



International Institute for
Applied Systems Analysis
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science for global insight

Differential Vulnerability, Disaster Risk Management & Climate Adaptation: Priorities and Opportunities for Research and Policy

Reinhard Mechler

Risk, Policy, Vulnerability (RPV) Program

**IIASA 40th Anniversary Conference
WORLDS WITHIN REACH: FROM SCIENCE
TO POLICY**

***Parallel Session 4: Assessing Education,
Human Capital and Vulnerability***

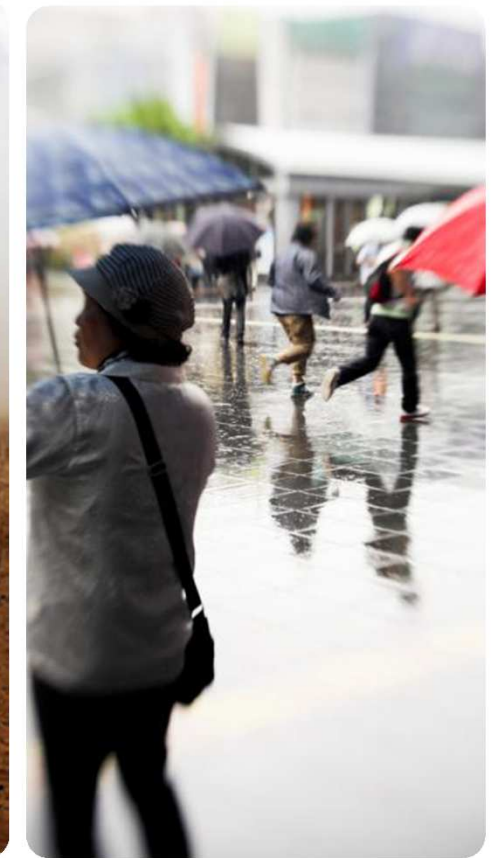
October 26, 2012



IIASA, International Institute for Applied Systems Analysis

Context: IPCC Special report on extreme events and adaptation (SREX)

- Impacts from disasters have increased over recent decades
- Anthropogenic climate change leads to changes in extreme weather and climate events!



Natural disasters are *unnatural*

Climate-related and socio-economic determinants of risk



nature and severity of hazard



exposure



vulnerability

Even non-extreme weather and climate events can lead to extreme impacts if vulnerability is high

- Africa's largest recorded cholera outbreak
- over 90,000 affected
- over 4,000 killed
- began following onset of seasonal rains
- vulnerability and exposure increased risk



From climate-driven to vulnerability-driven analysis!

- Projections of natural hazards and climate change associated with long time scales and large uncertainties
- Information on today's differential vulnerability (and exposure) as starting points for disaster risk management and adaptation assessments
- Offering benefits now and foundations for addressing future projected changes

From climate-driven to vulnerability-driven analysis
Starting points are vulnerability and exposure at scale of risk
management

Vulnerability
& exposure
at scale of
risk
management

From climate-driven to vulnerability-driven analysis

Starting points are vulnerability and exposure at scale of risk management

Vulnerability & exposure at scale of risk management	Information on climate extremes across spatial scales		
	Global: Observed and projected	Regional: Observed and projected	Scale of risk management: Available information

From climate-driven to vulnerability-driven analysis

Starting points are vulnerability and exposure at scale of risk management

Vulnerability & exposure at scale of risk management	Information on climate extremes across spatial scales			Options for risk management and adaptation
	Global: Observed and projected	Regional: Observed and projected	Scale of risk management: Available information	

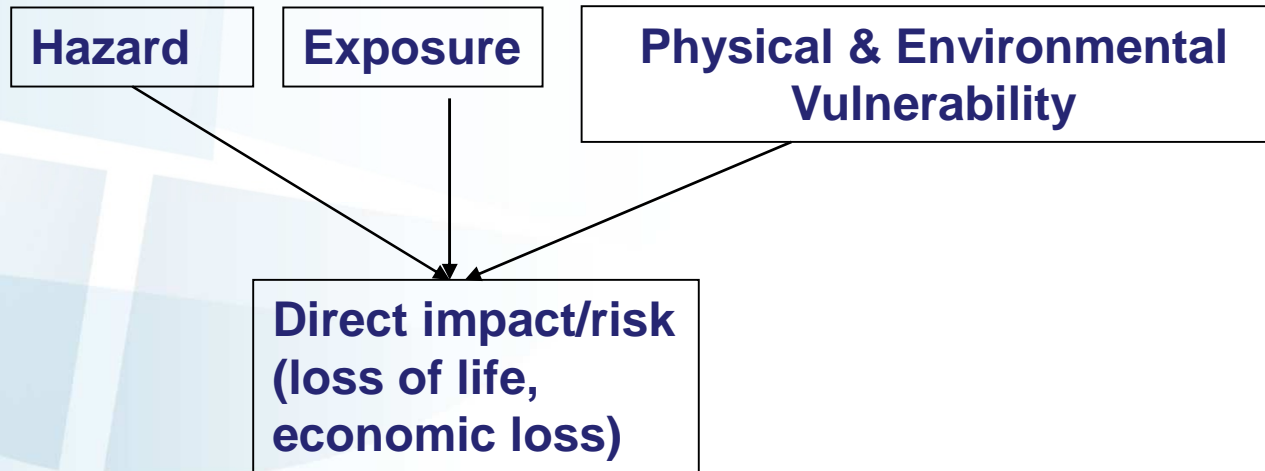


Flow of information

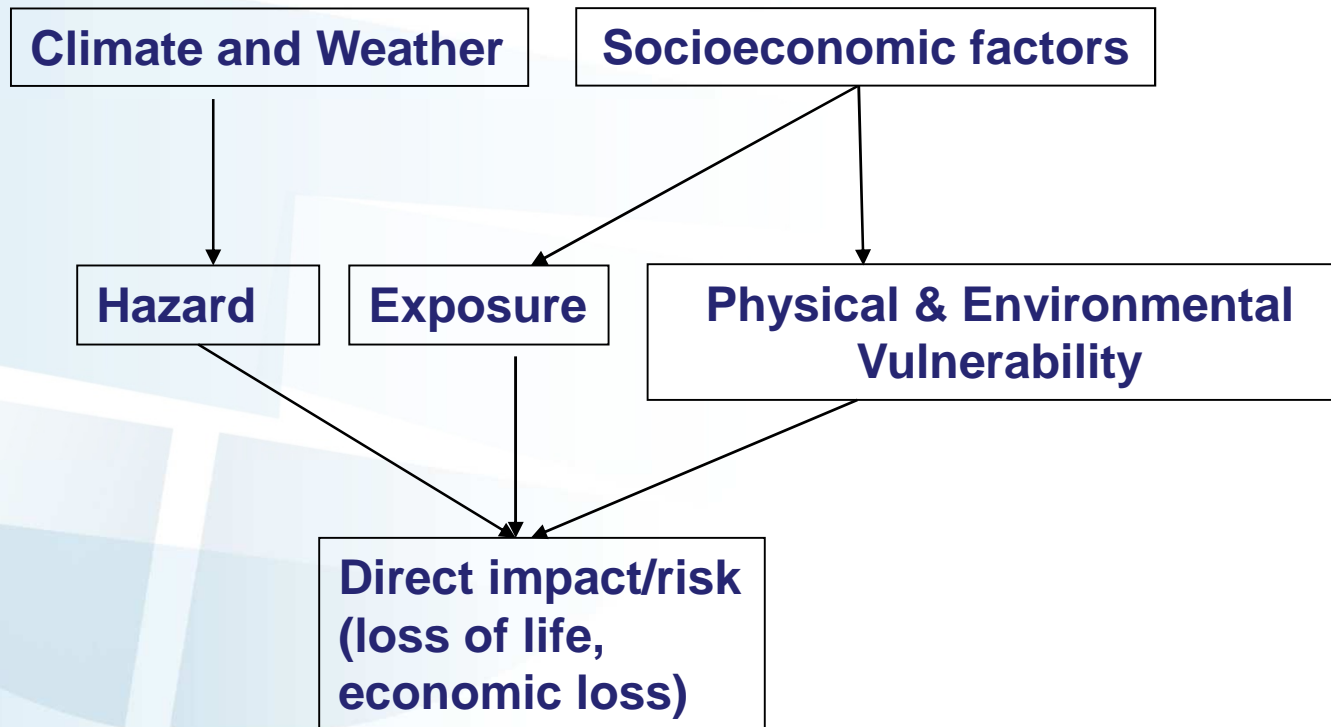
Gaps and priorities in Vulnerability & Risk research

- There are many types of vulnerability and determinants: how to integrate?
- Linking to an estimate of risk
- Lack of useful information on differential vulnerability at scale of risk management (farmers, households, governments)
- Better understanding of longer term, indirect effects

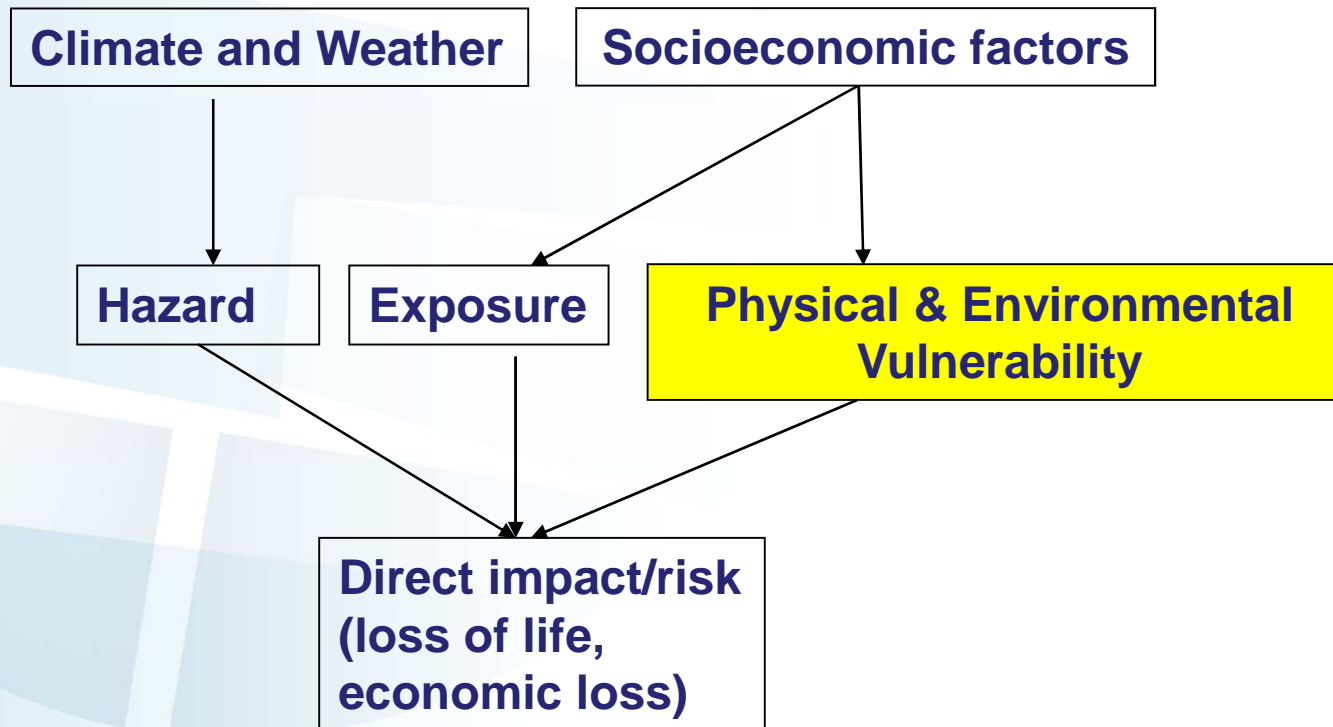
Conceptualizing and modelling vulnerability and risk



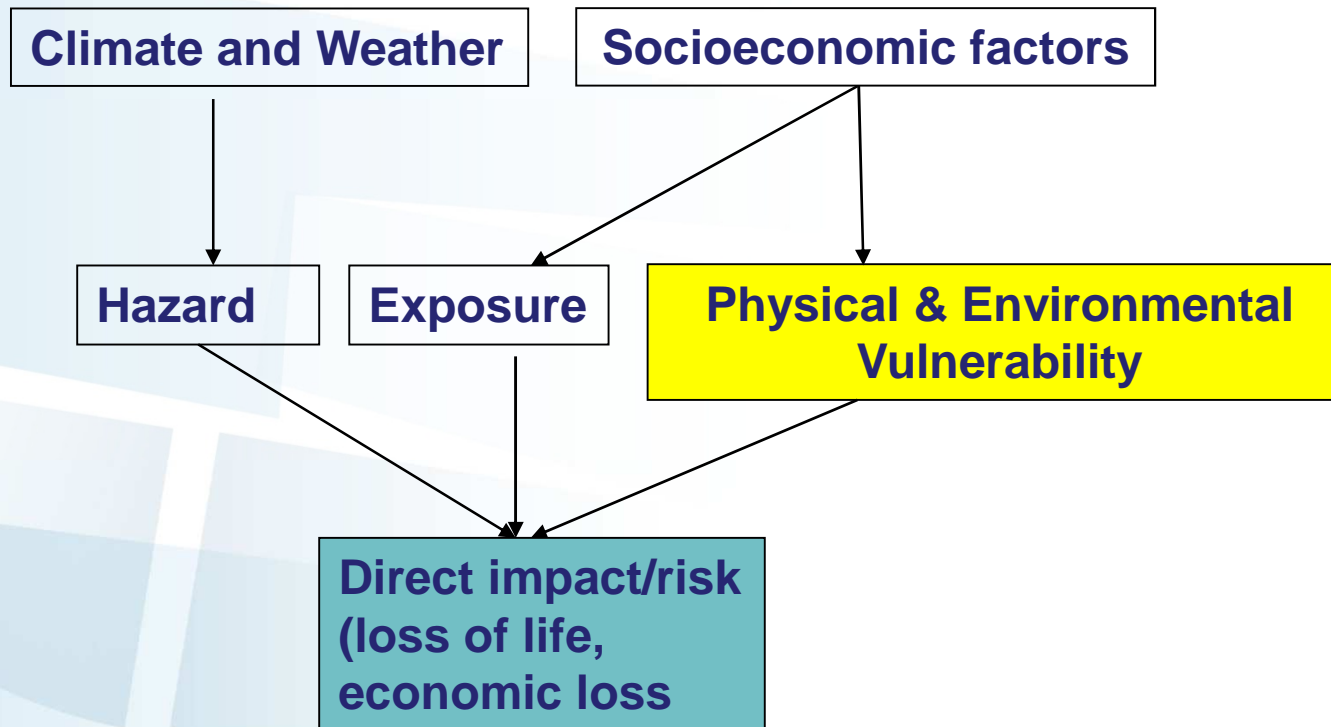
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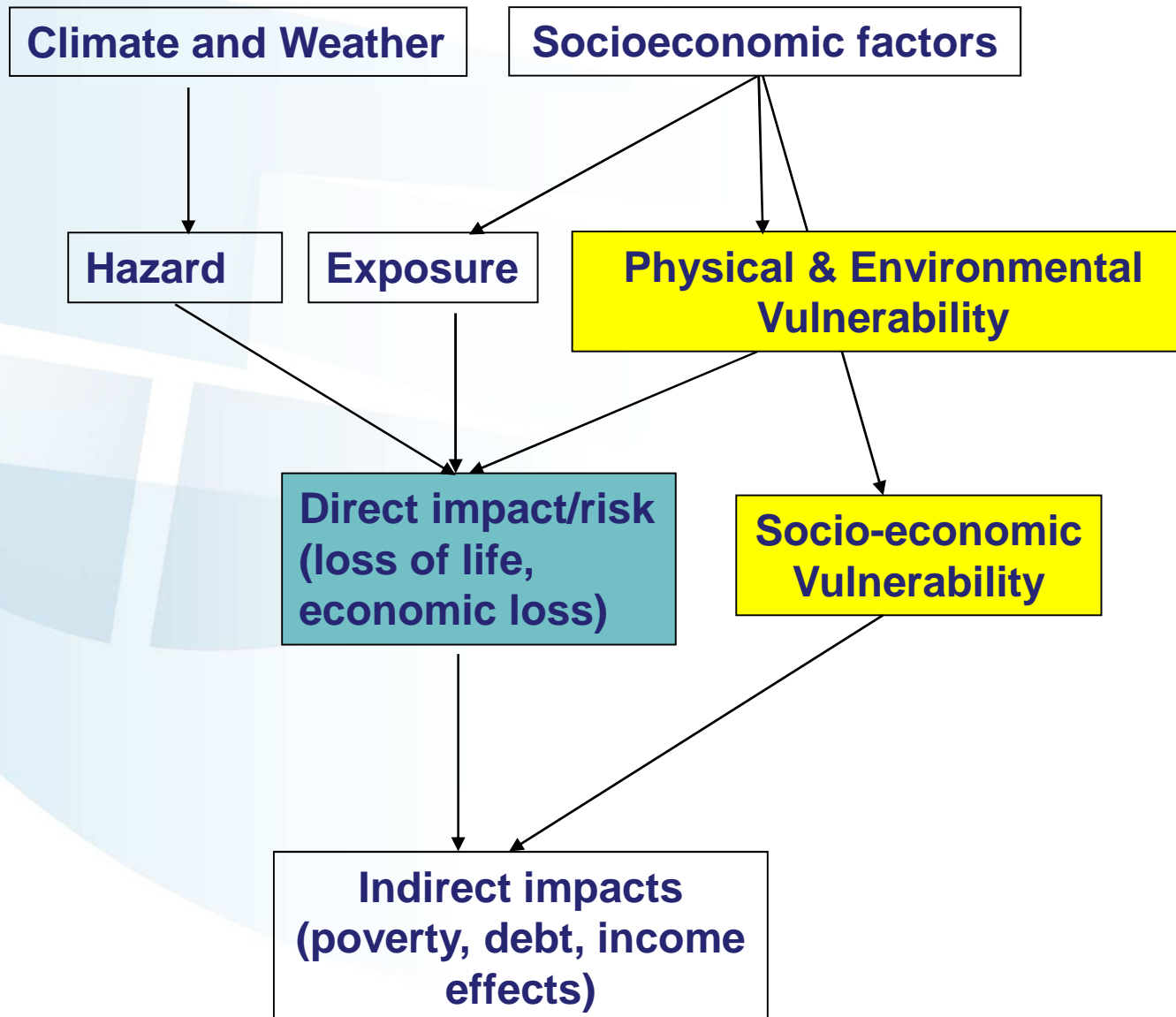
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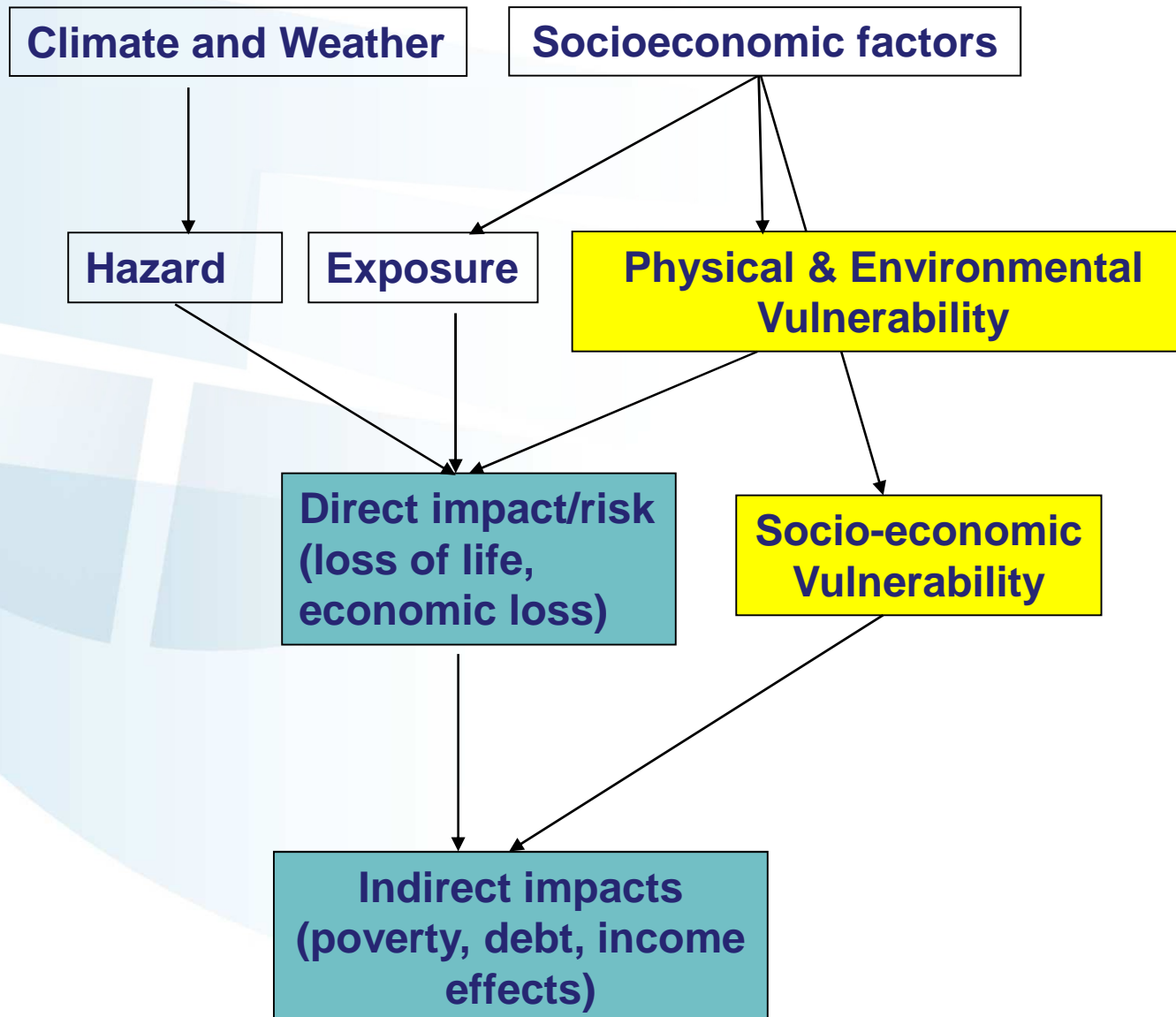
Conceptualizing and modelling vulnerability and risk



Conceptualizing and modelling vulnerability and risk



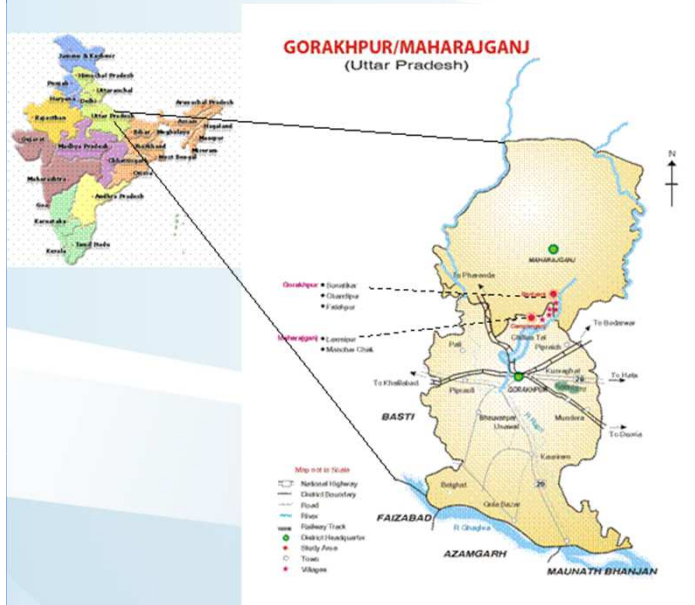
Conceptualizing and modelling vulnerability and risk



IIASA research

- On macro and micro scales
- Focus on set of micro-scale assessments:
Understanding interplay of extremes, risk and poverty
for subsistence farming households in Asia and Africa
- Informing implementation of mechanisms to lift farmers
out of poverty

Focus 1: Modelling extremes and poverty in Uttar Pradesh, India

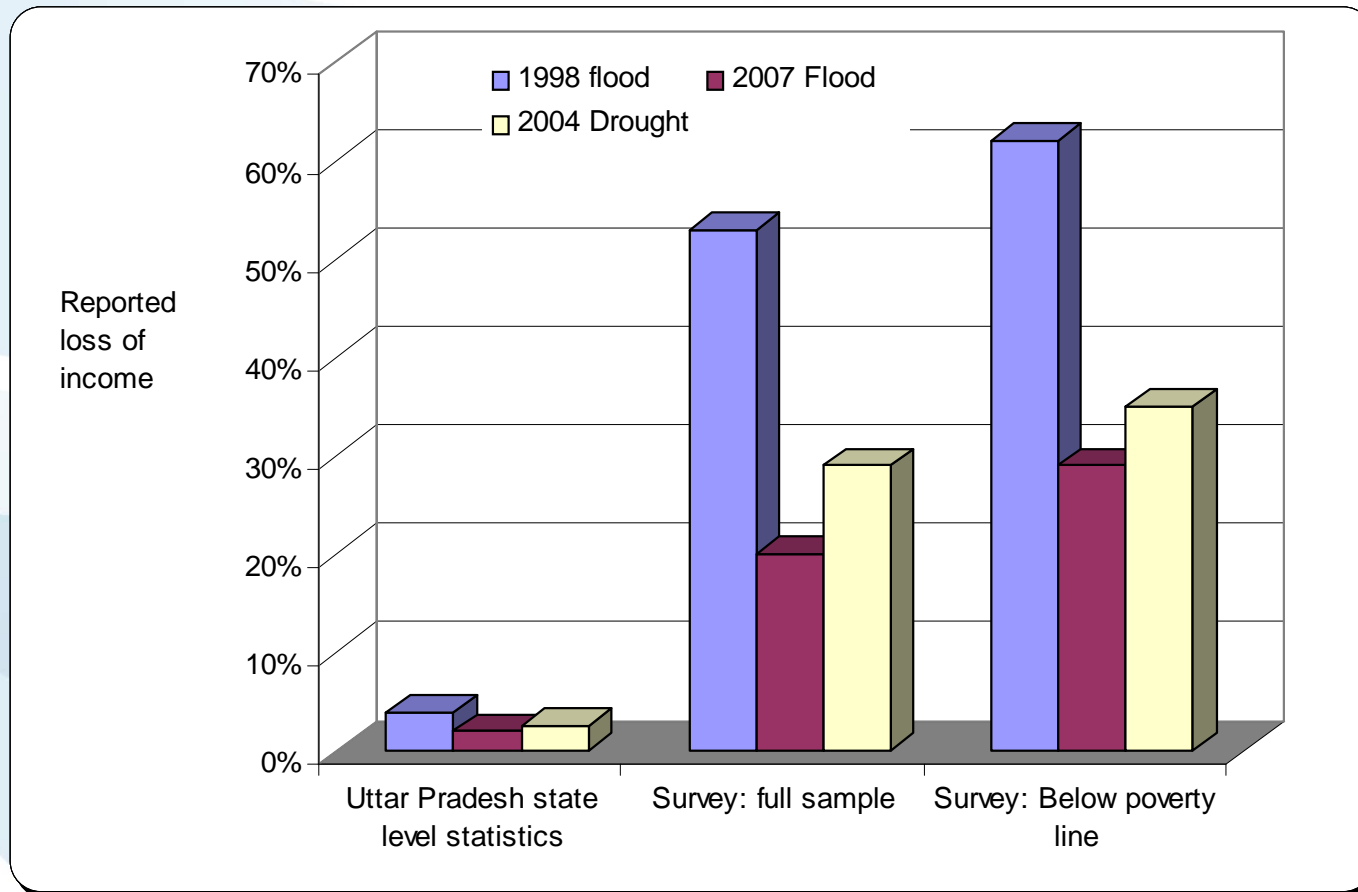


- How do disasters affect livelihoods of subsistence farmers?
- Survey in 2 villages with n=204
- Study partners:
 - Institute for Sustainable Environmental Transitions, Nepal
 - Gorakhpur Environmental Action Group, India
 - Winrock International, India



Focus 1: Uttar Pradesh, India

Survey reports differential direct impacts

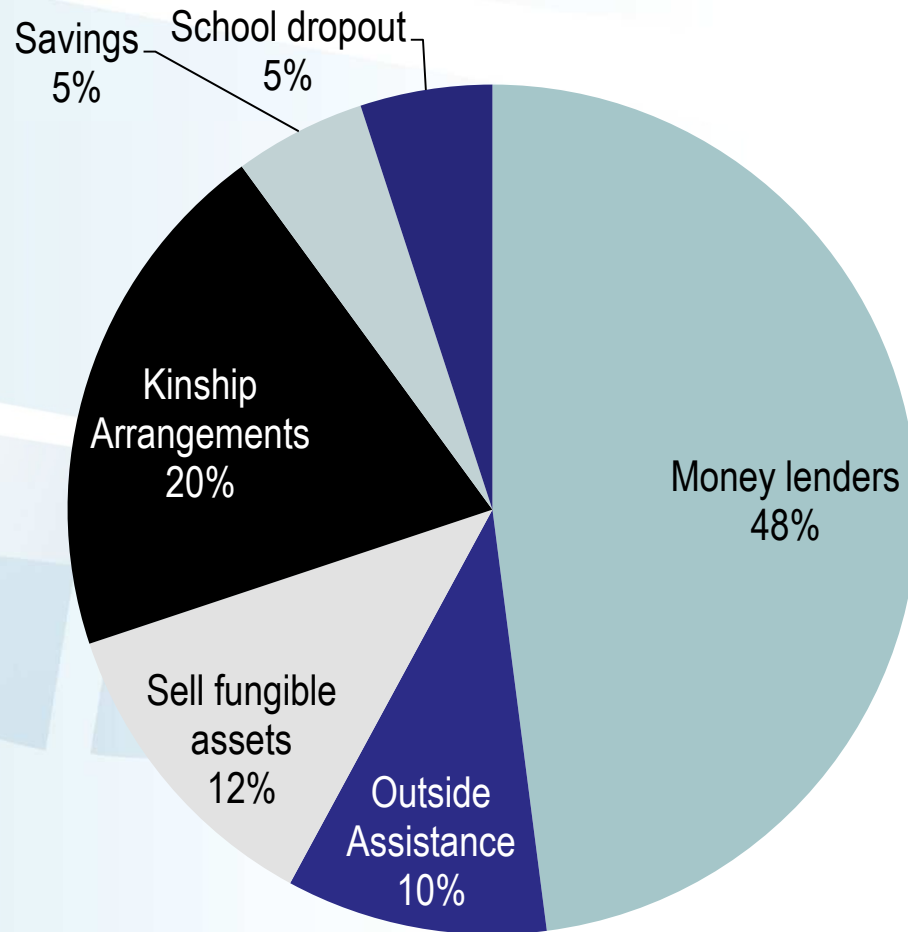


Survey results on direct losses in drought and flood events

Sources: Mechler et al., ProVention Consortium working paper #5, 2009
Hochrainer et al., Journal Mass. Emergency&Disasters, 2011

Focus 1: Uttar Pradesh, India

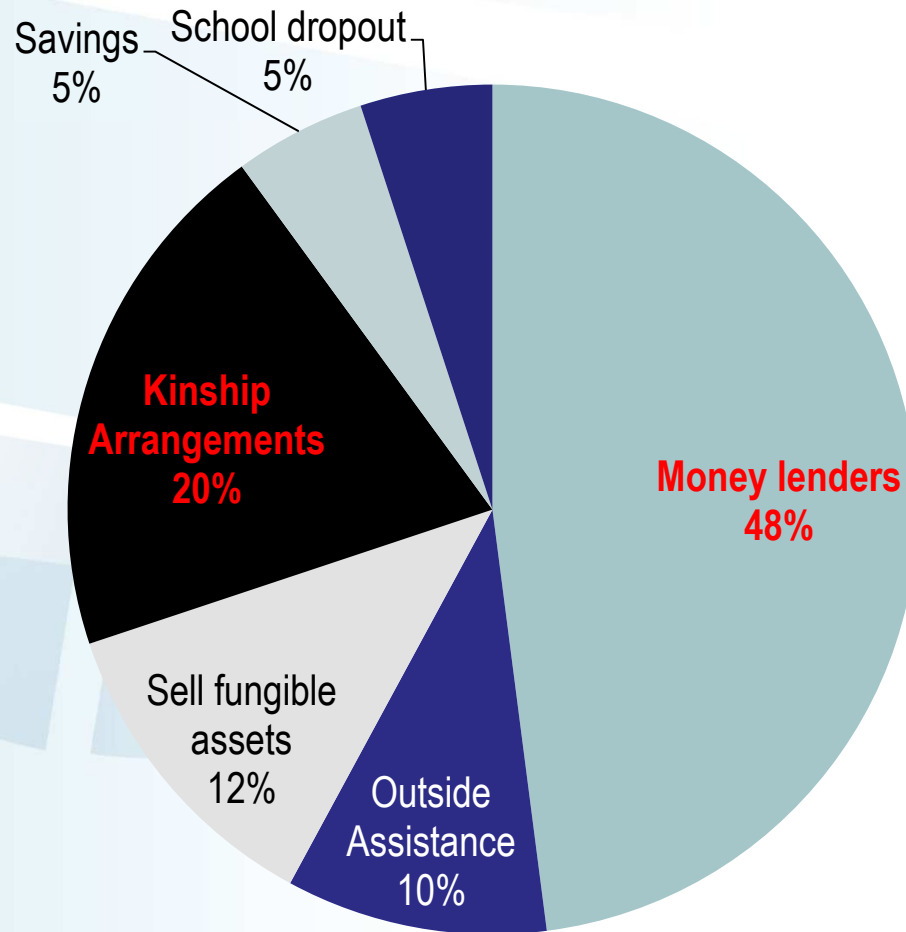
Survey results on coping mechanisms



Hochrainer et al., 2011

Focus 1: Uttar Pradesh, India

Survey results on coping mechanisms

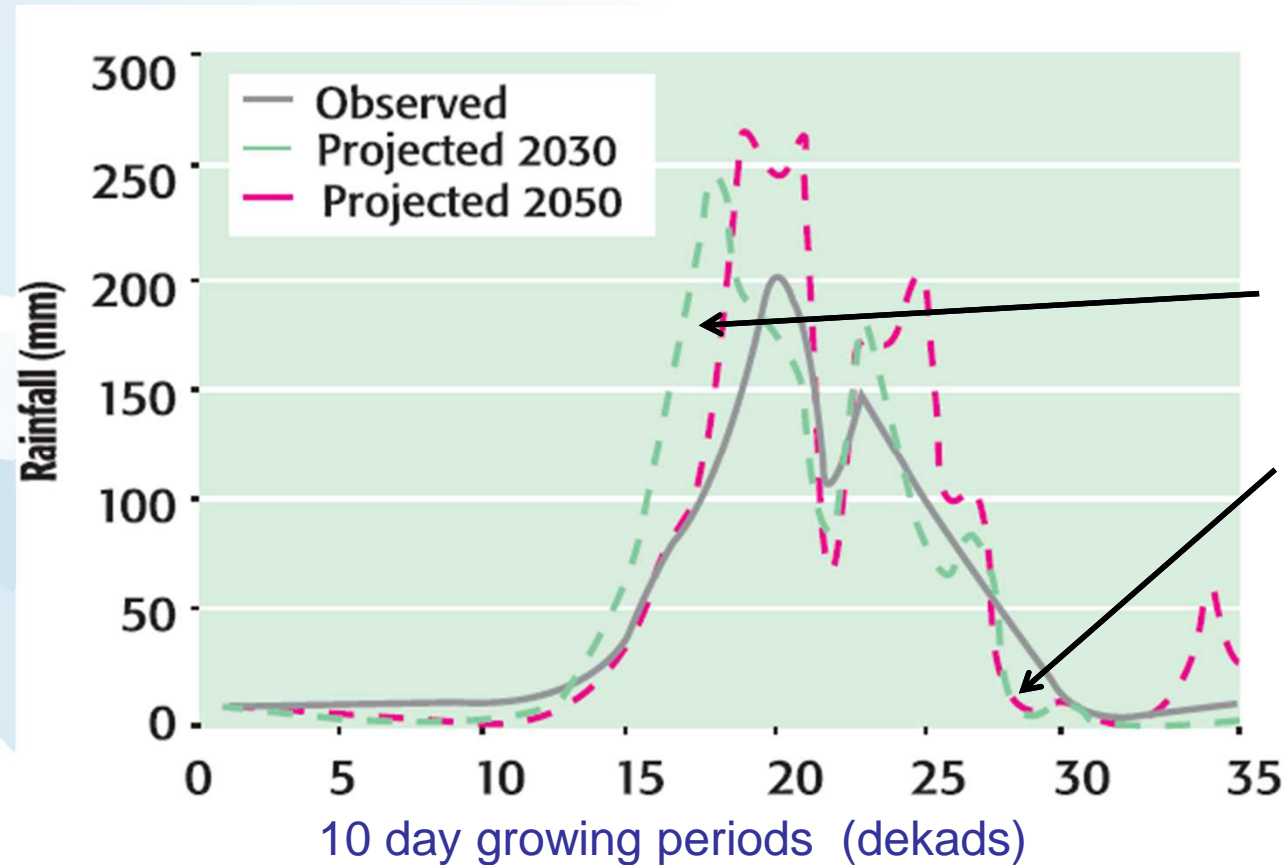


Access to economic and social capital important

Hochrainer et al., 2011

Focus 1: Uttar Pradesh, India

... coupled with hazard: precipitation and changes



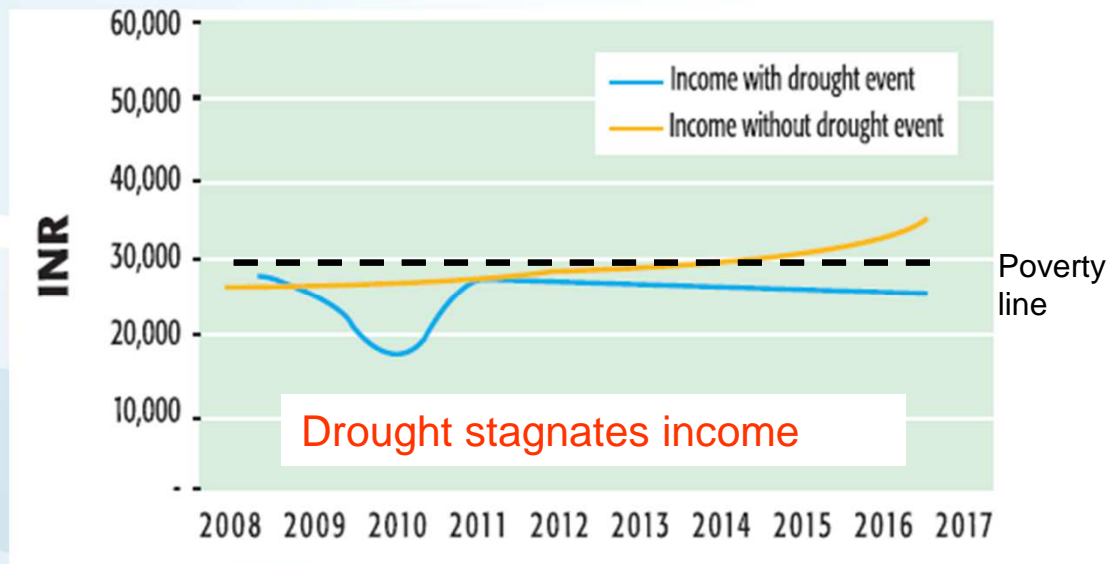
Projections of climate change suggest

- More rainfall early in the main growing season
- Less rainfall later on during harvesting

Distribution of rainfall over 10 dekads
(A2 scenario in CGMC3 climate model)

Focus 1: Uttar Pradesh, India

... can be combined to an estimate of longer term risk

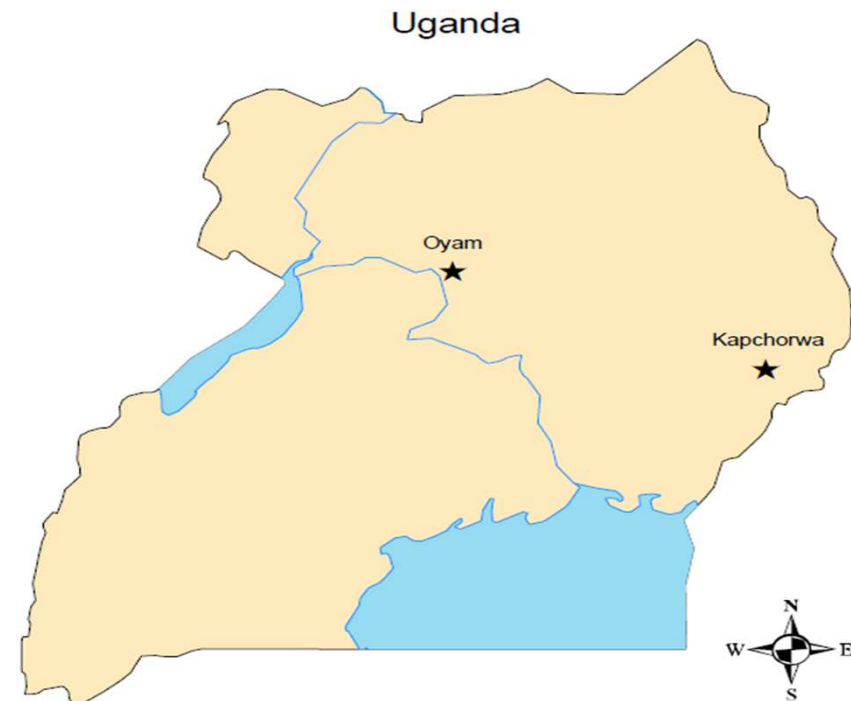


Points toward options
accessing economic and
social capital:
community-based and
donor supported
microinsurance

Income dynamics with a drought shock as compared to a baseline for a representative farming household

Focus 2: Understanding vulnerability and coping strategies in rural Uganda

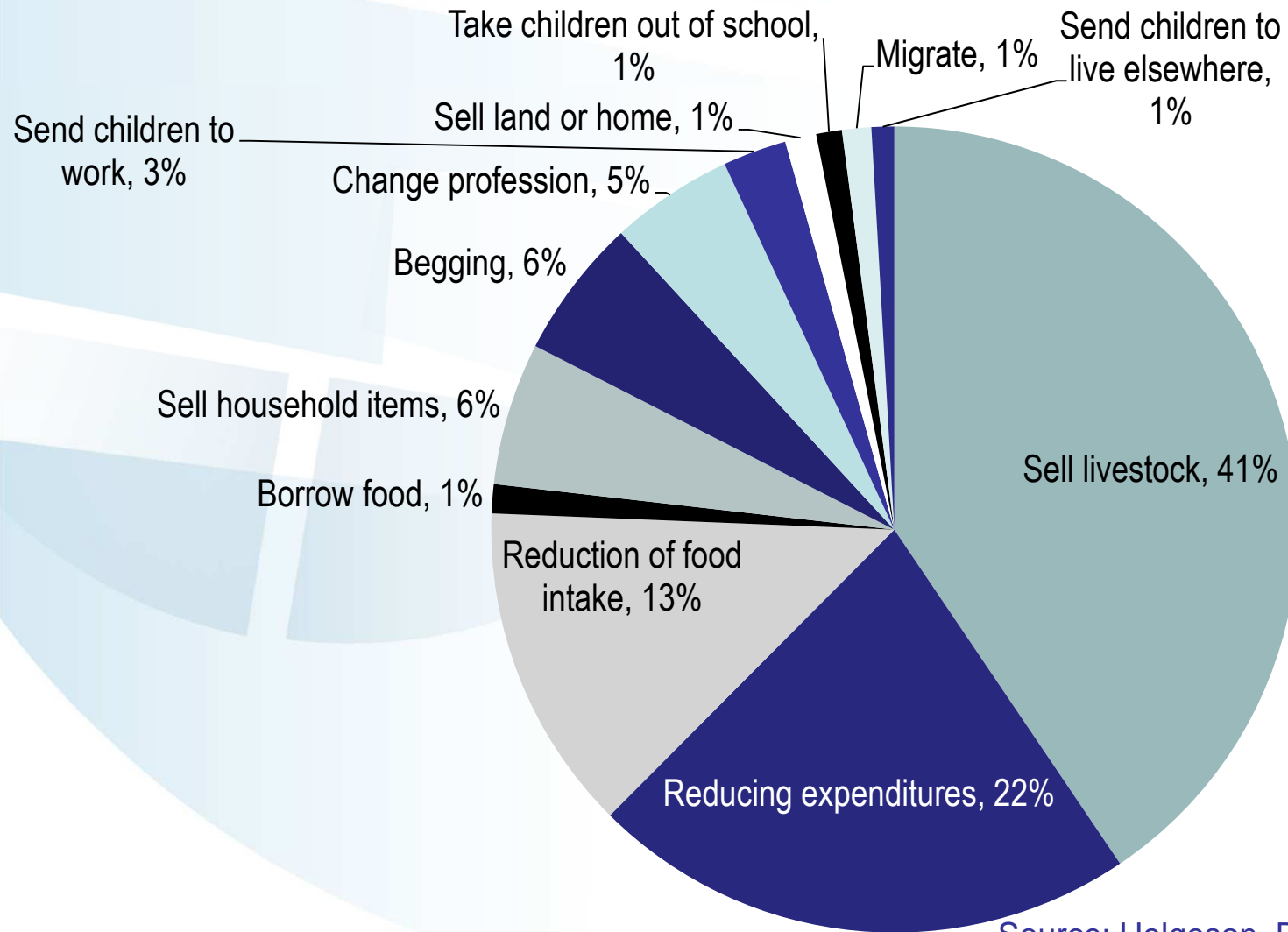
- Apart from economic factors, what other determinants shaping vulnerability and coping?
- Survey in two districts, garnered by knowledge workers using smart-phone technology
n=3258
- Partners:
 - LSE
 - Grameen Foundation, Uganda



Study areas in Uganda

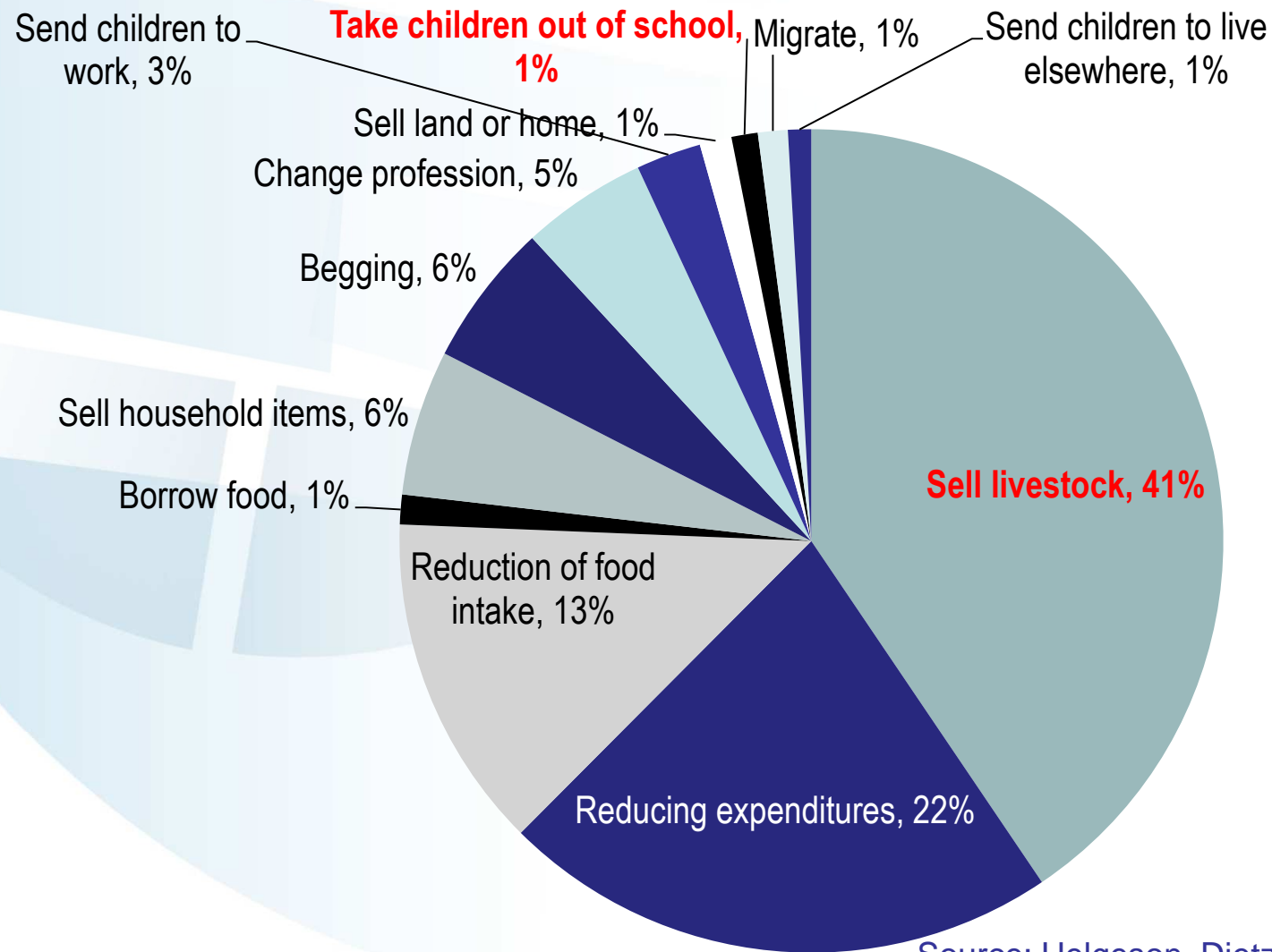
Source: Helgeson, Dietz, Hochrainer
Ecology and Society, accepted

Focus 2: Uganda Coping strategies



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Focus 2: Uganda Coping strategies



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Focus 2: Uganda

Probit regression results on determinants of coping strategies

- Livestock sale as dominant coping strategy:
 - Economic determinants (capital) important
 - e.g. crop surplus and share of income from farming reduce odds of selling livestock
- Reduced access to formal education: also human capital important:
 - Households with a more educated head less likely to choose coping strategies affecting children's educational attainment
 - Points towards benefits of investing into human capital

Conclusions

- Extreme events exert heavy toll on affected, particularly lower income, farming households
- IIASA research in South Asia and Africa derives locale-specific information on differential vulnerability and risk
- Dominant coping strategies are shaped by factors related to economic capital, but also human and social capital play a role
- Focus on today's and future vulnerabilities as starting points for analyses of disaster risk management and climate adaptation