

Work on linking the SBR to geo-spatial information in China

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Abstract:

Every unit in the Statistical Business Register of China (called SBR for short) has address and 12-bit statistical area code, and the smallest statistical area is census tract. In the 2013 Economic Census National Bureau of Statistics (called NBS for short) has collected the boundary of all the census tracts, and enumerators captured a GPS point of the address of census unit using PDA in the field work. Since SBR has been completely updated based on the information from the 2013 Economic Census, every unit of SBR can be assigned to accurate coordinates, and SBR and geospatial information can be integrated with geocoding. However, newly established units in SBR can only be located to a census tract from 2014, as the information of addresses hasn't been updated. NBS has analyzed and visualized some geospatially enabled information of SBR to support informed decision making.

Maintaining accurate, up-to-date boundaries of census tracts and coordinates of addresses is a key component of linking SBR to geo-spatial information. NBS is planning to update the boundaries of census tracts and the address in the upcoming 2018 Economic Census, and will cooperate with other institutions for establishing an address

database for statistics in the future.

1. Introduction

In China, economic census is an important source of SBR updating. The economic census in China takes place every five years. In the 3rd Economic Census held in the year 2013, GIS was widely used for the first time. NBS has collected the boundary of all the census tracts (more than 600,000) in China, and enumerators have captured a GPS point of the address of census units (more than 13,000,000) using PDA in the field work. So the links between units and geo-spatial information have been initially built.

Every unit in SBR has address and statistical area code. Since SBR has been completely updated based on the information from the 2013 Economic Census, each unit of SBR established before 2013 can be assigned to accurate coordinates. However, the new units in the SBR can only be located to a census tract from 2014, due to the coordinates of addresses hasn't been updated.

Based on these geospatially-enabled statistics, NBS has produced thematic maps and analysis reports to disseminate census results and support government policy needs. Some local statistical institutions have developed statistical-geographic information systems.

NBS will carry out the 4th Economic Census in the year 2018. Boundaries of census tracts and location information of all units will be

fully updated in this census. NBS is also making a Long-term plan to build a comprehensive and timely updated address database for statistics cooperation with other institutions, so that all the units in SBR can be located by address information.

2. Census Mapping of the 2013 Economic Census

The censuses conducted by NBS include economic census, population census and agriculture census, in which the economic census is carried out every five years, and the population census and agricultural census each are held every ten years. Before the 3rd Economic Census in 2013, there was no national standard in the census mapping. In most areas, paper maps of census tracts were drawn by hand, and some local census agencies collected local geographic data by themselves and drew census maps with computer.

In the 2013 Economic Census, NBS has cooperated with one of the biggest geography information company in China called AutoNavi to provide map services. The geographical data provided by AutoNavi include all level of roads, places, POI, river systems and remote sensing images (similar to Google Map). NBS and AutoNavi have developed a software for online census-mapping with B/S structured, and organized local census agencies to draw the boundaries of census tracts based on maps provided by AutoNavi(see figure 1).

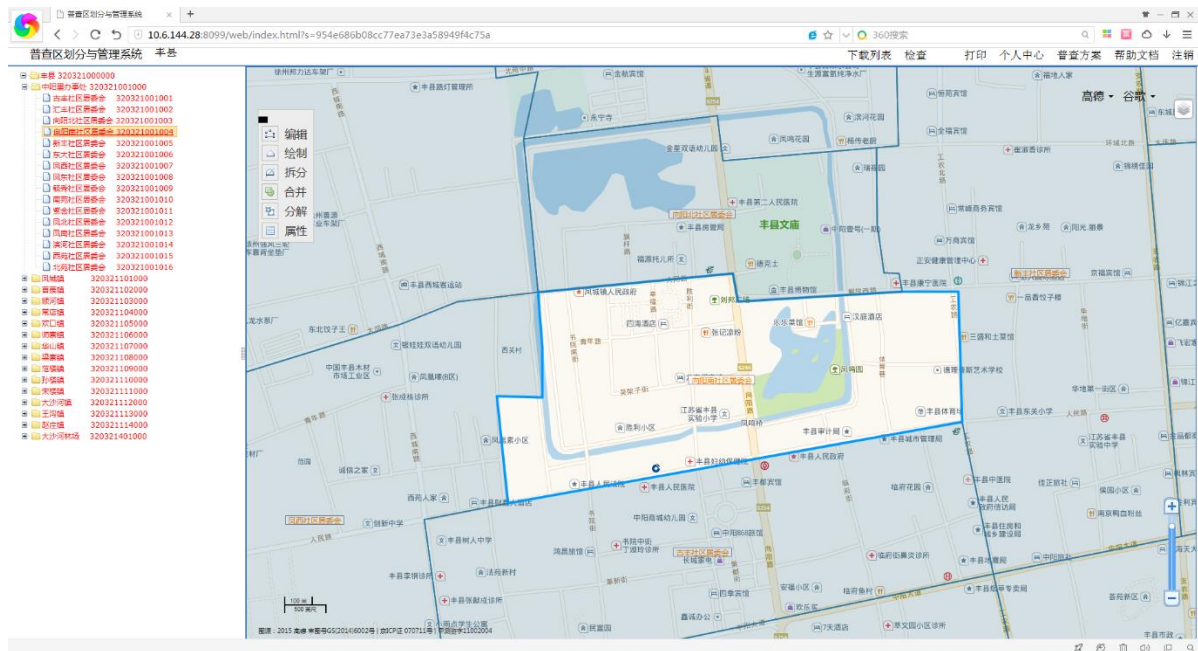


Figure 1. The online census-mapping software for economic census

In China, all the census and statistical investigation objects (including units, households, etc.) have the unified 12-bit statistical area code. Statistical area levels from large to small is provincial level (province, autonomous region, municipality under the jurisdiction of central government), municipal level (municipality, autonomous prefecture), county (district), township (sub district), village (community committees). In general, the census tract is equal to the village level in principle. Each community committees (in urban area) and village (in rural area) is a census tract, and the census tract can be divided into several census blocks if needed. In the 2013 Economic Census, there were 670,000 census tracts and 860,000 census blocks throughout the country (see figure 2).

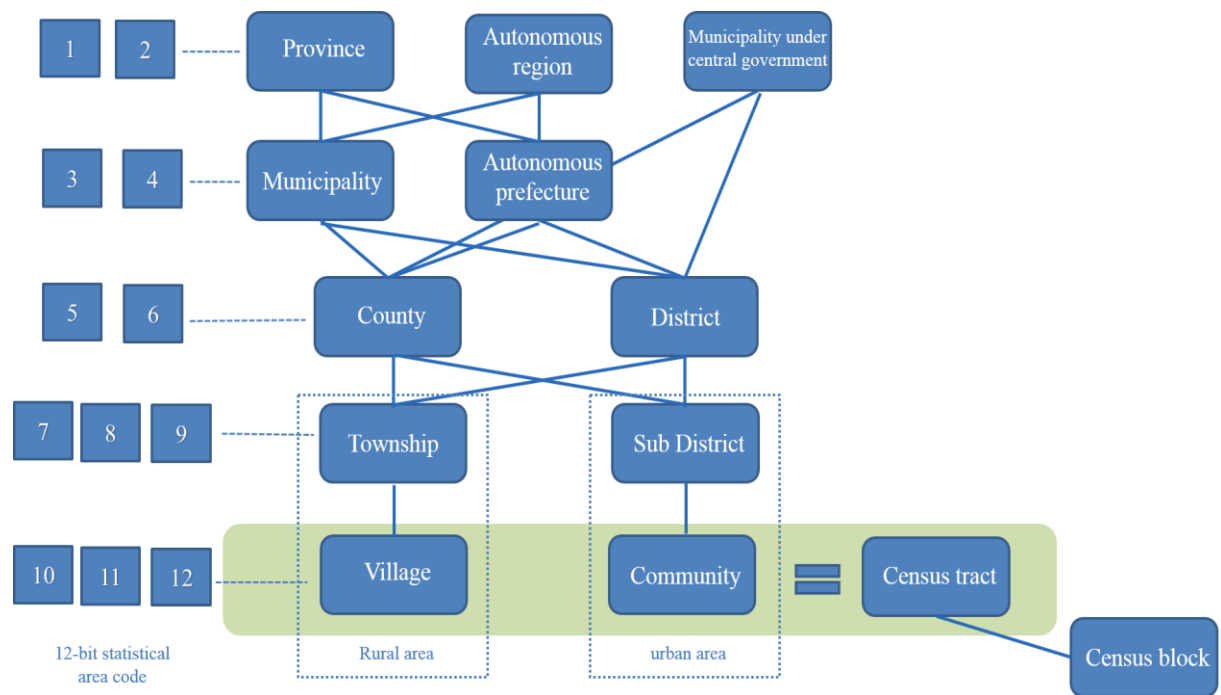


Figure 2. Statistical area levels

In the 2013 Economic Census, enumerators used PDA for field work. PDA has loaded census map to help enumerator to find and investigate units. Before entering the unit, the enumerator used PDA to locate the unit by GPS. PDA device has 7 inch touch screen, camera and GPS module with Android systems and customized APPs for economic census. National and local census agencies have bought more than 200,000 PDA for the 2013 Economic Census, which were also used for subsequent statistical surveys.



Figure 3. Map of a census tract in urban area

The related processes of the economic census and census mapping are as follows: 1 Draw the boundaries of the census tracts using online census-mapping software (organized by local census agencies). 2 Census map is automatic generated and sent to the enumerator's PDA who is responsible for the census tract with economic census software platform. 3 Enumerator investigates all the units in the census tract according to the map. 4 Enumerator uses PDA to locate the units before entering the building.



Figure4. Map of a census tract in rural area

3. How to build links between units and geo-spatial information

Every unit in SBR has address and statistical area code. As mentioned above, in the 2013 Economic Census NBS has collected the boundary of all the census tracts and the location of all the units. Since SBR has been completely updated based on the information from the 3rd Economic Census, each unit of SBR established before 2013 can be located to a point with accurate coordinates.

In non-census years, newly established units can't be investigated by PDA as they were in the economic census, because NBS don't have enough manpower. There are a large number of units in SBR and they are increasing very fast. There were about 11 million legal units in SBR in 2013, and up until the end of 2016, the number increased to 18 million. Additional units in SBR from 2014 can only be located to census tract by

statistical area code.

Address matching is a better solution to locate the units. But in recent years, there is too much rapid change in the Chinese cities and in the address information that there is no authoritative and comprehensive address database available for statistics. Additional units from 2014 can't be located to a point since the coordinates of addresses haven't been updated.

4. Benefits of linking SBR to geo-spatial information

The geo-spatial information can be used for the dissemination and analysis of economic census data and SBR data, especially for making small area statistic products. Based on these geospatially-enabled statistics, NBS has produced thematic maps and analysis reports to disseminate census results and support government policy needs. For example, figure 5 is the employees' density map by census tract in Beijing which is useful for urban planning.

Some local statistical institutions have developed statistical-geographic information systems. Users can query the distribution of the units on the map and check the unit's attribute information.

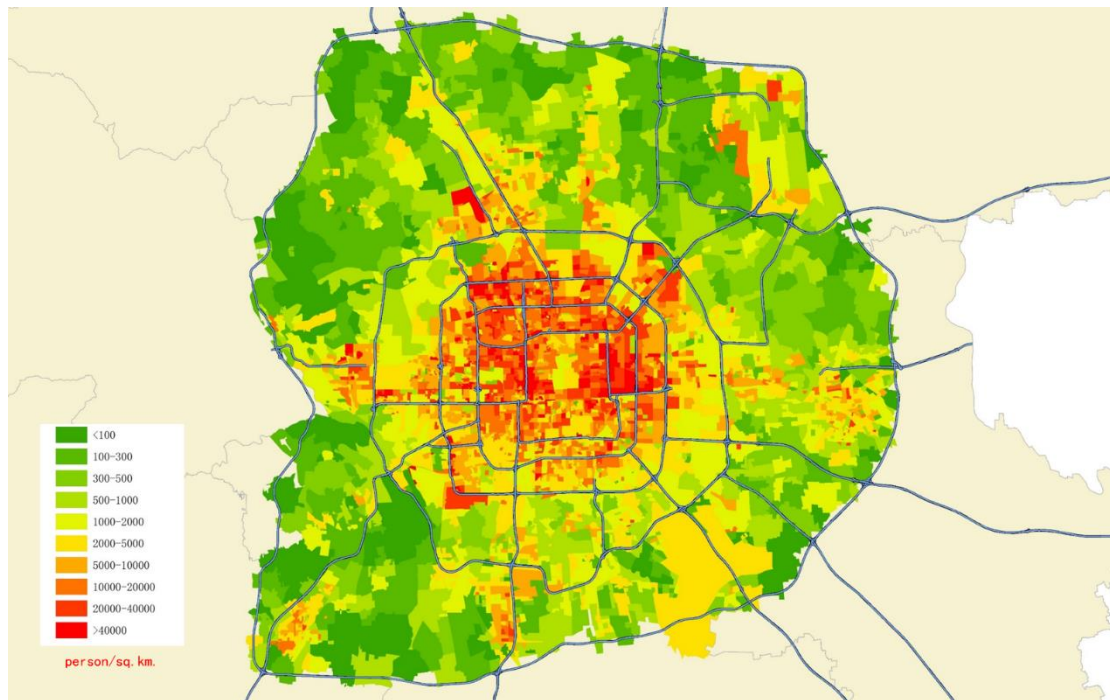


Figure5. Employees' density map by census tract

5. Prospects

In the United Nations Statistical Commission in 2017, UN EG-ISGI (Expert Group on the Integration of Statistical and Geographical Information) submitted a report proposing the implementation of Global Statistical Geospatial Framework, and presented the five main principles of the framework. The NBS approved the main contents of the report and planned to gradually promote the integration of statistical information and geographical information referred to Global Statistical Geospatial Framework.

NBS will carry out the fourth national economic census in the year 2018. Boundaries of census tract (which is equal to statistical area at village level) and location information of all units will be completely updated in this census.

NBS is making a plan to update the boundaries of village-level statistical areas every year. There is also a long-term plan about address database. NBS will work with other government departments and companies to build a comprehensive and timely updated address database for statistics, so that all the units in SBR can be located by address information.

Standards and guidance on the use of geographies for dissemination, visualization and analysis of SBR should also be proposed. NBS will release more maps and geography products on the website so that data users can discover and access geospatially enabled statistics easily.