Synergies of a Global Microdata Collaboratory

CLIMATE AND ECOLOGY

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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 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.

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

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<td>Input units</td>
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<td>127,000</td>
<td>~ 375,000</td>
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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.
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