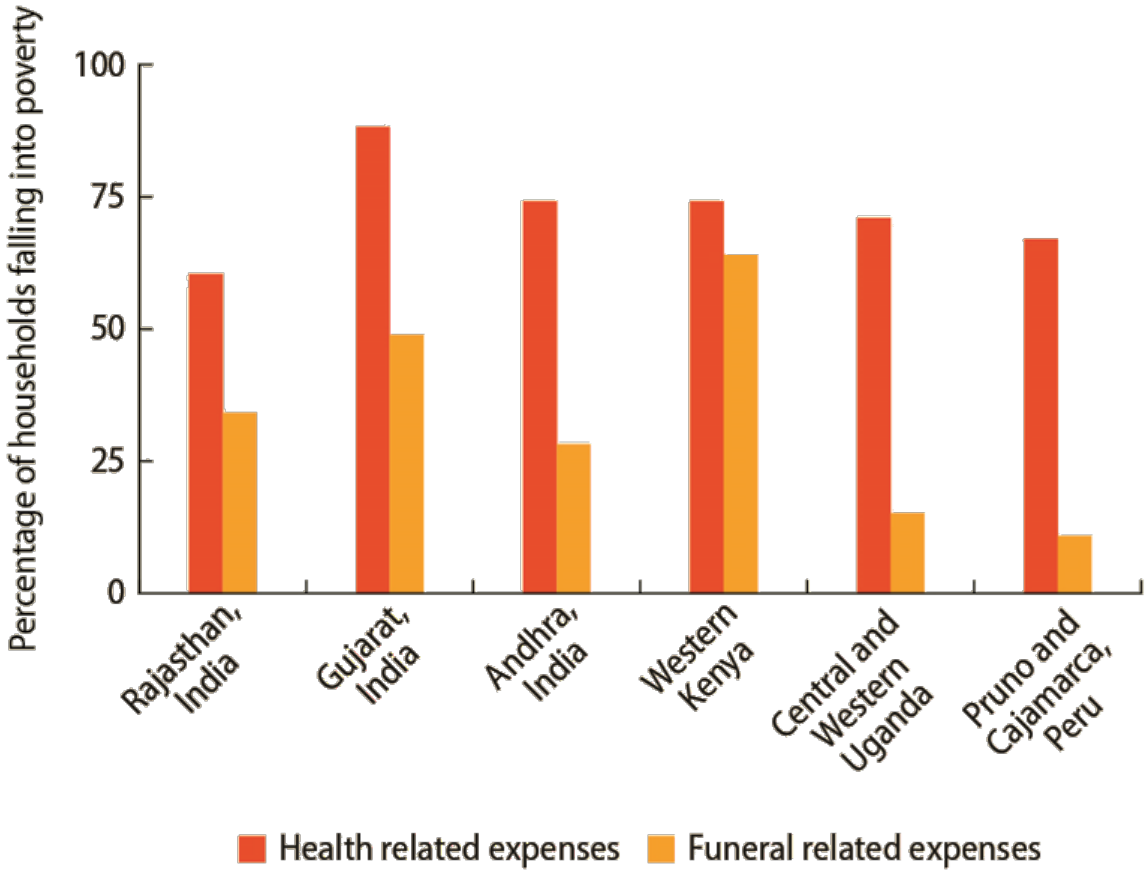


… poor people are more exposed to diarrhea

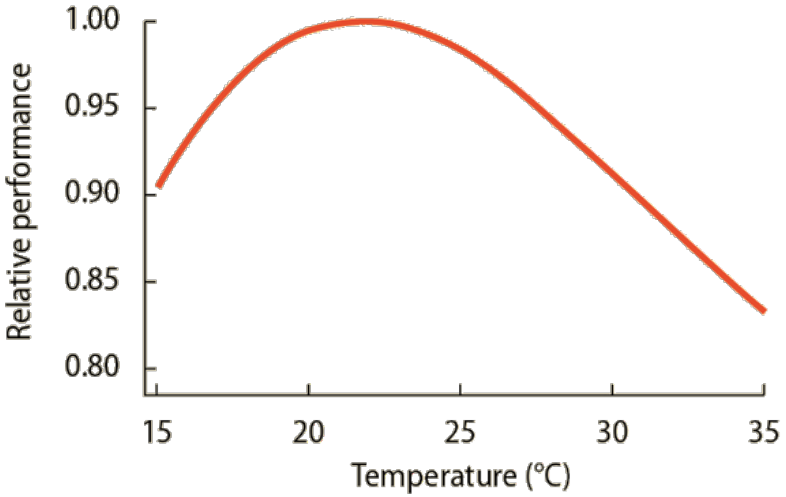


And health shocks contribute to poverty

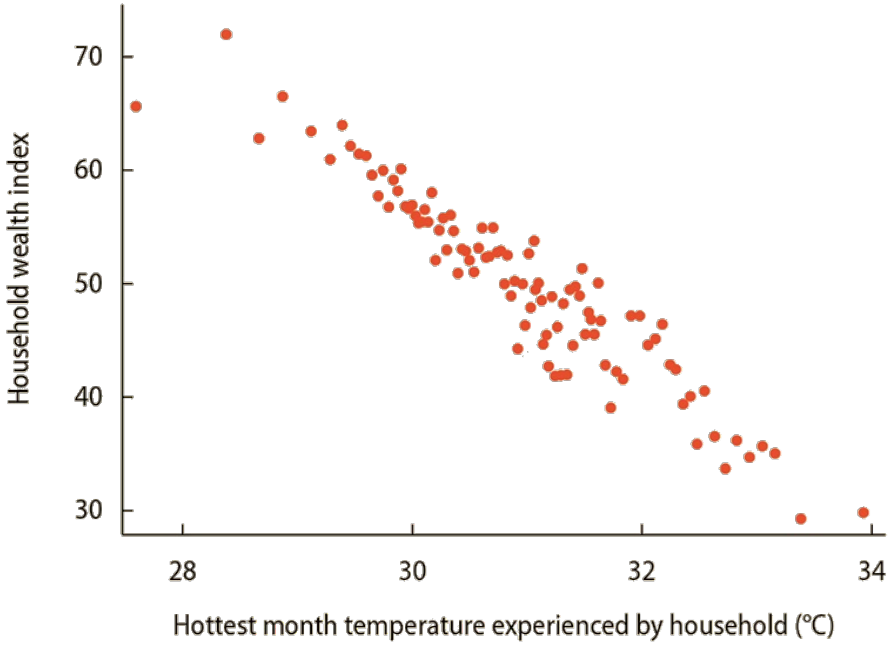
Percentage of households citing health and funeral expenditures as a principal reason for their descent into poverty



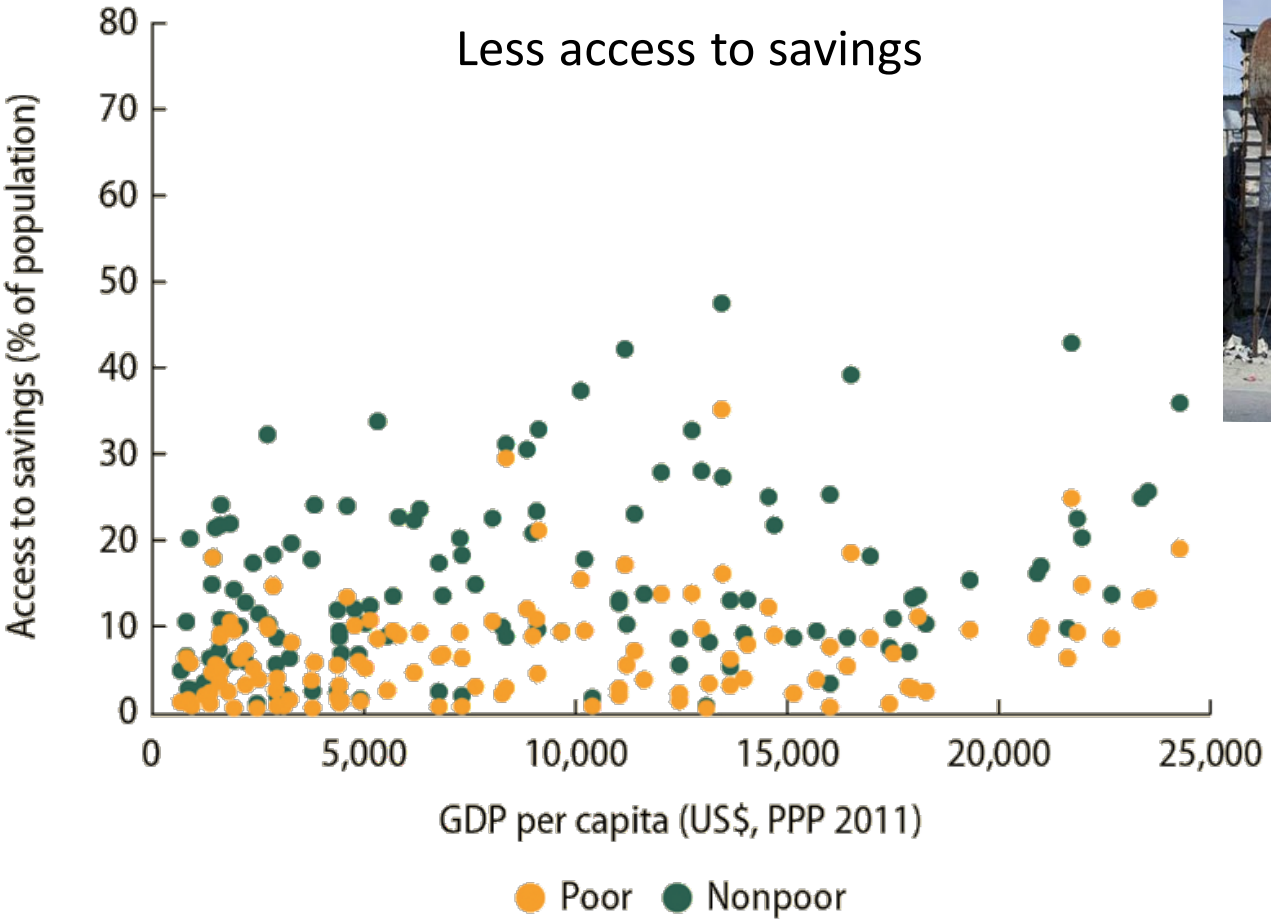
Poor people are more exposed to heat-related productivity losses



Poorer people live in warmer countries, and in the warmer regions of these countries… as in Nigeria



Poor people have less access to support



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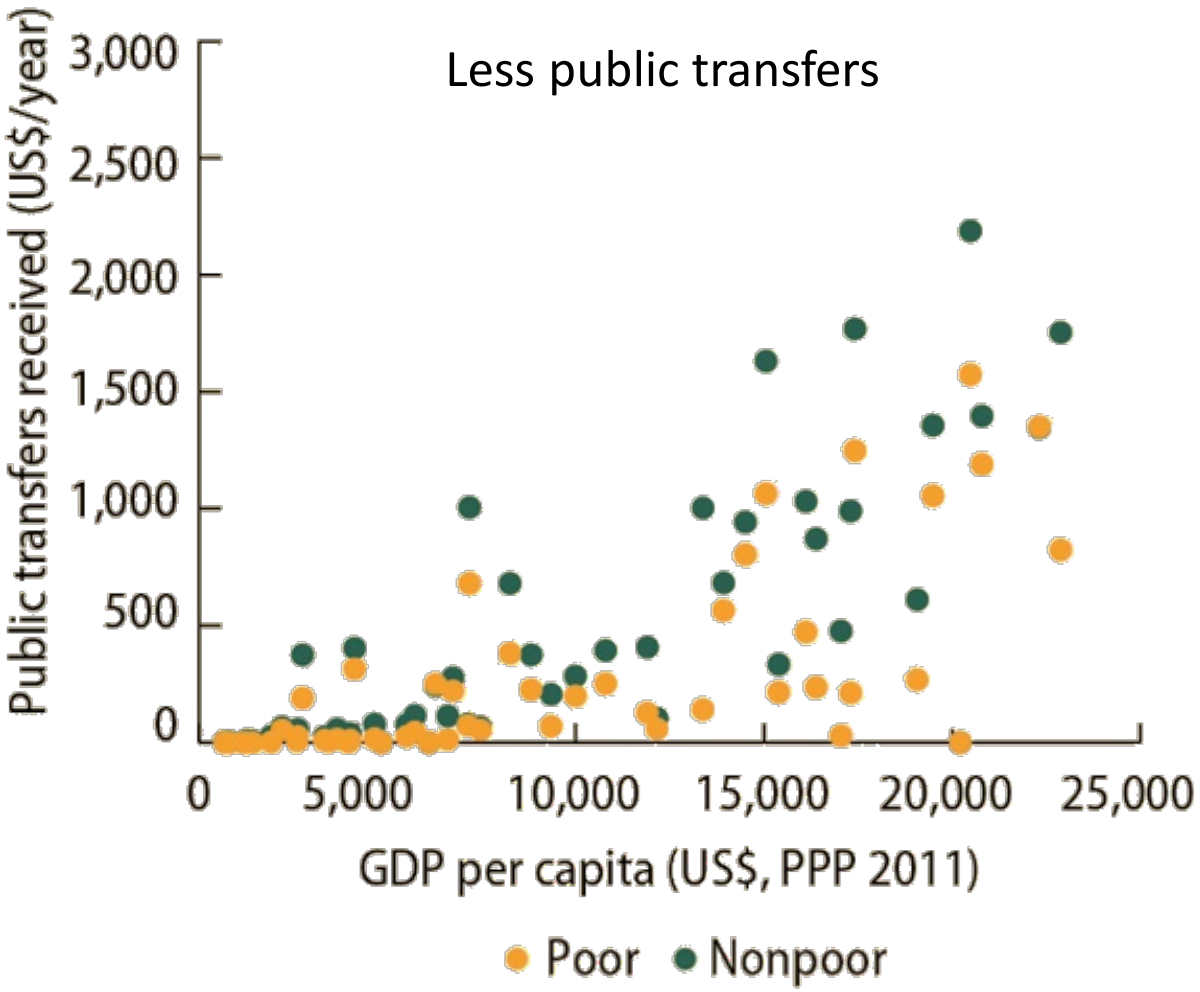
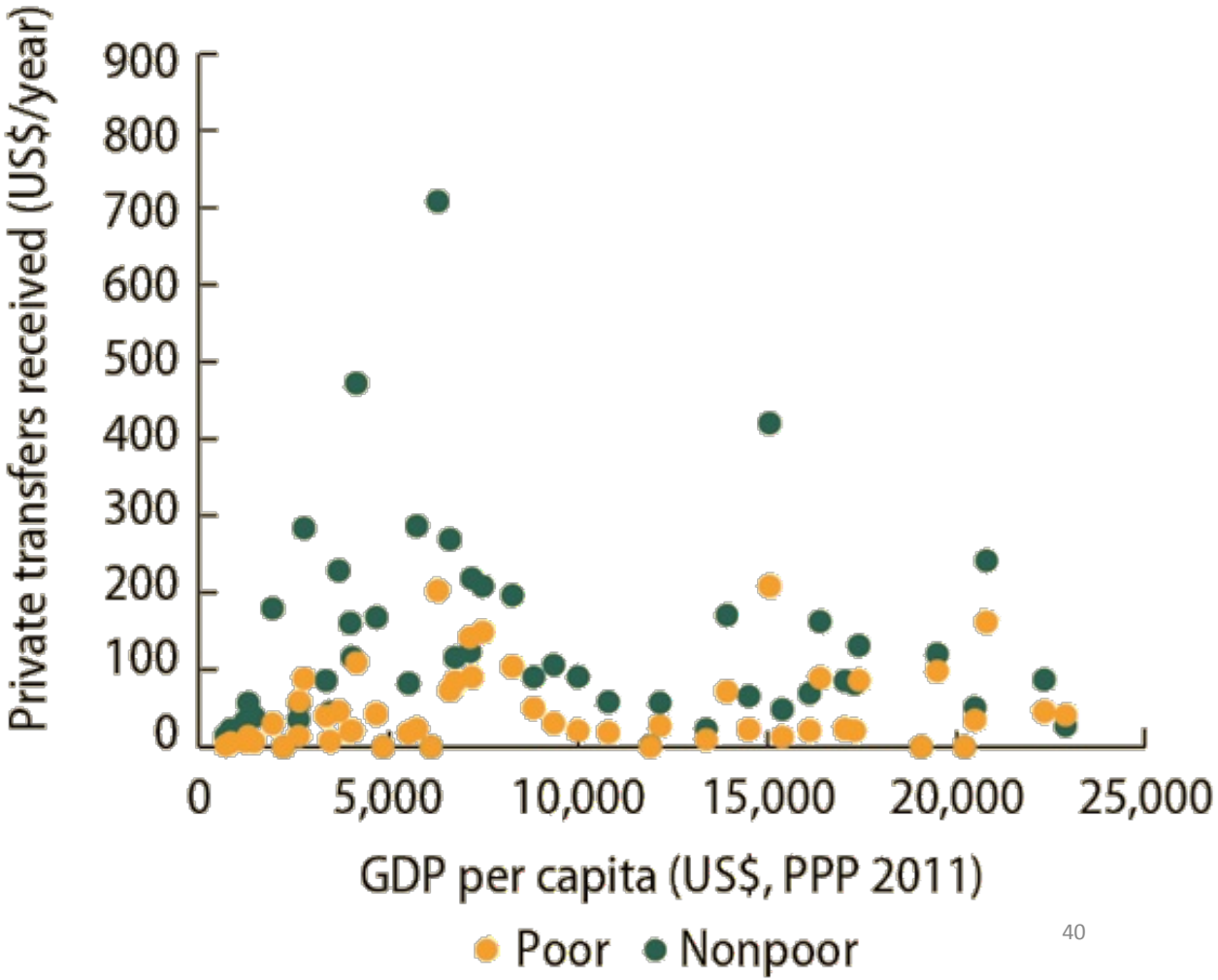
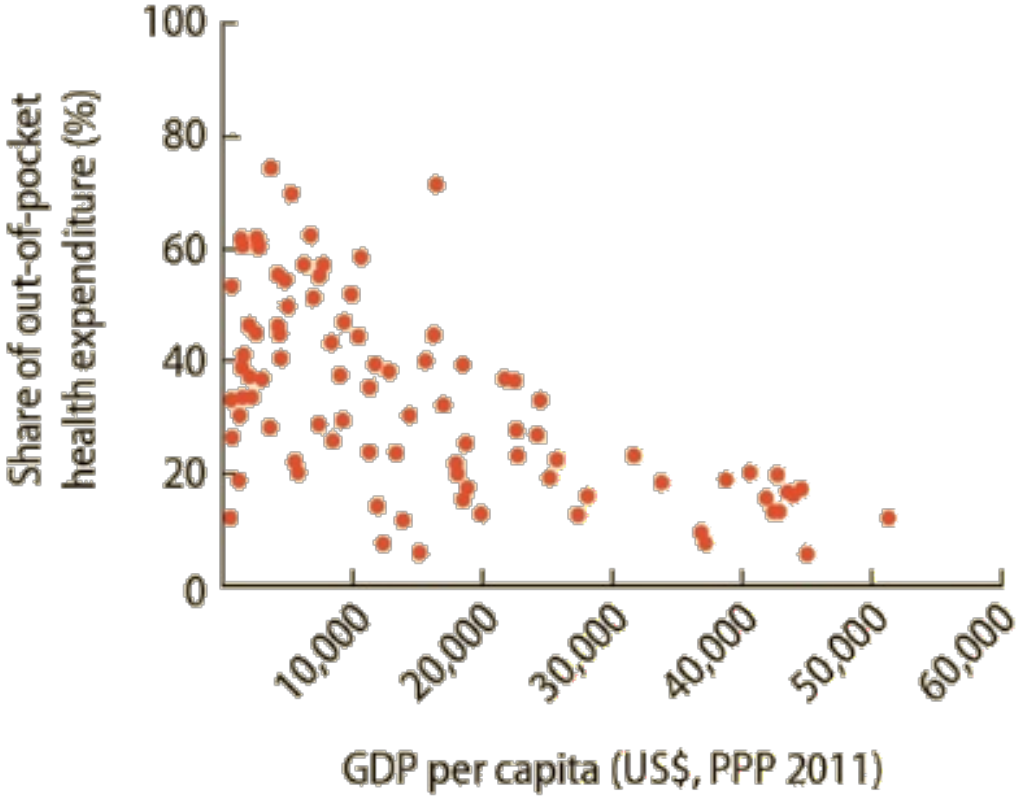


Poor people have less access to support

Less transfers from friends and family (remittances)

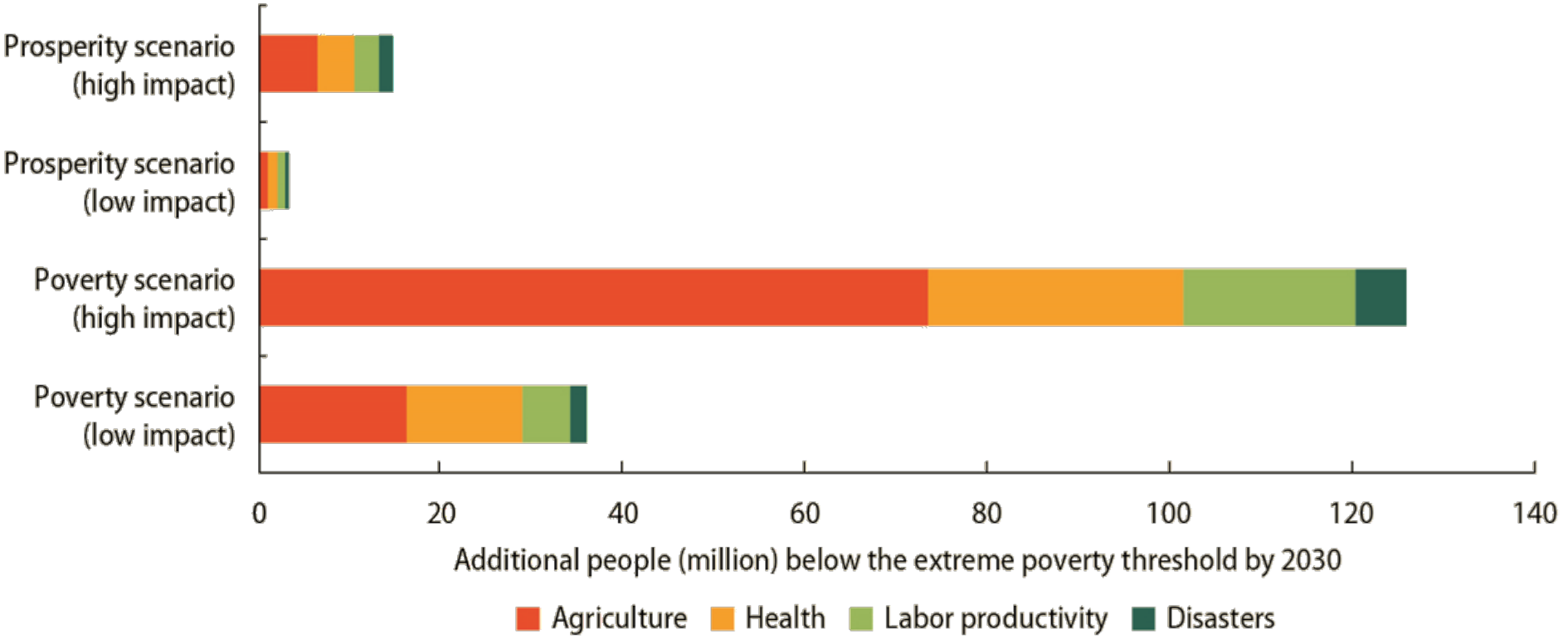


And people in poor countries mostly pay out-of-pocket their health expenditure



The WHO estimates that 100 million people fall in poverty every year because of health expenses

Agricultural impacts dominate at the global level



Overall, the negative impact of lower productivity on farmer incomes and higher prices on consumption dominate the positive impact of higher prices on farmer incomes

The uncertainty on future impacts remains driven by development choices

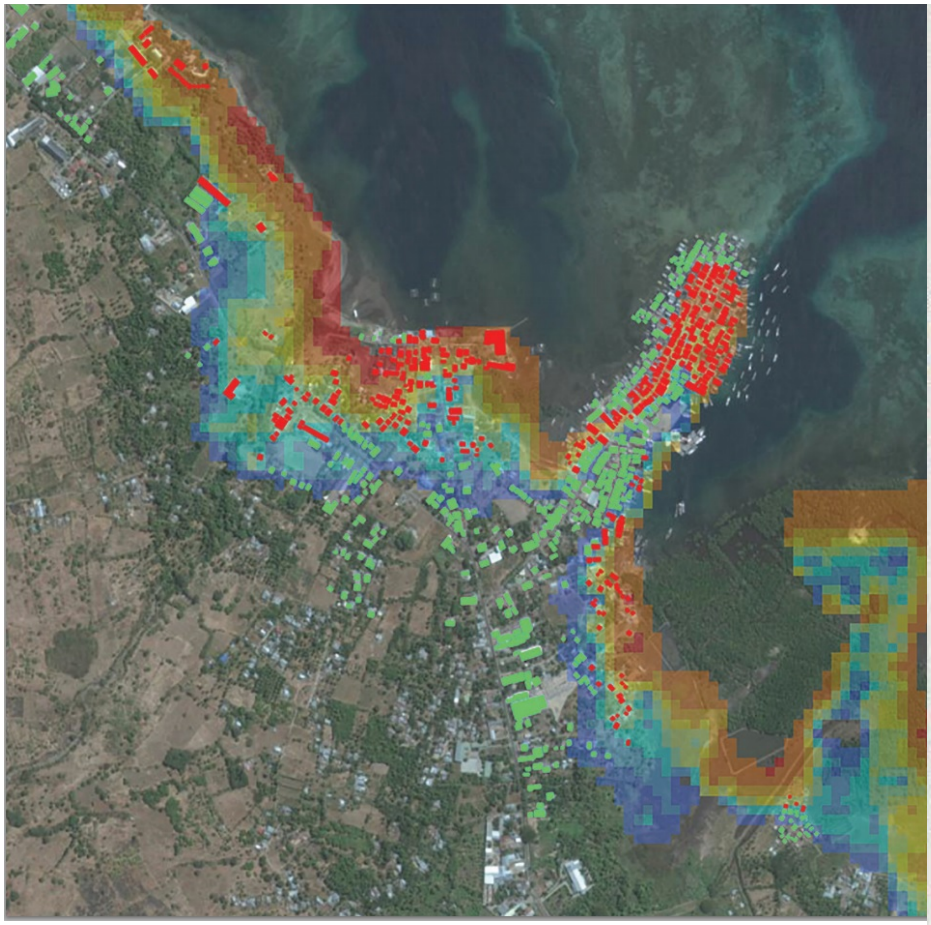
By 2030, climate change impacts remain limited – especially compared with longer-term changes. Even though, climate change has a significant effect on poverty.

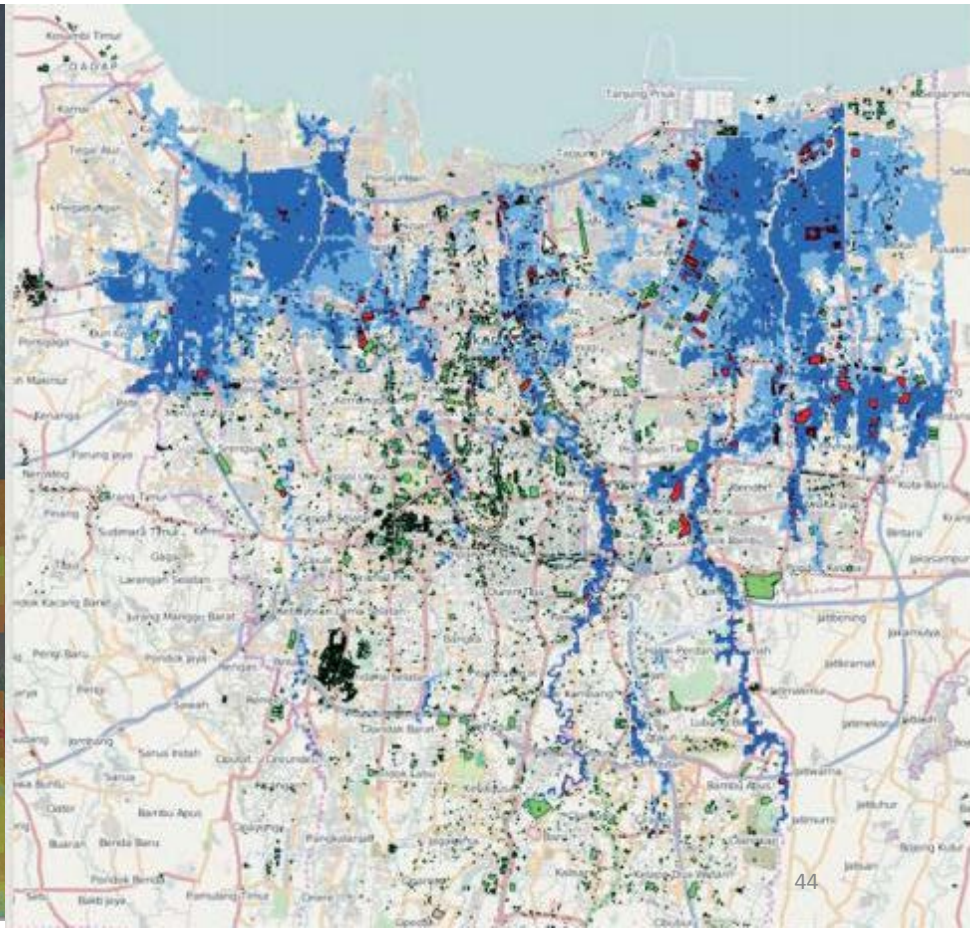
However, climate change remain a secondary driver of poverty, until 2030.

	Climate change scenario		
	No climate change	Low-impact scenario	High-impact scenario
Policy choices	Number of people in extreme poverty	Additional number of people in extreme poverty because of climate change	
Prosperity scenario	142 million	+3 million	+16 million
Poverty scenario	900 million	+35 million	+122 million

Solutions in risk management

Risk-sensitive land-use planning, more and better accessible risk data, more and robust infrastructure, and early warning systems can reduce climate change impacts through natural disasters





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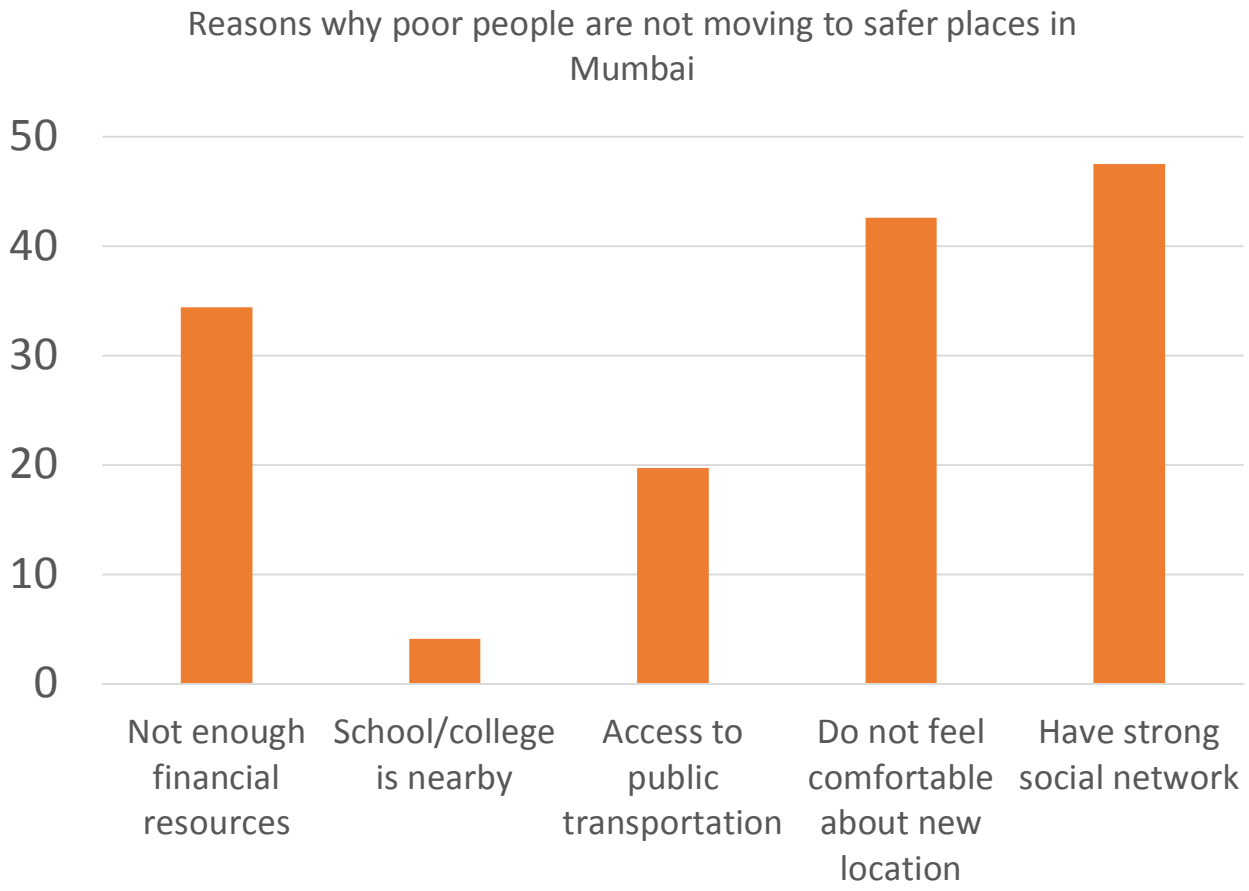


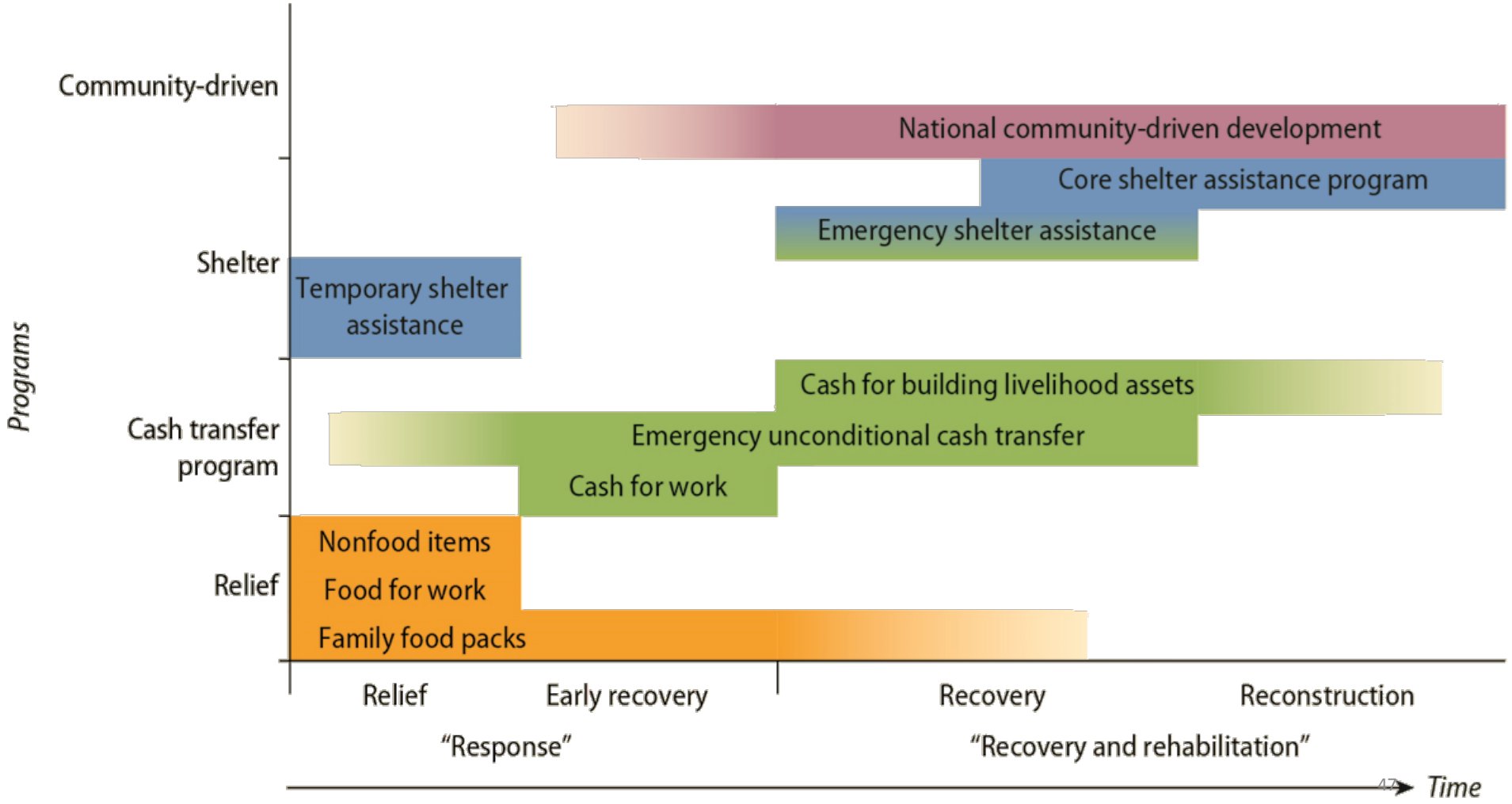
Scaled-up social protection to help households cope with shocks and avoid detrimental secondary effects

- In Mexico, beneficiaries of Prospera are less likely to withdraw their children from school when hit by shocks.
- In Kenya, the Hunger Safety Net Program prevented a 5 percent increase in poverty among beneficiaries following the 2011 drought.

- In the report we discuss how to scale up social protection after a shock:
  - Increase coverage (Ethiopia PNSP)
  - Increase amounts (Philippine 4Ps)
  - Create a new program (Pakistan *Citizen's Damage Compensation Program)*
- And we discuss how to finance this scale up:
  - Reserve funds
  - Insurance and risk sharing facilities
  - Contingent finance (CatDDOs)

Balancing quick response and narrow targeting

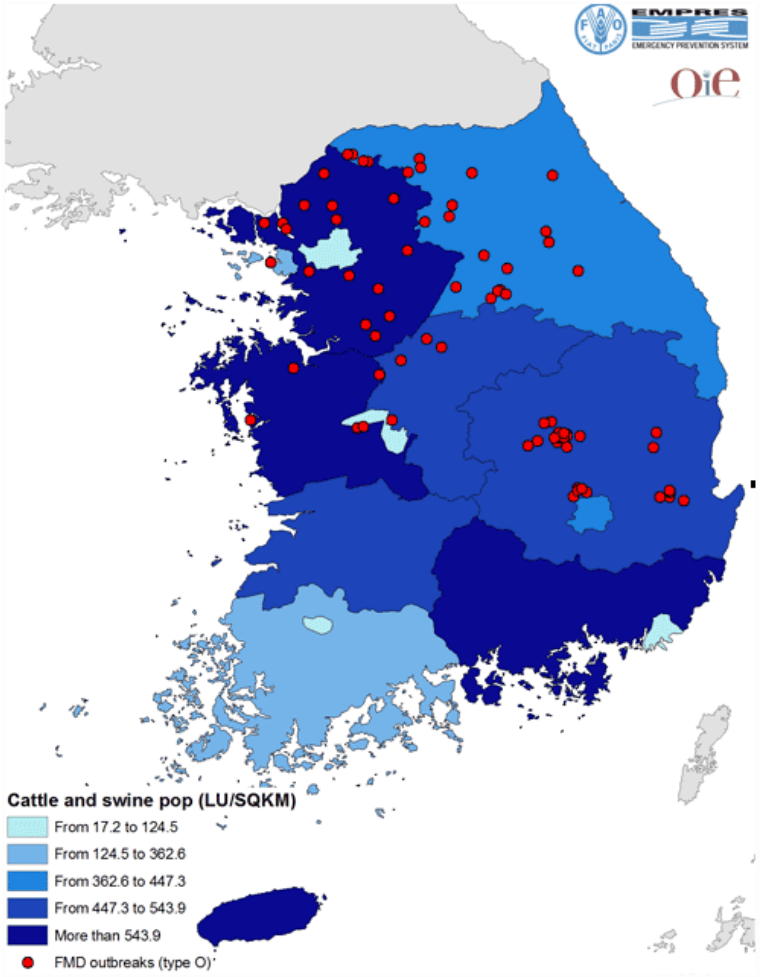
The Philippines' Response to Typhoon Yolanda



5 complementary ways to finance quick response

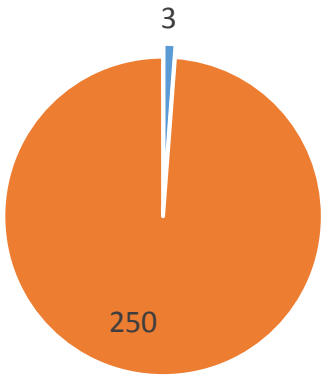
1. **Reserve funds** like in the Philippines
2. **International aid**, as last resort
3. **Insurance and catastrophe bonds**, if not too expensive
4. **Regional risk-sharing facilities,** like the *Caribbean Catastrophe Risk Insurance Facility* and the *Pacific Catastrophe Risk Assessment and Financing Initiative*
5. **Contingent credit: Cat-DDOs** (Catastrophe Deferred Drawdown Option)

Solutions in the health sector



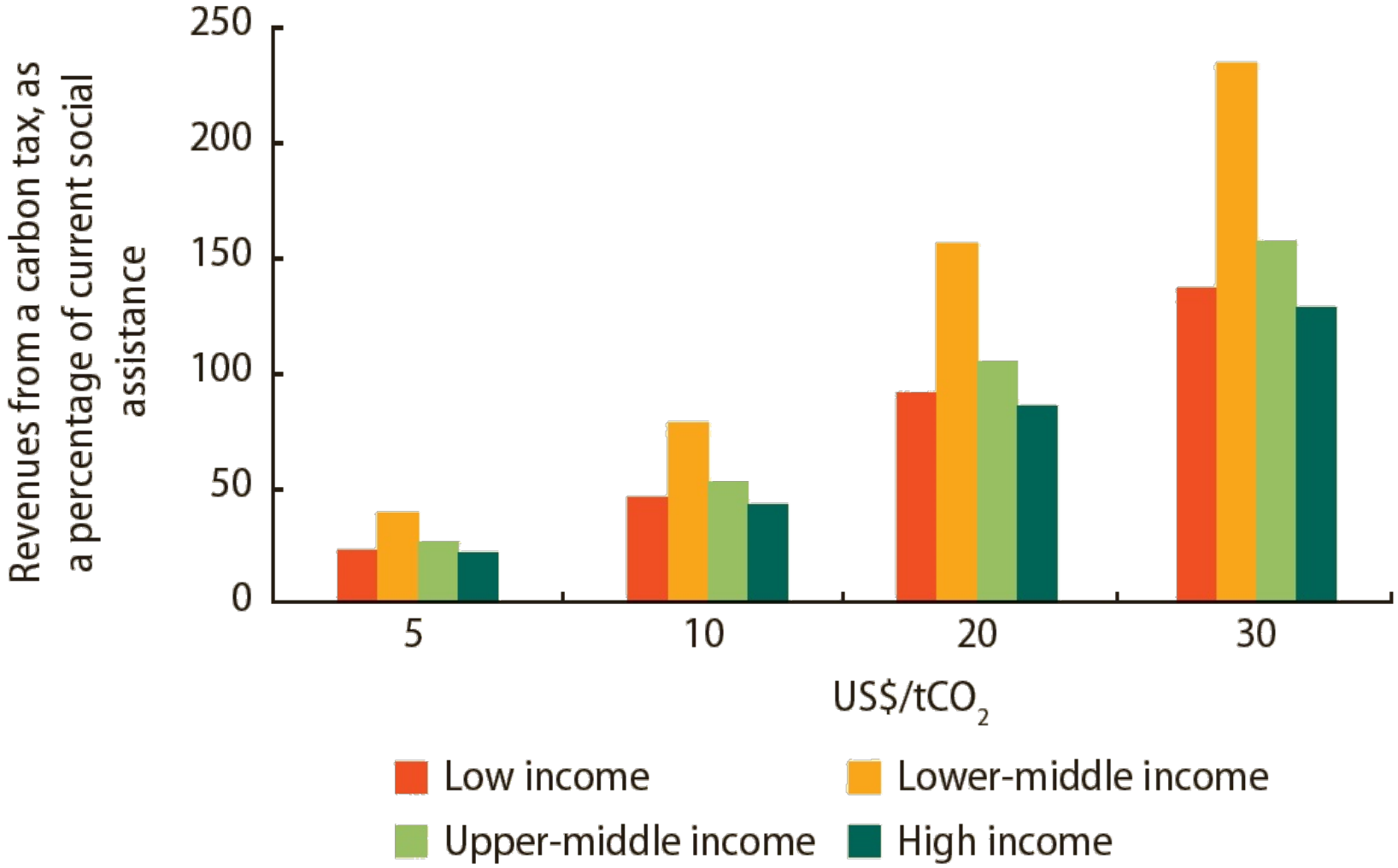
- Universal health care
- Disease early warning systems
- More R&D toward the diseases that affect poor people and are expected to increase with climate change

Annual R&D spending in health

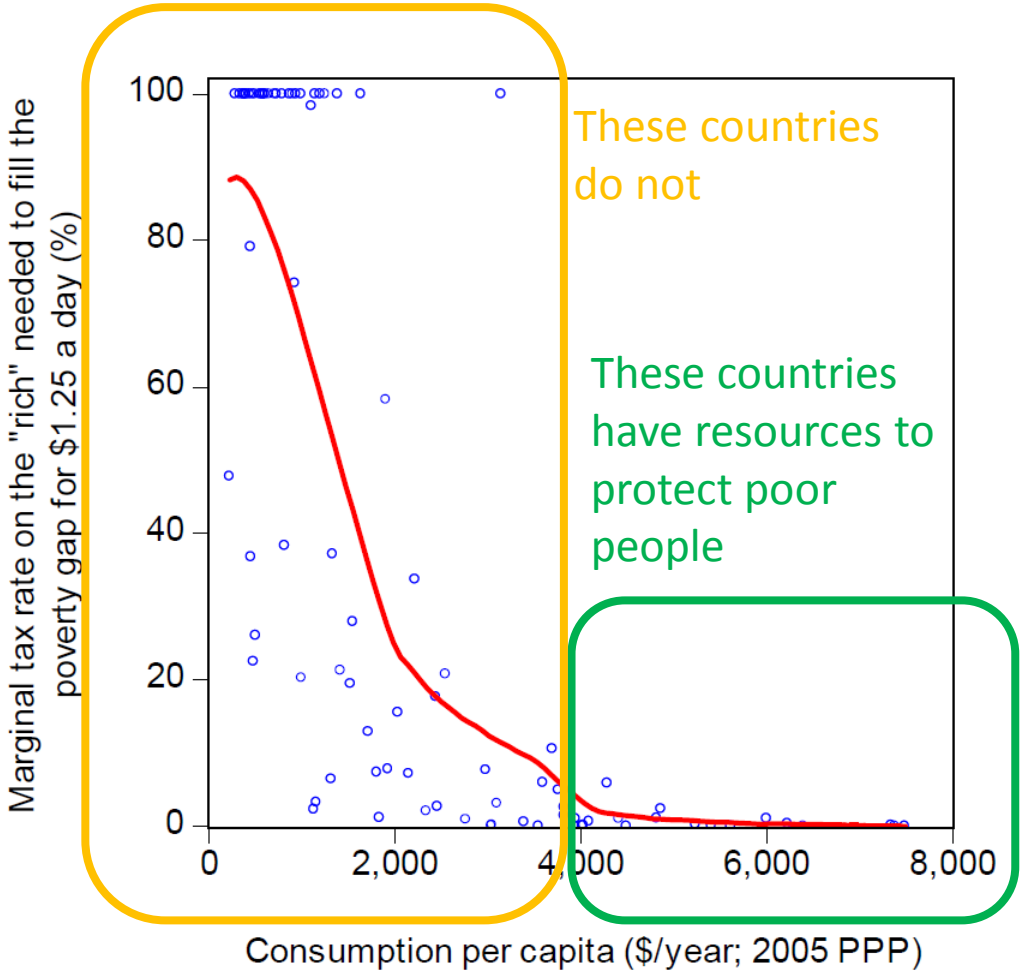


- Spending on infectious diseases prevalent in low- and middle-income countries
- Annual spending on health-related R&D

Environmental taxes can help boost social safety nets



But very poor countries cannot protect poor people



Source: Ravallion, 2010