Workshop “Global Integration of Population Microdata: Challenges for the 2010 Round”

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Synergies of a Global Microdata Collaboratory

CLIMATE AND ECOLOGY

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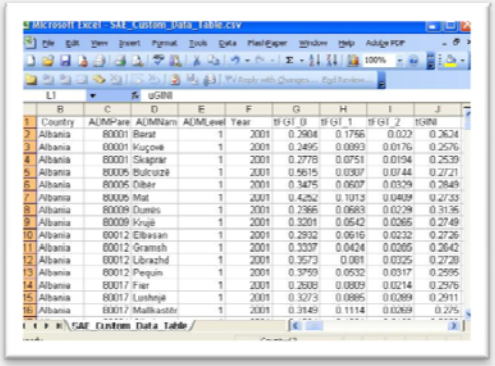
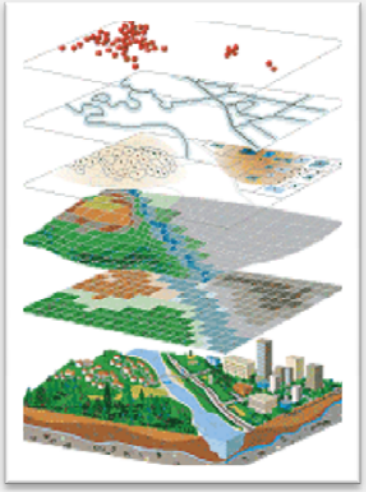


Population data

Administrative boundaries



Spatial data

Introduction

- The merging of population with climate, ecology and place characteristics in general, is one of the most challenging aspects of the integration of census and non-census data.
- It is also one of the most relevant.
- Objectives of the presentation:
  - to explore issues related to the integration of census microdata with climate and environmental data, and
  - to explore the possibilities of this integration for addressing significant global problems.

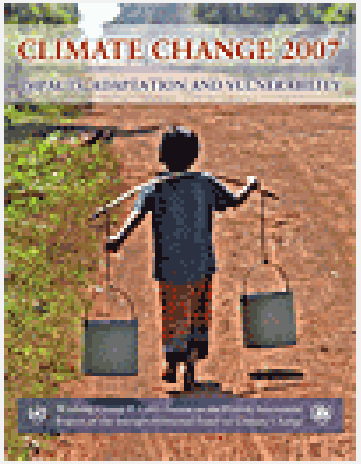
Coupled Natural and Human Systems

- Population and environment: recursive relationships with reciprocal effects.
  - The physical environment affects population processes.
  - Population is a key agent in processes of environmental change.
  - Logic and mechanisms of these relationships change over time and across space.
    - Importance of location, place and history.

- Global issues:
  - Population change, growth and distribution, including migration and urbanization.
  - Economic growth and the globalization of markets.
  - Global environmental change and increasing degradation.
  - Relentless poverty and growing inequality.

Dynamics of Coupled Systems: Climate Change

- Fourth Assessment (2007) WGII's emphasis on *environmental hazards, population vulnerability and resilience.*
  - potentially severe climatic changes that will have far reaching implications for human populations and their geographic distributions.
  - heightened policy attention and concern over: adaptation processes, how to mitigate climate change, and how to adapt to future impacts.



- **Patterns and degrees of vulnerability:**
  - External vulnerability or exposure - related to location.
  - Internal vulnerability or defenselessness - related to individuals or households' characteristics.
  - "The poor and marginalized have historically been most at risk, and are more vulnerable to the impacts of climate change" (Adger *et al.* 2007:720)

Dynamics of Coupled Systems: Data Issues

- Aim: to build integrated geospatial databases for understanding coupled natural and human systems at different scales and levels.

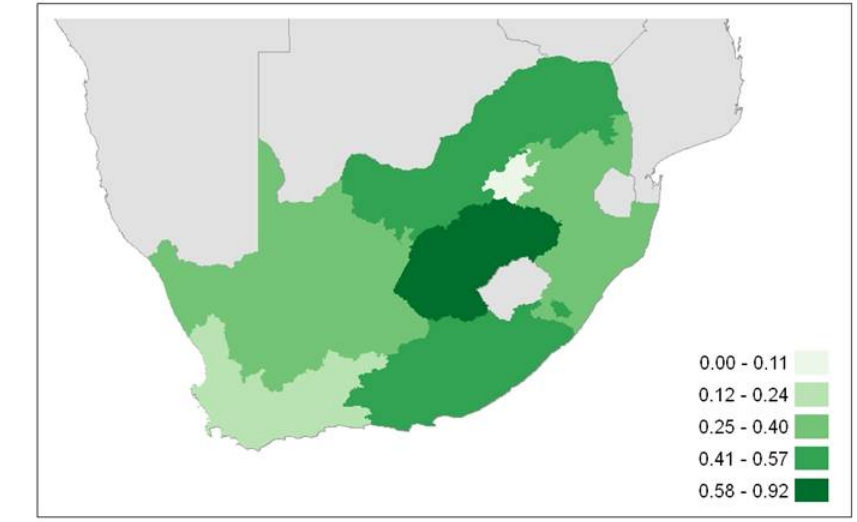
- Requirements: spatially-explicit, geo-referenced census microdata (including administrative boundaries).
  - Census tract.

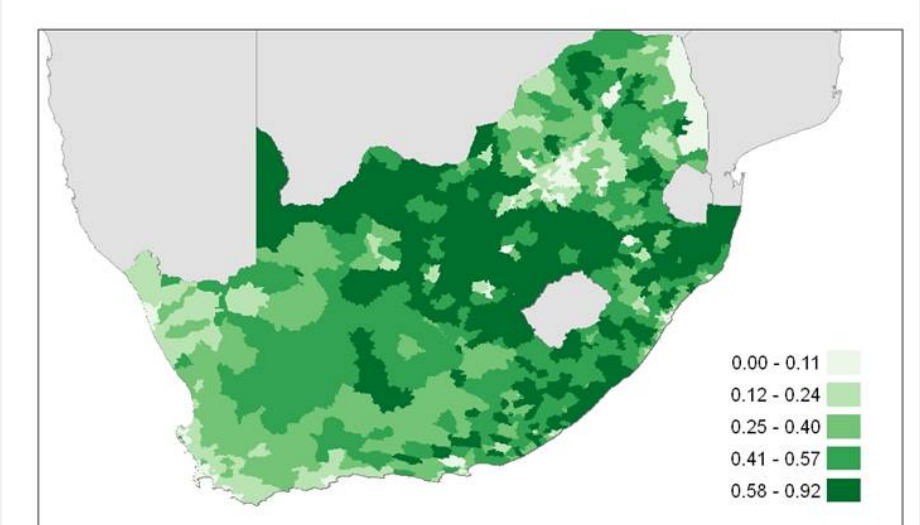
- Challenge: integration of census microdata with different types of contextual data.
  - Some issues:
    - Biophysical features are not measured in units typically compatible with surveys or censuses.
    - The systematic integration of census and biophysical data requires a spatial framework.

Geo-referenced census microdata: building blocks for high resolution socioeconomic data

- Flexibility for aggregation.
- Improved data for research purposes.
- More efficient policies, strategies, and resource allocation.

- Higher resolution data: an example





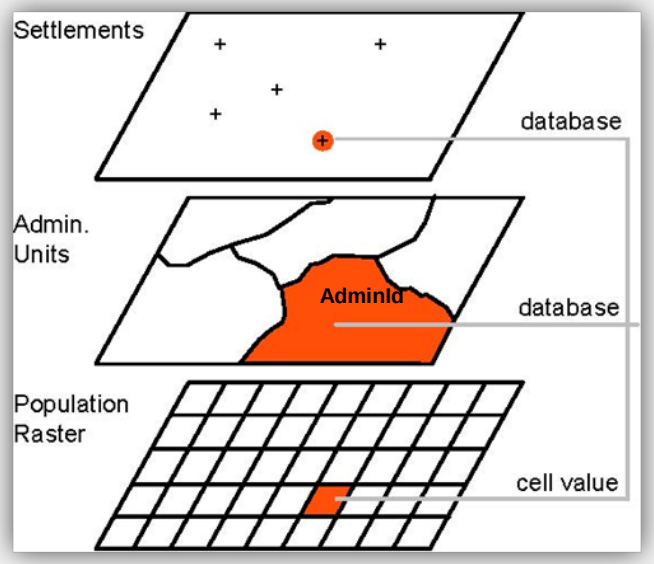
CIESIN @ work

- CIESIN works at the intersection of the social, natural, and information sciences.
- Specialization on spatial data integration and training, and interdisciplinary research related to human interactions in the environment.
- Integration of geography and environment with census data.
- Value-added data development, e.g. by spatially referencing data.
- Interdisciplinary tradition: talking across disciplines.
- Confidentiality and privacy issues related to the integration of geo-referenced data from the natural, social, and public health sciences. http://sedac.ciesin.columbia.edu/confidentiality/

http://www.ciesin.columbia.edu/

Global Population Datasets

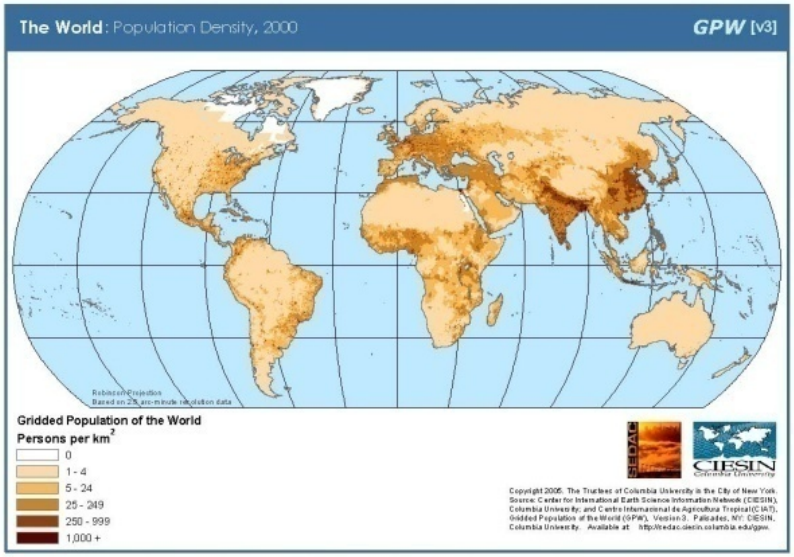
- Best available population data at the highest resolution.
- Administrative boundaries and population information in raster format.
  - Physio-geographic variables (climate, vegetation, soils) are frequently stored in raster format (Deichmann 1996).
- Planned updates:
  - New variables.
    - Age and sex structure.
  - Refining GRUMP.
    - Urban area extents.



Source: Deichmann 1996: 24

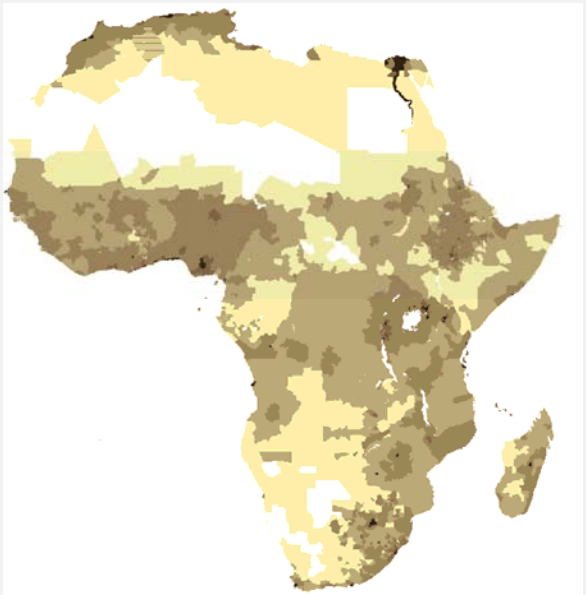
Global Population Databases (cont.)

GPW - Gridded Population of the World (v3)



- Distribution of global population across the globe.
  - Estimates of human population for the years 1990, 1995, and 2000 by 2.5 minute latitude-longitude grid cells (~ 5x5 km) and associated datasets dated circa 2000.
  - Includes: population count grids (raw counts), population density grids (per square km), land area grids (actual area net of ice and water), mean administrative unit area grids, centroids, a national identifier grid, national boundaries, and coastlines.
  - A proportional allocation gridding algorithm, utilizing more than 300,000 national and sub-national administrative units, is used to assign population values to grid cells.
- Partners: CIESIN, CIAT, FAO
- Purpose: to provide the latest data on human population distribution that can be used in interdisciplinary studies of the environment.

Evolution of the Gridded Population of the World

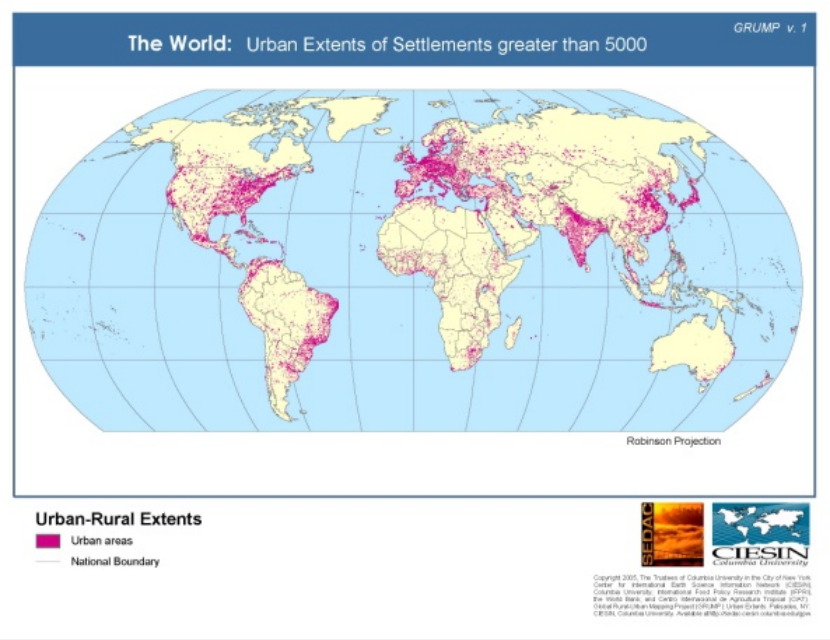


Version (pub)	GPW v1 (1995)	GPW v2 (2000)	GPW v3 (2005)
Estimates for	1994	1990, 1995	1990, 1995, 2000
Input units	19,000	127,000	~ 375,000

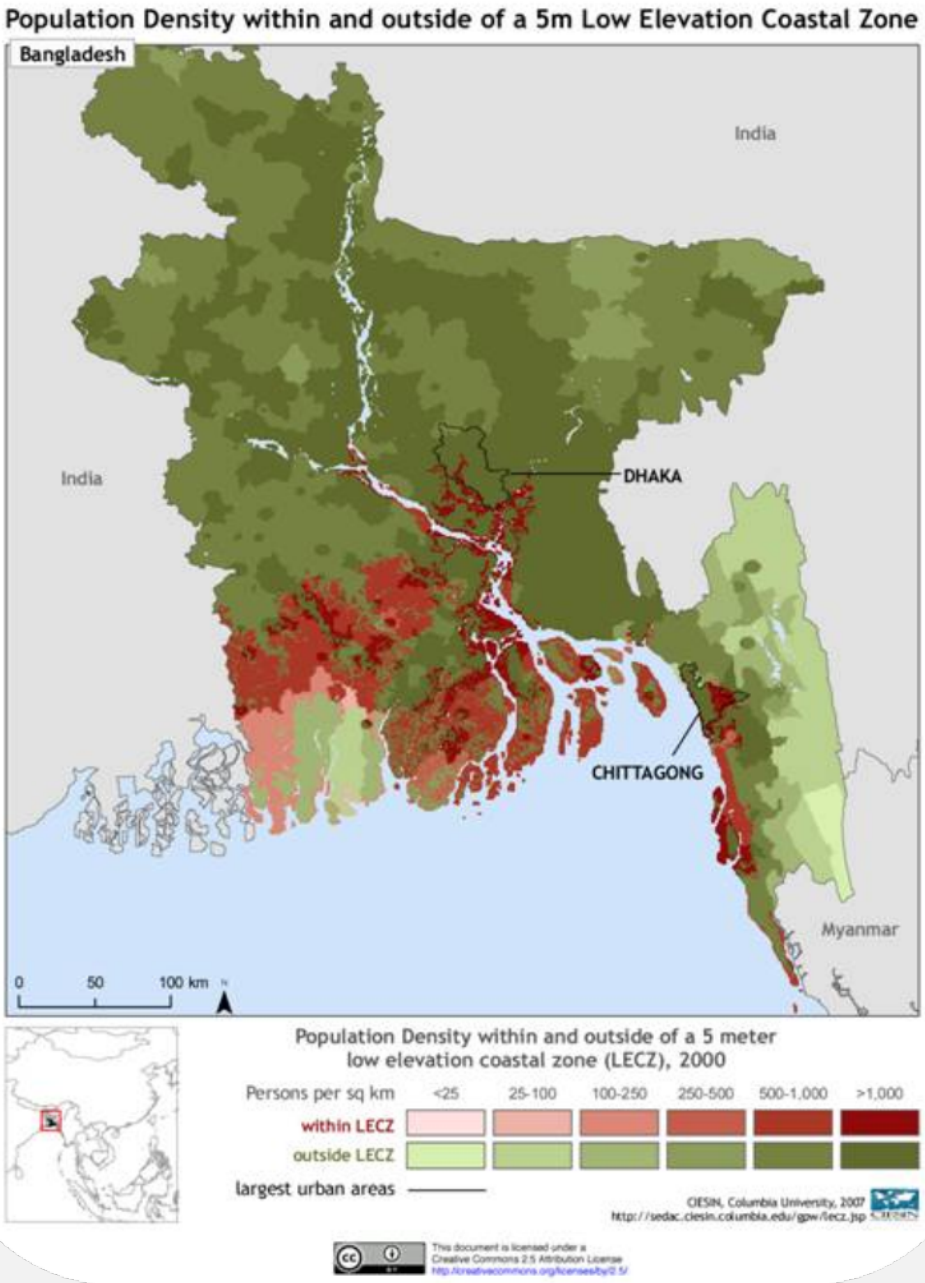
http://sedac.ciesin.columbia.edu/gpw/

Global Population Databases (cont.)

GRUMP - Global Rural Urban Mapping Project (alpha version)



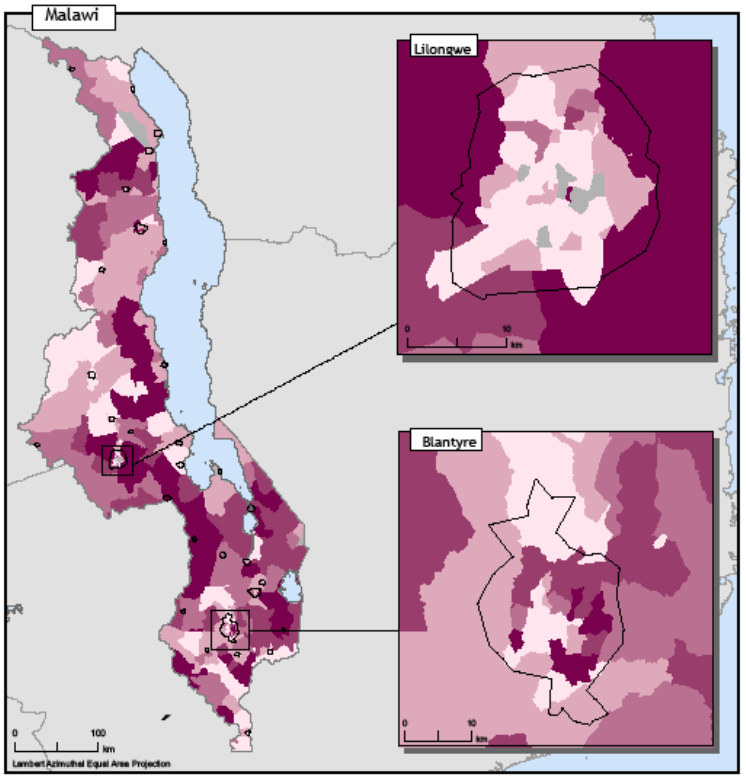
- Add urban-rural specification to the Gridded Population of the World.
  - Gridded Population of the World with Urban Reallocation with a grid cell resolution of 30 arc-seconds (~ 1km).
  - Also includes: a land area grid showing worldwide urban areal extents and a database of human settlements, their spatial coordinates, and populations.
- GRUMP beta will be available soon.
- Partners: CIESIN, IFPRI, The World Bank, CIAT.
- **Purpose**: To allow analysis of urban and rural population figures based on a consistent global dataset.

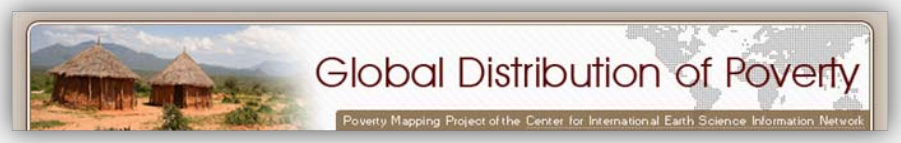


Global Rural Urban Mapping Project

- Low elevation coastal zone data: based on GRUMP data in conjunction with SRTM-based elevations from ISciences at 1-km resolution

Poverty Mapping





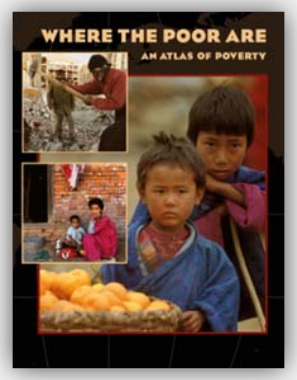
- Developed in collaboration with the World Bank Development Economics Data Group.

- **Small area estimates:**
  - Indirect methods for inferring welfare (e.g. poverty and inequality) estimates by combining census microdata and survey data,
  - Combines the spatial precision of censuses with the substantive depth of surveys.

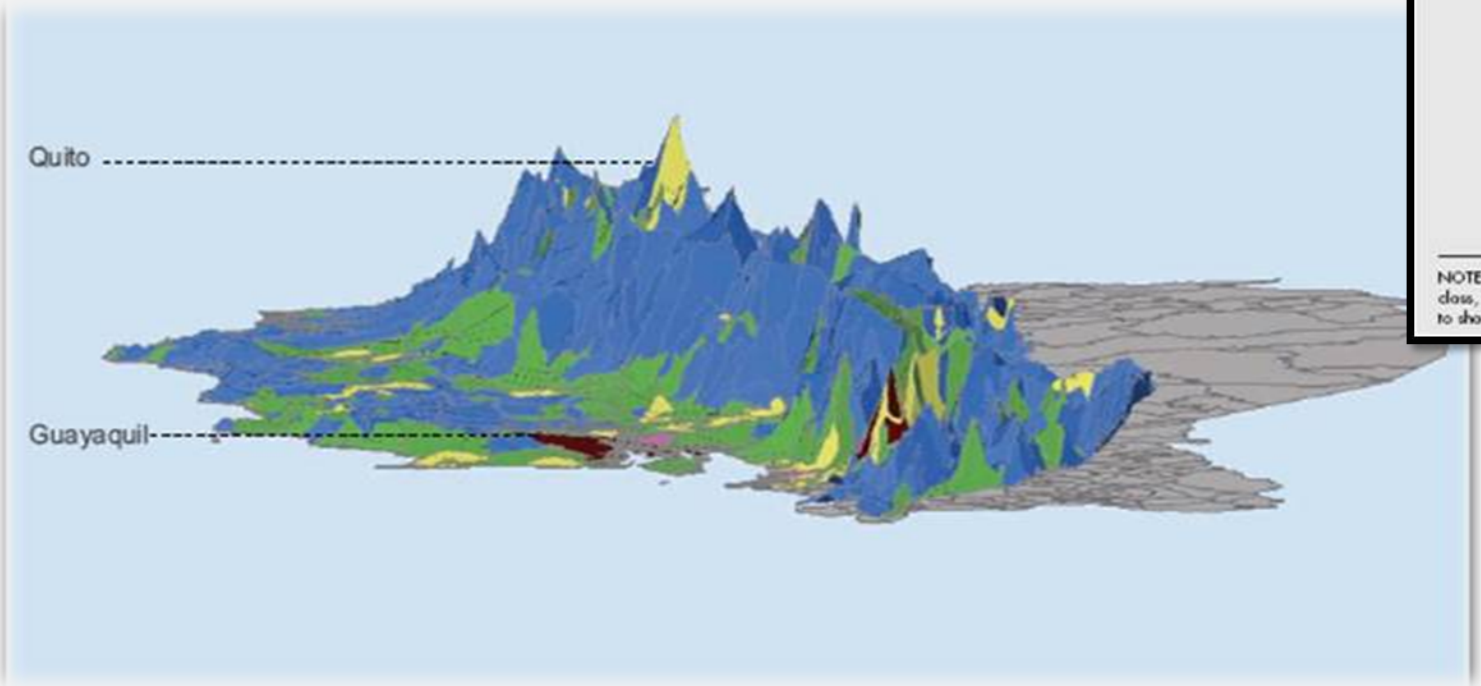
Malawi – Poverty Gap Index

Administrative level 3:
Traditional authority (rural) / Ward (urban)

Poverty mapping (cont.)



- Advantages:
  - More efficient policies, strategies, and allocation of resources
  - Better statistical models in research
  - Applications to ecological and other diverse issues.
  - Possibility of using high resolution poverty data in combination with high resolution biophysical, infrastructure (roads, health/education facilities), or other data.



Ecuador: poverty and altitude

In summary

- The integration of census microdata with ecology, climate and place characteristics data presents advantages for addressing significant global problems involving coupled human and environment systems.

- It also presents methodological and technical challenges that require interdisciplinary and cooperative work.

Thank you

CIESIN – The Earth Institute – Columbia University