CODING THE ADMINISTRATIVE UNITS OF NEPAL FOR DATA INTEGRATION AND VISUALIZATION

Suresh Man Shrestha, Cartographic Engineer
topochiefnepal@gmail.com

KEYWORDS

Map, Data, Integration, Codes, Administrative Units, GIS

ABSTRACT

The value of data increases by multifold if they are presented in spatial context. For the meaningful use of data, the data table and the spatial component, the map, should be processed and prepared in such a way that they can be integrated easily. Common identification code for data and map units (point, line or polygon) is the key to this integration.

1 INTRODUCTION

For any development tasks to be formulated, scheduled, implemented and monitored, people need information. Nature is the ultimate source of all kinds of information. Almost all information is there with her, we just have to discover them for our needs. The information discovered should be passed to others so that they can use that information for the benefit of the society.

Developments in the field of electronics, for example fax (facsimile) machines, video cameras, CD players, printing press, personal computers, digitizing devices, softwares etc. have been the characteristics of the last few decades.

Organizational communication is important in every business. People in organizations need to communicate to coordinate their work and to inform others outside the business about their products and services. All these developments in the modes of communication have helped map – makers to produce more effective maps, a graphic method of information communication and sharing.

In this communication process a large variety of professionals are involved. For example, map makers, data producers, planners, decision makers, and map / data users to list a few. No single organization can accomplish all these tasks on its own. So, there is a need to design a mechanism to integrate the information from a wide range of sources so that we can produce meaningful products on which the planning and further actions can be based.

1.1 Maps

We live on the Earth, one of the several planets of our solar system. The earth is almost a perfect sphere with a radius of about 6,366 Km. The surface of the earth consists of different natural and man-made features like forest, lakes, mountains, urban areas roads and so on. The earth is so big that we can't see it at her completeness at one glance. To perform different activities of our needs, the features of the earth must be portrayed into a small form so that we can visualize a large part of the earth.

One of such small forms of the earth is a GLOBE. The globe is one of the most perfect representations of the earth. But the globe is not convenient to use for different purposes. For example, it is practically very difficult to perform linear measurements on a globe. The size of the globe would be very big, if we want to show more information on it. The radius of the globe would be about 64 meters to represent the earth at the scale 1:100 000. It takes a lot of space to store the globes. The globes are not convenient for carrying from one place to another. Since, the globes are generally made of metals or plastic, it is not convenient to add additional information on it.

So, it is more practical to represent the features of the earth onto a flat surface like a paper. This process of representing the features of the earth's surface onto a flat surface involves conversion from the curved surface into flat surface. *The reduced and generalized, in a scientific way, representation of the whole or a part of the earth onto a flat medium (generally a paper) is called a MAP.* With the development in the fields of Computer and Information Technology, Geographical Information System, Surveying and Mapping Technologies, professionals have started to make, disseminate and use maps in digital forms.

Map making is a very professional, time and cost consuming task. So, generally, the base maps are prepared by a National Mapping Authority of the Government, for example, Survey Department in Nepal. The latest series of topographic base maps (1992 – 2001) at scales 1:25,000 and 1:50,000 have been digitized to create National Topographical Database in digital form. On the basis of this database, Survey Department has generated digital database at scales 1:100,000, 1:250,000, 1:500,000 and 1:1,000,000. The database at scale 1:1,000,000 is freely available from the Department's web site. Apart from other data layers, this 1:1,000,000 scale database consists of an administrative boundary layer.

1.2 Map as an interface to data

Maps have been used for centuries to visualize and understand the ground reality. Map users understand different natural and artificial phenomena on the basis of appropriate maps. Different information such as distances, directions, volumes, areas, interrelationship between two or more phenomena can be derived from a map.

Maps contain different types of spatial data. Spatial data refer refers to objects or phenomena having specific location in space. Spatial data can be divided into two categories viz. geometric and attribute data. The first refers to the geometrical aspects (location and dimension) of the phenomenon and the second refers to other, non-geometrical aspects. For example, district wise population density map of Nepal. In this case, the boundary lines defining the given district are the geometric component and population density is the attribute component of the given spatial data.

Maps are made, in essence, from different data sources viz. geometric data about the ground features and attribute data related to different feature units. Surveying (ground surveying or remotely sensed surveying) and existing maps are major sources for the geometric data. Attribute data are collected by different agencies viz. organizations responsible for census, forest, agriculture, education, health and so on. In this way maps act as an interface to visualize the data in much more meaningful way.

1.3 Usages of maps

Consciously or unconsciously we use maps in our daily life. When somebody asks us about how to go to certain place, we first of all make a mental map in our brain and direct that person on how to reach there.

These days use of open source web maps has been a common practice. These maps are

generally prepared by international professional organizations/groups in collaboration with government organizations and interest groups.

Almost all people use maps. Maps are very useful for different types of engineering works. Engineers construct different structures first on the maps. Different calculations can be done in maps. For example, we can calculation of length, area and volume. Some other map users are a vehicle driver, a scientist, a teacher, tourist, planners and decision makers, emergency service provider etc.

2   CURRENT ADMINISTRATIVE STRUCTURE OF NEPAL

According to the Constitution which came into effect on Sept 20, 2015, Nepal has 7 provinces with 77 districts. In due course of time 753 local units (6 Metropolitan Cities, 11 Sub-Metropolitan Cities, 276 Municipalities and 460 Rural Municipalities with 6,743 wards in total) were formed. So, the wards are the smallest administrative/political units in Nepal. Each ward consists of a few settlements.

The boundaries of these local units are not marked on the ground. Mostly, the natural and man-made features (ridges, rivers, roads etc) represent the boundaries. In many cases, especially in case of areas declared as "designated areas" (National Parks, Hunting Reserves, Conservation Areas), there are confusions on the boundaries. The boundaries of the settlements are not yet mapped in Nepal.

3   INTEGRATING DATA WITH MAPS

Basically, the process of combining data from different sources to create a unified view may be called data integration. Data integration always results in a value added product, saves time, creates environment for better collaboration between different organizations and assist in the knowledge-based and informed decision making process.

Mostly, the data and derived information are published in tabular form. For the decision makers and planners, it is neither easy nor comfortable to visualize, analyze and decide on the basis of such data in tabular form which lacks spatial component.

By integrating data with maps, one can derive more accurate insights, clearly see the spatial distribution of the data, compare with other relevant data and can generate information in spatial context based on which more reliable, reasonable and practical plans can be designed for the betterment of the society.

3.1 Data collection

For national, provincial and district level planning purposes, different government agencies collect data throughout the country. National Planning Commission, Central Bureau of Statistics (CBS), Ministry of Education, Science and Technology, Ministry of Health and Population, Ministry of Agriculture and Livestock Development, Ministry of Industry, Commerce & Supplies, Election Commission and so on collect the data required to fulfill their organizational mandates. The Census data are collected by the Central Bureau of Statistics (CBS) once in a decade.

The Census data are generally aggregated in ward level. Most of the other data are aggregated by the local units and districts.

3.2 Coding the mapping units

The key to integrate the data with maps is to establish national codes for administrative units, linear and point features represented in maps and use them throughout all agencies collecting data and making maps.

In order to integrate the tabular data with the map, one needs to relate the row of data in tabular form to a specific unit in the map data. This is done by assigning a common code to the row of

data in tabular form and corresponding unit in the map data. The common code may be text, number or alphanumeric. More practical way of coding is to assign numbers to all units. Due to lack of uniformity in names of geographical and man-made features, it is not practical to use such names as common codes.

3.3 Usefulness / benefits of codes of mapping units

In absence of common code for the mapping units, one has to rearrange the data table or map data to make the data integration possible. And it takes a lot of time and man-power. Having common codes for mapping units, we can easily use data collected by any other organization and it is one of the main ideas of the principle of data interoperability and cost saving.

4   CODING ADMINISTRATIVE UNITS AND OTHER FEATURES IN THE PAST

Until the recent past, different agencies were using different codes for the then districts and lower level administrative units. For example, Survey Department and Central Bureau of Statistics were assigning different codes for districts of Nepal.

Attempts were made to use common codes and as a result a "National Standard" was developed and published. But, in practice it was not followed. The reason may be that the different agencies found it comfortable to work with the codes practiced in their own organizations.

Apart from the administrative units, Survey Department has developed a list of feature codes for all point, line and polygon features presented in the base map of Nepal. The feature code list is available at www.ngiid.gov.np maintained by Survey Department. But, the codes for individual point, line and polygon features are yet to be worked out.

5   CODING ADMINISTRATIVE UNITS OF NEPAL

Now, the administrative structure has been changed. Accordingly, their codes have to be revised. A new coding system suitable for the current administrative structure should be designed.

The Central Bureau of Statistics (CBS) has already developed a new coding system according to current administrative structure. Each local unit is given a five digit number, for example, for Dharan, the code is 11301. The first digit represents the province number $(1-7)$, next two digits represent the district number and last two digits represent the local unit number.

According to the system adopted by Central Bureau of Statistics for the numbering of districts, firstly, districts are numbered from 1 in each state and as much as possible the numbering starts from the district of north east side of the state and continues in "S" direction. Then the geographic code of a district is manipulated as an alignment of state geographic code and district serial number. For example, the serial number of Taplejung district is 01 and it falls in state 1, then its geographic code will be 101. Same principle is adopted for local units in each district. Figure 1.

There is no hard and fast rule for coding administrative units. However, considering our eye rhythm during writing and reading, we print written materials with the words arranged horizontally left to right. To read this material, the eye moves left to right along a line of type and then sweeps to the left and down to the beginning of the next line. This suggests the coding process to start from left to right along a line and down to the beginning of the next line. This may be one of the agenda for discussion among the concerned agencies.
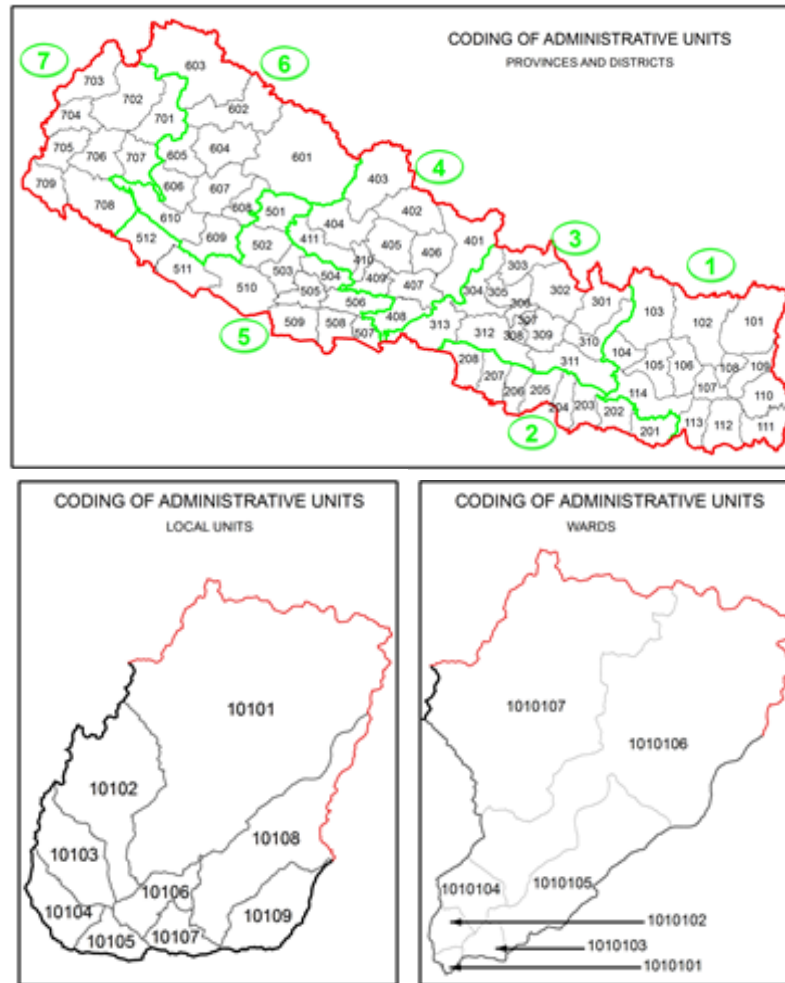
Figure 1 Coding administrative units of Nepal

6 DATA VISUALIZATION

Primarily the data are collected in pre designed forms – in hardcopy or digital format. Eventually, the collected data are arranged in tabular form – database table.

Generally, the human brain perceives information more clearly and quickly in the form of maps, charts and graphs than in the form of table or reports. In broader context, individual data has very little meaning. For example, the population of Kathmandu Metropolitan City is just a figure. But, when the populations of all Local Units are considered, it gives information on different aspects of population. And one can identify the areas which need attention.

After proper data integration, one can visualize the data in the form of map, charts, and graphs. Maps are more effective tool for visualization and proper understanding of the data. One can see the trend of the data including spatial component. With the in-built tools in the GIS softwares like ArcGIS, QGIS, we can analyze and visualize the data as per our requirement.

7 CONCLUSION

Mapping and data collection are highly professional tasks and the government allocates a huge amount of resources for their creation. This national investment should be used at optimum level so that the information can be used for the pre-directed national development.

Developing a common code for mapping and data collection units along with the standardization of mapping and data format are the keys to make the data integration possible.

Coding of the mapping units should be widely discussed among all concerned agencies and a system agreed upon by all concerned agencies should be brought into practice.

8 RECOMMENDATIONS

1. Map producer, Survey Department and data producers should work in close coordination so as to produce more meaningful products.

2. National Standards on coding of mapping features should be revised to reflect the current changes in the administrative structures of the country. For this, all the stake holders may sit together for meaningful discussion.

3. The National Code should be complete as far as possible. For example, the codes of administrative units developed by The Central Bureau of Statistics (CBS) may be extended to incorporate wards and settlements by adding two digits for wards and two (or three) more digits for settlements.

4. The National Code should also incorporate other features like highways, airports, headquarters, and designated/protected areas and so on.

5. The National Code should be passed by the Mapping Committee and enforced throughout the country.

REFERENCES

Definitive Guide to Data Integration. Talend, https://www.talend.com

Government of Nepal (1960). *Geographical Coding of States, Districts and Local units.* National Planning Commission, Central Bureau of Statistics, Nepal, 1960

Shrestha, S. M., (2005). One plus one is more than two – The making of the Population and Socio-Economic Atlas of Nepal. *Nepalese Journal on Geoinformatics,* Number 4, 2005

Author's Information

Name	:	Suresh Man Shrestha
Academic Qualification	:	M. Sc. Engineering (Cartography)
Organization	:	Retired from Government service as Deputy Director General of Survey Department in 2018
Work Experience	:	30 years in Surveying and Mapping Profession.
Published Papers/Articles	:	10