Socio-economic resilience to natural disasters

a framework for risk-informed development planning

Stephane Hallegatte, Mook Bangalore, Adrien Vogt-Schilb

The World Bank

Project A

Costs $100 million

Prevents on average $20 million
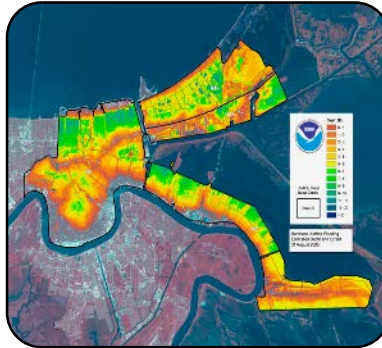of losses per years

Project B

Costs $90 million
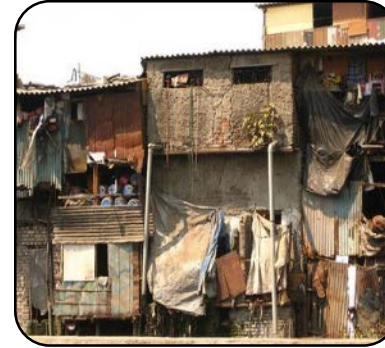
Prevents on average $5 million
of losses per years

THANKS!

Usual risk assessment combines hazard, exposure and vulnerability of assets...

Hazard

Exposure

Vulnerability

Socio-economic capacity

ASSET LOSSES

Poor people are often more exposed to these shocks

take the case of Nigeria
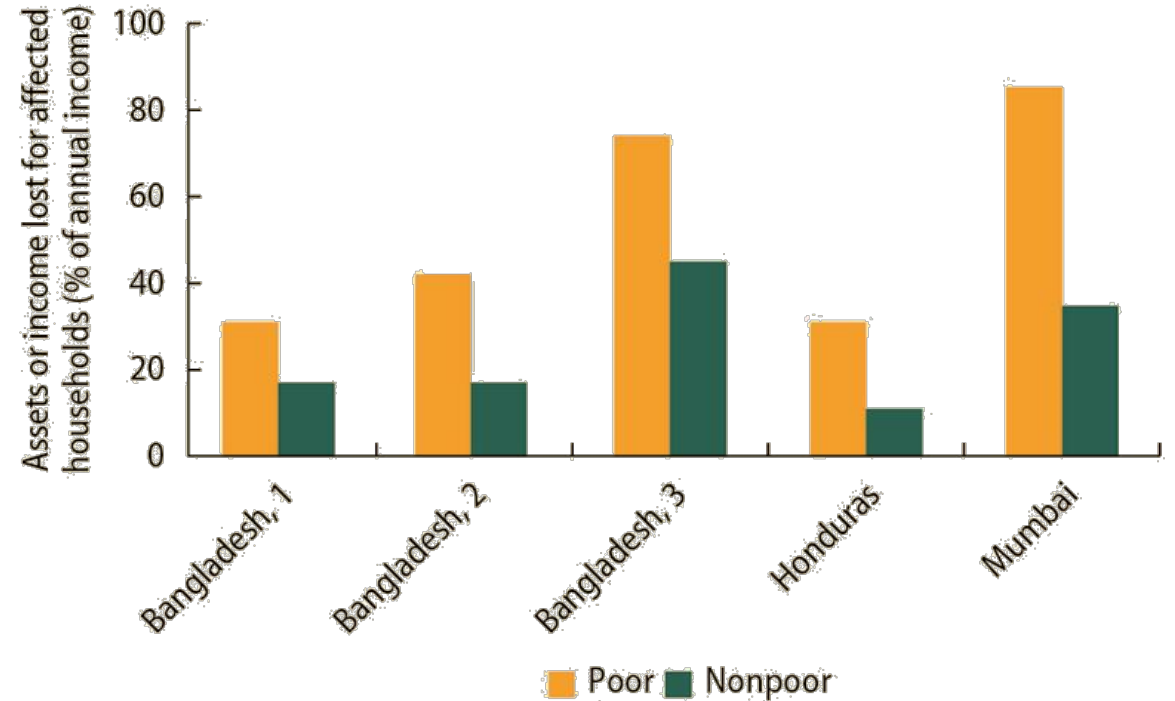
Poor people are 50% more likely to be flooded

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 losing more then they are affected
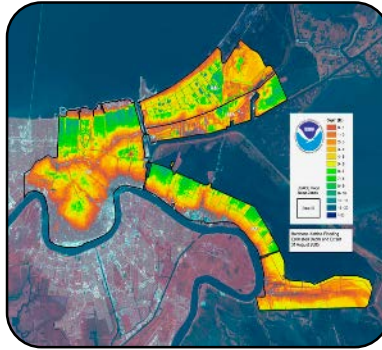

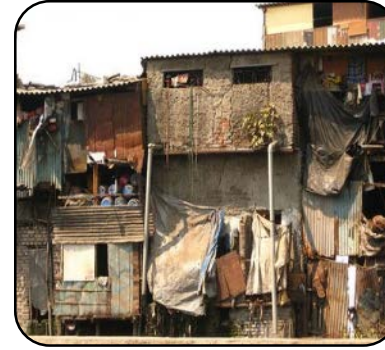And poor people receive less support after shocks and disasters

Usual risk assessment combines hazard, exposure and vulnerability of assets...

Hazard

Exposure

Vulnerability

Socio-economic capacity

ASSET LOSSES

And we account for the specific situation of the poor, to calculate the welfare losses due to disasters

Hazard
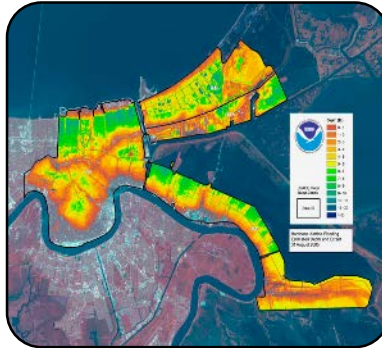
Exposure (poor people)

Exposure (non-poor people)
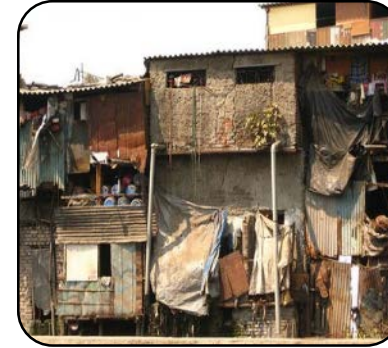
Vulnerability (Poor people)

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

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

- If resilience is 100%, losing $1 in a disaster has the same effect on well-being as a decrease in GDP by $1, equally distributed in the population

- If resilience is 50%, losing $1 in a disaster has the same effect on well-being as a decrease in GDP by $2, equally distributed in the population

Data sources used for the global application
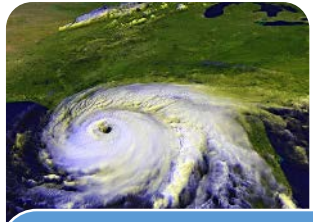
Hazard

- Flood level from GLOFRIS global model
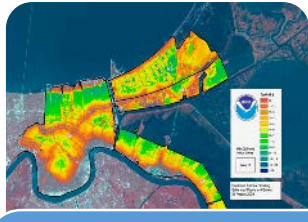- Protections using global database FLOPROS

Exposure

- Localization of people and assets based on Landscan global data
- Case study results for the over-exposure of poor people (WB Shock Waves report)

Asset vulnerability

- Housing quality based on USGS/PAGER global database and simple vulnerability functions
- Early warning (from HFA) reduces losses

Impact on income

- Diversification of income through transfers (from ASPIRE and others)
- Link between assets and income, using average capital productivity (PWT)
- Simple assumption for the duration of reconstruction

Coping capacity and social protection

- Scale-up of social protection, based on credit ratings and HFA monitor
- Financial inclusion from FINDEX
- Access to education and health and employment opportunity (WDI)

Impact on welfare

- Marginal utility of consumption ($\eta=1.5$)
- Share of income of bottom quintile (WDI)
- Poverty traps modeled as life-long reduced earning

Assessment of risk and resilience to floods in 116 countries...

Resilience (%)
- 25 — 37
- 37 — 50
- 50 — 62
- 62 — 75
- 75 — 86
- No data

Expected asset losses (% of GDP)
- 0.00 — 0.01
- 0.01 — 0.05
- 0.05 — 0.20
- 0.20 — 0.70
- 0.70 — 3.00
- No data

Expected welfare losses (% of GDP)
- 0.00 — 0.02
- 0.02 — 0.07
- 0.07 — 0.30
- 0.30 — 1.20
- 1.20 — 5.00
- No data

Assessment of risk and resilience to floods in 116 countries...

Resilience (%)
- 25 — 37
- 37 — 50
- 50 — 62
- 62 — 75
- 75 — 86
- No data

In Germany, losing $1 in a disaster has the same effect on well-being as a decrease in GDP by about $1.2

In Malawi, losing $1 in a disaster has the same effect on well-being as a decrease in GDP by $2
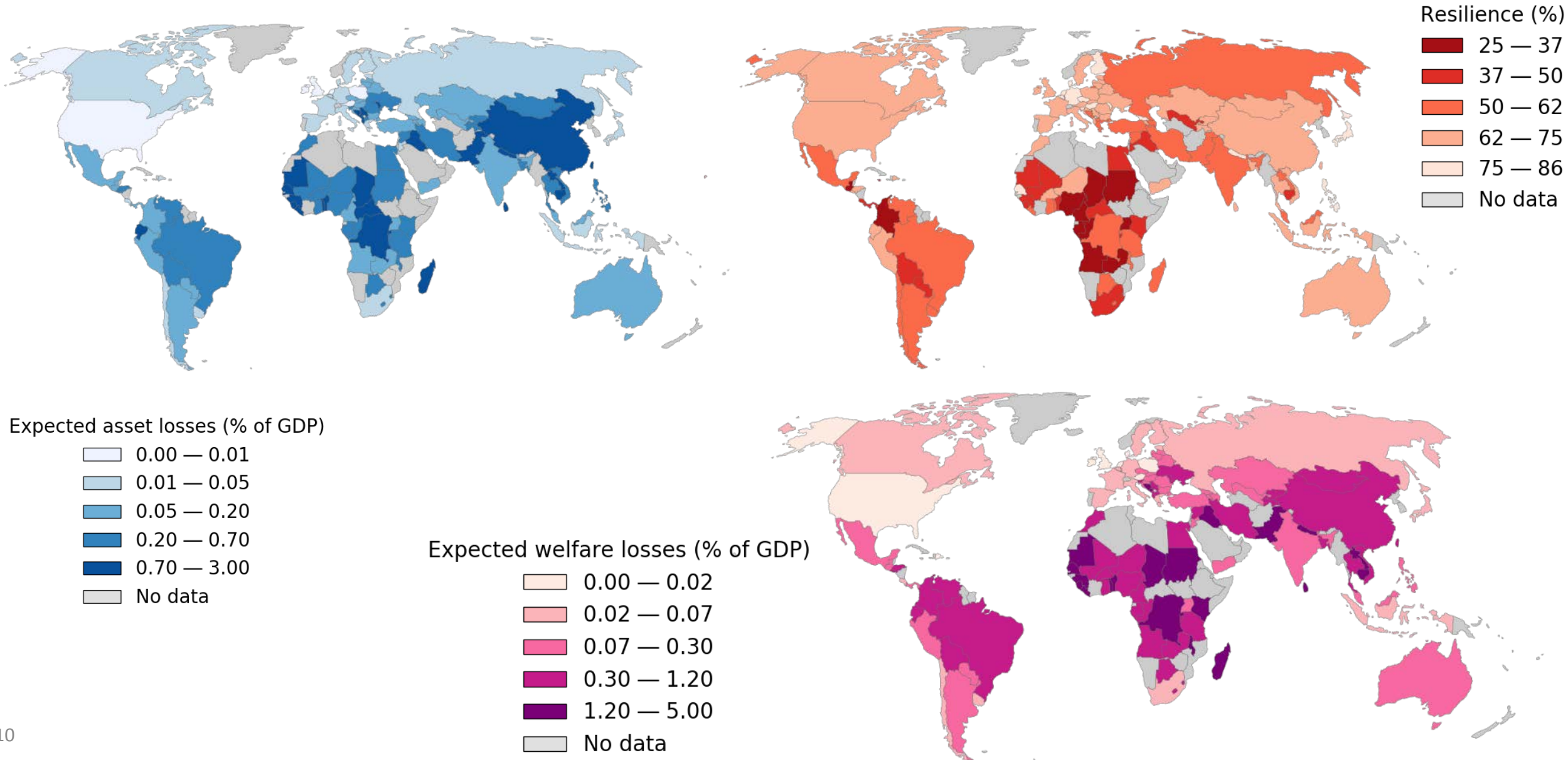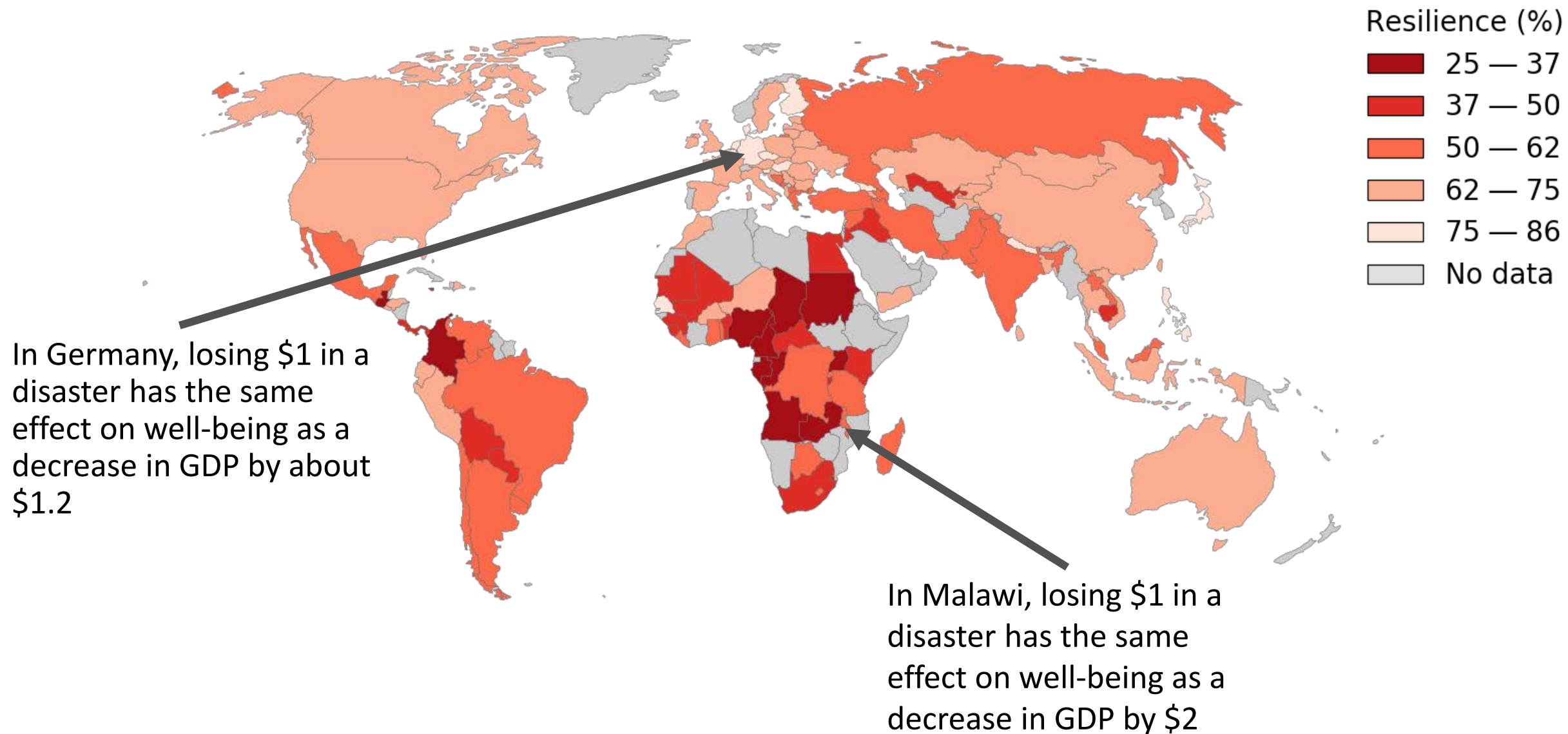
Application to the Philippines at the provincial level
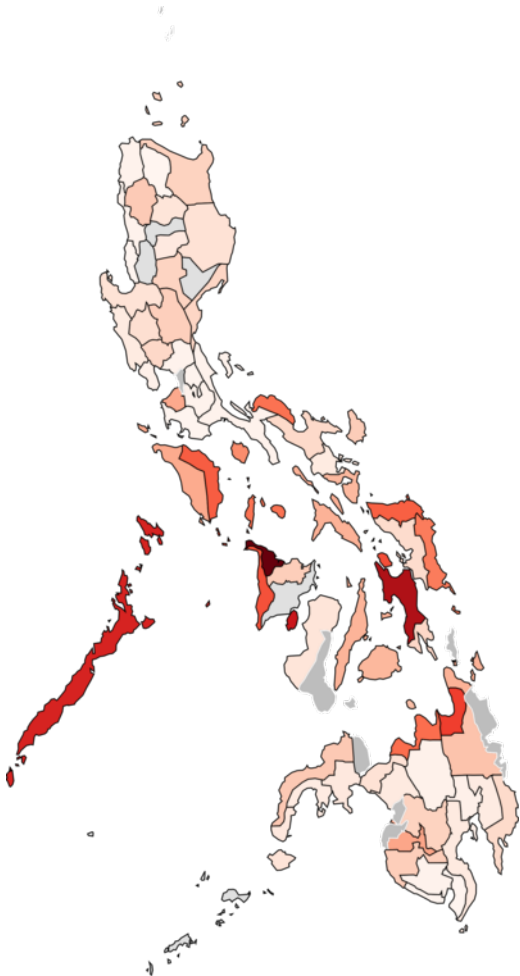
Annual asset losses (% of GDP)

Risk to assets
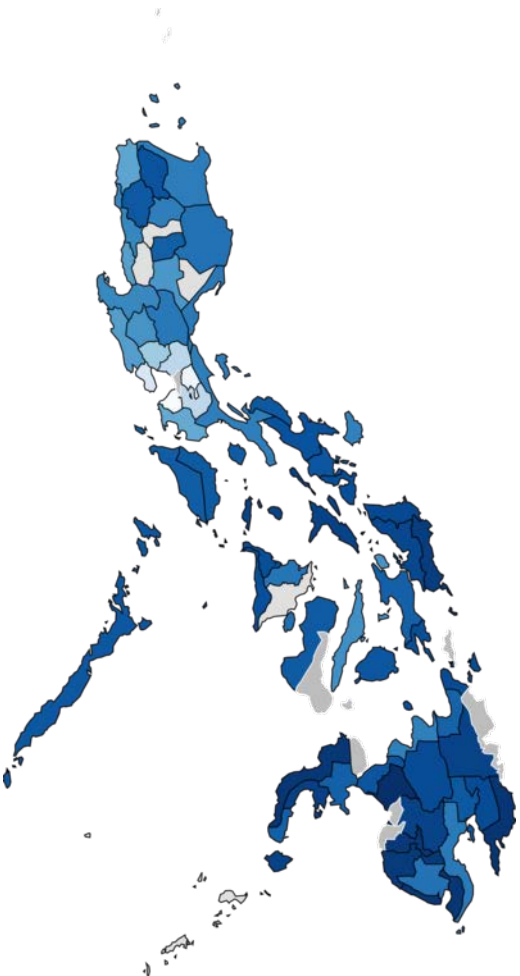
Socio-economic capacity (%)

Socio-economic resilience
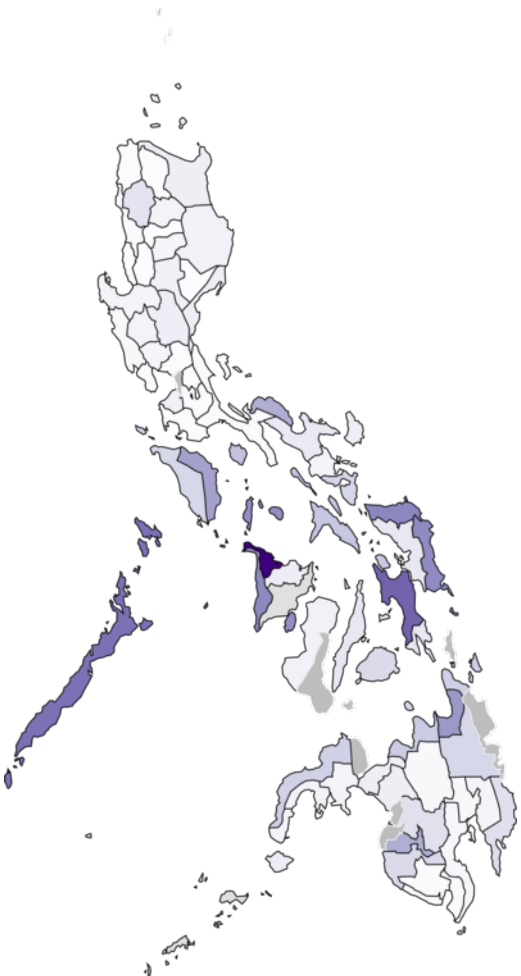
Annual welfare losses (% of GDP)

Risk to welfare

Assessing policy and project benefits in welfare terms

Maguindanao

million pesos per year

Assessing policy and project benefits in welfare terms

Maguindanao

Policy/Project	Effect on welfare losses	Effect on asset losses
Protection (+1 yr)	-290	-130
Exposure of poor households (-1%)	-220	-55
Asset vulnerability for poor households (+1%)	-52	-17
Exposure of nonpoor households (-1%)	-35	-74
Share of risk transferred nationally (+1%)	-31	0
Income of poor families (+1%)	-26	10
Poverty incidence (-1%)	-26	-6.2
Reactivity to early-warnings (+1%)	-16	-7
Scale-up of social protection for poor households (+1%)	-14	0
Average income in the province (+1%)	-14	12
Social protection for poor households (+1%)	-13	0
Asset vulnerability for nonpoor households (+1%)	-11	-44
Access to early warning (+1%)	-5	-2.1
Scale-up of social protection for nonpoor households (+1%)	-0.02	0
Social protection for nonpoor households (+1%)	-0.02	0

million pesos per year

Some policies and projects can reduce welfare losses *by* reducing asset losses…

Assessing policy and project benefits in welfare terms
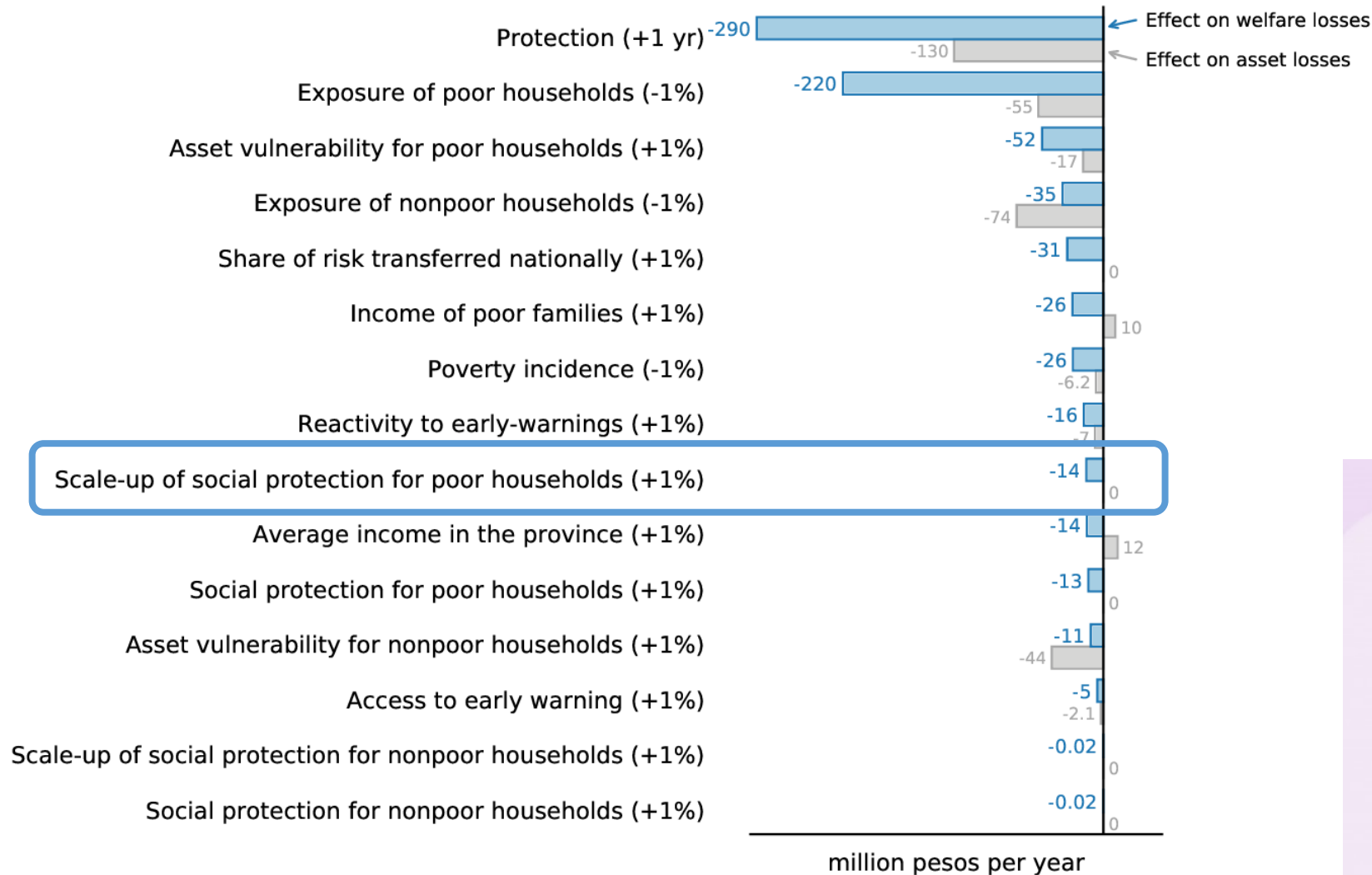
Maguindanao

← Effect on welfare losses
← Effect on asset losses

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million pesos per year

Other policies leave asset loses unchanged, but they decrease resulting welfare losses by building socio-economic capacity

# Assessing policy and project benefits in welfare terms

Maguindanao

million pesos per year
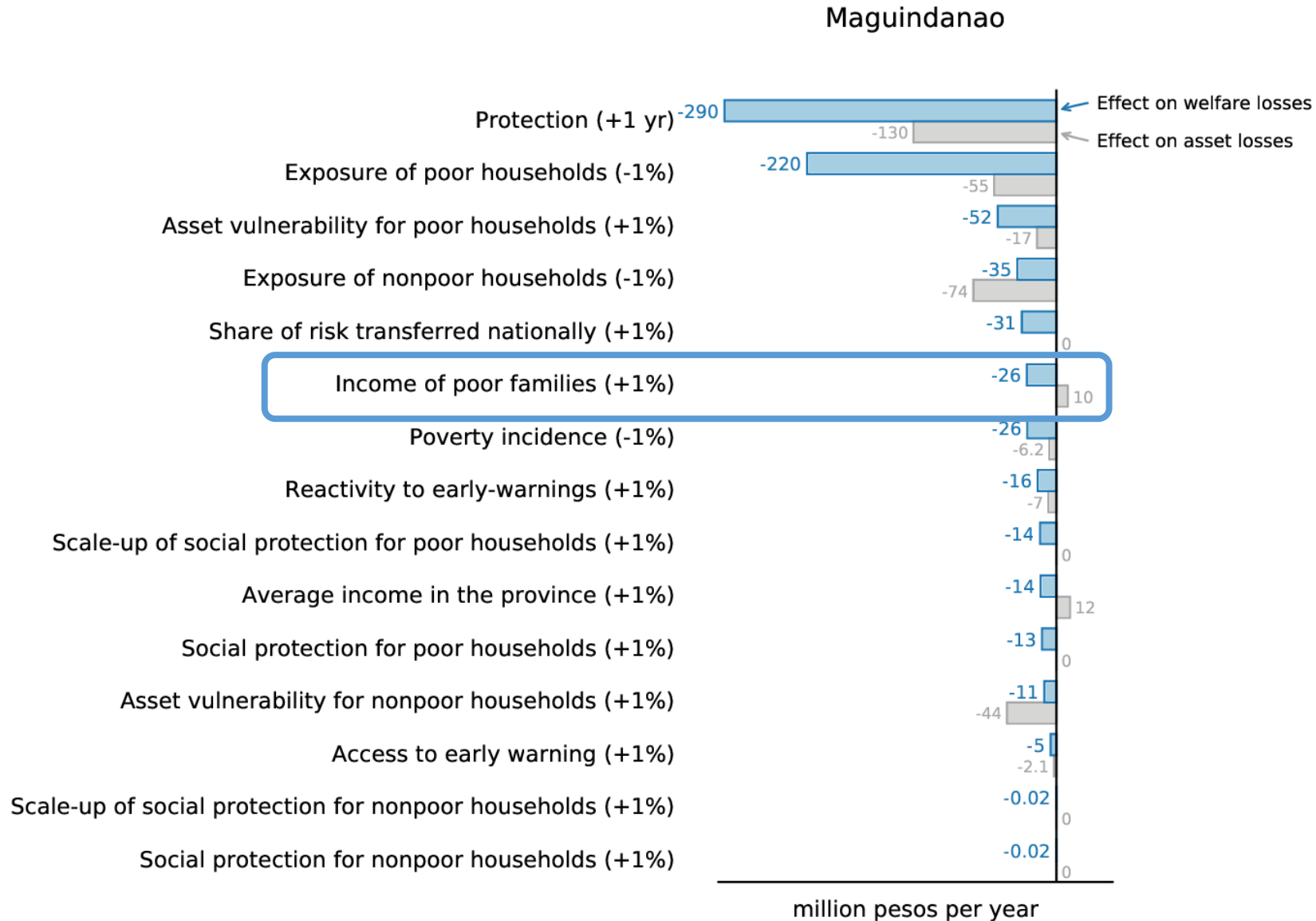
Finally, some policies increase asset losses, but they increase capacity even more, and ultimately reduce welfare losses.

In all cases, we find that reducing poverty increases asset losses, but decreases welfare losses

Disaster losses are increasing. But it does not mean that the impact on well-being is increasing.

(US$billion)
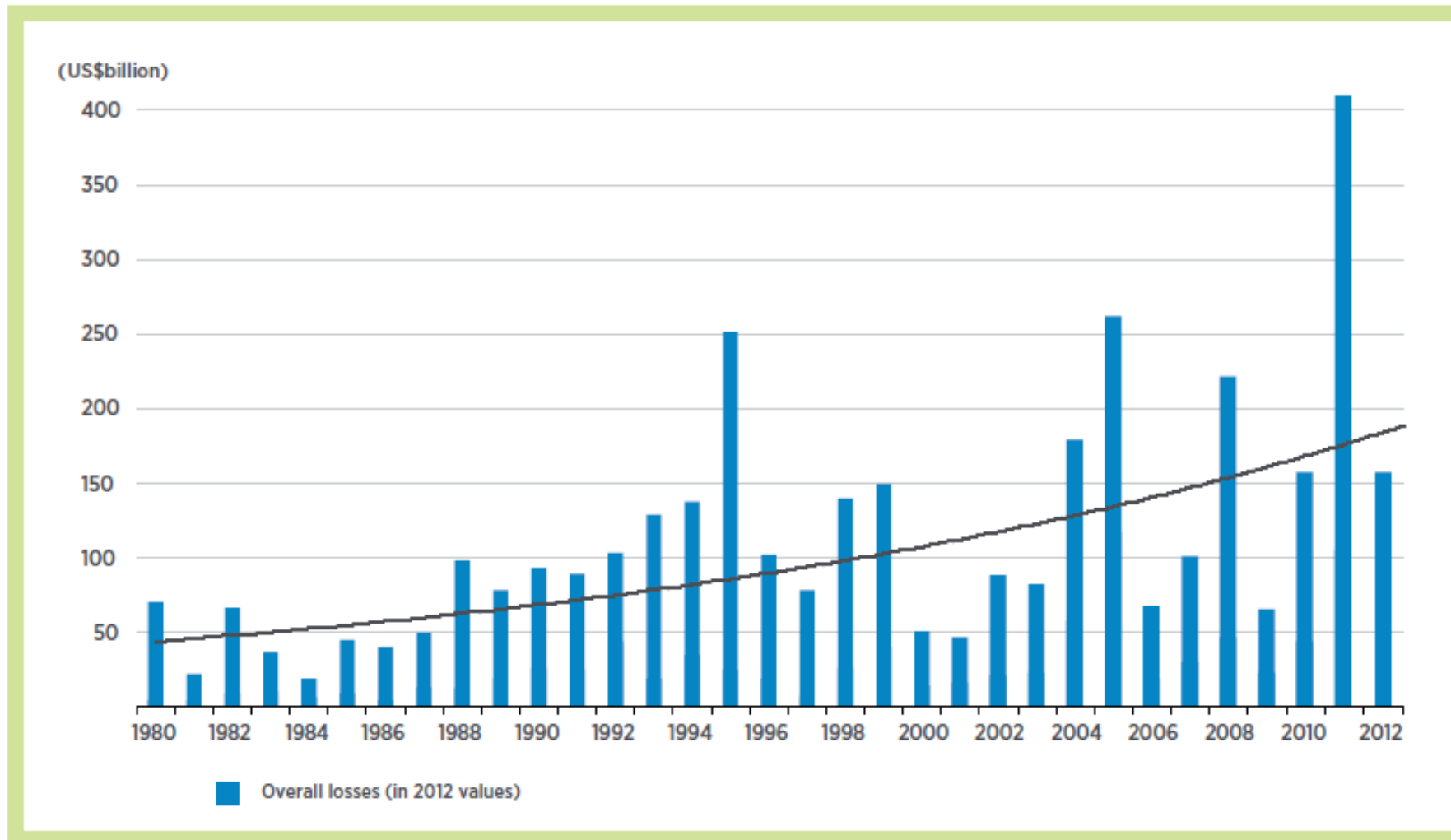
The bars indicate annual disaster losses. The line indicates the trend.

Source: © 2013 Münchener Rückversicherungs-Gesellschaft, Geo Risks Research, NatCatSERVICE (as of January 2013)