Socio-economic impacts:

**Assessing short and long-term impacts
of climate-related extreme events on households**

Understanding Risk Europe, Bucharest, 2019

Dr Anne Zimmer (Climate Analytics),
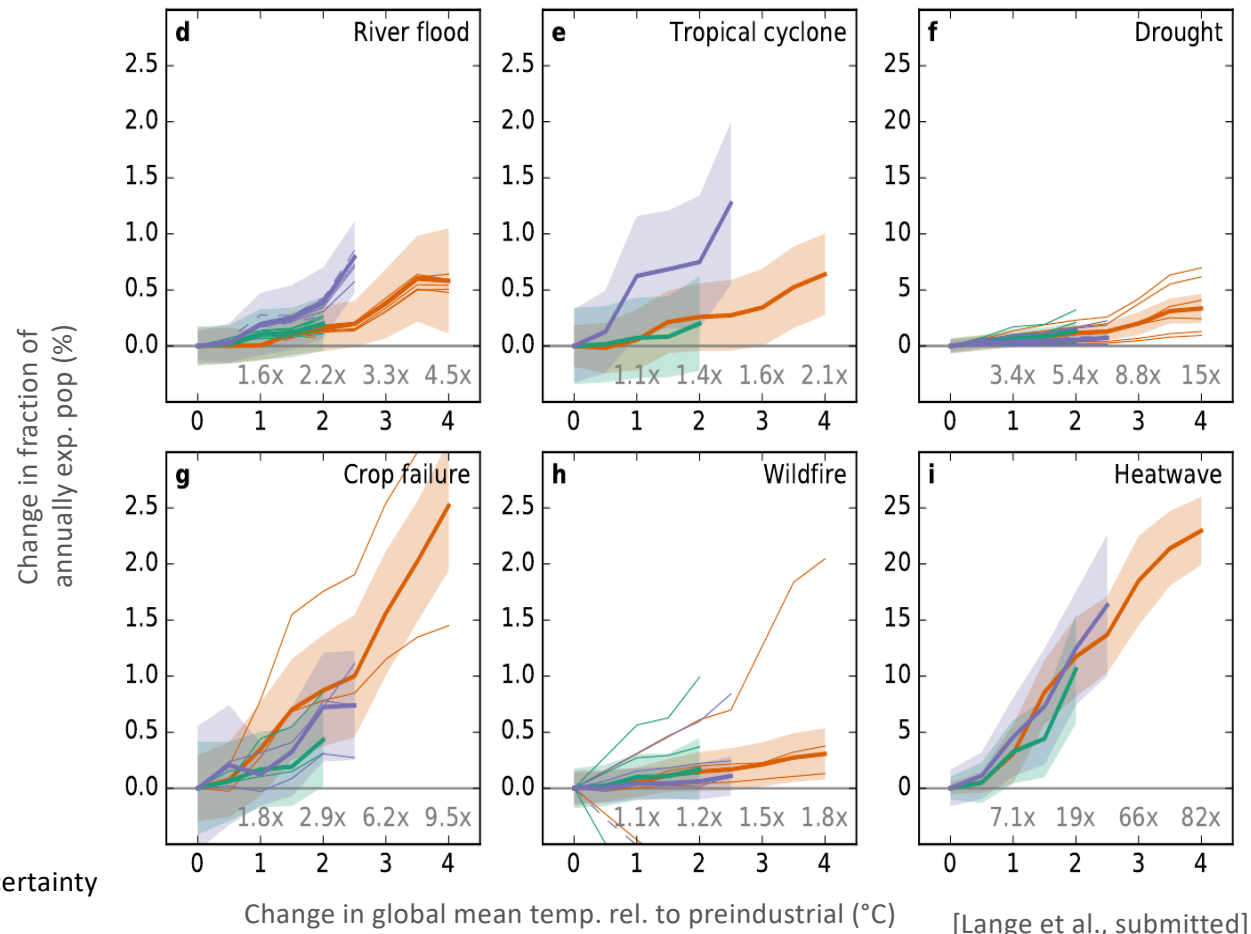Dr Markus Zimmer (ifo Institute) & Dr Christian Otto (PIK)

Biophysical risks from climate change

**People affected globally
by climate-related extreme events**

→Current level of
warming has already
almost tripled global
population **exposed
to extreme events**
each year

Colors = Climate models
Shading = Impact model uncertainty

Change in fraction of annually exp. pop (%)

Change in global mean temp. rel. to preindustrial (°C)

[Lange et al., submitted]

Biophysical risks from climate change

Synthesizing scientific knowledge for (scientific and non-scientific) stakeholders

ISIMIP
Inter-Sectoral Impact Model Intercomparison Project

ISIpedia
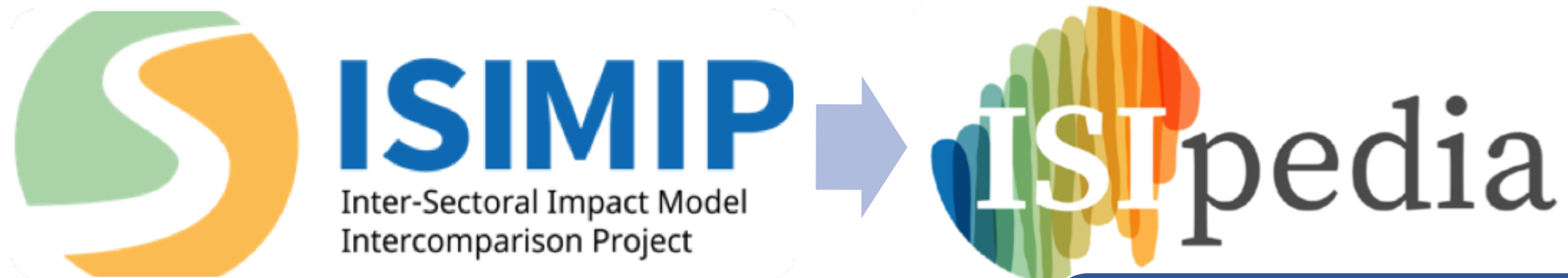
How does climate change affect us?

- Synthesize results from climate impact model for past, present & future
- **100+ models** covering **13 sectors**
- Accounting for both **bio-physical** and **socio-economic factors**

Modellers — Stakeholders

ISIpedia

How do make the information accessible and useful for stakeholders?

- **Open climate-impacts database**
- Addressing stakeholder needs
- Focus regions:
  - **Eastern Europe**
  - West Africa
  - South-East-Asia

Biophysical risks from climate change

Country Level Risk Reports

- **Country Level Risk Profiles** for **all countries worldwide**
- Risk types:
  - Riverine Floods
  - Drought risks
  - More planned: e.g. water, forest, health, biodiversity
- Risks at different levels of temperature increases
- Currently in **Testing phase**

Biophysical risks from climate change

Country Level Risk Reports (example: Romania)

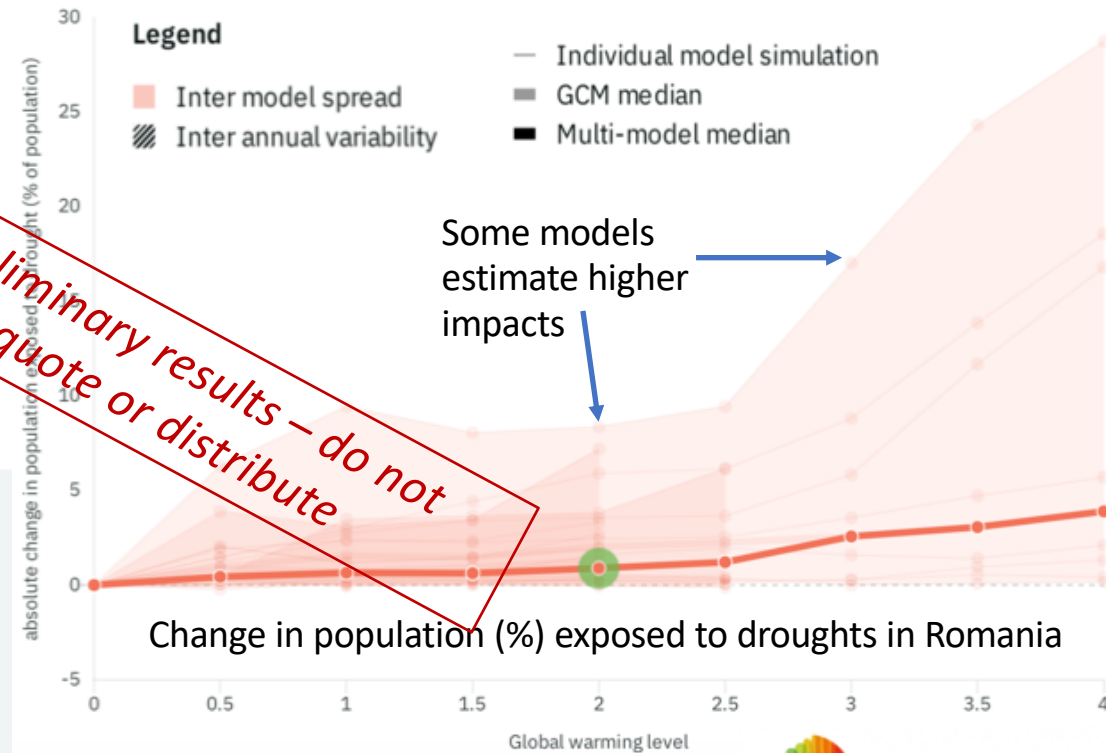CLIMATE ANALYTICS — PIK — IIASA — ISIMIP Inter-Sectoral Impact Model Intercomparison Project

Drought risks and change in exposure*:

- Today's level of warming (~1°C): Already about **100.000 more people** in Romania are currently exposed to droughts than without climate change

- 2°C of warming: About **900.000 more people** in Romania will be exposed to droughts

- 3°C of warming (current NDCs): About **2.6 million more people** in Romania will be exposed to droughts

- Regions are **affected differently**
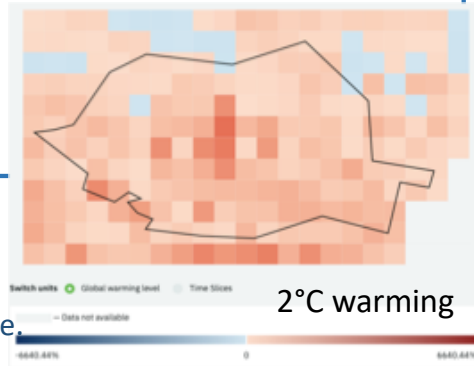
*Assuming present day population patterns; change in exposure compared to world w/o climate change; median of model ensemble.

2°C warming

Population exposed to droughts

Legend
- Inter model spread
- Inter annual variability
- Individual model simulation
- GCM median
- Multi-model median

Some models estimate higher impacts

Preliminary results – do not cite, quote or distribute

Change in population (%) exposed to droughts in Romania

absolute change in population exposed to drought (% of population)

Global warming level

ISIpedia

From biophysical risks to socio-economic impacts

Socio-economic impacts of climate-related extreme events on households

SLICE — **Short- and Long-Term Impacts of Climate Extremes**
Identifying key impact channels and effective strategies for long-term economic development under climate change

*What are the **socio-economic impacts** of climate-related extreme events (such as floods, droughts, cyclones)?*

poverty

inequality

health

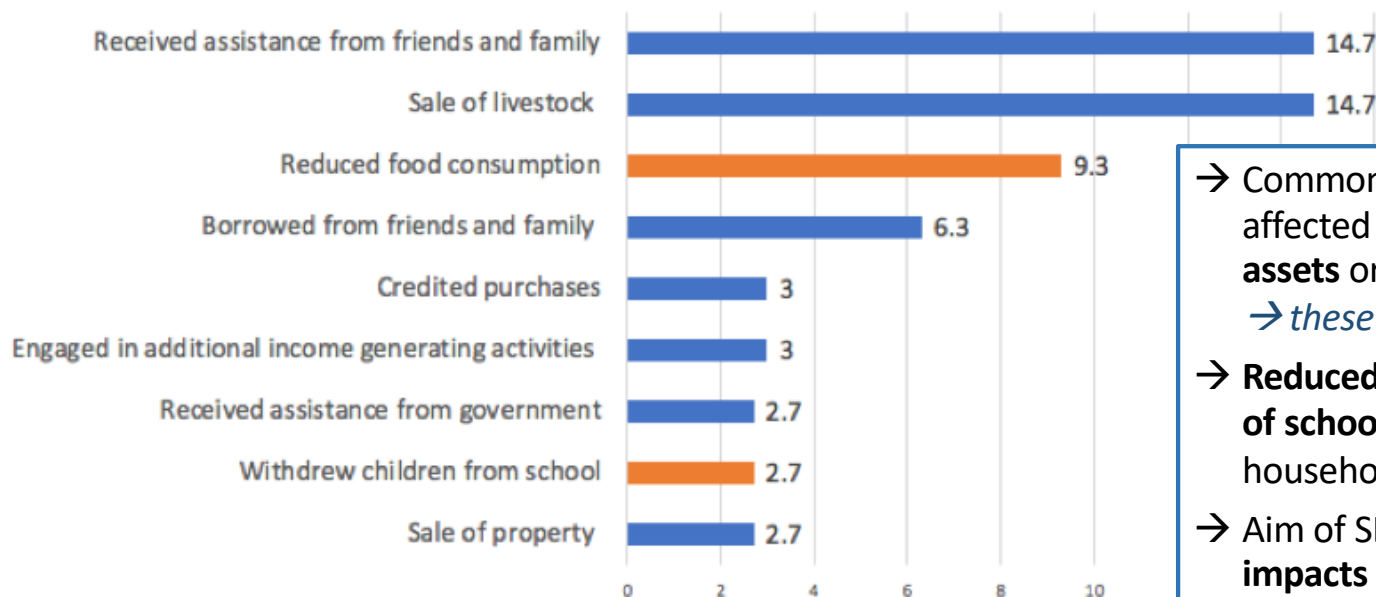education

Socio-economic impacts of extreme events on households

Reactions of households affected by flood events in Nigeria (2012 wave)

Nigeria: Share of hh affected by flood shock reporting certain first
response to cope with shock (%)

Response	%
Received assistance from friends and family	14.7
Sale of livestock	14.7
Reduced food consumption	9.3
Borrowed from friends and family	6.3
Credited purchases	3
Engaged in additional income generating activities	3
Received assistance from government	2.7
Withdrew children from school	2.7
Sale of property	2.7

Source: Calculated based on World Bank LSMS-ISA data
for Nigeria (wave 2012)

→ Common reported reactions by households
affected by flood shocks are building on **selling assets** or on support from **friends/family**
→ *these options are exhausted at some point*

→ **Reduced food consumption** or **taking children out of school** are also reactions reported by households as short-term responses

→ Aim of SLICE to assess the **short- and long-term impacts of extreme events on**

→ **Economic well-being & poverty**
→ **Education**
→ **Health**
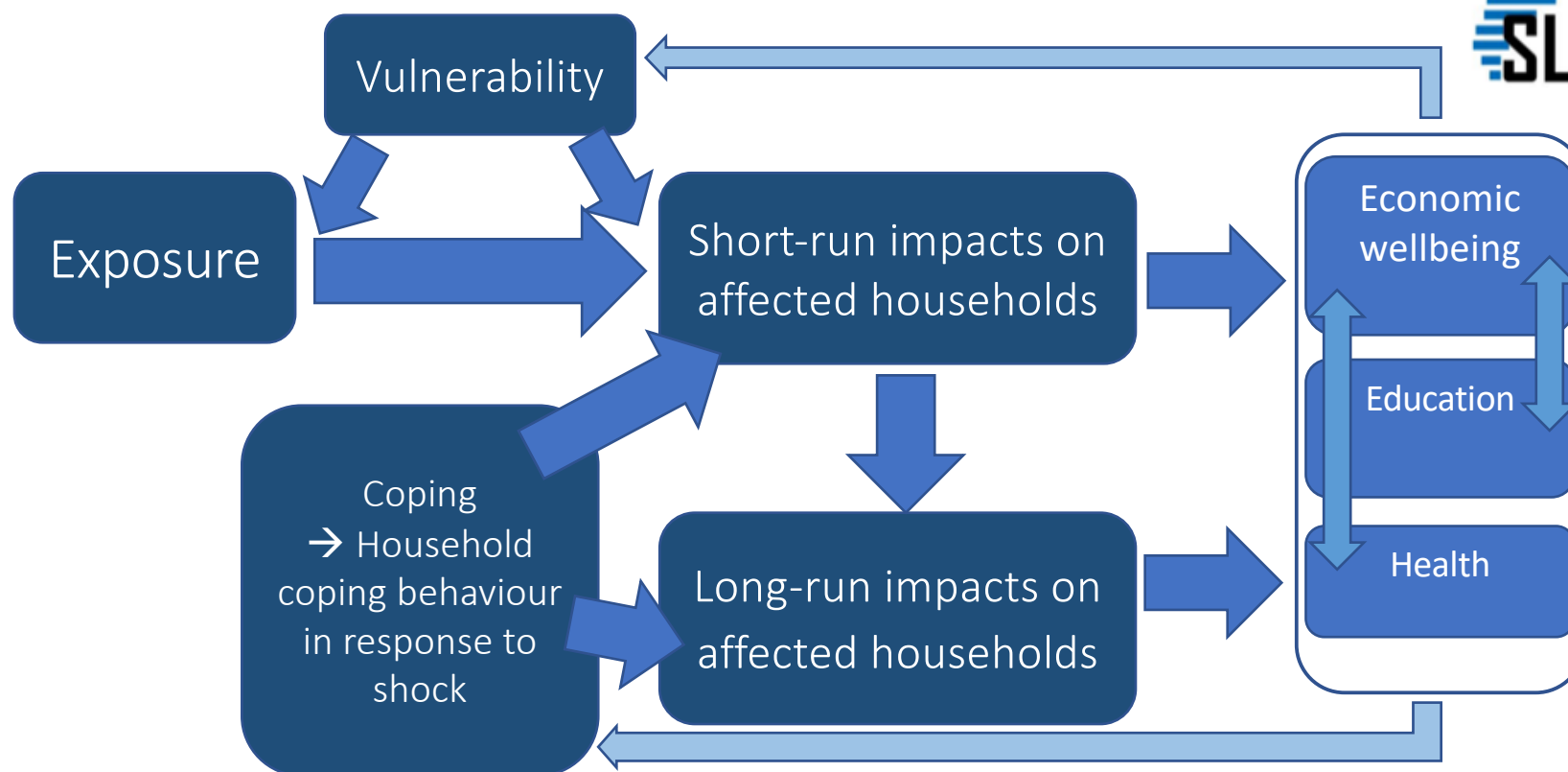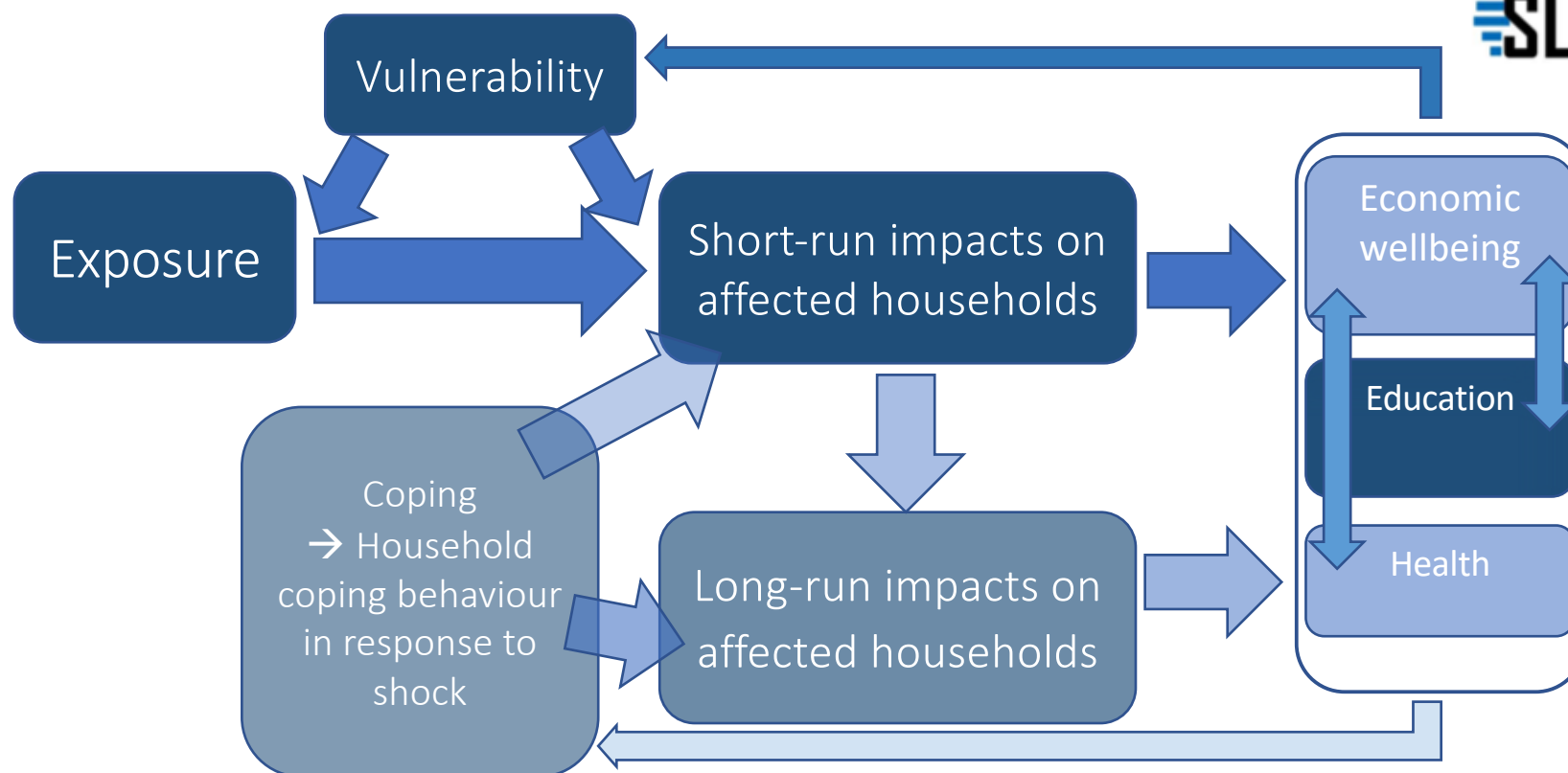
Socio-economic impacts of extreme events on households

Impacts of flood events on households in Nigeria - **Role of education**

- Households with higher education (literacy) show a significantly lower probability of reporting to be affected by a flood shock
  → *Can education policy help to reduced vulnerability and/or exposure?*

flooding
- 0,000000 - 0,010526
- 0,010527 - 0,034247
- 0,034248 - 0,070175
- 0,070176 - 0,125000
- 0,125001 - 0,294118

Regional shares of households **reporting flood shock** (resulting in crop loss)

Literacy
- 0,000000 - 0,333333
- 0,333334 - 0,580645
- 0,580646 - 0,775000
- 0,775001 - 0,920705
- 0,920706 - 1,000000

Regional share of households with **at least one literate member**
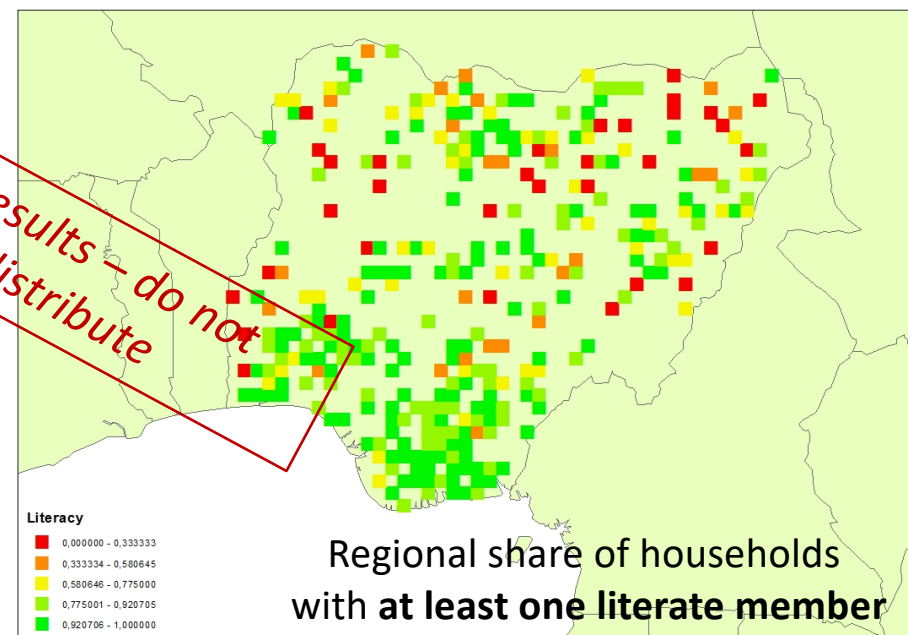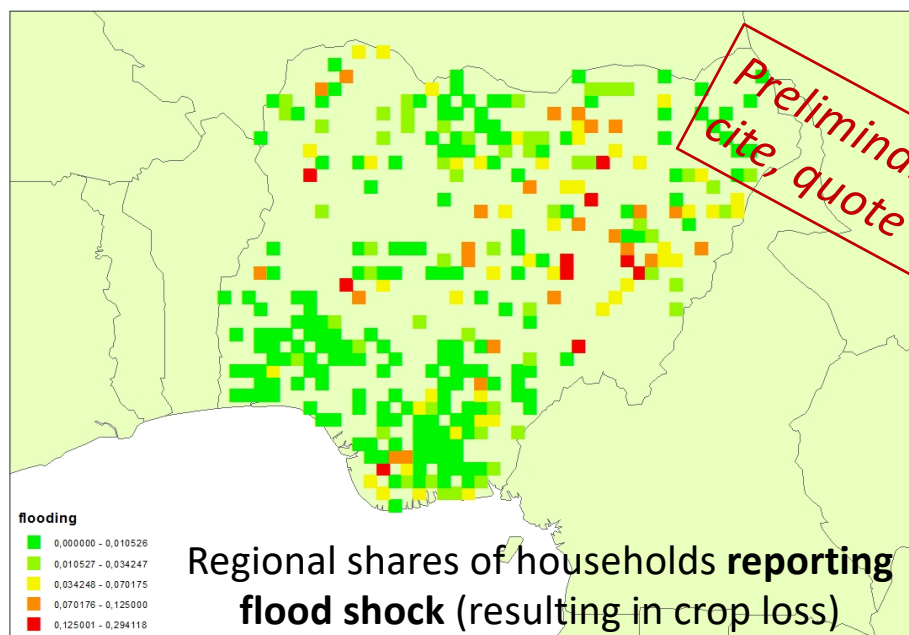
Preliminary results – do not cite, quote or distribute

From biophysical risks to socio-economic impacts
Socio-economic impacts of extreme events on households
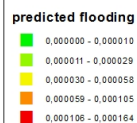
Outlook: How can insights from science be useful for policy making?

→ Use insights on **vulnerability from past events** and **projected climate risks** to derive implications for policy making regarding *expected (regional) socio-economic impacts by climate change*

→ Derive insights for policy making **how socio-economic impacts** *can be reduced, e.g. by education policy*

Climate change is projected to **increase extreme precipitation events** in Nigeria by about 20%

Preliminary results – do not cite, quote or distribute

predicted flooding
- 0,000000 - 0,000010
- 0,000011 - 0,000029
- 0,000030 - 0,000058
- 0,000059 - 0,000105
- 0,000106 - 0,000164

Predicted increase in share of households affected by flood due to **climate change** effect on extreme precipitation

Education policy as a means of **decreasing vulnerability** of households to climate impacts

Preliminary results – do not cite, quote or distribute

full lit historic effect
- -0,000030 - -0,000028
- -0,000027 - -0,000010
- -0,000009 - -0,000005
- -0,000004 - -0,000001
- -0,00001 - 0,00000

Predicted decrease in share of households affected by flood if **at least one literate person in each hh** was achieved

Thank you

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