Common Geographic Boundaries: Small Area Geographies, Administrative, and Grid-based Geographies – One or Many?

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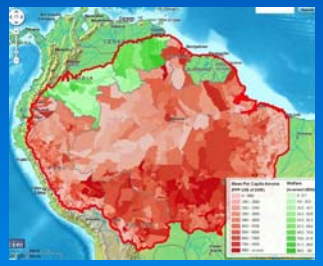
UN Committee of Experts on Global Geospatial Information Management (GGIM) has offered a GLOBAL PERSPECTIVE for:

… a global geospatial framework

Energy

Human Health

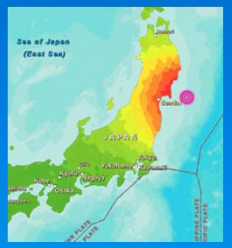


Government

Water Resources

Infrastructure

Economic Recovery



Natural Disasters

Transportation

Pollution

Mapping

Social Conflicts

The Challenge:
Create an international approach to link data to locations

Environment

Defense & Security

Utilities

Climate Change

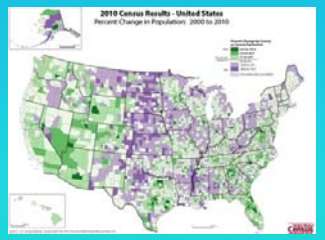
Education

Population Growth

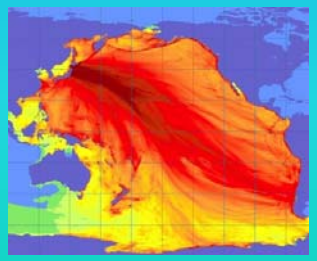
Business

Nature Conservation

Oceans



Urbanization & Development



Agriculture

Science & Technology

Linking geospatial information to statistics through geocoding.

[2nd Session of UN-GGIM, August 2012]

Stronger interoperability and integration, between geospatial and statistical authorities.

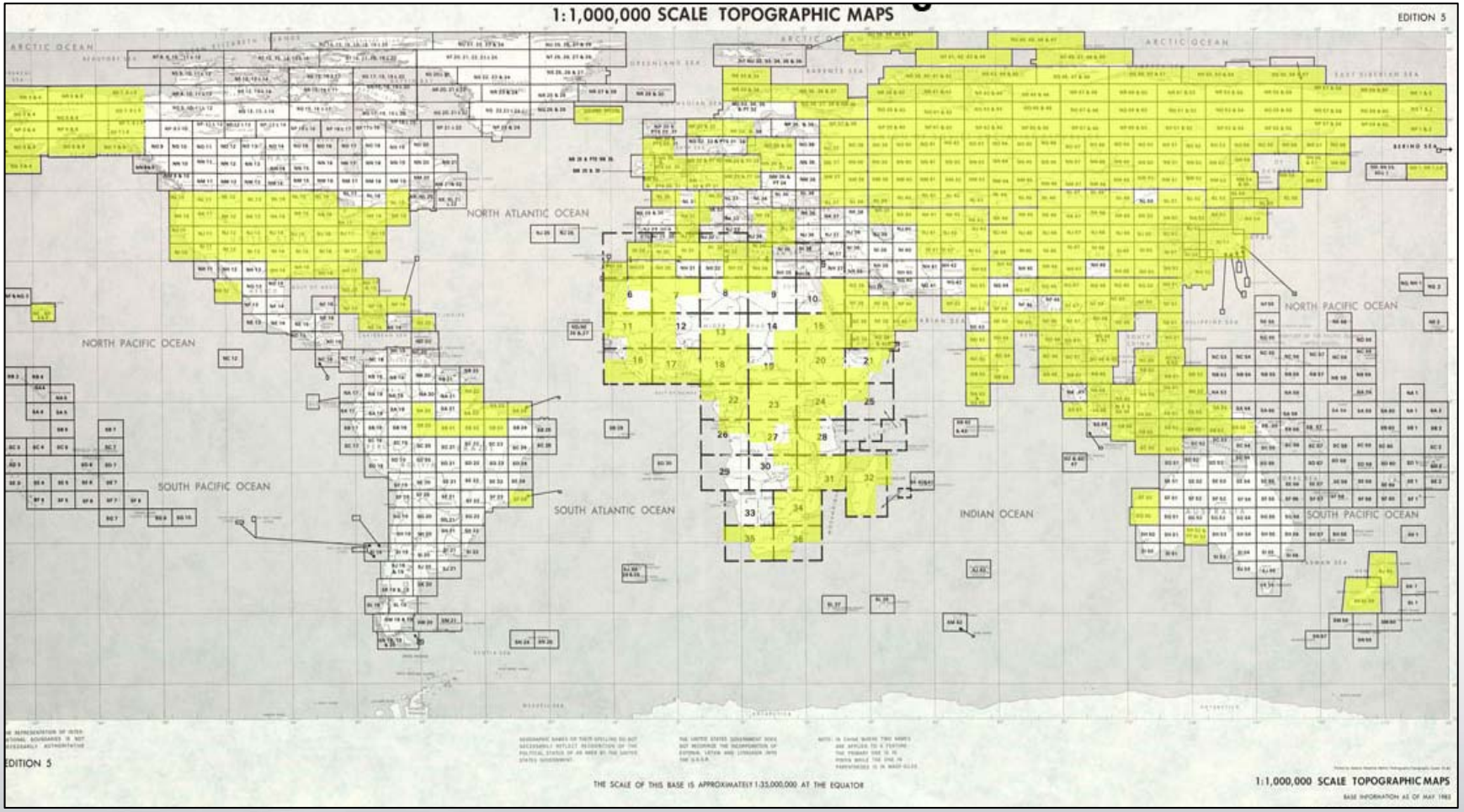
[Future trends in geospatial information management:
the five to ten year vision, July 2013]

International standard for linking socio-economic information to location—an **international statistical geospatial framework.**

[UNSC Programme Review. February 2013]

Early International Mapping Initiatives:

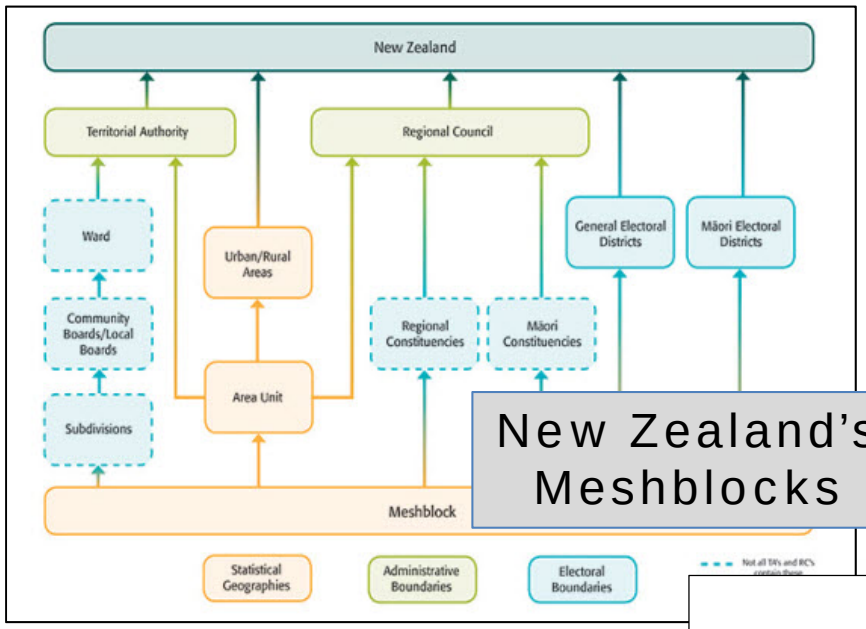
International Map of the World (IMW) -- "Millionth Map"



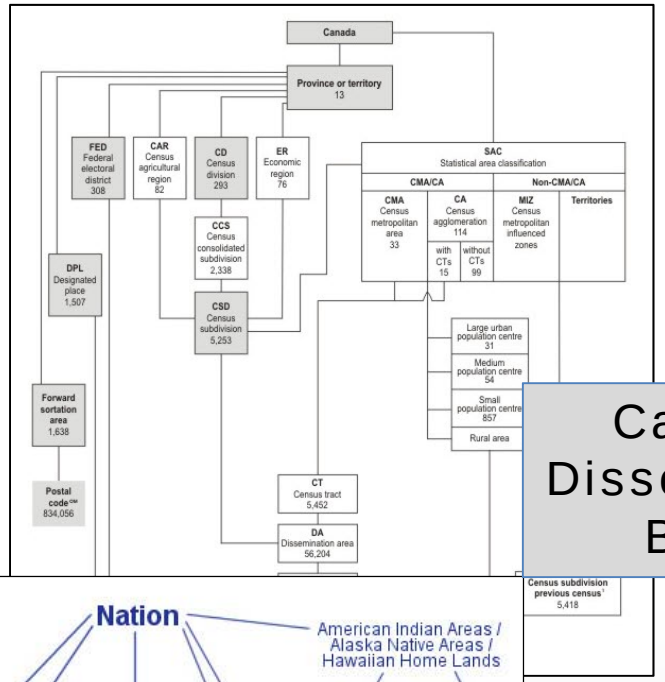
Spatial Population Data Initiatives began in the 1990s

- U.S. Census Bureau's Global Population Database (1990s)
- African Population Grid (UNEP/GRID, 1991)
- Gridded Population of the World (GPW) v1 and Global Demography Project (NCGIA & CIESIN, 1994)
- 1 degree global grid (Environment Canada, 1994)
- Europe (Rijksinstituut voor Volksgezondheid en Mileu--RIVM, 1995)
- Africa update and Asia (NCGIS, UNEP/GRID & WRI, 1996)
- Latin America (CIAT)
- HYDE (RIVM/Klein Goldewijk 1997, 2001, and 2006)
- LandScan (ORNL, 1999)
  - [Chronology from Alex de Sherbinin, EFGS, 2010]

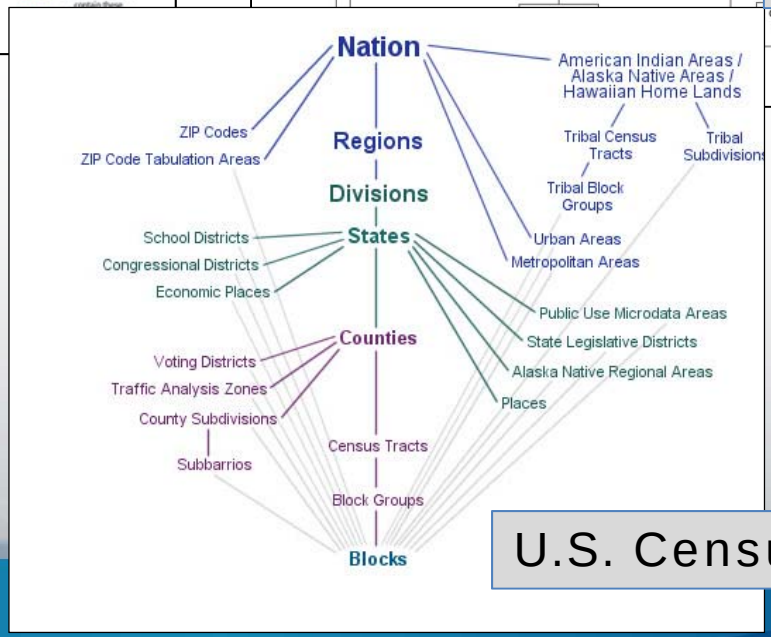
Geographical Hierarchies based on census “blocks”



New Zealand’s Meshblocks



Canada’s Dissemination Blocks



U.S. Census Blocks

PROS and CONS of Statistics by Administrative Areas

PROS:

- Spatial accuracy of data
- Field verification
- Imagery verification
- Geocoding / address verification
- Authoritative sources
- Local government involvement
- Local knowledge
- Nesting relationship w/other geographic areas
- Cadastral boundaries
- Data thresholds
- Separate land & water area
- Response rates
- Response options
- Response quality
- Sample frame

CONS:

- Comparability
- Boundary changes
- Use of non-visible boundaries
- Number of different geographic areas
- Cartographic considerations / generalization of boundaries
- Varying participation
- Irregular size
- Irregular shape
- Variable density measures
- Legal variation
- Regional variation
- Topographic variation

Geospatial Statistical Frameworks in National statistical systems

Cadastre and Registration

Portugal

Property Boundaries

Nigeria

- ***"According to the 'Data provider survey' made by the GEOSTAT project, at least 15 national statistical institutes are going to compile grid-based statistics from the 2010/2011 census data."***

  [Marja Tammilehto-Luode, Statistics Finland, WSC, 2011]

- ***"A continuing gap in the successful unification of national, regional, and global geospatial information management capability is the lack of an agreed set of readily available and authoritative global reference datasets by specific themes."***

  [GGIM, NY, August 2012]

- ***"The benefits of linking socioeconomic and spatial information are increasingly acknowledged. This is reflected in the growing demand for statistical organizations to provide information for smaller and smaller geographic areas, right down to the geocode."***

[Report of the Australan Bureau of Statistics on developing a statistical-geospatial framework, E/CN.3/2013/2]

PROS and CONS of Grid-based Statistical Areas

PROS:

- Global scope
- Cross-border studies
- Comparability
- More attention to problem-oriented science
- Can locate people in space with more precision
- Good territorial framework for sampling
- Can aggregate to different kinds of territorial units
- Ready to use with GIS analysis
- Easily generated from point-based georeferenced data
- Able to see clusters

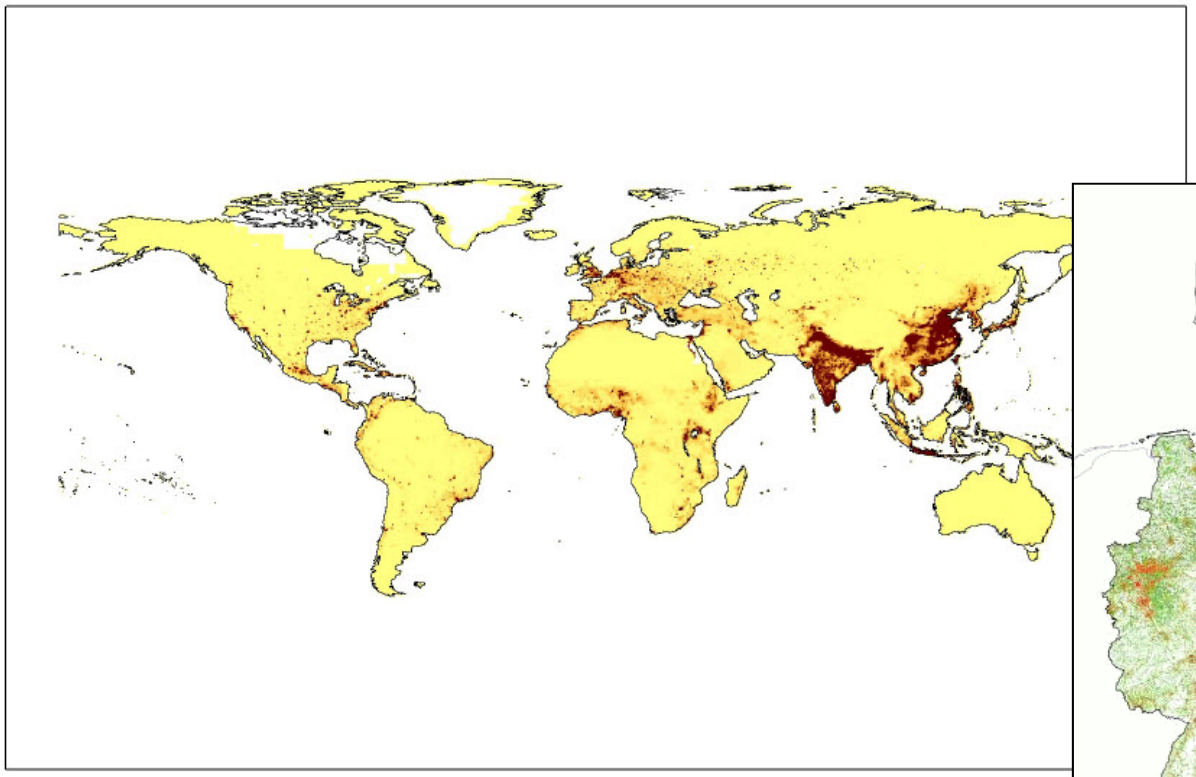
[Alex de Sherbinin, "Construction of gridded population and poverty data sets from different data sources." EFGS, 2010]

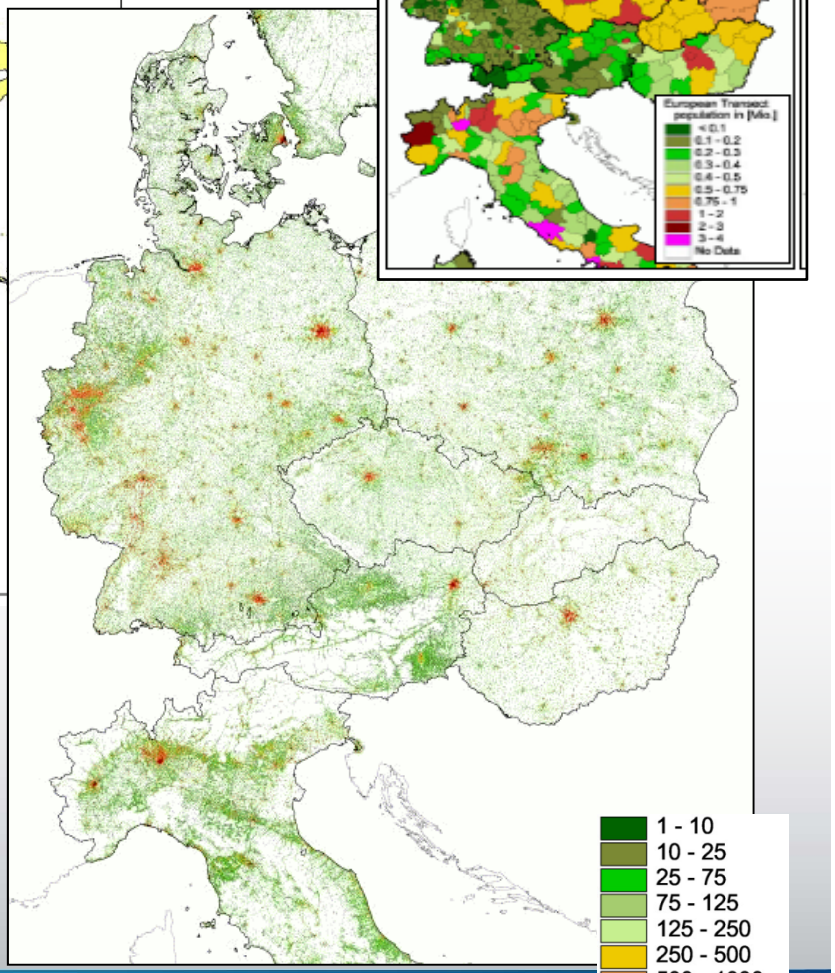
CONS:

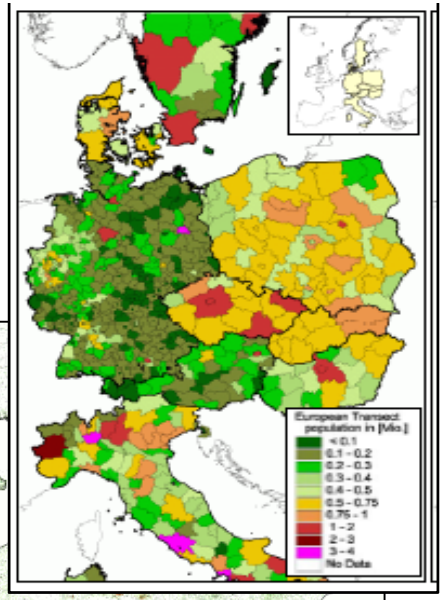
- Disclosure control / cell size
- Grid cell sizes in rural areas
- When merging datasets, there is a need to change from one coordinate system to another before the data compilation into grids
- European terrestrial reference system (ETRS80) is based on Lambert Azimuthal Equal Area coordinate reference system with fixed projection center; different projections may be needed in other parts of the world
- Coding systems [scale intervals vs quadtree solutions
- Errors are difficult to find and correct
- Various grids

[Marje Tammilehto-Luode. "Opportunities and challenges of grid-based statistics." WSC, 2011.]

Grids are International





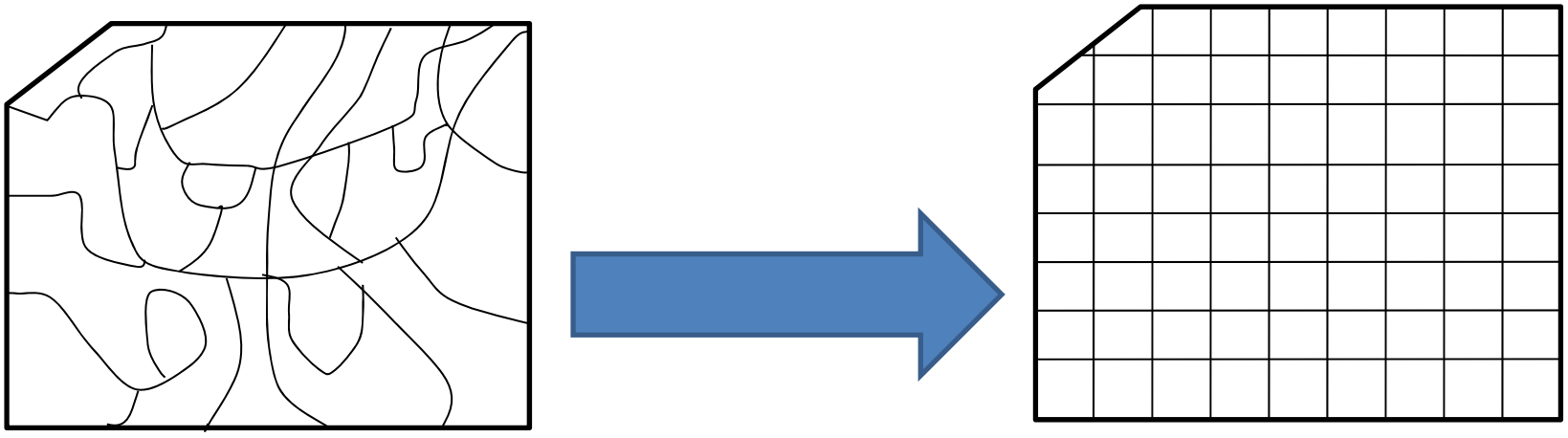


"We grid so we can locate people in space with more precision and not be constrained by admin unit."

[Map and quote: Alex de Sherbinin (CIESEN), EFGS, 2010]

[European population disaggregated to a 500- m grid: Klaus Steinnocher et al. AIT Austrian Institute of Technology]

Issues concerning transition from Administrative Units to Grids:

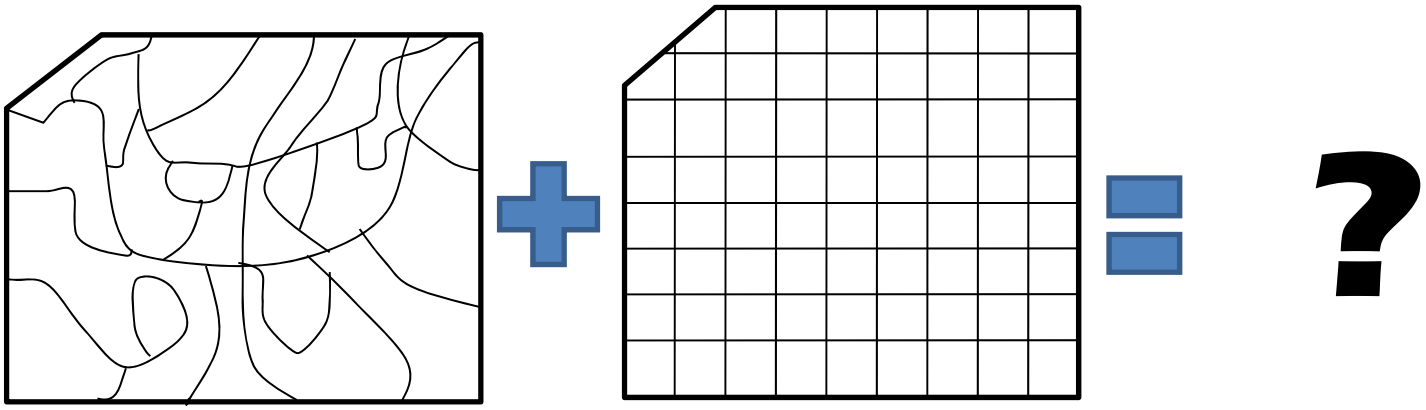


Administrative Areas

Regular Grid

- Map projections and coding systems
- Data and Methods [aggregation vs disaggregation]
- Quality measures and specifications
- Metadata standards
- Confidentiality and disclosure concerns

The HYBRID approach
Case studies at the U.S. Census Bureau

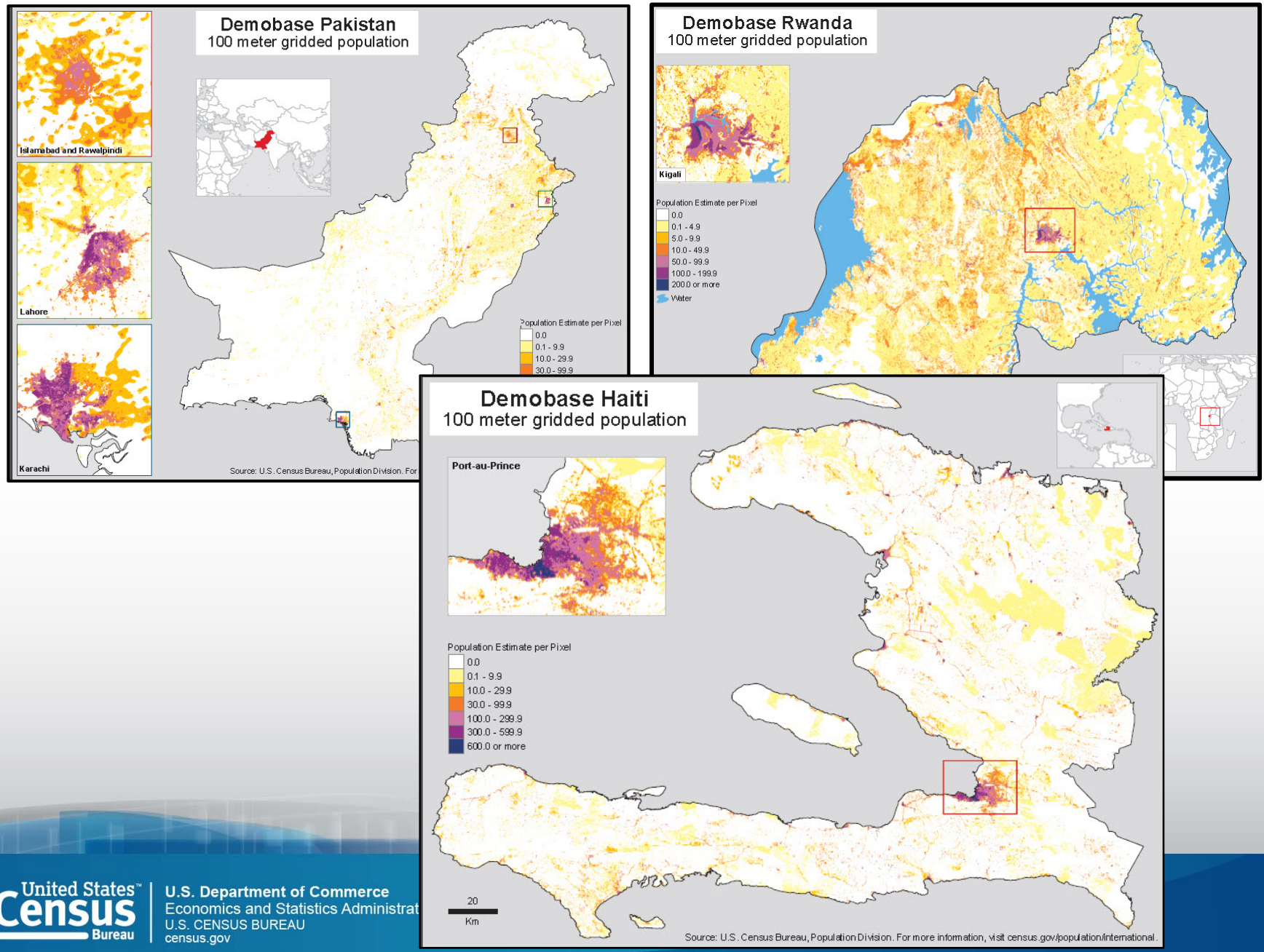


Administrative Areas | Regular Grid | Hybrid

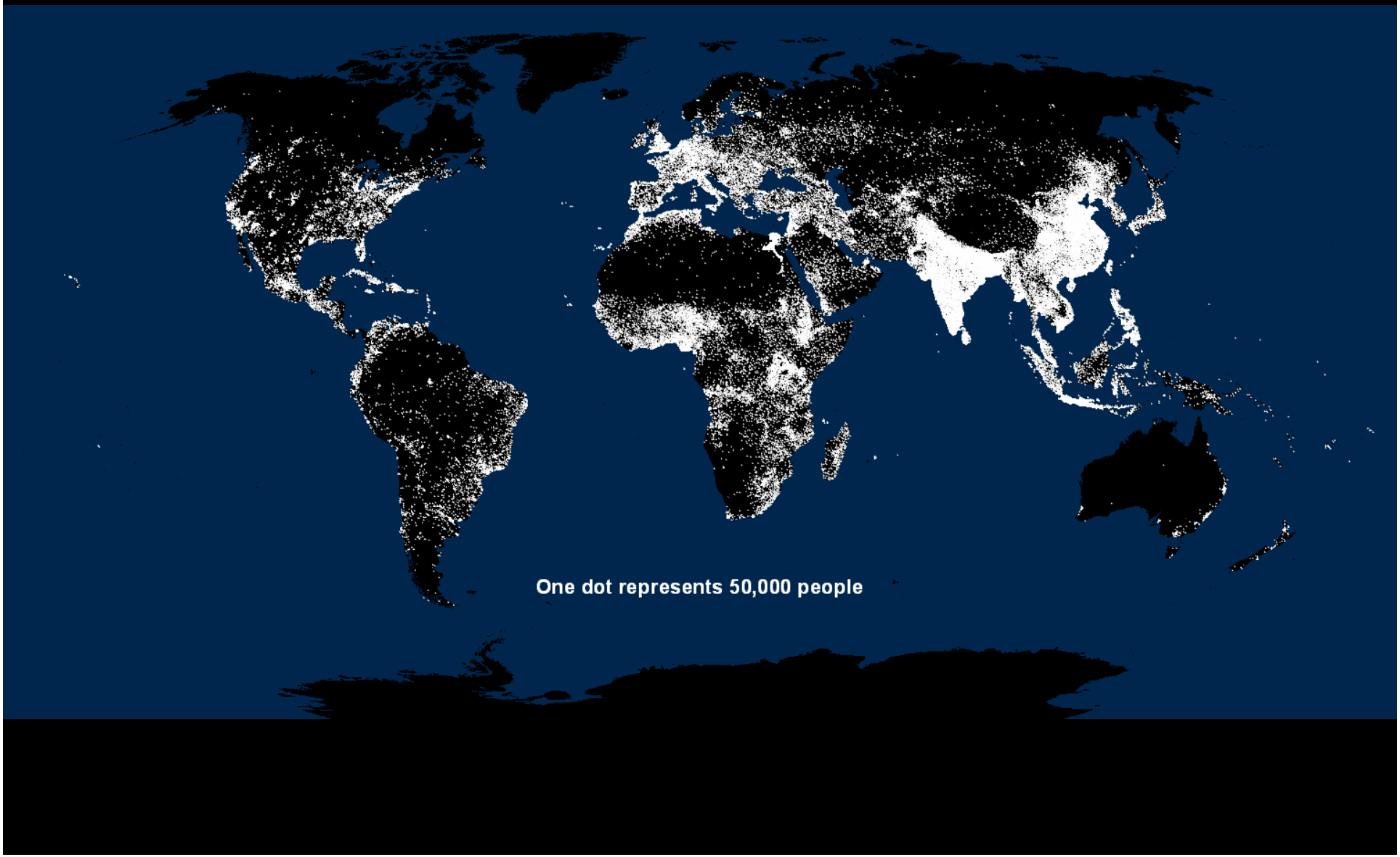
- 1992 *Agricultural Atlas of the United States*
- Haiti Demobase, 2010
- *Population Distribution of the World* (data provided to LandScan/Oak Ridge National Lab)

Source: Esri

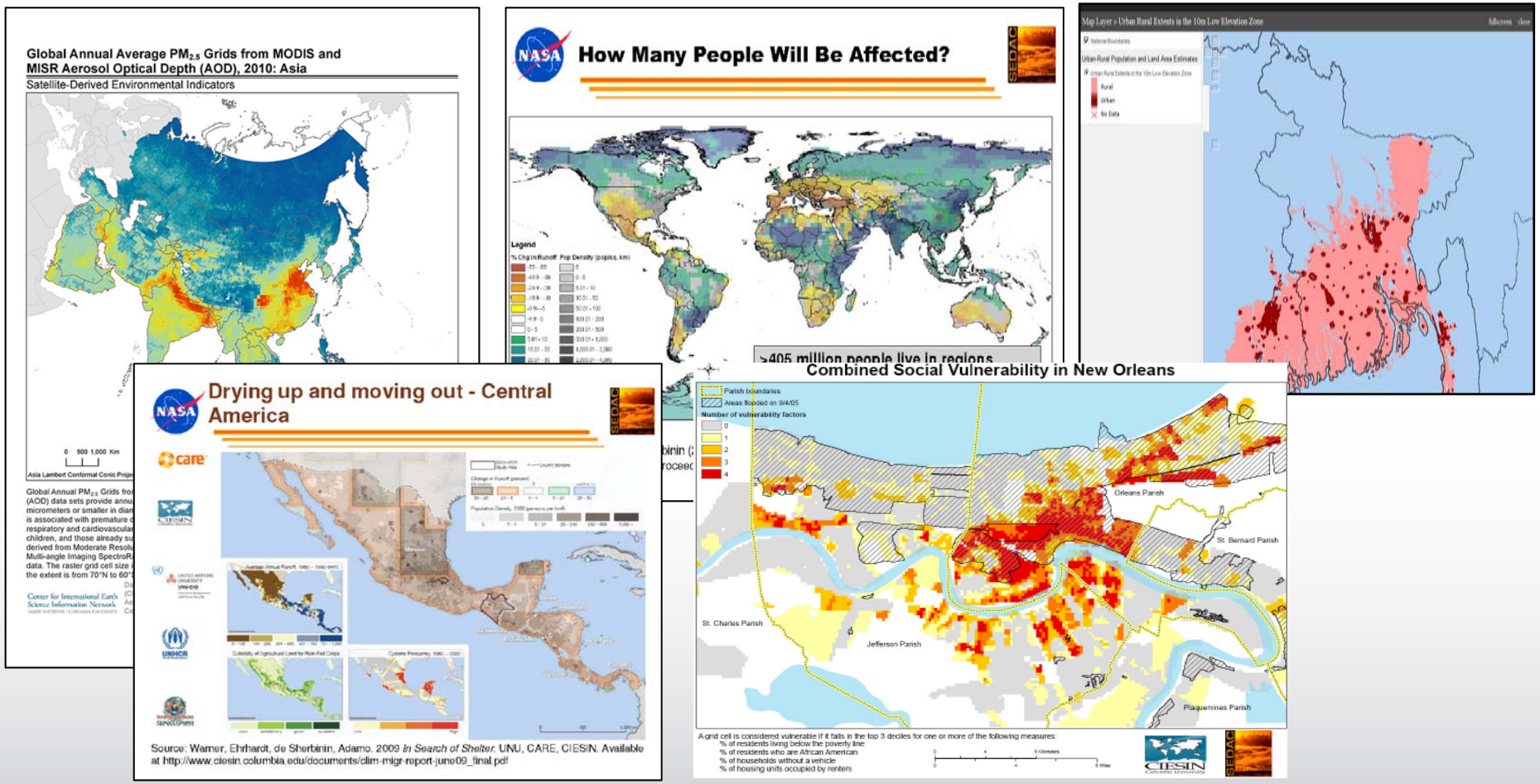
Gridded Population Maps from Census Bureau: Demobase



Population Distribution of the World



Examples of construction of gridded data



- Alex de Sherbinin, NASA Socioeconomic Data and Applications Center, CIESIN—The Earth Institute at Columbia University, USA

Questions

- With the demand to link statistics to location, there are national statistical agencies with a considerable wealth of experience. How can this knowledge and experience be applied globally?
- How can regions work together to define useful administrative areas?
- How can the international community integrate existing grids?
- What are next steps?

Tasks

- Survey and inventory the geographic classifications currently in use, through a global consultation questionnaire on national data collection and geocoding practices.
- Evaluate further the pros and cons of the administrative approach and the grid approach for geocoding.
- Expand on a bibliography of research on international geocoding practices.
- Identify technical, institutional, and information policy issues

Summary

- The convergence of technology improvements (especially GIS) and the increased availability of data (both spatial and statistical) have contributed greatly to the value of a global network of information.

- The debate about statistics by administrative areas, vs grid-based statistics patterns, in the form of statistical grids, or the combination of the two approaches will inform the discussion on international geospatial statistical frameworks .

- Research and efforts of the UN-GGIM will guide next steps to discover best practices in linking geospatial information to statistics.

Questions?