3D Cadastre Oriented Reconstruction of Administrative Procedure in Chinese Urban Land Management

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Key words: 3D Cadastres, Land Management Procedure

SUMMARY

Focusing on the recent management problem of 3D land utilization in the administrative procedure in China, this paper firstly elaborates the basic characteristics of land ownership and management in China, and then introduces the main concepts and steps in the current urban land management procedure, and reveals the deficiency in supporting 3D utilization for urban regions. Finally, from the perspective of 3D space and regarding 3D cadaster management as the core, this paper presents new administrative procedure of urban land management reconstructed from the recent procedure.

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1. INTRODUCTION

The current urban land management system of China is based on the management ideas and technology of 2D cadastre. In quite a long historical period in our country, it has played a positive role in promoting and guiding urban land daily management and urban construction. However, along with the rapid development of the national economy and current urbanization in China, especially the expansion of big cities, the urban land resource becomes increasingly short of supply. The pattern of urban development turns progressively from the past 2D expansion mode towards the 3D utilization mode. Under the new urban development mode, the traditional 2D management concept has many shortages in 3D land use. It also constrains the polymorphic 3D development of the city and may lead to more hidden troubles for future management of urban land ownership and resources.

Focusing on the recent management problem of 3D land utilization in the administrative procedure in China, this paper firstly elaborates the basic characteristics of land ownership and management in China, and then introduces the main concepts and steps in the current urban land management procedure, and reveals the deficiency in supporting 3D utilization for urban regions. Finally, from the perspective of 3D space and regarding 3D cadaster management as the core, this paper presents new administrative procedure of urban land management reconstructed from the recent procedure.

2. LAND OWNERSHIP AND MANAGEMENT IN CHINA

2.1 Land Ownership Structure in China

Not as the same as many countries in the world, the differences between urban and rural areas in China not only exist in the construction form and industrial structure, but also in the administration law, property rights and household registration system. Urban and rural areas have a clear policy boundary.

According to the "constitution" and the "land management law", The People's Republic of China resorts to a socialist public ownership, i.e. an ownership by the whole people and ownerships by collectives, of land. To be specific, the urban land belongs to the whole people, which is also called state-owned land; The rural land belongs to rural residents, which is also called collective-owned land.

2.2 Land Management in China

The "land management law" in China clearly divides the land into state-owned land and collective-owned land. And the land uses are set into three ways: farm use, construction use, and unused. A strict control is to place on the turning of land use from farm use to the

construction use in order to control the total amount of land for construction use and exercise a special protection on cultivated land.

At the same time, trading, transferring and circulating land are allowed, but this only applies to state-owned land for construction use. Land for other use is prohibited from trade and circulation. Meanwhile, due to socialist public land ownership in our country, only the right to use land can be transferred, not the ownership. The ownership of state-owned land for construction use still belongs to the whole people after transferred and circulated.

The main object of cadastral management in China is the state-owned land for construction use. The content of cadastral management regards the property right to the state-owned land for construction use as the core and executes according to law land survey, registration, monitoring, the construction of cadastral management information system, etc. Currently, since the state-owned land for construction use only exists in the urban area, cadastral management in China involves only a part of land management, not all state-owned land and even without involving the collective land in the rural area. These are the characteristics of current cadastral management in China. This paper explores the land management under this situation.

With the development of cities, the urban construction takes up land owned by peasant collectives in suburbs. According to the legal regulations, the expansion procedure is as follows: based on the land use planning, the urban government firstly acquires land owned by peasant collectives and compensates the farmers, and then turns the land owned by peasant collectives to that owned by the State or convert the land not for construction use to that for construction use.

3. ADMINISTRATIVE EXAMINATION AND APPROVAL PROCEDURE AND CHARACTERISTICS

3.1 Administrative Examination and Approval Procedure of Urban Land Management

As is mentioned before, the current urban land management procedure of administrative examination and approval in China is based on 2D cadastre management concepts and technology. As is shown in Figure 1, the administrative examination and approval procedure can be divided into planning and land management. The planning level, from a top-down view, mainly includes the urban master planning, land use master planning, regional planning, regulatory detailed planning (also known as statutory chart), and construction detailed planning (also called a detailed blueprint); while the land management level, from a top-down view, includes land expropriation, site selection/preliminary examination (the preliminary examination opinion on site issued), field survey delimitation (surveying and mapping property point line), land value evaluation, land assignment scheme, production of the parcel map and the land assignment contract (issued the land assignment contract), construction planning acceptance (issued acceptance measurement report), property registration (issued land real estate registration certificate), etc.

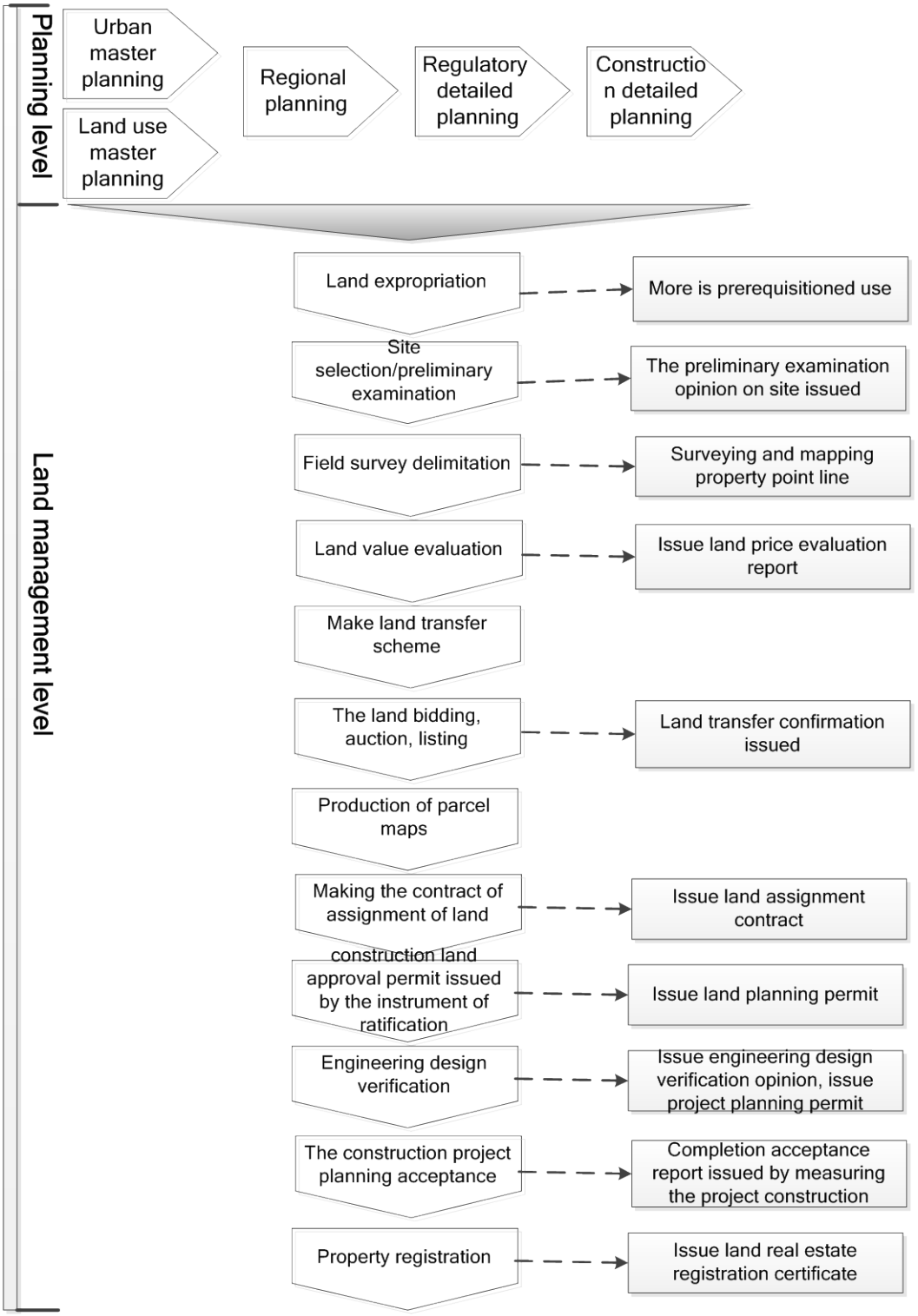

Figure 1. Flow chart of administrative examination and approval of urban land management

3.2 Features of Administrative Examination and Approval Procedure of Urban Land Management

Figure 1 demonstrates the current basic administrative examination and approval procedure of urban land management. According to the emphasis and sequence, this procedure can also be divided into five steps: planning, land, construction, checking, and registration. As shown in Figure 2, the features of each step are as follows:

Planning: The characteristic of this step is that, planning ranging from coarse levels to fine levels is all based on the urban plan, current land use maps, topographic maps and other basic data of the urban area. In this step, all the planning is done only with the planar graph, and the land uses and functions are simply divided in 2D space view.

Land: In the area within the scope of land owned by the State for construction use in the planning, for those areas planned to sell, 2D cadastral surveys and mapping technology are used in the site selection, preliminary examination, surveying and demarcating. The boundary point planar coordinates of the sold land and its boundaries and area size are determined, which could be used in the following construction.

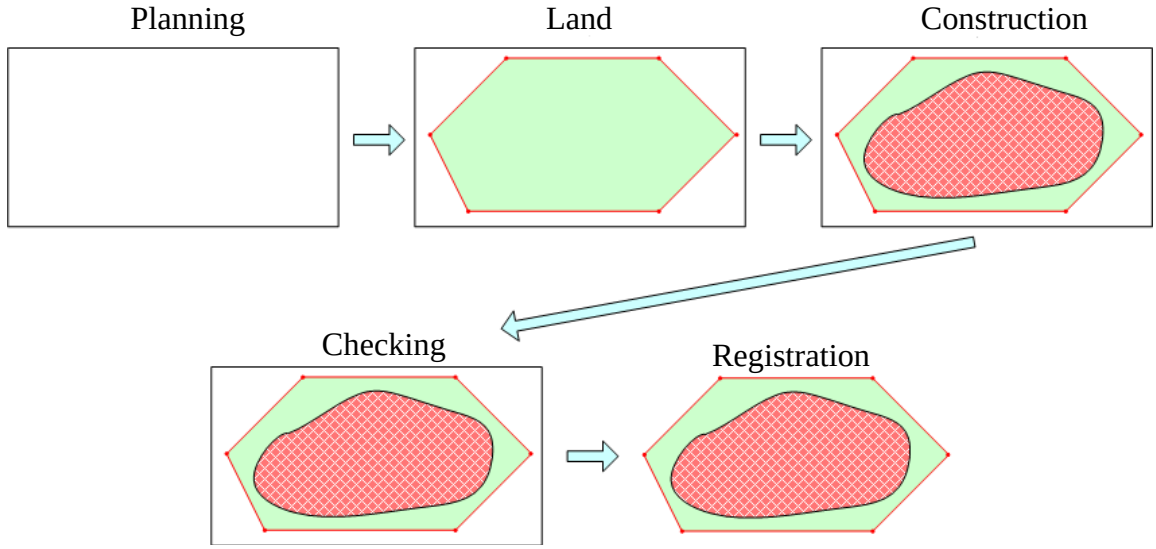

Figure 2. Five steps of the administrative examination and approval procedure of urban land management

In this step, since the land user does not submit the detailed size information about various buildings planned to construct to land management departments, the start-stop height of the land in the vertical direction could not be determined in the land lease management, which means the actual location and scope of the land in the 3D space could not be determined. In a word, in this step what the land management departments approve is the scope of the land defined by the 2D boundary points and lines.

Construction: Land users submit construction elements to land management departments. Then land management departments will examine and approve the design points of these construction elements. Due to the construction elements describe the height of buildings and other relevant information, the concept of elevation finally appears in the administrative examination and approval procedure. In other words, only where height information appears

land management can be 3D. At the same time, one matter we need to explain is that according to the relevant specification in the aspects of land and planning, considering the rights and interests of the adjacent land block, the boundary of the buildings on the land for construction use has to recede from the "red line", meaning that the construction is limited within an area whose boundary is a certain distance away from the boundary of the land parcel (Figure 3).

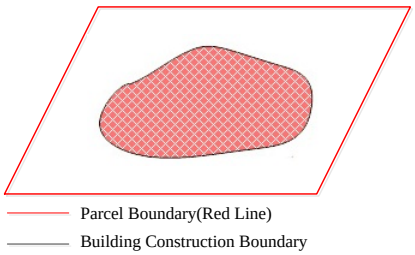

Figure 3. Parcel Boundary and Building Construction Boundary

Checking: Land management departments will survey the building after its construction is completed. In this step, land management departments need to survey the planar coordinates and height of both the whole building and each independent unit (such as a building and every house), in order to check whether or not the building is constructed according to the submitted construction elements and to ensure that the building planar range is within the land boundary determined by its boundary points and lines. In the check process, land management departments survey both the planar range and the height of the land and its above buildings, which has the characteristic of 3D space management.

Registration: Due to the limitation of current concept and technology of 2D cadastre management, when registering the completed construction of the state-owned land for construction use, land management departments only register the planar position and coordinates of land and its above buildings, without the elevation information of the buildings. According to this, land management departments make the land registration book and issue the land registration certificate. In land registration certificates, state-owned land for construction use and its buildings, such as a whole building, is in one to one relationship, while the building to each independent unit, i.e. the whole building to each property, is in one to many relationships. All the relations among land, buildings, and rooms need to be described in the form of planar charts and text description in this registration process.

4. CHALLENGES TOWARDS 3D UTILIZATION OF CURRENT CADASTRAL MANAGEMENT

For 2D land use, in a given planar range, vertical direction of land use right must be consistent, this will certainly constrain full use of the 3D space resources. For example, the space under a piece of urban green space could only be used by the owner of the use right - not by a third party. However, with the propulsion of urbanization, the land resource becomes less and less, and therefore development and utilization of 3D spatial resources has become an inevitable trend and first choice. In 2007, China promulgated and implemented the "Property Law", which stipulated explicitly that the right to use construction land may be created separately on the surface of above or under the land. This law provides legal support for 3D utilization of land. With the enforcement of the law, more and more cases of 3D land use will increasingly

emerge, such as overcrossings, underground passages, underground shopping malls, underground garages, etc. A special case is the metro depot for assigning the right to use the air space. The space from the ground to the16m height level is sold to construct the metro depot, while the space above the 16m height level is sold for private property to construct the affordable housing for low-income families.

As is shown in the example (Figure 4), there are two parcels beside the municipal road, parcel A and B. Owing to the two-dimensional urban land management mode and technical conditions, parcel A and B may not infringe upon the rights of the municipal road, which is an urban public facility. Therefore the two parcels in the plane space beside the municipal road are unable to connect with each other. With the development of the city and the land use mode, parcel A and B will be linked by channels above or under the ground. The space under the municipal road can be developed as underground parking garage or underground commercial street (Figure 5). Cases based on the 3D space of the urban land use challenge not only the cadastral management based on 2D thinking mode, but also the current urban land management administrative procedures. In addition to the breakthrough in 3D cadastre technology, the reconstruction of the administrative procedure is also urgently needed.

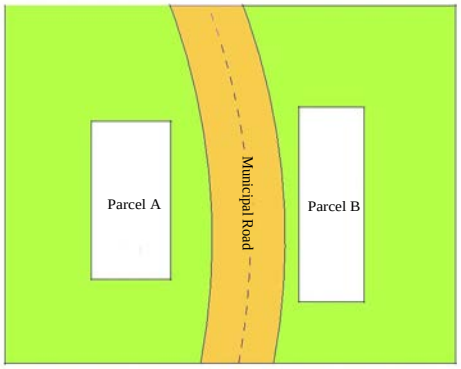

Figure 4. Urban land management from 2D spatial perspective

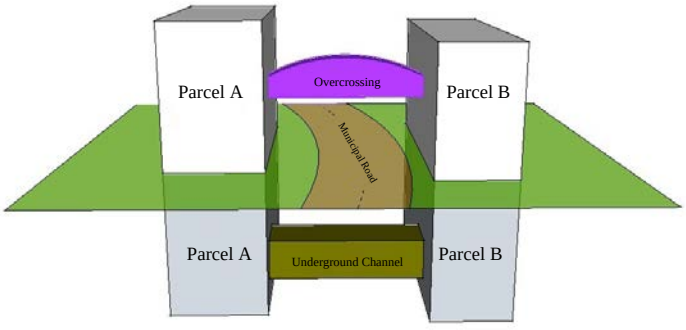

Figure 5. Urban land management from 3D spatial perspective

According to the current administrative procedure, the urban planning only regulates land orientation of 2D partition, and urban facilities layout. In the sections of construction site selecting or the land transferring, the ground level is not determined and the scope of 3D land use cannot be confirmed. As a result, the using right of space cannot be confirmed and causes the subsequent administrative licensing cannot be provided, which will lead to implicit potential ownership disputes and administrative risks in the future. Additionally, 3D land use

will inevitably involve public facilities arrangement in the vertical direction. For land use rights differ in vertical direction, coordination has to be considered in the design and construction phase of construction engineering.

5. 3D CADASTRE ORIENTED ADMINISTRATIVE PROCEDURE OF LAND MANAGEMENT

The aim to reconstruct the administrative procedure is to solve the problems that are encountered in 3D land use. Briefly speaking, it is to avoid potential conflicts, and ensure the realization of 3D land use right. To be specific, we should have the ability to measure accurately the spatial range (surfaces, lines and points) of the land rights at appropriate time.

According to current regulation, site selection will not be taken until the planning is determined. It needs to expand current planning regulation, deepen the content of planning, explore vertical planning necessarily and even dive into the level of urban design to carry out regional comprehensive 3D planning. When constructing different building floors, for a hierarchically remunerative grant of land use right, the architectures should be designed before the land transferring. It means that, the architecture design scheme should be attached with the land leasing. And the coordination of construction and checking should also be increased to ensure the setting of land rights.

Figure 6 shows the reconstruction of land administrative procedures. It is obvious that the new program features are the way of the land transferring and its use under certain conditions.

6. CONCLUSION

This paper discusses the challenges towards 3D land management and presents effective solutions. The implementation of these solutions may involve significant adjustment of the administrative procedure and high cost, but it is imperative. Since the new procedure has not been adopted and implemented yet, an expedient solution is surveying the range of land ownership after the architectural design scheme is determined. This of course may increase the uncertainty of the problem and calls for the cooperation of land users.

In addition, 3D cadastre may lead to more problems involving administrative procedures such as technical specifications and operation procedures of measuring boundary points and surfaces, as well as the content and procedure of checking completed 3D constructions. Since these are more microscopic, they are not taken into discussion in this paper but they are worth studying as well.

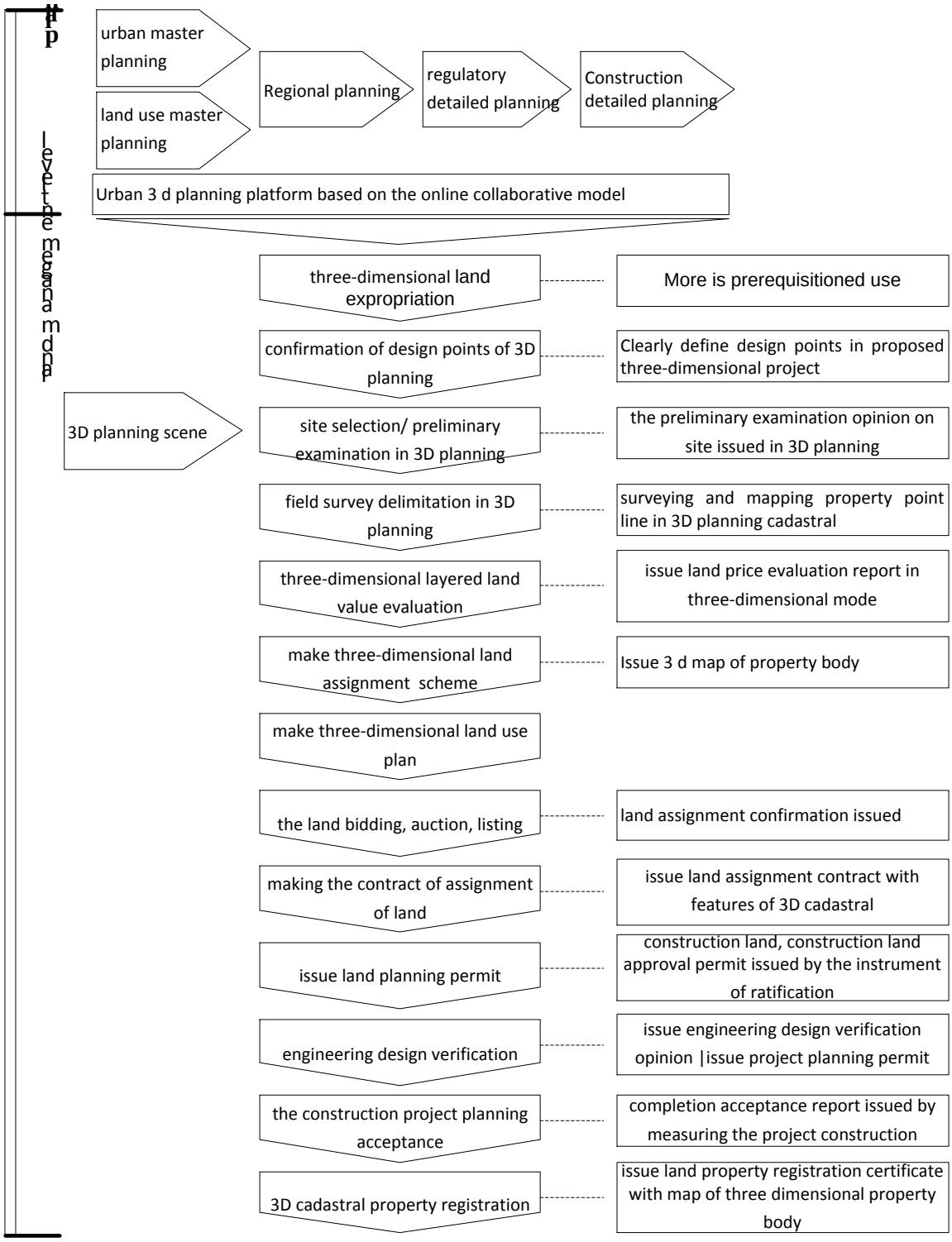

Figure 6. Reconstructed steps of urban land administrative examination and approval

BIOGRAPHICAL NOTES

Renzhong Guo is a famous professor and the deputy director of the Urban Planning, Land and Resources Commission of Shenzhen Municipality. He received his Ph.D in cartography and geography major from Franche-Comté University, France, in 1990 and has worked on cartography and GIS for many years. His current interests include 3D cadastre, GIS, and cartography.

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