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Plenary Session on Population and Climate Change

CLIMATE CHANGE - POPULATION INTERACTIONS: A SPATIAL AND REGIONAL PERSPECTIVE

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Overview

- Spatial dimension refers to:
 - variability across space;
 - the effects of scale;
 - the significance of place.
- Focus of this presentation:
 - distribution of hazards, population settlement, and demographic processes.
 - implications of the regional/local variability for vulnerability to climate changes impacts

Spatial dimension in the IPCC's Forth Assessment Report

- About drivers and impacts:
 - The socio-economic processes that drive land-use change include population growth, economic development, trade and migration; these processes can be observed and measured at global, regional and local scales.
 - At a regional and sub-regional scale, vulnerabilities can vary quite considerably.
- About scale:
 - Aggregation, whether by region, sector, or population group, implies value judgments about the selection, comparability and significance of vulnerabilities and cohorts. ***The choice of scale at which impacts are examined is also crucial***, as considerations of fairness, justice or equity require examination of the distribution of impacts, vulnerability and adaptation potential, not only between, but also within, groupings.

Uneven distribution on both sides of the equator

- Environmental hazards, including climate-change related ones, are not evenly distributed across the globe, they happen in specific locations.

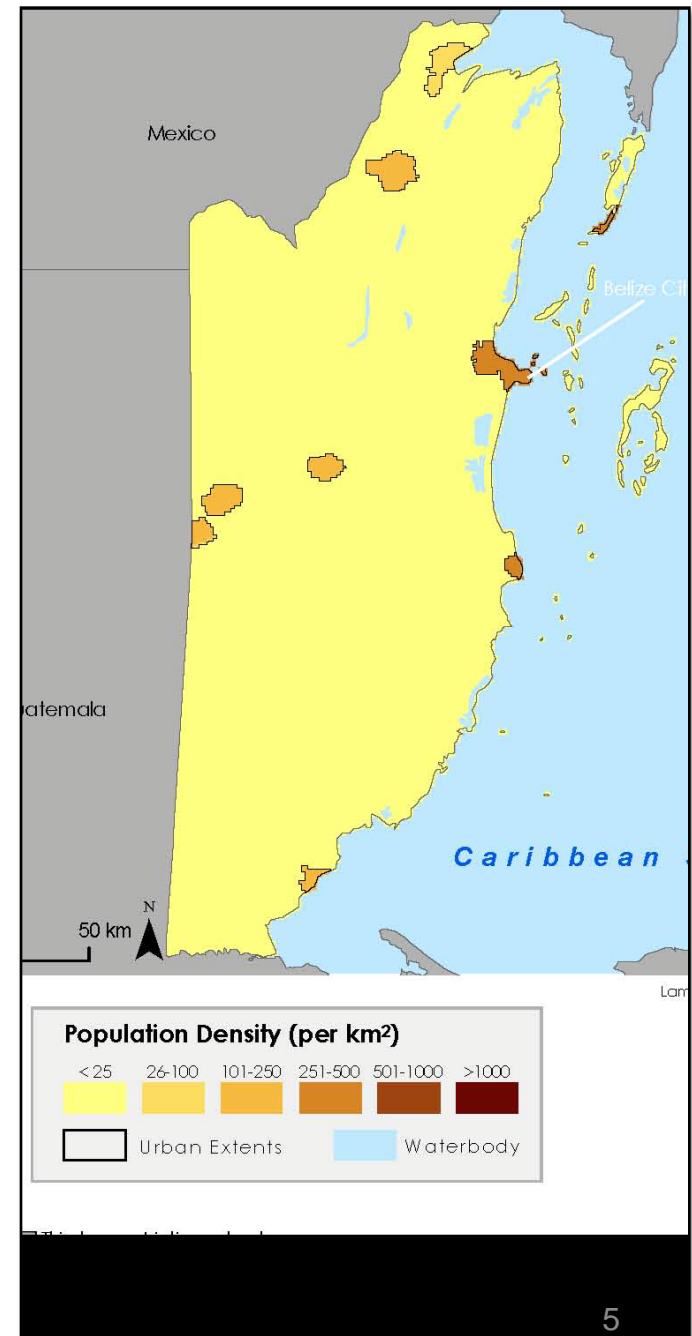


Belize: Low elevation coastal zone

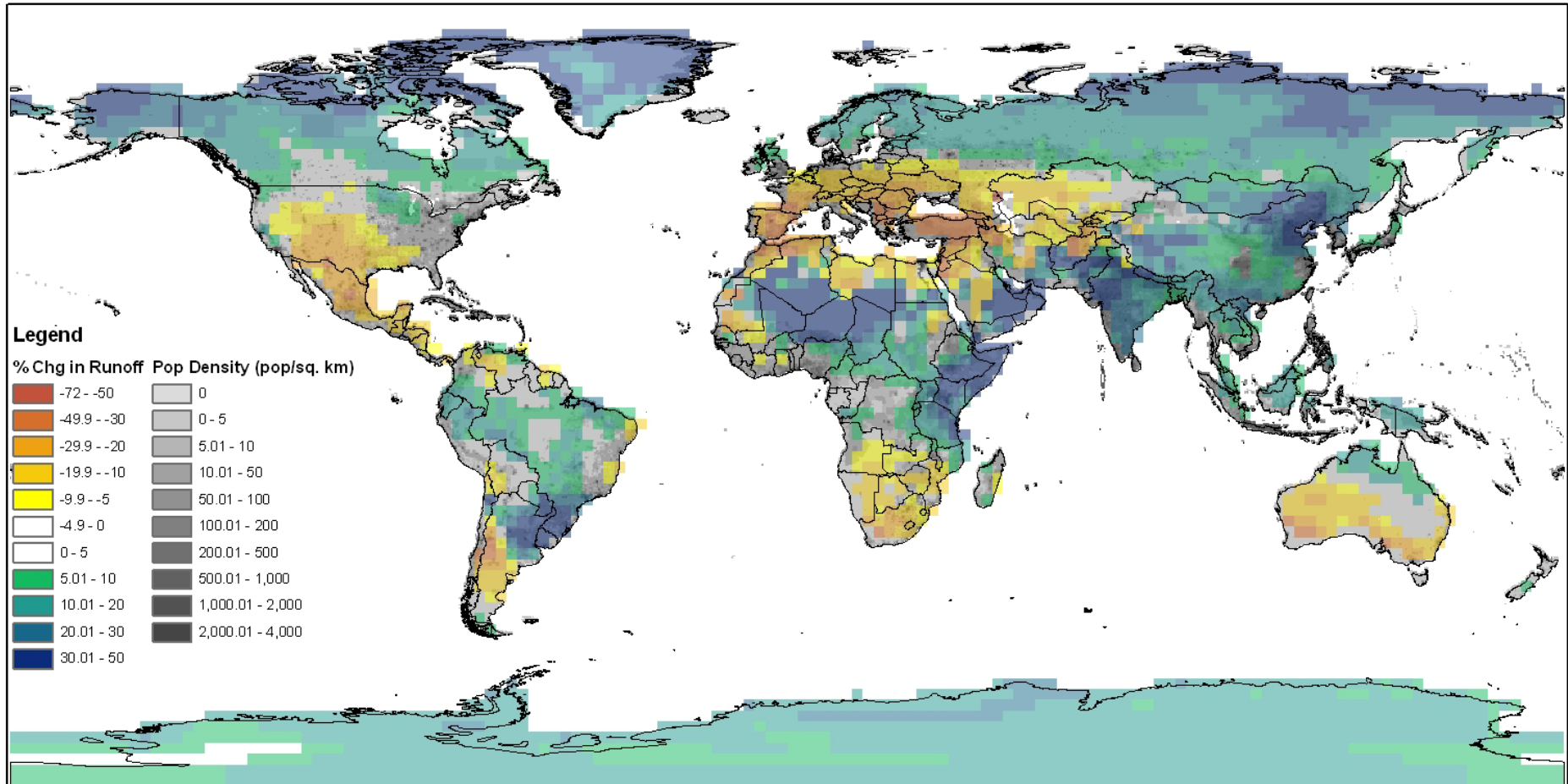
Uneven distribution of both sides of the equation

- Population distribution is also uneven.
 - older adaptations to change and stress;
 - diverse habitability of Earth's biomes;
 - particular settlement history;
 - regional variations in demographic dynamics.

Belize: population density, 2000



Percent change in runoff overlaid on population distribution

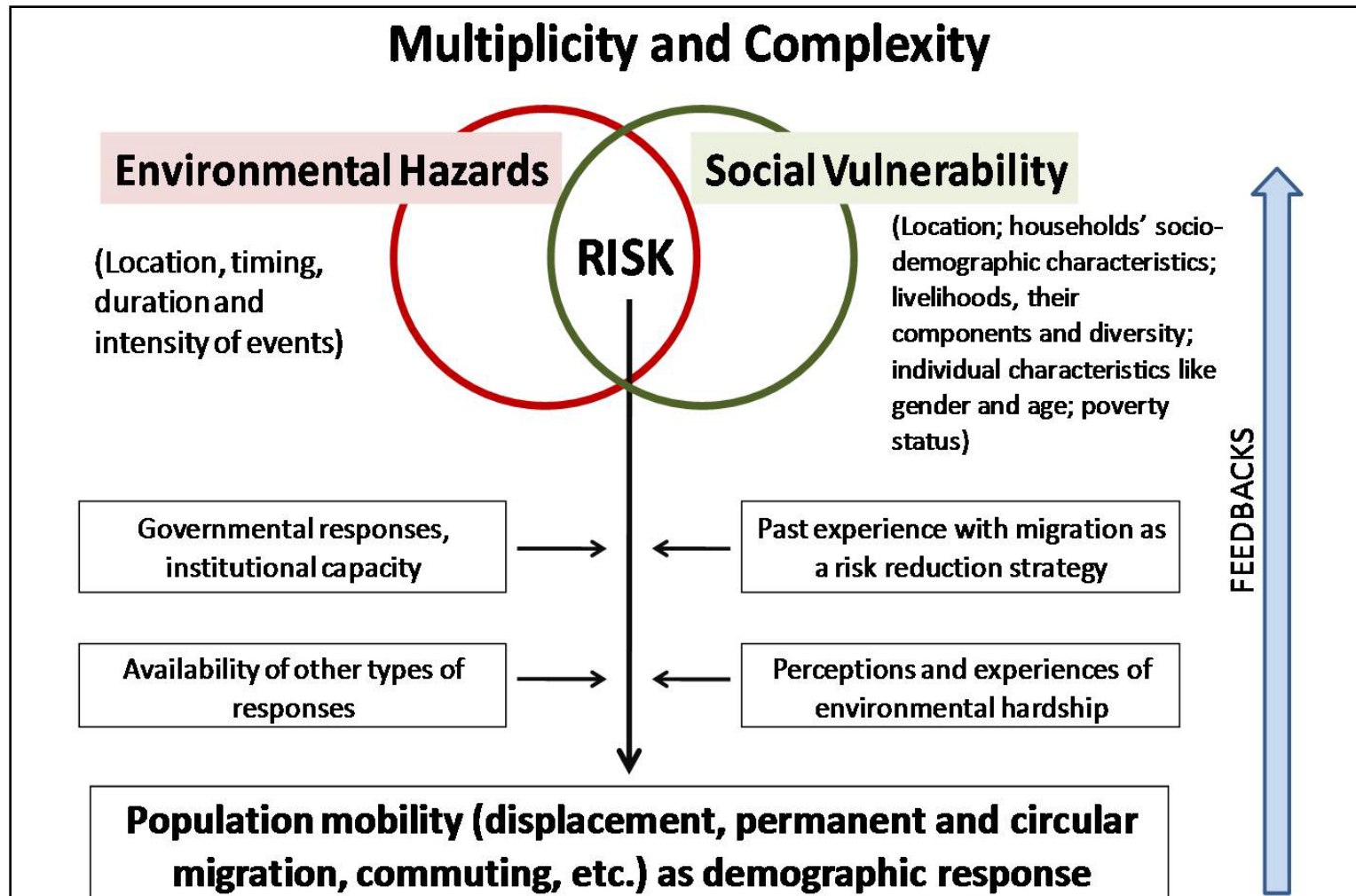


Elaborated by A. de Sherbinin based on Nohara et al. 2006. "Impact of climate change on river runoff. *Journal of Hydrometeorology* 7: 1076-1089; and CIESIN and CIAT. 2005. Gridded Population of the World Version 3 (GPWv3) (<http://sedac.ciesin.columbia.edu/gpw>)

Local implications of the coupled distribution of populations and hazards

- The uneven distribution of natural environments, housing and other elements of the economic and social structure --like infrastructure or economic opportunities-- precede the actual occurrence of the climatic event, laying down the foundations for the risk of being affected by climate changes events.
- The external dimension of vulnerability: someone or something is exposed to hazards or risk just for being present at the place and time of occurrence of the particular hazard.
- Vulnerability varies across space and over time.
- The actual and expected distributions of the impacts of climate change –global, regional, local– are heterogeneous, embedded in contexts and history, for example prior stresses, level of development, or political institutions.

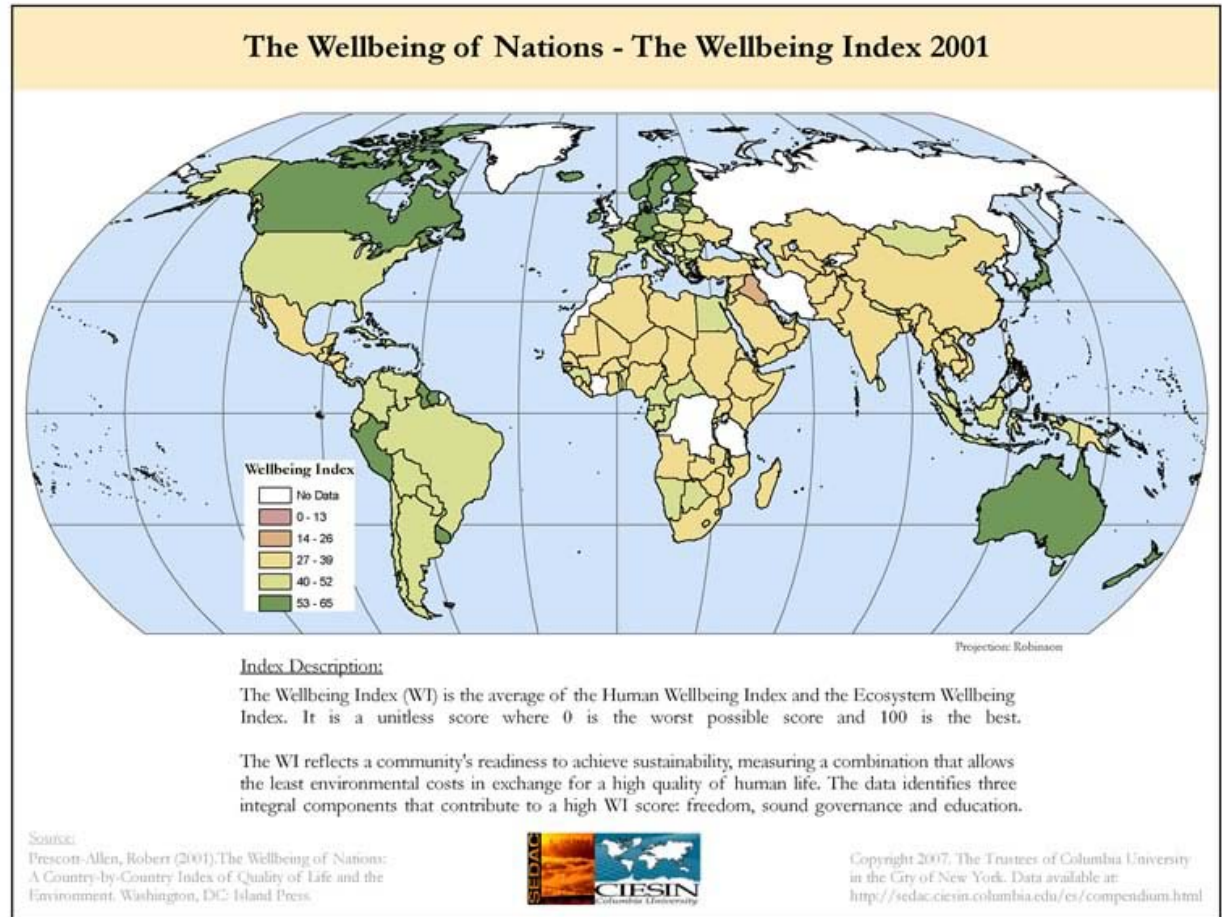
Migration as response to environmental hardship



Elaborated by S. Adamo based on Hewitt, K. 1997. *Regions of risk. A geographical introduction to disasters*; Blaikie, P., T. Cannon, I. Davis, and B. Wisner. 1994. *At risk: natural hazards, people's vulnerability and disasters*; Meze-Hausken, E. 2000. Migration caused by climate change: how vulnerable are people in dryland areas? A case study in Northern Ethiopia; Adamo, S. 2003. *Vulnerable people in fragile lands: migration and desertification in the drylands of Argentina*.

The country level: governance and preparedness

- Countries differ in their ability for coping with and adapting to climate change and its effects.
- Country-level differences are superimposed to the local and regional variations.
- Policy issues.



Final remarks

- Regional diversity is built into the mechanisms that link climate change processes and population dynamics.
- Uneven distributions requires regional, national and ***subnational*** approaches for understanding and addressing these processes in order to take into account the dynamics.
- Future scenarios exercises need to consider the background, antecedents and different contexts of population-environment interactions.
- This will present large challenges in terms of conceptual frameworks, data requirements and integration, and the use of geographic information systems.

Thank you

IUSSP INTERNATIONAL POPULATION CONFERENCE

**Session 181: Population and climate change (IUSSP Plenary), Thursday
October 1st, 17:30-19, Ministres**

Presenter: Susana B. Adamo

**“Climate change-population interactions from a spatial and regional
perspective”**

CLIMATE CHANGE- POPULATION INTERACTIONS FROM A SPATIAL AND REGIONAL PERSPECTIVE

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Presentation

1-2. The objective of this presentation is to highlight the relevance of explicitly considering the spatial dimension in the climate change-population debate. Spatial dimension refers, among other things, to variability across space, to the effects of scale, and to the significance of place. Today, I will focus on the distribution of hazards, population settlement, and demographic processes; and on the implications of regional/local variability for vulnerability to climate changes impacts.

3. The IPCC's Fourth Assessment Report clearly acknowledged that climate change and population interactions present regional and local variations across different scales.

- About the drivers and impacts of climate change, the AR4 stated that "The socio-economic processes that drive land-use change include population growth, economic development, trade and migration; these processes can be observed and measured at global, regional and local scales"¹, and also "At a regional and sub-regional scale, vulnerabilities can vary quite considerably"

- There is also an important warning about scale, "Aggregation, whether by region, sector, or population group, implies value judgments about the selection, comparability and significance of vulnerabilities and cohorts. The choice of scale at which impacts are examined is also crucial, as considerations of fairness, justice or equity require examination of the distribution of impacts, vulnerability and adaptation potential, not only between, but also within, groupings"²

4. Spatial variability of drivers and impacts of climate change is of course related to the heterogeneous distribution across space of elements on the two sides of the population-climate change equation. Environmental hazards, including climate-change related ones, are not evenly distributed across the globe, but happen in specific locations. Perhaps the

¹ Rosenzweig, C. and G. Casassa. 2007. Assessment of observed changes and responses in natural and managed systems. In Perry, M. et al. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, Cambridge University Press. Pp.84 <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter1.pdf>

² Schneider, S., S. Semenov and A. Patwardhan. 2007. Assessing key vulnerabilities and the risk from climate change. In Perry, M. et al. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, Cambridge University Press. Pp.784; 791 <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter19.pdf>

most evident case is sea-level rise affecting low-elevation coastal zones. The map on the rights displays the low elevation coastal zones for Belize. But other predicted climate change impacts, as changes in the frequency and amount of precipitation, also present an uneven distribution.

5. On the other side of the equation, population distribution is also uneven. Current patterns of population distribution are the result of older adaptations to change and stress. World population is not uniformly distributed because of the diverse habitability of Earth's biomes, particular settlement history, and regional variations in demographic dynamics, among other things. As an example, the map displays the population density of Belize around 2000. One of the most densely populated areas overlaps an area exposed at a sea level rise of up to three meters.

6. The joint distribution of hazard and population result in differentiated exposure to specific risks. The map shows the modeled percent changes in runoff³, a proxy for water availability, between the year 2000 and 2080⁴, and overlaid on a global population distribution surface. This illustrates areas in which runoff is likely to increase or decrease significantly based purely on climate parameters.

The most negatively impacted regions in terms of percent decline in runoff are Central America and southwestern USA, the southern cone of South America, South Africa, the entire Mediterranean basin, Central Asia, and the southern half of Australia. The most densely settled of these regions are Central America, southern Europe, southern Africa, and the coastal areas of Australia.

Now, although runoff may *increase* by up to 50% in East Africa and South Asia, according to some sources populations are expected to increase by 121% in East Africa and 50% in India and Nepal, leaving these regions with either lower or unchanged per capita water availability by 2050. Furthermore, inter- and intra-annual variability and extreme precipitation events (e.g., tropical cyclones) may result in a greater frequency of droughts and floods, rapid runoff, and soil erosion, all of which could result in yield declines despite increases in annual precipitation.

7. We turn now to the local implications of the coupled distribution of populations and hazards. The uneven distribution of natural environments, housing and other elements of the economic and social structure – like infrastructure or economic opportunities – precedes the actual occurrence of the climatic event, laying down the foundations for the risk.

³ Runoff can be thought of as the proportion of precipitation that is left after evapotranspiration and after the soil moisture deficit is satisfied. It is typically reported in millimeters, just like precipitation.

⁴ Based on weighted ensemble model runs generated from the SRES A1B scenario. The A1 family of scenarios is characterized by rapid economic growth, population stabilization at 9 billion by 2050 followed by declines, a rapid spread of new and efficient technologies, and regional convergence in terms of income and way of life, and scenario A1B represents a balanced usage of all energy sources.

This is the external dimension of vulnerability: someone or something is exposed to hazards or risk just for being present at the place and time of occurrence of the particular hazard.

As a consequence, vulnerabilities vary across space and over time. And the actual and expected distributions of the impacts of climate change – global, regional, local – are also heterogeneous, embedded in contexts and history (e.g., prior stresses, level of development, or political institutions).

8. We can illustrate this point by looking at migration as adaptive or coping strategy to face environmental hardship. What we would need to include to model migration or displacement as response to a climate change event?

First, we would need to consider that at any given place and time, risk is defined by the characteristics of the hazard and of social vulnerability.

Second, population mobility as response to environmental hazards is also related to people's subjective view and perception of the hazard and of their own vulnerability.

Third, migration as a response may be influenced by past experiences of migration as a risk reduction strategy, or simply migration as a common practice. Displacement in response to gradual environmental events is likely to follow already established internal and international migration patterns, and most environmentally induced displacements occur within countries. Movements may include different types of flows (rural-to-urban, rural-to-rural, urban-to-urban flows, or a combination of them), and they could be temporary or permanent, and over short- or long-distances.

Forth, governmental responses and institutional capacity also make a difference when coping with environmental hazards and in the decision to leave or stay.

Finally, migration is just one among several possible responses and adaptations to environmental change.

9. In terms of regional variability we also need to consider the all important factor of the country-specific ability for coping with and adapting to climate change and its effects, in terms for example of governance and preparedness. This often introduces difference across countries (it means, the country is the unit of analysis), which are superimposed to the local and regional variations, as well as policy aspects.

The map on the right illustrates this point. It displays the wellbeing index, which reflects a country readiness to achieve sustainability, measuring a combination that allows the least environmental costs in exchange for a high quality of human life. The data identifies three integral components that contribute to a high well being index: freedom, sound governance and education.

10. I want to conclude with some final remarks.

Regional diversity is built in the mechanisms that link climate change processes and population dynamics.

This uneven distribution requires regional, national and subnational approaches to understanding and addressing these processes in order to take into account the local dynamics in policy developments.

Future scenarios exercises need to consider the background, antecedents and different contexts of the relationship.

This will present challenges in terms of conceptual frameworks, data requirements and integration, and the use of geographic information systems.

11. Thank you.