Study on the Classification of Urban-and-rural Integration Cadastral Elements

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Key words: urban-rural integration, cadastral elements classification; data model

SUMMARY

The rural land and urban land are managed separately in existing cadastral management policy in China. In rural area, land-use and land cover are paid more attention, While in urban area, land property are focused. With the rapid development of social economy and urban construction, the gap between the urban and the rural is narrowed, and accordingly, the contradiction of such binary-system cadastral elements classification based on urban-rural difference becomes increasingly apparent, which results in much difficulties for land management. In this paper, the unified mathematical, classification, coding, rules and methods of cadastral elements classification are studied, the uniformed urban-and rural cadastral data model is designed, and the prototype system is developed for urban-rural cadastral management in Wuhan, China.

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1. INTRODUCTION

The urban cadastral and rural cadastral are managed separately using different data models in recent China. The key of urban cadastral is land property management, namely management's ownership of the land, therefore the smallest unit of cadastral management is parcel(Zahir Ali, Arbind Tuladhar, Jaap Zevenbergen,2012). The urban cadastral consists of four features, which is county (city, district), street, neighborhood and parcel. The main task of rural cadastral management focuses on land resources, namely land use/cover management, followed by the collective ownership of land management. Four features—county (city, district), the township (town), administrative villages (village groups) and figure spot composed of hierarchical model of rural cadastral, and the administrative village or village group which is the smallest unit. The difference between rural cadastral and urban cadastral lies not only in the investigation of scale, but also in the content, that is urban cadastral focus on land property, rural cadastral focus on land category(João Paulo Hespanha, Peter van Oosterom, Jaap Zevenbergen, Gonçalo Paiva Dias,2006).

Building up the integral database of urban and rural cadastral is an important to solve the problem (Wuhan Land Resources Administration，2006), This is not mechanically pieced the two database together, but the integration of data classification, database structure and coding system(Volkan Çağdaş, Erik Stubkjær,2009). Fortunately, the development of cadastral data standards and technology provide a solid foundation of the integration of urban and rural cadastral database (Maria Augusta Silva, Erik Stubkjær,2006).

1) Issued by the State Land Use Classification, urban and rural land classification is in a unified system, which ensures the unity of urban and rural cadastral data at the land category standards;
2) Registration and certification of Collective land ownership will further rationalize the rural collective land property and strengthen the management of collective land ownership;
3) Ministry of Land and Resources has formulated the standard-"the dividing and coding of urban and rural parcel", which enable the unique code of each parcel;
4) With the rapid development, GIS and database are capable of managing seamless, multi-scale, multi-source, multi-format, multi-precision spatial data, which enable the integration of urban and rural cadastral database and applications (Li zong hua，2008).

2. DISADVANTAGES OF CLASSIFICATION ON URBAN-RURAL DUAL SYSTEM

In the past, the classification on urban cadastral and rural cadastral played an important role in China. The main elements of urban cadastral classification are: ① the data organizationed by neighborhood; ②parcel is the smallest unit; ③ seamless between neighborhoods, but there maybe gaps between parcels; ④the goal of land use classification is to the area of each type, and to establish a statistical account. The main elements of rural cadastral management classification is ① the data organizationd as village; ②land use figure spot is the smallest unit; ③ seamless between villages, land use figure spots; ④the goal of classification is the registration and certification of land ownership, namely ownership management(Abbas Rajabifard, Ian Williamson, Daniel Steudler, Andrew Binns, Mathew King，2007).

The urban and the rural areas are continuous in space, therefore the exist classifications of urban and rural cadastral does not accord with the data model and relationship abstracting from reality. The disadvantages of the urban-rural cadastral classification as following:

1) The land use classification and coding, and the management system in uban and rural cadastral are seperately, which result in difficulties in further comprehensive applications of the urban and rural land management database.
2) With the accelerated process of urbanization in rural areas, urban and rural differences gradually decrease in the urban fringe, land use and ownership status changed rapidly, and the state-owned land and collective land are intertwined. It is difficult to accurately manage the land in accordance with the two classifications.
3) According to the two classification standards, the urban fringe land use and ownership have to be recorded and maintained in two databases, which results in difficulties in the unity of the database management.
4) Land statistics is important in the cadastral management. There maybe inconsistence in the statistical data due to the different classfication standards, Thus the comprehensive land statistics could not be provided to other applications such as land use controlling, land use planning, and the authority of the cadastral data are suspected.
5) In existing urban-rural dual system, the rural land use database and the urban cadastral database are seperated, and also the information are seperately, there no linkages between these database and systems, which results in the further data mining and applications.

Therefore, the classification of urban-and rural integration cadastral elememts and the data model of integration cadastral element must be established. This work will lay foundation for realizing the integration of urban and rural land management.

3.THE MAIN IDEAS OF CLASSIFICATION ON THE INTEGRATION OF URBAN AND RURAL CADASTRAL ELEMENTS

There are certain logic relationship between the cadastral elements of each layer in the cadastral management. In order to meet the needs of urban-rural integrative cadastral management, fully considering the requerements of GIS and Database, we should classify the

integration of urban and rural cadastral elements from the following aspects:

1) To realize the integration management of land ownership(Wuhan Urban Planning Information Center ， 2008). Land ownership is the key of Land Management. The land ownership in China is divided into state-owned land ownership and collective land ownership. In practice, once the collective land ownership is determined, the boundary of the state-owned land will be also clear.
2) To realize the integration management of land use. The national standard "Current land use classification" is published and carried out from 2007 in China. It eliminates the differences between the urban and rural land use, may be considered a unified definition benchmark of urban and rural land use.
3) To realize the integration management of spatial model and coding system. In urban and rural area, the land use and ownership coding system is inconsistent, which cannot meet the needs of the integration of urban and rural cadastral management. Combining with the Ministry of Land and Resources "parcel code preparation rules (Trial)" to establish a hierarchical model and coding system of integration of urban and rural cadastral elements. Which achieves the hierarchical management ,the multi-level networking and application sharing of the integration of urban-rural cadastral data through connecting with the chart, the number and table,.
4) To realize the integration management of database content. In the process of land resources management, each spatial objects of business type and business environment is a plot, which has determined location and clear boundaries, and is continuous in space. In cadastral management, this plot is cadastral parcel which is can be calssified into land ownership and land use right.

4. MAIN MEASURES OF THE URBAN-RURAL INTEGRATION CADASTRAL ELEMENTS CLASSIFICATION

Data classification is mainly based on the spatial characteristics and attributes. It is convenient to do data analysis, statistics, and query, if the cadastral data is classified based on data characteristics of the urban-and-rural integration.(Li zong hua，2009).

Both in the urban cadastral management and rural cadastral management, the database is organized by classification or partition, only the key point of management is different , the focus of urban cadastral management is land property information, while rural cadastral management information focuses on land-use. Actually the two management models can be one-to-one corresponding, just past rural cadastral management model weaken the management of collective ownership land information,which is need to strengthen,nowadays.

After the merge of urban cadastral and rural cadastral management, build the urban-rural integration cadastral hierarchical model which is composed of 5 major classes:the 5 major classes include administrative class,investigation area class , ownership class, land class and terrain class.The administrative classes contain provincial, municipal and county 3 small classes;the investigation area classes contain cadastral and cadastral subarea classes; the ownership classes contain collective land ownership parcel, collective construction land

ownership parcel, collective homestead ownership parcel and National Land ownership parcel; terrain class is mean land-class map spots, it is the expression of the land-use-element which is within the parcel, no miss,no overlap and full coverage; the terrain class includes control points, contours, elevation and houses. As the Fig shown below:

Major class	Secondary Class	Element content
Administrative	Provincial elements	The provincial boundary data of the national land administrative area
	Municipal elements	National land administrative area municipal boundaries data
	County level elements	Smallest administrative unit to carry out the management of the integration of urban and rural cadastral area is closed by the county administrative boundaries
Investigation area class	Cadastral area elements	Heads the division of the work area in the range of the counties (cities, districts)
	Elements of the promoter region of the cadastral	Divided the work in the area of the cadastral area, cadastral investigation and management smallest operating unit
Ownership class	Collective land ownership parcel elements	Belong to a farmers' collective economic organizations of all ownership boundaries of enclosed land or space, the elements including boundary points, boundary lines and parcel
	Collective construction land use rights Parcel elements	Parcel construction land use right in accordance with the law on collective land rights of possession, use and income for the elements including boundary points, boundary lines, parcel
	Collective homestead use the right parcel elements	Assigned to members of the land for the construction of residential and ancillary facilities by the rural economic organizations in accordance with the law approving the use of limited collective parcel of land use rights, the elements including boundary points, boundary lines, parcel
	Parcel of state-owned land use rights elements	Closed boundaries of the same land tenure law rights to the use of state land plots or space, the elements of the the boundary point boundary lines, and the parcel
Land type class	Class diagram of spot elements	Land type is the smallest unit of land-use management, and is composed of three types of objects of the class diagram of spots, linear features and sporadic feature.Single land type plots, as well as administrative boundaries, land ownership boundaries or linear features split a single land type plots called class diagram of plaques
Terrain class	Control point elements	Storage and management of the control point name, rank, type and other information
	Contour elements	Storage and management of spatial location and elevation values of the contour lines
	Elevation elements	Storage and manage the location and elevation of the elevation point value
	Housing elements	Information such as the spatial location of the storage and management of the housing, with the stratum, structure and area

5.PRACTICES OF WUHAN UNIFIED CADASTRAL MANAGEMENT

(1) Construction of Unified cadastral management information platform in Wuhan City,CHINA

According to operation mode of the urban and rural integration, making full use of information technology, integrating cadastral daily issuing data, the second land investigation data, the rural collective land ownership registration data, the basic geographic data, and other land-use planning data, compiling the city parcel Uniform Code, establishing the city's unified cadastre management database and data updating mechanism, building coverage of the city's domain, the urban-rural integration, land-use and land property integration, two three-dimensional integrated cadastral management information platform to achieve the purpose for the city's cadastral management working coordination , real-time updates, information sharing, and efficient operation. To provide the cadastral data support and application services for national economic and social development, as well as land resources management.

(2) Construction of "cadastral one map"

"Cadastral one map" is both the important land resource database sub-library but also the data supporting of the city's unified cadastral management information system. In "cadastral one map", the unified coordinate system is applied, different points in time, different scale cadastral and related data is integrated into a unified spatial database system. Based on the cadastral management needs, "cadastral one map" is composed of cadastral area, the sub-region of the cadastral, parcel, boundary points, boundary lines, issuing building and other construction, classification of polygons, terrain elements and so on. And compiled with the daily registration issuing layers, the basis of geographic layers (basic topographic maps, aerial and satellite remote sensing image, place names addresses), the special investigation Layer (urban cadastral investigation of Wuhan, The second land investigation, land use, annual land changes investigation), to management approval Layer (approved, the levy for use), the planning layers (land use planning, district-level planning, town planning) and other correlative layers to a cadastral information syntheses.

6. CONCLUSION

The land use management,land property managment and land registeration management are considersidered in urban and rural integrated cadastral elements classification model. Based on this model, we established Wuhan city's unified cadastral management information platform, namely " cadastral one map ", implementing cadastral data sharing between municipal and district bureau. In general the complement has a positive reference and guidance to other cities.

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