Population Dynamics, the Environment, and Climate Change

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Outline

1. Rural population-development-environment linkages in low income countries
2. Macro-level population-development-environment linkages
3. Population dynamics and climate change vulnerability and adaptation

Part 1: Local-level linkages

GOAL 1	End poverty in all its forms everywhere
GOAL 2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
GOAL 3	Ensure healthy lives and promote well-being for all at all ages
GOAL 4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
GOAL 5	Achieve gender equality and empower all women and girls
GOAL 14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
GOAL 15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

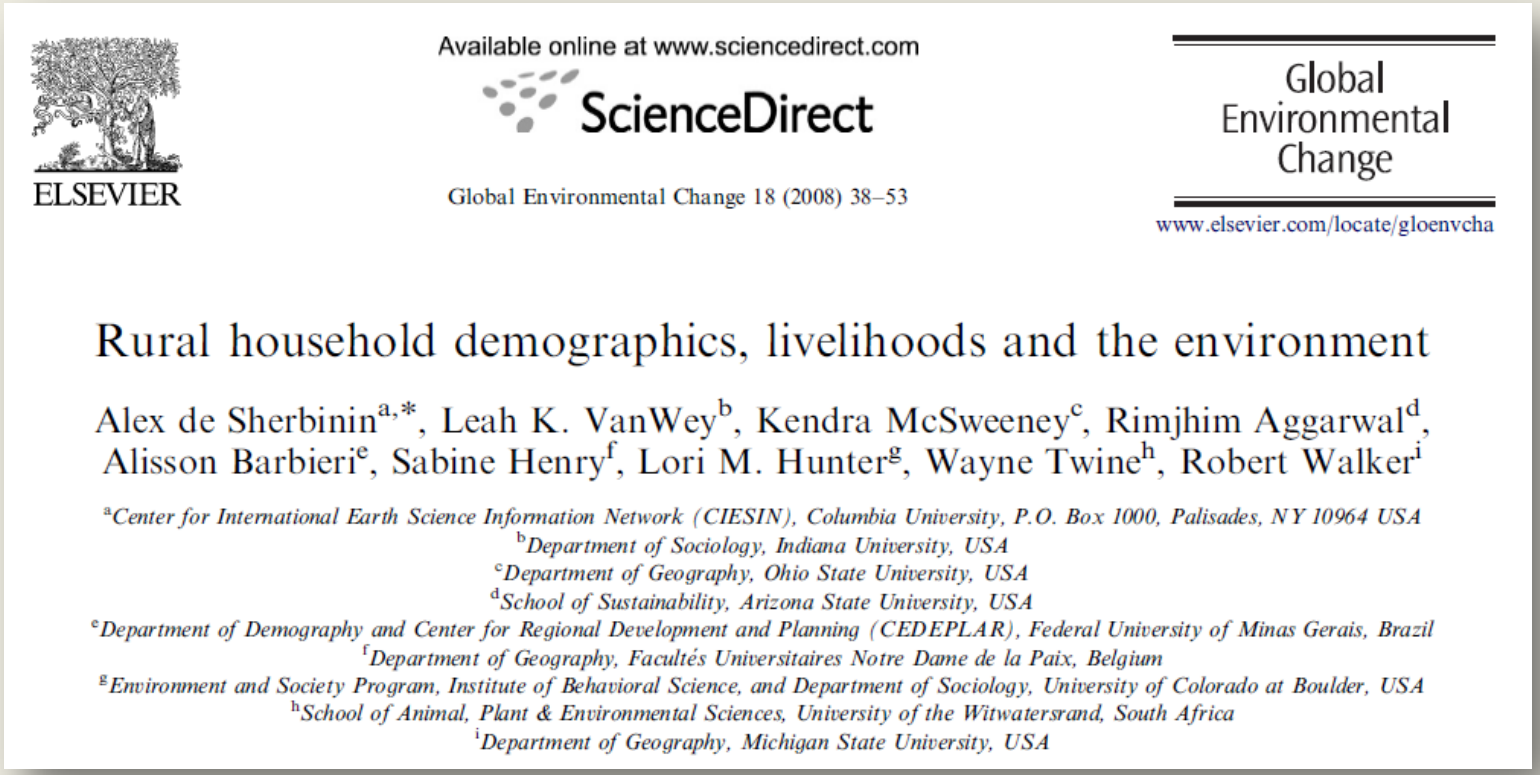
Situating this work within the SDGs

Part 2: Macro-level linkages

GOAL 10	Reduce inequality within and among countries
GOAL 12	Ensure sustainable consumption and production patterns

Part 3: Population dynamics and climate change

GOAL 11	Make cities and human settlements inclusive, safe, resilient and sustainable
GOAL 13	Take urgent action to combat climate change and its impacts*



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Rural household demographics, livelihoods and the environment

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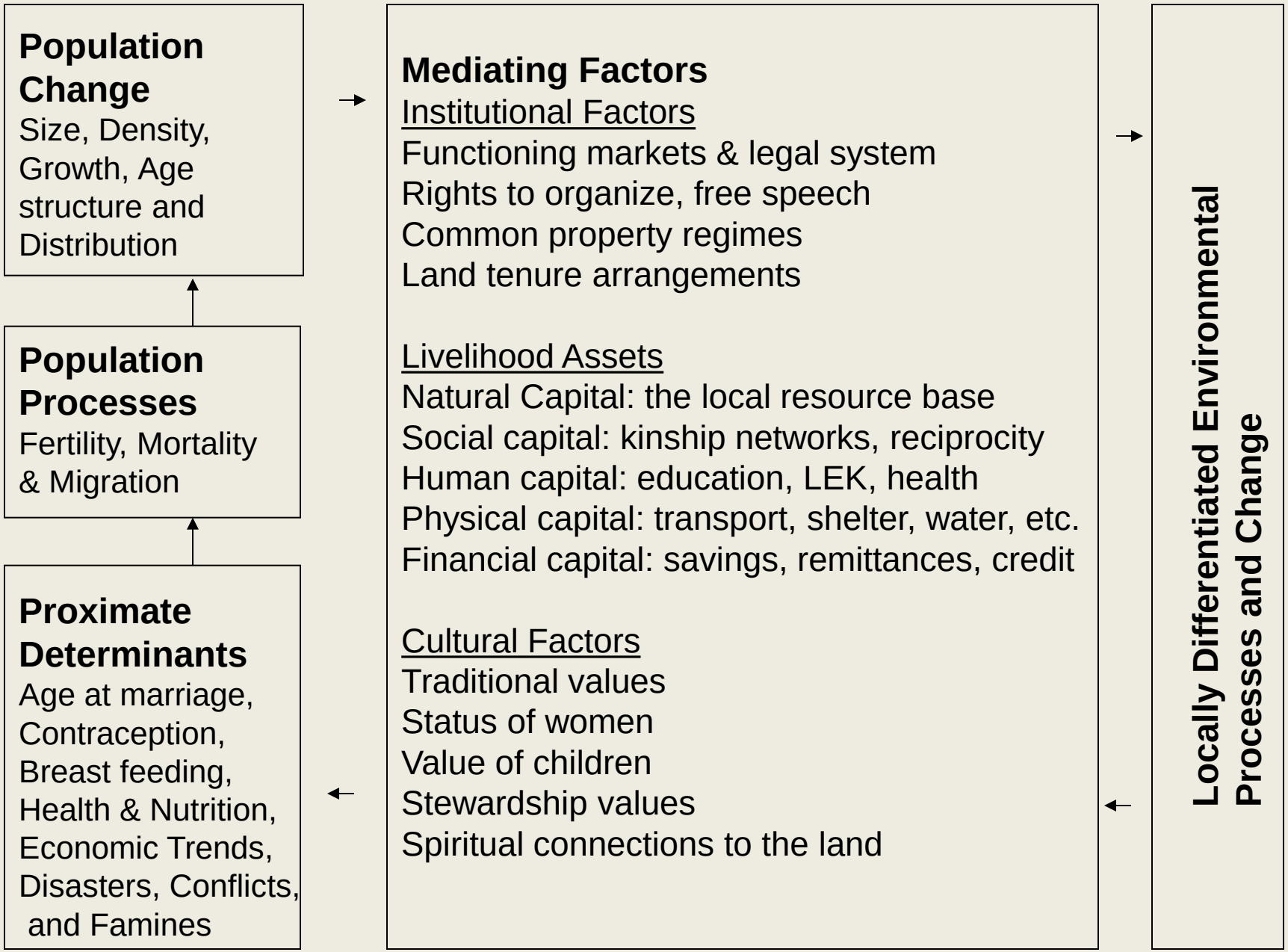
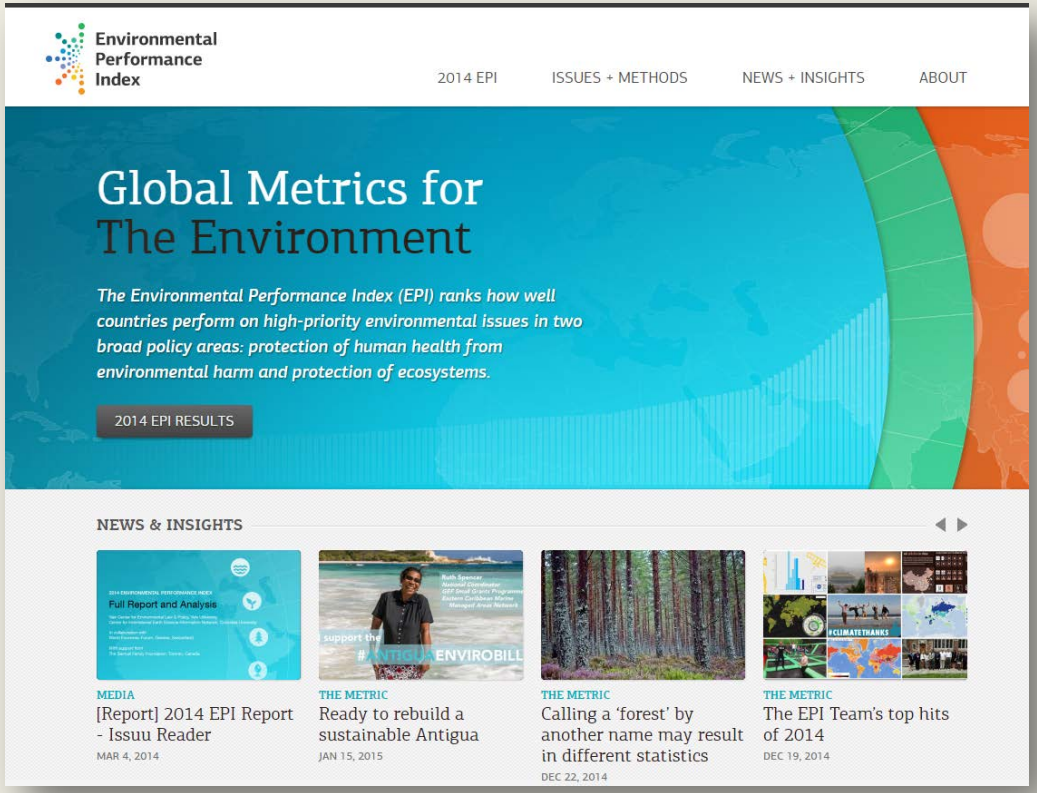
PART 1: RURAL PDE LINKAGES


Population Change
Size, Density, Growth, Age structure and Distribution
Population Processes
Fertility, Mortality & Migration
Proximate Determinants
Age at marriage, Contraception, Breast feeding, Health & Nutrition, Economic Trends, Disasters, Conflicts, and Famines
Mediating Factors
Institutional Factors
Functioning markets & legal system
Rights to organize, free speech
Common property regimes
Land tenure arrangements
Livelihood Assets
Natural Capital: the local resource base
Social capital: kinship networks, reciprocity
Human capital: education, LEK, health
Physical capital: transport, shelter, water, etc.
Financial capital: savings, remittances, credit
Cultural Factors
Traditional values
Status of women
Value of children
Stewardship values
Spiritual connections to the land
Locally Differentiated Environmental Processes and Change

Key Findings on Link Between HH Demographics and Local Environmental Change

- Fertility
  - Limited support for the “vicious circle model” (VCM)
  - Improving women’s status is a ‘‘win–win’’ strategy for reducing fertility rates while improving incomes and the environment
- Morbidity/Mortality
  - Adult morbidity/mortality reduces HH wealth/income and increases dependence on natural resources
  - Timber, NTFPs, wildlife, etc., are an important “buffer” for poor HHs
  - Can result in a loss of local environmental knowledge
- Migration
  - Faced with resource scarcity, HHs will employ intensification, extensification, and out-migration
  - Evidence of env’tal decline both contributing and curtailing out-migration
  - Remittances can reduce dependence on the local NR base (increase food imports) or result in investments that increase forest conversion

Source: de Sherbinin, A., L. VanWey, K. McSweeney, L. Hunter, et al. 2008. “Household Demographics, Livelihoods and the Environment.” *Global Environmental Change*, Vol. 18, no.1, pp. 38-53.



PART 2. MACRO-LEVEL PDE LINKAGES

EPI Framework

ENVIRONMENTAL HEALTH

- Health Impacts
- Air Quality
- Water and Sanitation

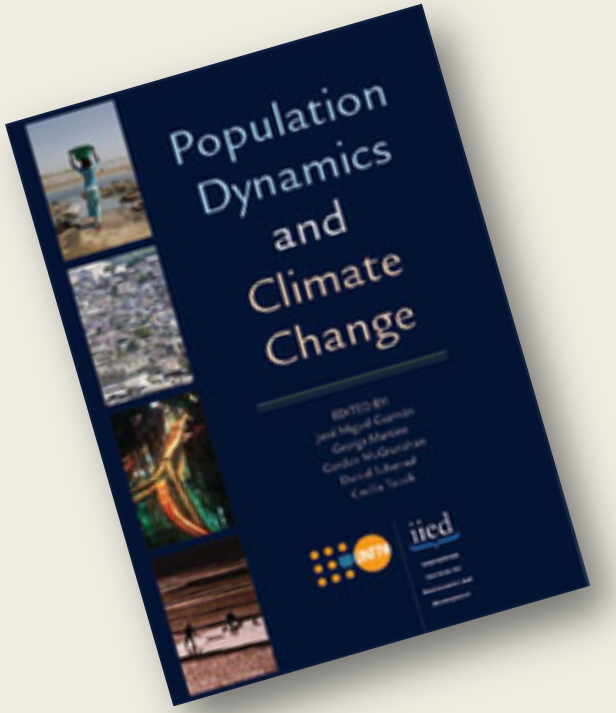
ECOSYSTEM VITALITY

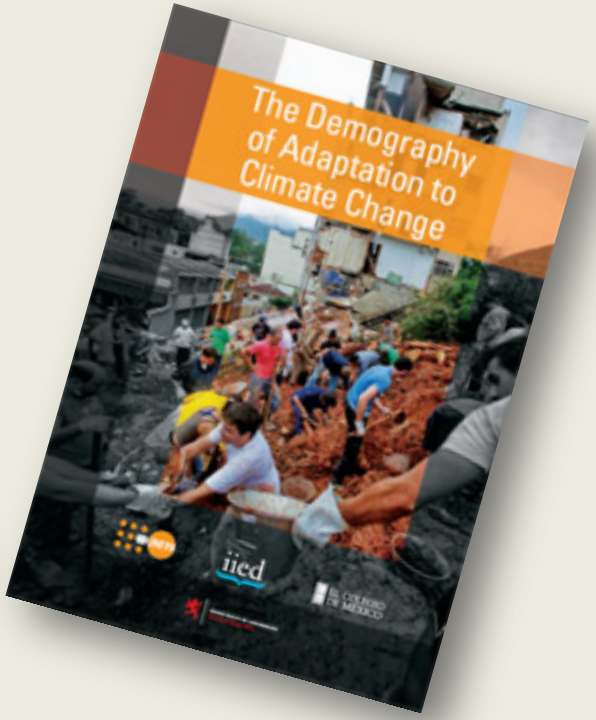
- Water Resources
- Agriculture
- Forests
- Fisheries
- Biodiversity and Habitat
- Climate and Energy

EPI and Population Density & Change

	PopGrwth2012	PopDens2010	TFR2012
2014 EPI score →	-.454** .000 171	.150* .050 172	-.718** .000 170
EPI 2000-2010 (% change) →	.139 .070 171	-.126 .101 172	.277** .000 170
Environmental Health →	-.490** .000 171	.151* .048 172	-.812** .000 170
Ecosystem Vitality →	-.328** .000 171	.113 .122 172	-.487** .000 170

- High EPI scores are associated with low population growth and low fertility rates
  - The negative correlation is even higher for Environmental Health
- Population density has a slight positive relationship with EPI scores
- Countries with improving EPI scores also have high fertlity





PART 3. CLIMATE CHANGE VULNERABILITY AND ADAPTATION

Population Dynamics and Climate Change
Vulnerability & Adaptation

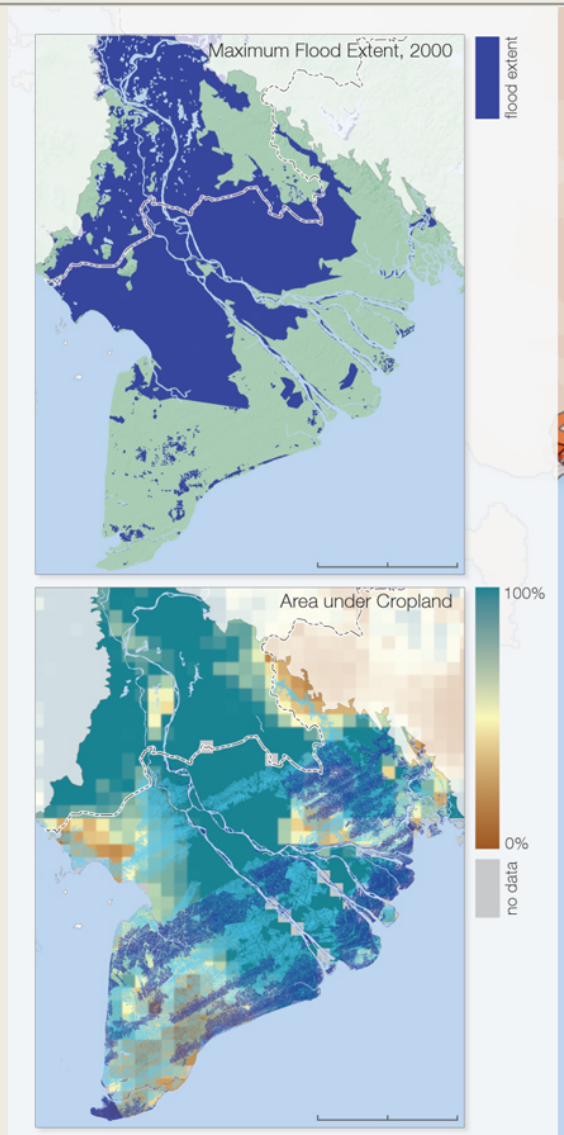
"Vulnerability is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity."

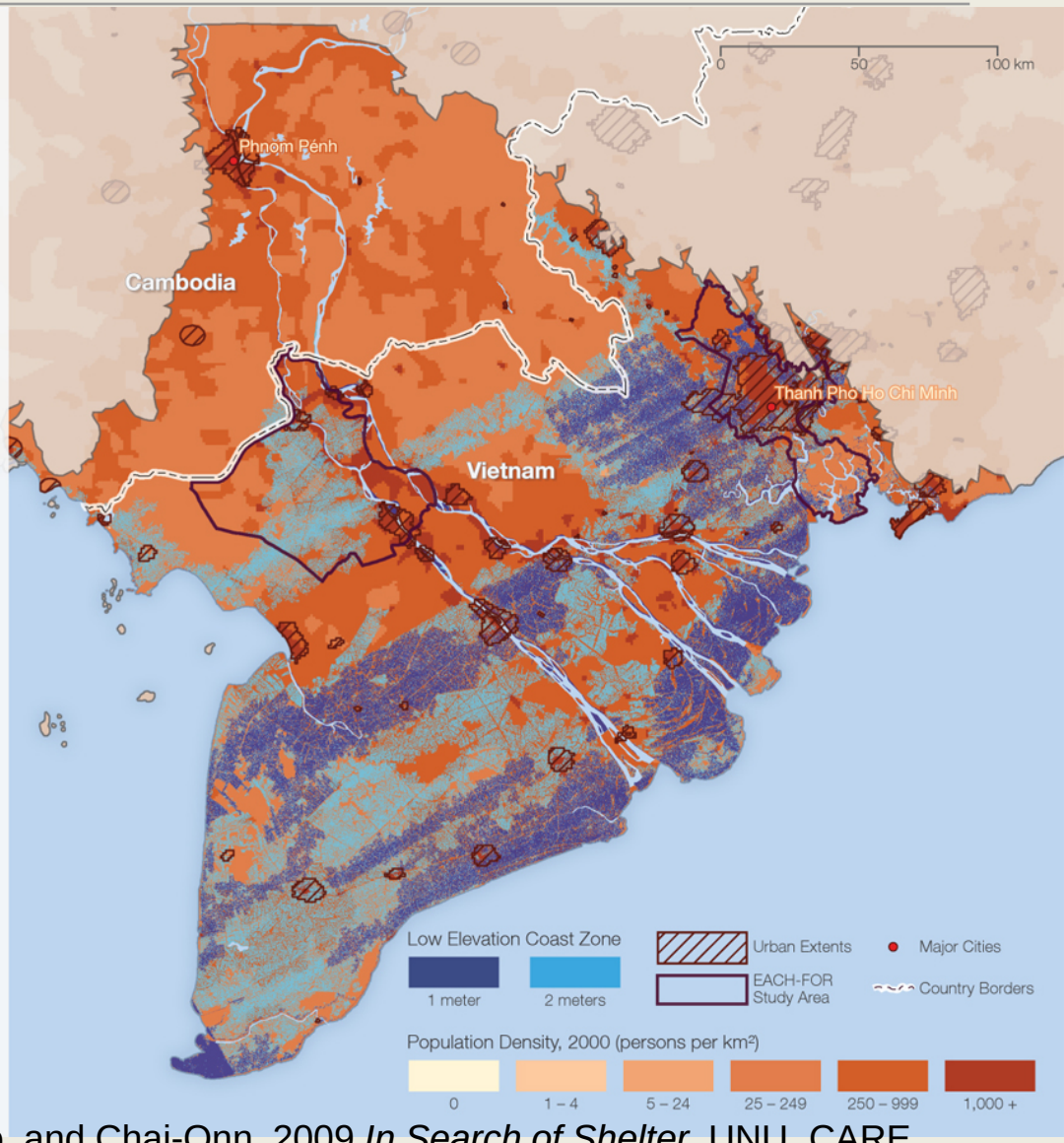
Population's Vulnerability = f (E, S, A)

Where

- E = exposure — the location of occurence of certain kinds of hazards and their magnitude
- S = sensitivity — the intrinsic characteristics of a population and institutions that influence abilities to withstand stressors; in modeling approaches, the dose-response function
- A = adaptive capacity — capacities of the system, sector or group to resist impacts, cope with losses, and/or regain functions

Identifying Exposed Populations



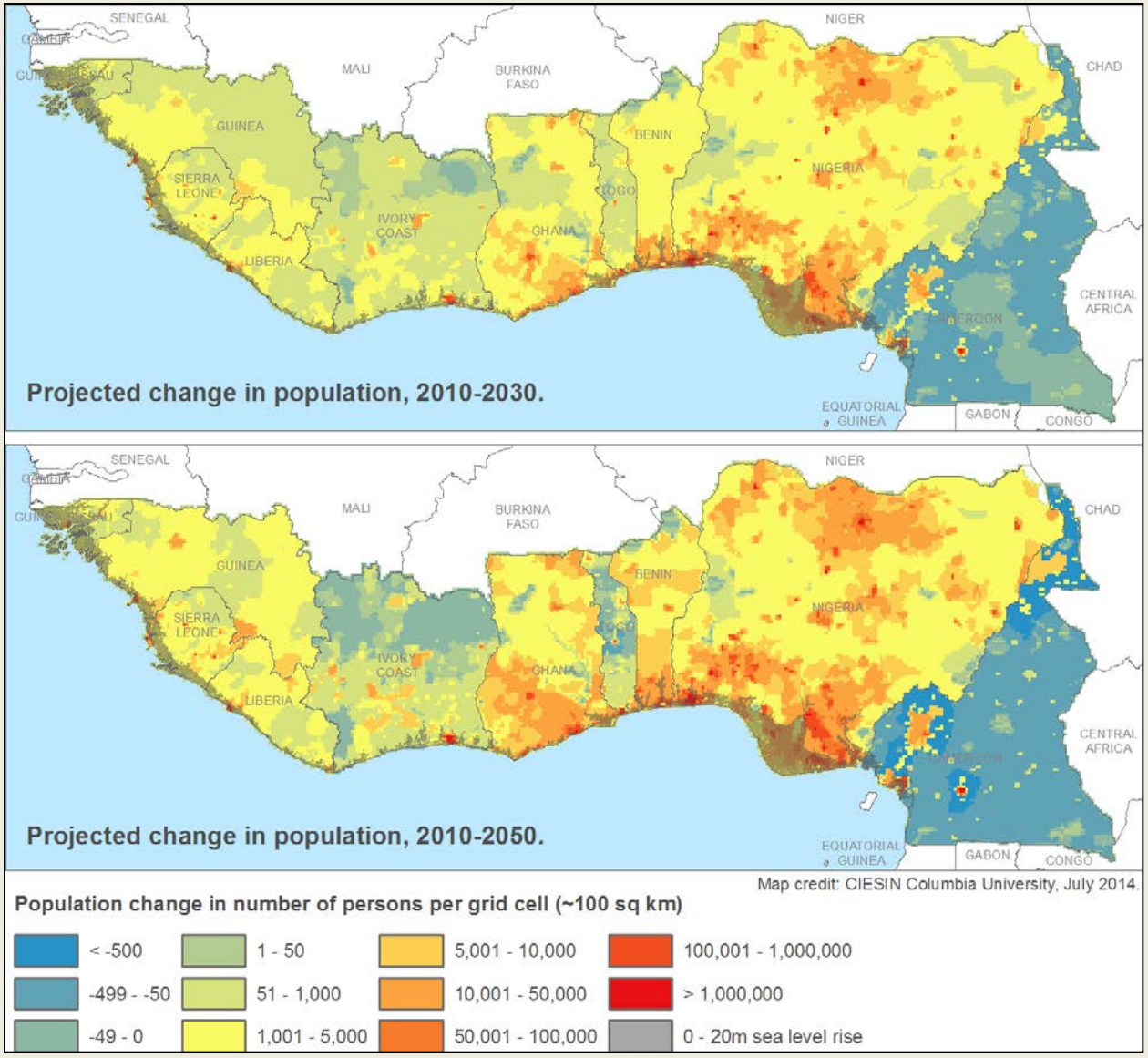


Source: Warner, Ehrhardt, de Sherbinin, Adamo, and Chai-Onn. 2009 *In Search of Shelter*. UNU, CARE, CIESIN. Available at http://www.ciesin.columbia.edu/documents/clim-migr-report-june09_final.pdf

Projected Population Exposure

>40m people in the 0-5m LECZ of Nigeria by 2050

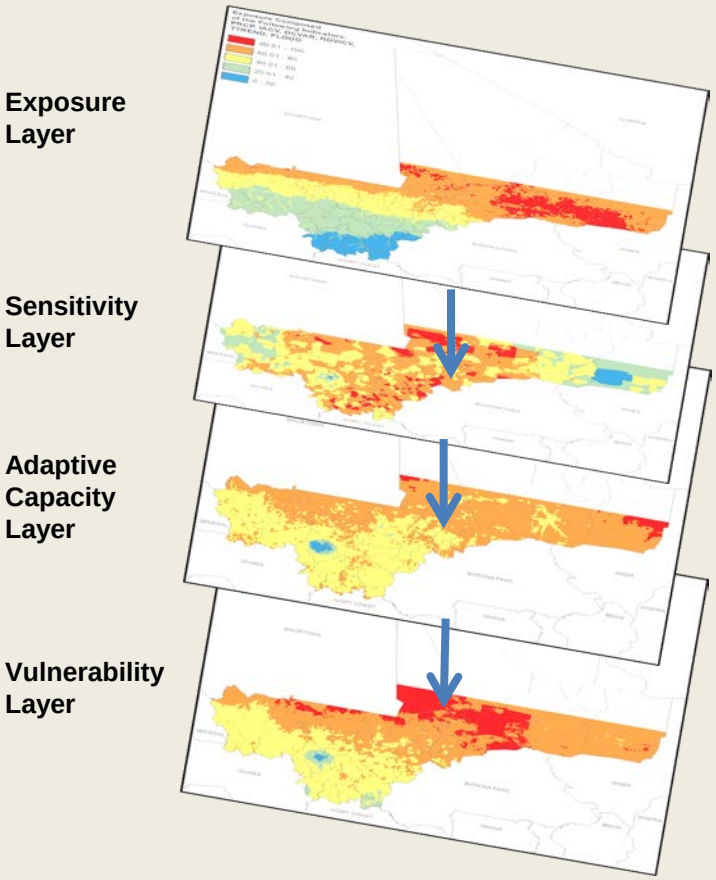
~5m people in the 0-5m LECZ of Liberia by 2050



Source: CIESIN. 2014. Mapping the Exposure of Socioeconomic and Natural Systems of West Africa to Coastal Climate Stressors. Report of the USAID African and Latin American Resilience to Climate Change project.

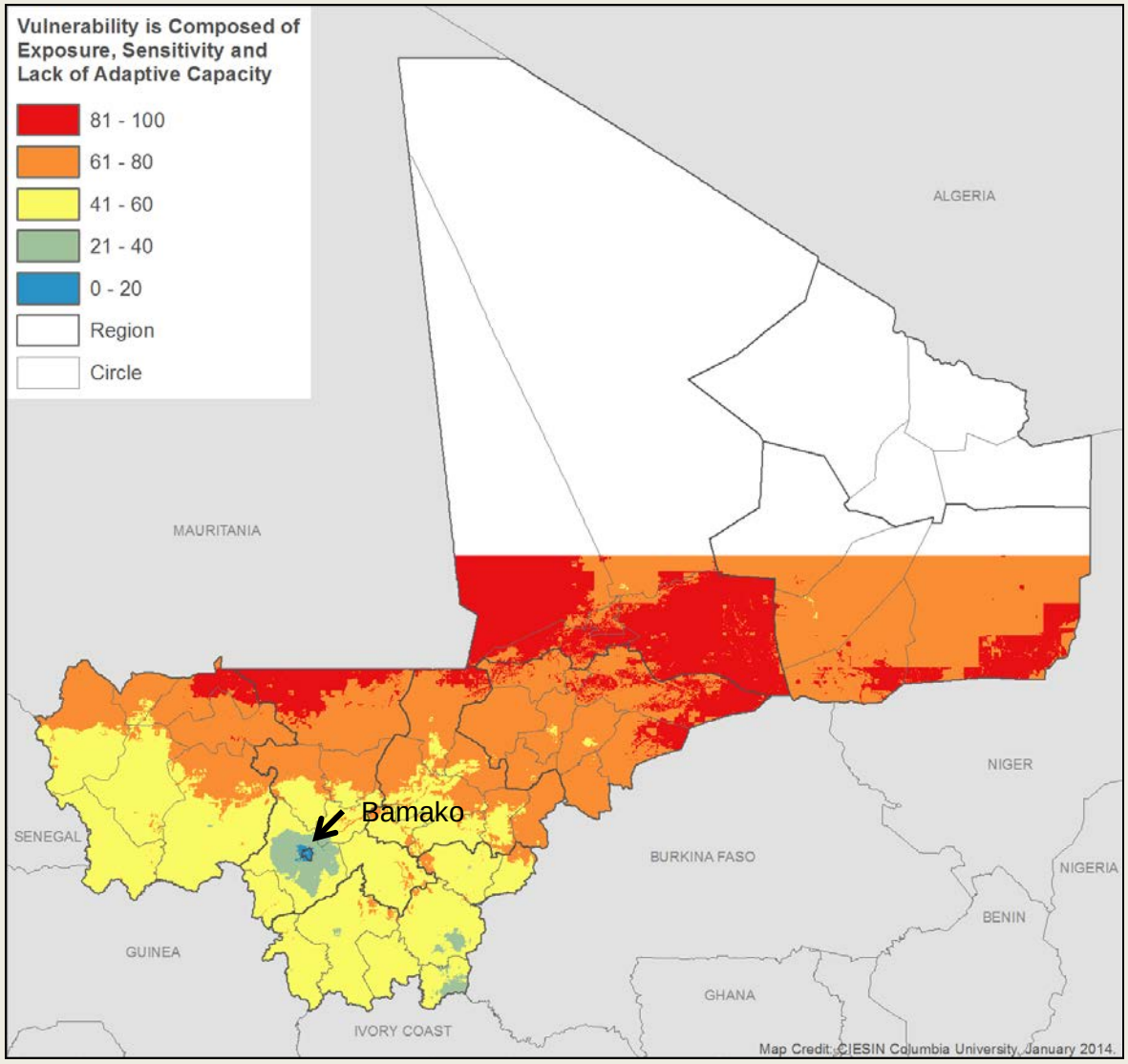
Vulnerability Mapping

- Integrates *spatial variability* in:
  - Climate / biophysical changes
  - Human / system vulnerabilities



Mapping can illuminate key vulnerabilities in the coupled human-environment system and, in turn, inform where adaptation may be required

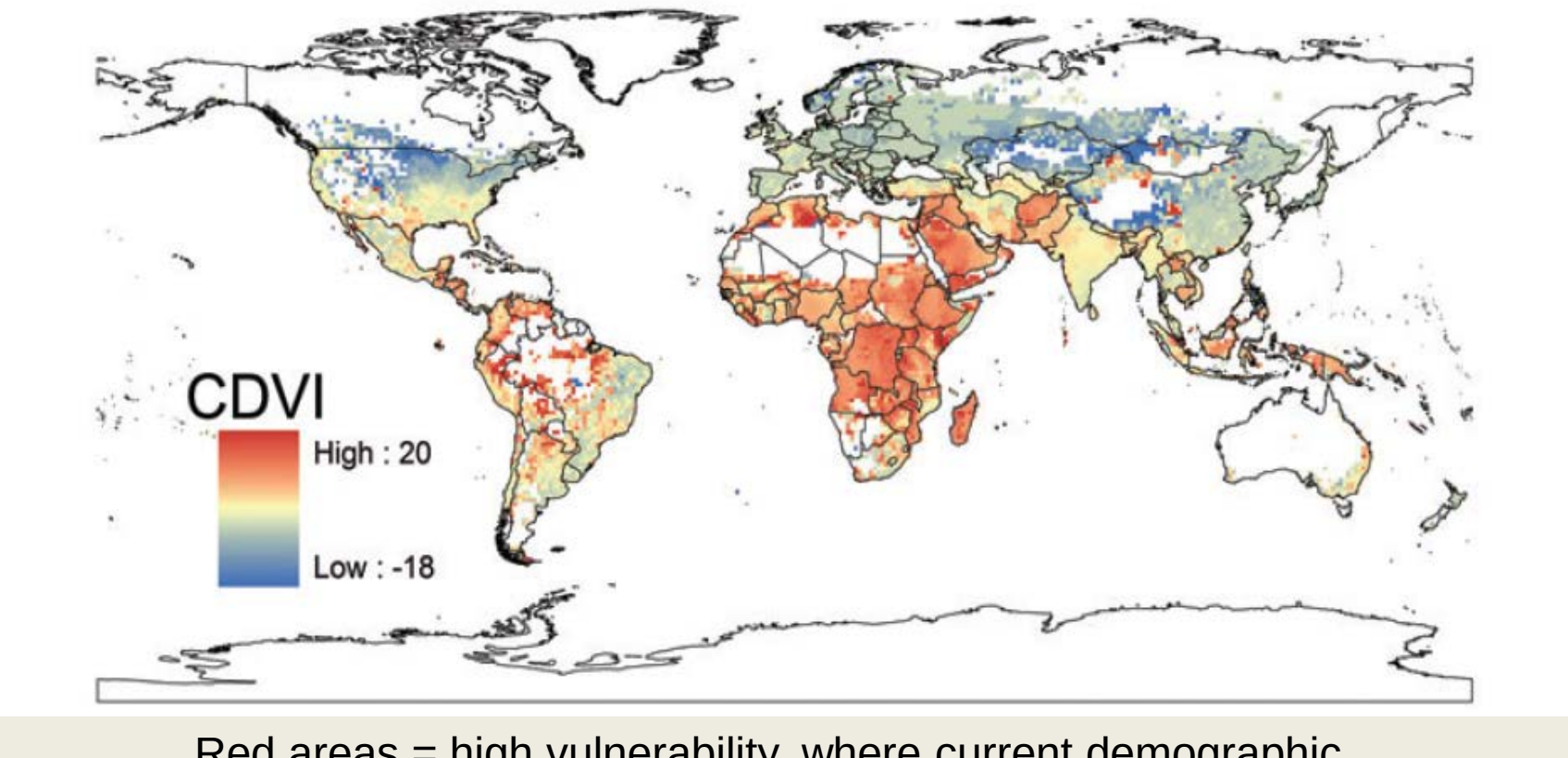
Mali Climate Vulnerability Mapping



- Baseline assessment using the IPCC definition of vulnerability
- Extensively used Demographic and Health Survey (DHS) data :
  - Child stunting
  - Infant mortality rate
  - Household wealth
  - Mother's education

Source: CIESIN. 2014. Mali Climate Vulnerability Mapping Preliminary Results. Report of the USAID African and Latin American Resilience to Climate Change project

Climate-Demography Vulnerability Index



Red areas = high vulnerability, where current demographic growth vastly exceeds “climate consistent” population growth
Blue areas = low vulnerability, where population growth is lower than “climate consistent” population growth

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

Conclusions

- Rural PDE linkages are many and varied
  - It is better for the local environment and natural resources to have low fertility and low morbidity and mortality
- Macro-level linkages between population and environmental indicators show that high population growth is associated with lower EPI scores
- Population dynamics are an integral part of understanding climate vulnerability and planning for adaptation
  - There is a need for more high resolution census data to better map vulnerability
- Population growth may have greater impacts than climate change on resources and the environment

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THANK YOU!