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Workshop on Data and Methods for Modelling Migration

Associated with Climate Change

5-6 December 2016, Paris France

Introduction

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Why this workshop?

Displacement, refugees, mass migration and increasingly climate refugees are capturing public attention

Museum of Modern Art (MOMA), **Bouchra Khalili: The Mapping Journey Project** 8 September 2016

I take a train, I arrive in London.

When we come to the Mediterranean Sea, of course,

At Breda, I spent four days looking for work without finding anything

Museum of Modern Art (MOMA), **Insecurities:
Tracing Displacement and Shelter**
8 November 2016

My personal journey

- In 2007 the UN Population Division commissioned Susana Adamo and me to write a paper "Climate Change Impacts on Population Distribution and Migration" (published 2011)*

    - In that paper we wrote, "The classic way of projecting population, with its assumptions of progressive changes in fertility, mortality and migration, does not incorporate any type of **environmental feedbacks or constraints**, nor any consideration of abrupt changes in the underlying conditions. This is a known issue. For example, **Cohen (1998) has proposed the incorporation of limiting factors** into population projections and estimates, particularly in long-term projections. Depending on the scope, scale and purpose of the projection, these external factors may include **government migration policies, regional water shortages, or locally limited agriculture potential**... Given the information presented in previous sections about the likely impact of climate change events on population distribution and migration, this is an option to be considered in the near future, though the **uncertainties and specific feedbacks are difficult to fully anticipate**."

* Adamo, S.B., and A. de Sherbinin. 2011. "The Impact of Climate Change on the Spatial Distribution of Populations and Migration." Chapter in: *Proceedings of the Expert Group Meeting on Migration*, New York: United Nations Population Division.
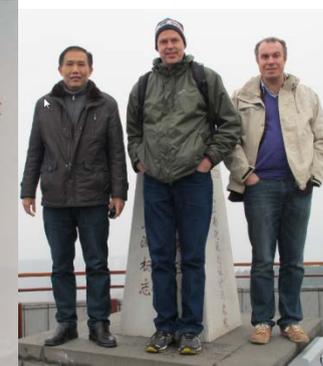
The following text in our original report* was redacted by the UN Population Division in the published version:

"Although we have deliberately avoided 'worst case' or apocalyptic scenarios, as noted in the introduction, a growing number of reports by reputable organizations and researchers are beginning to describe the potential impacts of a 'business as usual' scenario in which greenhouse gases continue to rise, the global community cannot agree on even minimum measures for mitigation, and little is done to redress global economic inequalities. **In this scenario, temperatures rise inexorably, glaciers and ice caps melt, global hydrology is irreversibly altered, millions of kilometers of productive land (e.g. in the Ganges and Mekong deltas) are under water, climate hazards become more severe, and agricultural systems have difficulty adapting to climate variability.** And all of this occurs in a world of **3-4 billion more people** than at present. Political scientists who have studied the correlates of state failure suggest that such changes would likely lead to an increase in armed conflict – producing more refugee flows and further disruptions. … **The results of unmitigated climate change are highly unpredictable, and might be best modeled as a chaotic, non-linear system, rather than a systematic set of causal chains.** Under such circumstances, traditional population projections might well become a thing of the past. "

* Adamo, S.B., and A. de Sherbinin. 2008. "The Impact of Climate Change on the Spatial Distribution of Populations and Migration." Report submitted to the UN Population Division.

Personal journey (continued)

- Collaboration among CIESIN, UNU & CARE looking at climate impacts on migration
  - *In Search of Shelter* (2009)
  - *Where the Rainfalls: Climate Change, Food and Livelihood Security, and Migration* (2012)
  - Plus three subsequent reports on loss & damage
- 2010 workshop with Francois and ensuing research and on potential resettlement issues around climate change
  - "Preparing for Resettlement Associated with Climate Change" *Science* (2011)
  - "Resettlement in the Twenty First Century" *Forced Migration Review* (2014)
  - Trip to Mekong Delta and then to Three Gorges Dam with Francois (2014)

Why develop scenarios of CC-induced migration and population distribution?
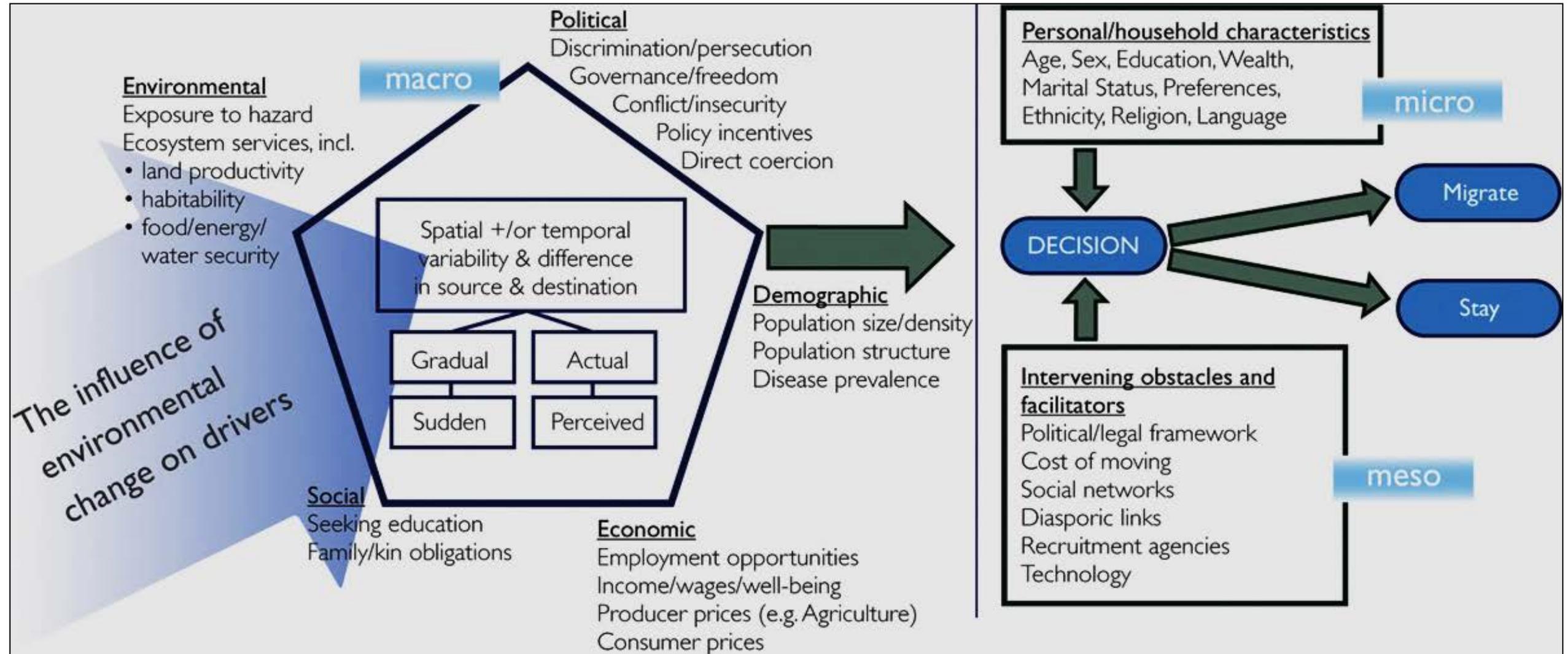
- For the same reason demographers have always projected population
  - Policy makers want to know future demographic patterns
    - For planning purposes, since population is fundamental
    - Because we're entering into uncharted waters with climate change
    - For humanitarian and development purposes
  - Both sending and receiving countries have an interest in future migration streams
- We can no longer assume population distributions will evolve as they have in the past
- The media have an insatiable curiosity surrounding the numbers

Additional questions

- How will scenario-based global/regional/country projections be used?
  - What are the views of IOM and IDMC on the need for numbers?
- Is it foolish to undertake global projections given all the uncertainties?
- What are the relative merits of country-level flow data vs. subnational projections?
- What is the potential for "mis-use" of these numbers?
  - Who defines "mis-use"?
  - How might "mis-use" influence how we set about our work?
- To what extent is the quest for future numbers driven by policy demand, media interest, or by research interest?
  - Are we doing this because we can, or because it is needed?

Hotspots Mapping

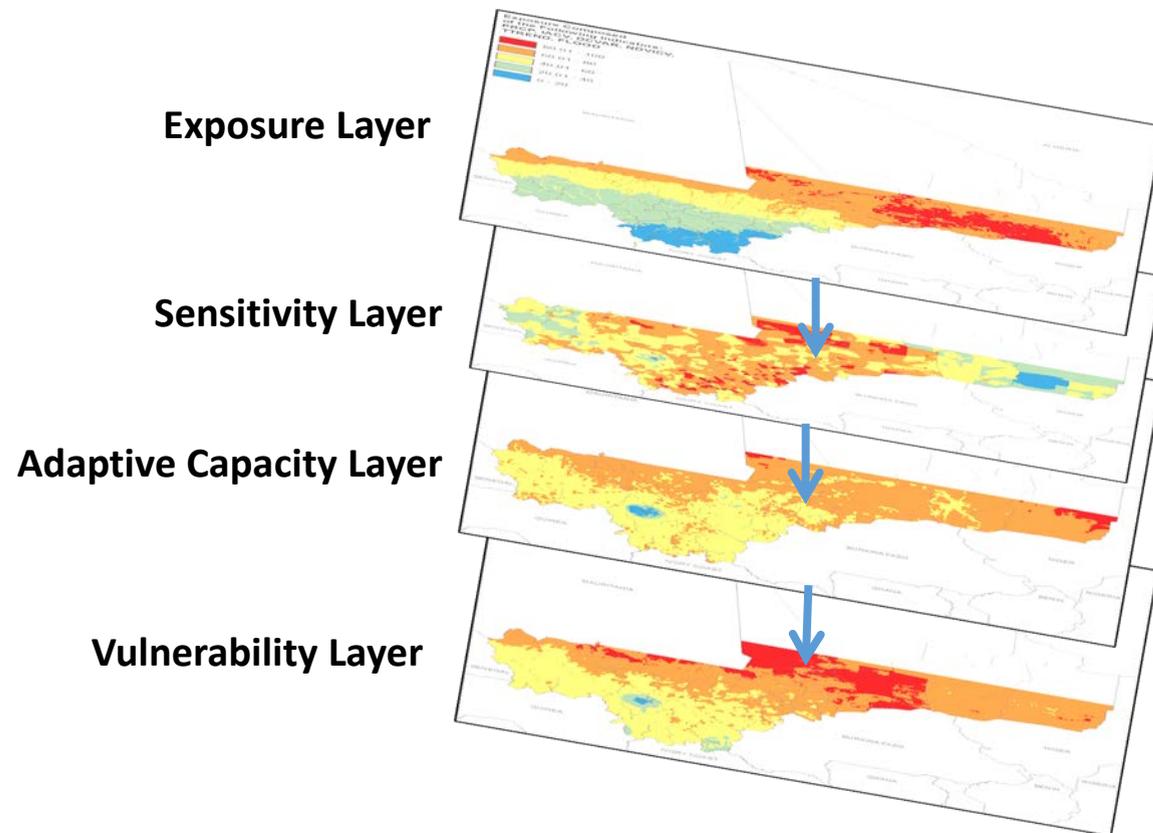# Modeling migration an displacement is messy

Source: Black, R., W. N. Adger, et al. (2011). The effect of environmental change on human migration. *Global Environmental Change-Human and Policy Dimensions* 21: S3-S11. Based on Foresight: Migration and Global Environmental Change (2011) Final Project Report The Government Office for Science, London
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/287717/11-1116-migration-and-global-environmental-change.pdf

Different Approaches to Understanding Climate Change Impacts on Migration (complementary, not exclusive)

- **Historical analog:** What is the empirical evidence for migration being induced by climatic changes or extremes? Can a separate "climate signal" be detected at all?

- **Livelihoods focus:** How will climate change impact the natural resources and productive systems upon which many poor people depend?

- **Future impacts:** What are likely impacts? How many people live in areas affected? What proportion of those affected will migrate? How will the proportion vary by impact type?

- **Migration systems:** how will existing migration systems and drivers of migration be impacted by CC? (push, pull, intervening variables)

What is a climate change hotspot?

- Integrates *spatial variability* in Climate / biophysical changes, and Human / system vulnerabilities
- *Climate change impacts, vulnerabilities and adaptive/coping capacities are all spatially differentiated*
- *Mapping can illuminate key vulnerabilities in the coupled human-environment system and, in turn, inform where adaptation may be required*
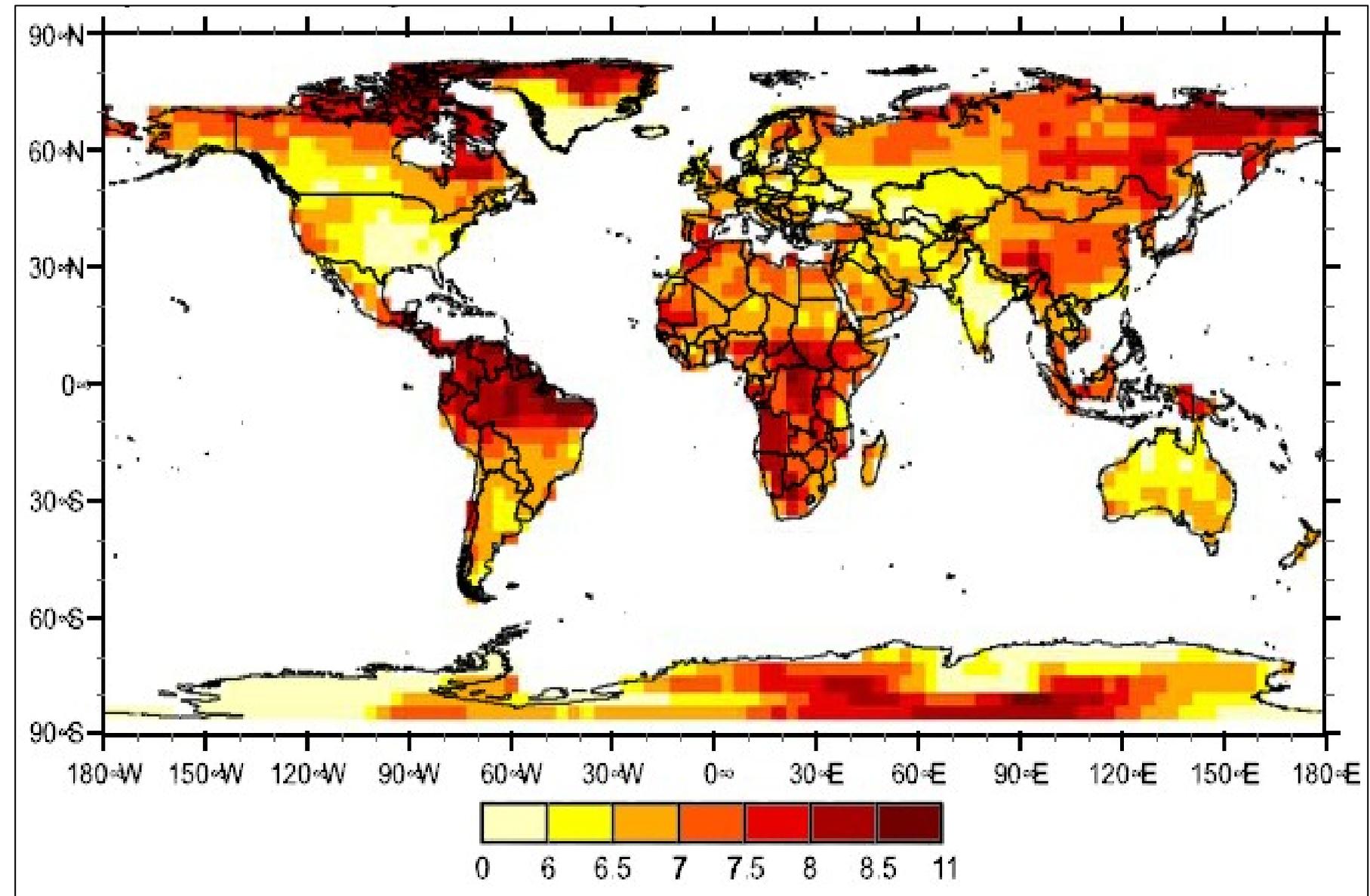

Exposure Layer

Sensitivity Layer

Adaptive Capacity Layer

Vulnerability Layer

"In the past 5 years there has been a proliferation of efforts to map climate change "hotspots" — regions that are particularly vulnerable to current or future climate impacts, and where human security may be at risk. While some are academic exercises, many are produced with the goal of drawing policy maker attention to regions that are particularly susceptible to climate impacts, either to mitigate the risk of humanitarian crises or conflicts or to target adaptation assistance." (de Sherbinin 2014. Climate change hotspots mapping: what have we learned? *Climatic Change*. 123(1):23-37 DOI 10.1007/s10584-013-0900-7

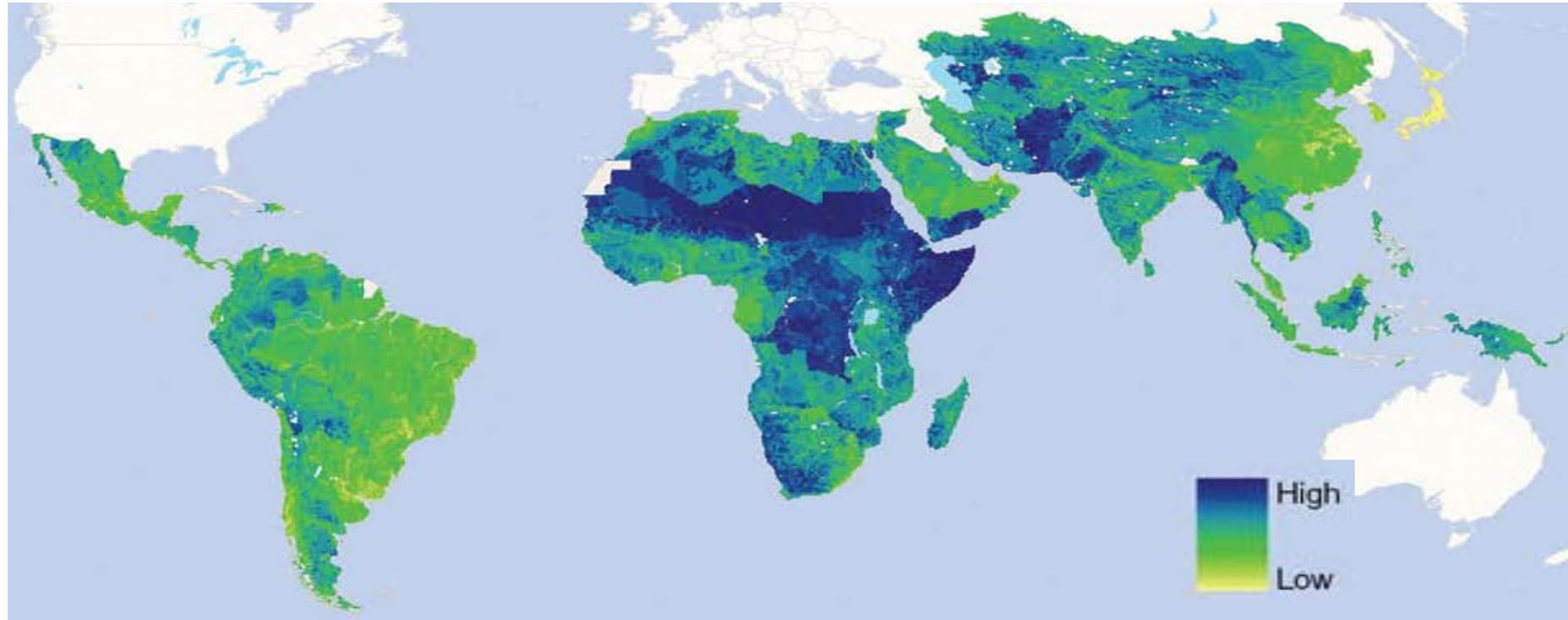# Future Impacts: Climate Change Index

The index tracks increases in the probabilities of events relative to a 1 in 20 year return cycle for the same events under current climatology.

It includes indicators such as additional hottest years, additional driest years, and additional extremely warm / wet / dry seasons.

Source: Baettig, M.B., M. Wild, and D.M. Imboden. 2007. A climate change index. *Geophysical Research Letters*, 34, L01705.
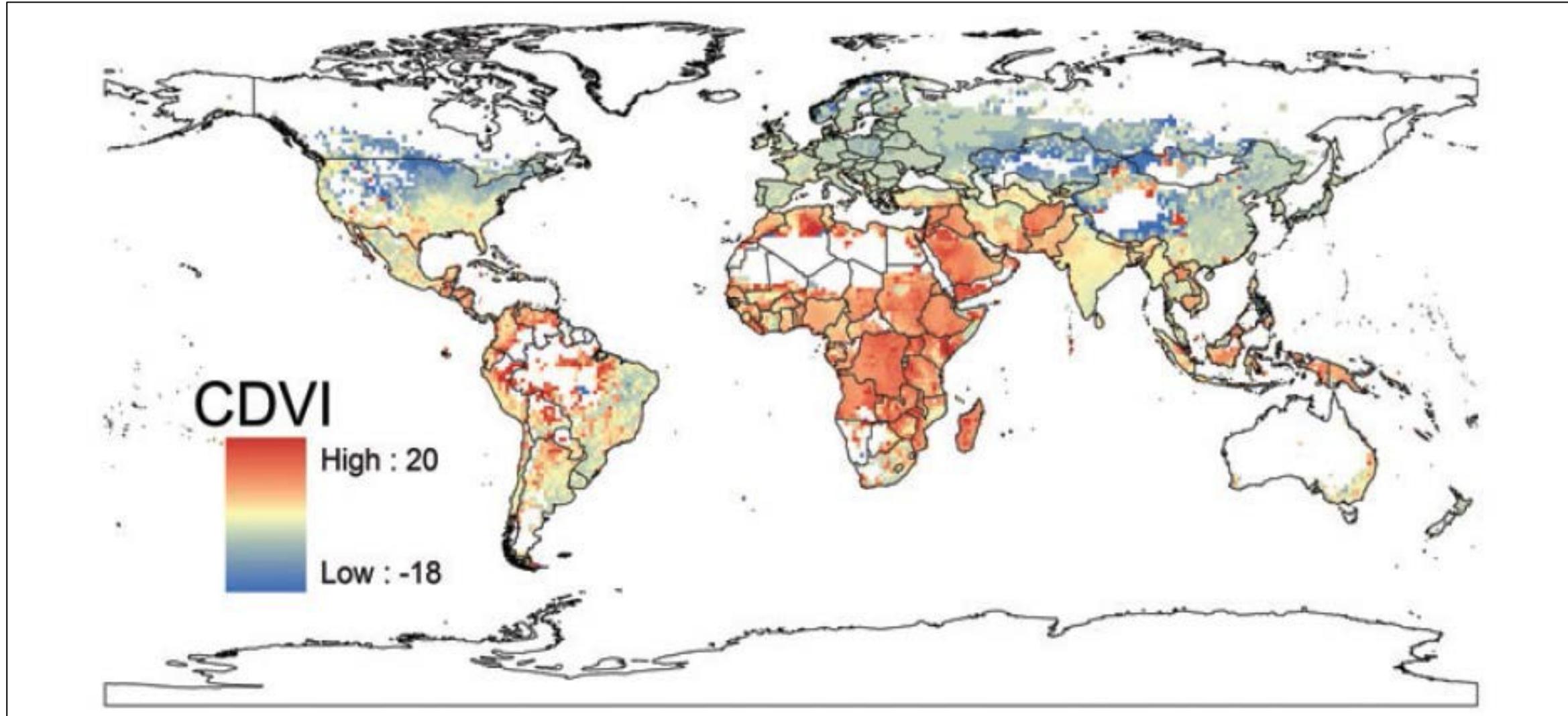
Incorporating vulnerability: Humanitarian implications of climate change

Source: CARE and Maplecroft. 2008. *Humanitarian implications of climate change: Mapping emerging trends and risk hotspots*. Geneva, Switzerland: CARE International.
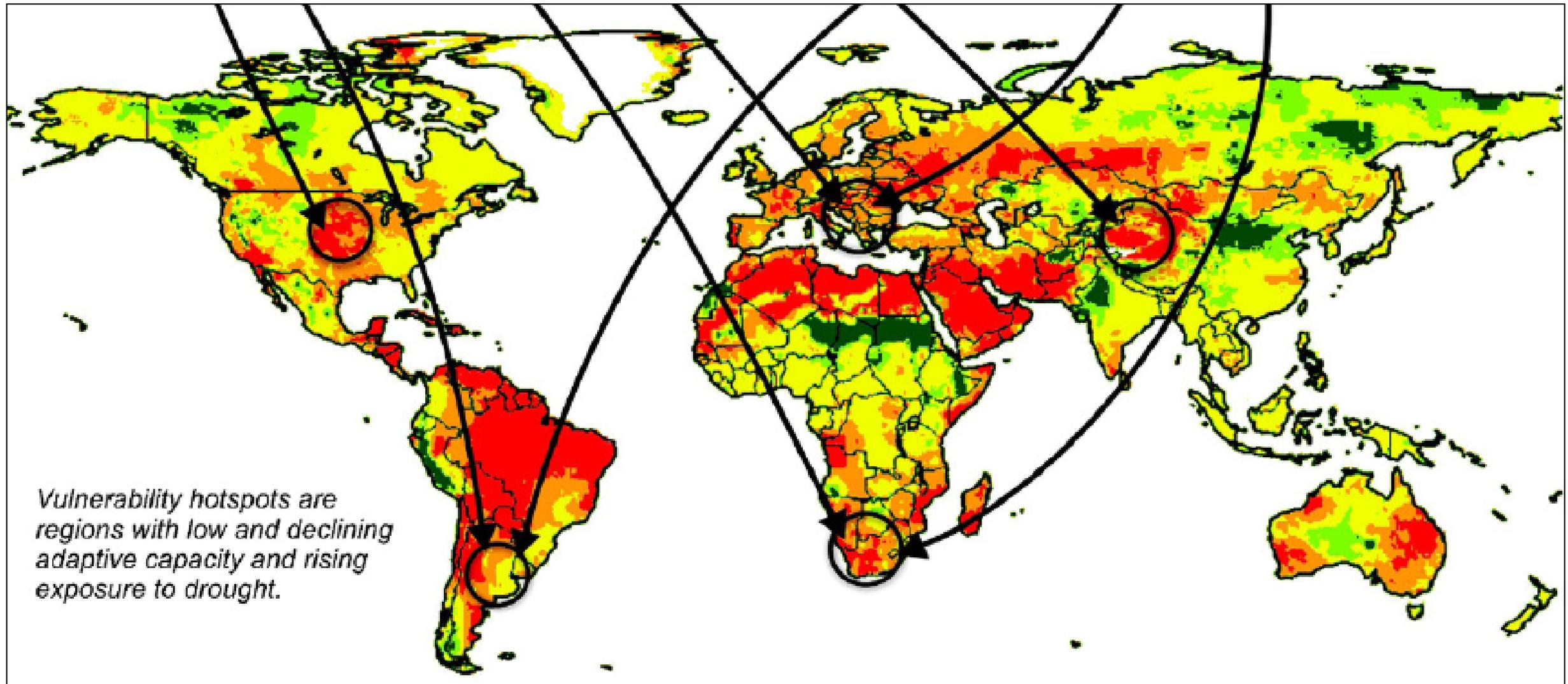
- Uses combination of historical country-level data (refugees/displace-ment, conflict) and CIESIN's gridded data for population, poverty and climate hazard exposure

- Climate scenario data (A1B) for: % change in extreme precip, % change in maximum dry periods, and future dynamics of drought risk

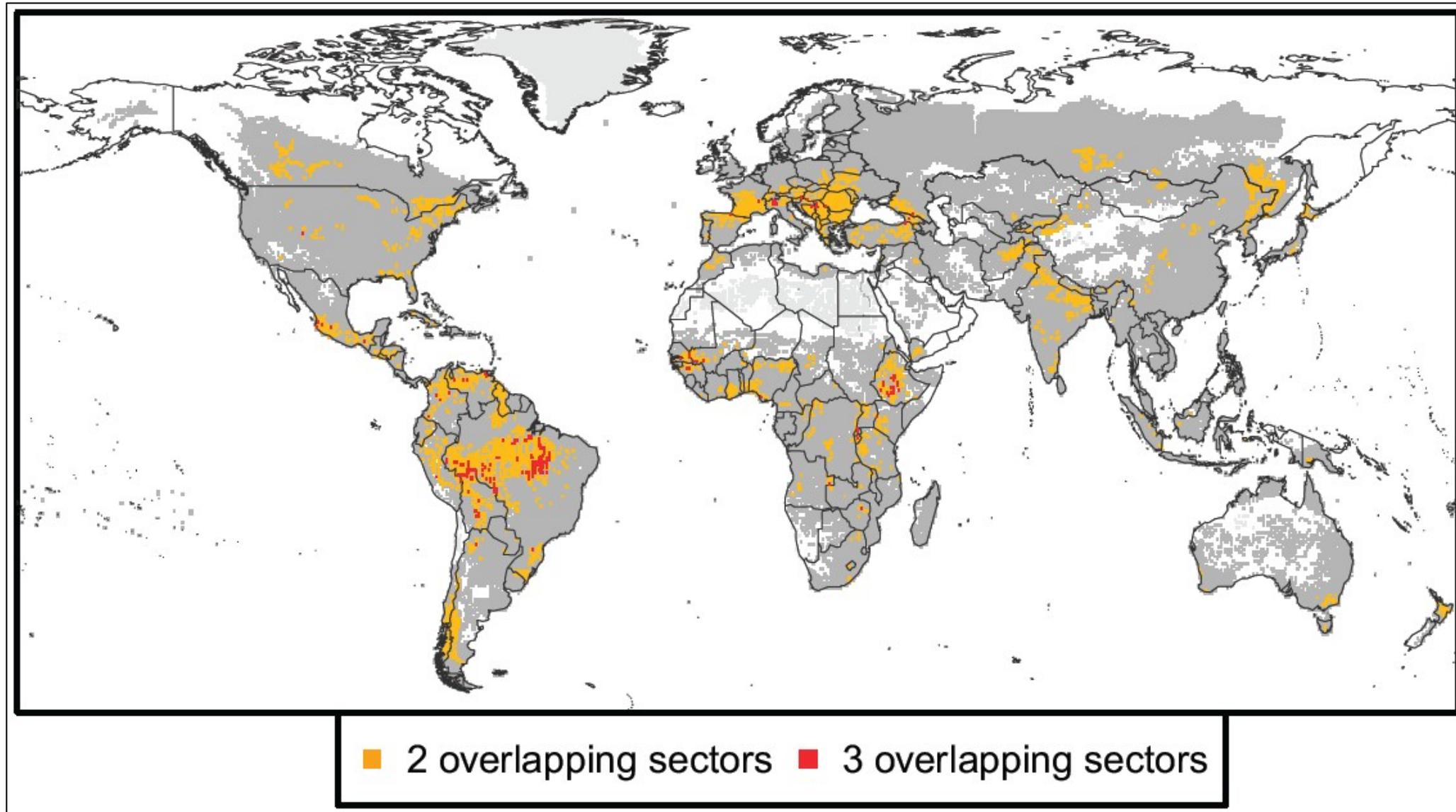# Future Impacts: Climate - Demography Vulnerability Index

Source: Samson, J., D. Berteaux, B.J. McGill and M.M. Humphries. 2011. Geographic disparities and moral hazards in the predicted impacts of climate change on human populations. Global Ecology and Biogeography doi:10.1111/j.1466-8238.2010.00632.x

Future impacts: Vulnerability hotspots for wheat and maize

Vulnerability hotspots are regions with low and declining adaptive capacity and rising exposure to drought.

Source: Fraser, E.D.G., E. Simelton, M. Termansen, S.N. Gosling, and A. South. 2012. "Vulnerability hotspots": Integrating socio-economic and hydrological models to identify where cereal production may decline in the future due to climate change induced drought. *Agricultural and Forest Meteorology*, in press.

Future Impacts: Multisectoral Hotspots of Impacts

■ 2 overlapping sectors   ■ 3 overlapping sectors

Source: Piontek F, Müller C, Pugh TAM et al (2013) Multisectoral climate impacts in a warming world. *Proceedings of the National Academy of Sciences*. doi:10.1073/pnas.1222471110.

Some issues to consider

- Demand for hotspots maps will likely increase as decision makers seek to identify where impacts will be greatest and what adaptation measures, if any, are possible.
  - "Seemingly innocent and value neutral, maps could play an important role in framing societal responses to climate change and its impacts in ways that are surely not neutral" (de Sherbinin 2014:34)
- Migration related questions:
  - What proportion of the affected population will leave?
  - How to merge current migration dynamics (e.g.,, migration systems) with hotspots mapping results?
  - Can we accurately predict large scale crisis migration?
- Often not addressed:
  - Multiple stressors beyond climate change -- economic downturn, commodity prices, HIV/AIDS, disease outbreaks, political instability, and conflict -- are generally not taken into account
  - Potential direct displacement from major infrastructure projects and their environmental impacts
- Ideally, developing future *scenarios* of *possible* migration flows would emphasize the need for preventive mechanisms.
  - *As weather and climate-related disasters are becoming more frequent and destructive in Mexico, the model suggests that out-migration will continue to rise in the coming years **if an active disaster prevention strategy and structural adaptation measures are not duly implemented*** (Saldaña-Zorrilla & Sandberg 2009)