Linking People and Socio-Economic Information to a Location:

Integrating Statistical and Geospatial Information

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Summary

• Need for Integration of Statistical and Geospatial Information
• Example of the Census
• Trends in Technology
• UN Activities
• Future Actions/Conclusion
UN working with two professional communities

- Working with **National Statistical Offices** to evolve a global statistical system -- Many achievements over 65 years;

- Working with **National Geospatial Information Authorities** to evolve a global geospatial information platform with common practices and standards;

- Now working to bring these two communities together to evolve an **integrated national/global information system**.
Divergence and Overlaps

- Two communities operating on different analytical schemes and data structures, with minimal overlaps;
- Distinct culture, language, and practices;
- Comfortable as distinct professional communities;
- But now compelled by emerging trends to look for the common ground.

- What is the Common Ground? How to get there??
Matrix: Data Structure for Statistics

This data structure may explain to some degree why it took a long time to adopt the geographic approach.
Statistics are about human characteristics and activities which are geographic in nature.
Location as Basic Unit of Observation

25 Dupont St, Town T
x, y: 35.5676, 135.6587

Address / Geocode

Enumeration Areas
(operational geographic units for data collection)

Geographic Data Structure: Points, Lines, and Polygons
Need for a Statistical Spatial Framework

A common geographic framework is fundamental to integration.

Aggregated to a district level

Aggregated to an administrative unit

Aggregated to Local Government area or higher

Geocoded unit level data
25 Dupont St = x,y: 35.5676, 135.6587

Need for appropriate standards to support the linking of socio-economic information to location
Census Cycle

Enumeration
Maps support data collection, monitoring

Pre-enumeration
Maps provide cartographic basis for the delineation of Enumeration Areas

Census

Pre-Census

Post-Census

Post-enumeration
Maps make it easier to analyze, display and disseminate; also support survey projects during the decade after the Census

Survey Samples
Rolling Census

Census geography: Shift from “redoing from scratch” to “up-to-date-approach”
Coding Scheme

- **Enumeration Area (EA):** a basic geographic feature

- **Coding scheme:** relating EAs and administrative units:
  - (A unique code assigned to each EA, used in data processing)

- Example of a hierarchical coding scheme:

```
1 2 0 3 4 0 1 2 5 0 0 2 4
```

province  district  locality  Enumeration area
The Coding scheme is the basis to build a GIS which works on geocoded data.

Each NSO which has its coding scheme has already a “GIS”, even if it is not in a digital form!
Main components are:
Street network,
Buildings
EA boundaries layer
Annotation,
Symbols,
Labels
Building numbers
Neatlines
Legend

Enumeration Area Map

Symbols

- District
- Locality
- EA
- Building number
- Hospital
- Church
- School


Approximate scale

0 50 100 200m

Enumeration Area Map

Province: Cartania 14
District: Chartes 032
Locality: Maptown 0221
EA-Code: 00361

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EA features stored as map layers in the same spatial reference system

Street Network

Buildings

Boundaries

Building numbers

Neatlines and legend

Annotation and symbols
Building a Geographic Database at EA level

Working with data stored in a geodatabase, you will organize and prepare data for (spatial) analysis, create geoprocessing models.
Spatial Analysis/Migration Analytics

Internal Migration in England & Wales, year ending June 2010

- National
- Local

Mouse over the map or the graph to see details of migration flows, click the 'clear' button to reset the map or use the list to select a different area.

Manchester

Inward and outward migration estimates:

- In: 34,300
- Out: 36,700

Inward migration, ordered by total number of migrants:

20 migrants from Maidstone

Significant flows highlighted using a method adapted from [Homes and Hawcroft (1977)].

Graphical: [ONC Data Visualisation Centre]

Data source: [ONS Migration Estimates (published 10th October 2013)]

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Interactive Map of Chile Administrative Districts-Atlases
(Population and Housing Census 2002)
Personal Digital Assistant (PDA):

Integrated Field Data Collection

(Electronic Questionnaire + GPS, etc.)
Integrated Mobile Devices (PDA, Tablets) – Brazil: an example of massive use

- Data Collection and Entry: automated/built-in
- Embedded “GPS”: georeference units visited/track location of data entry/positioning and guidance of the enumerator
- Integrated field platforms with GPS, cellular, camera and OS applications
- Commercial or In-house devices, Tablet, Cell…

Figure 15 - Satellite Image on PDA screen.
As technological developments and data availability advance rapidly, statistical agencies must be prepared to respond to user expectations for data access and interaction.

Source: T. Trainor, US Census Bureau, 2009
Census Dissemination

- Customized to Census dissemination

- Use of SMS to disseminate some census results (e.g. Kenya)
Scalable Hardware - (Source: ESRI)

- Faster
- Multi Processors
- Loosely Coupled
- Connected

... and Services Oriented
Handbook on Geospatial Infrastructure in Support of Census Activities

- Audiences: managerial and technical

- “Cook-book” to illustrate the role of geospatial technology in each step of the census process

- Each country has to find its own best possible solution

- Available in the six UN official languages

Regional Workshops on Census Mapping with GIS

- For English-speaking African countries: Lusaka, Zambia, 8-12 October 2007: 30 participants from 14 countries
- ESCAP region: Bangkok, Thailand, 15-19 October 2007: 31 participants from 16 countries
- CARICOM: Port-o-Spain, Trinidad, 22-27 October 2007: 28 participants from 16 countries
- For French-speaking African countries: Rabat, Morocco, 12-16 November 2007: 48 participants from 10 countries
- For SPC region: Noumea, New Caledonia, 4-8 Feb. 2008: 30 participants from 10 countries and two territories
- ESCWA region: Doha, State of Qatar, 18-22 May 2008: 44 participants from 12 countries
- Latin America region: Santiago, Chile, 24-27 November, 2008: 47 participants from 17 countries
- CIS region: Minsk, Belarus, 8 - 12 December 2008, 41 participants from 11 countries

(300 participants from 106 developing countries and two territories):
Statistical Commission Decision on the Integration of Statistical and Geospatial Information

Decision 41/110 (of the 41st SC session in 2010):

• Recognized the importance of the integration of geographic and statistical information and the opportunities provided in that context by the swift development of information technology, noting that national statistical offices are playing an increasing role in such integration, especially in the area of census management
UN Committee of Experts on Global Geospatial Information Management (UN-GGIM)

- **ECOSOC decision 2011/24** established the UN Committee of Experts on GGIM (UN-GGIM)

- “**Recognizing** the importance of **integrating cartographic and statistical information, as well as spatial data**, with a view to fostering location-based geospatial information, applications and services”
An Action Agenda for the Integration of Geospatial and Statistical Information

• Establishment of UN Expert Group on the Integration of Statistical and Geospatial Information
  – First meeting in New York, 30 Oct. – 1 Nov. 2013

• The United Nations will facilitate the collaboration of the two communities globally and nationally in:
  – Developing a Statistical Spatial Framework
    • Common geographic framework, fundamental to integration
    • Need for appropriate standards to support the integration

• International Workshop on Integrating Geospatial and Statistical Information, Beijing, 9-12 June 2014

• Global Forum on the Integration of Statistical and Geospatial Information-New York, 4-5 August 2014
Conclusions:

- Location matters!

- The revision of UN Principles & Recommendations for the 2020 Round of Censuses has shown that NSO are increasingly recognizing the importance of the use of Geospatial tools (GIS, GPS, Imagery, Web Mapping, etc.) in support of statistical activities.

- Strong Recommendation: Census Geography/Mapping should be a continuous process.

- Need for cooperation between NSOs and NMAs to develop a national geospatial infrastructure in support of statistical activities.

- Integration of Statistical and Geospatial Information is key for Evidence-based Decision Making.

- Driver: “Data Revolution”… “Big Data”
Paradigm shift: Location is the 4th dimension of decision making
Vital Statistics of a Deadly Campaign: the Minard Map

"The best statistical graphic ever drawn", is how statistician Edward Tufte described this chart in his authoritative work ‘The Visual Display of Quantitative Information’.
THANK YOU !!

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