

Research on the application of GIS technology in the spatial status grooming of village areas

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Abstract. The preparation of five levels and three categories of territorial spatial planning includes many aspects, and this article mainly deals with one of the levels and categories: detailed territorial spatial planning of village areas; it focuses on the preliminary work of planning preparation: the current situation combing of village territorial spatial areas. The article firstly outlines the basic application of GIS technology in the current situation combing; then introduces the relevant contents of the Third National Land Survey. Finally, with actual cases, we focus on the significant role played by GIS technology in the integration of land use data in the base period of village territorial space, the location of permanent basic farmland indicators, the location of ecological protection red line, and the statistics of conflicting patches of ecological environmental protection and basic farmland protection.

1 Introduction

The practice of five levels and three categories of territorial spatial planning is now in full swing in China, which contains a lot of work, so I will not repeat it here. Geddes, a Western humanist planning master, creatively proposed the general method of regional planning: "investigation-analysis-planning", which was later regarded as the general procedure of planning; The author believes that this point coincides with the words of a great Chinese man, Mao Zedong: "Without investigation, there is no right to speak". The author is convinced that without investigation, one cannot even speak, let alone carry out subsequent planning work. Any level of planning work can not engage in one-size-fits-all, not just to meet the laws and regulations and technical specifications can be; also cannot be because of time constraints, heavy tasks will only focus on the final planning results, while ignoring the decision to plan the results can be achieved "tailored", "into the countryside with the customs The key part of "tailor-made" and "customizable" planning results: the overall grasp of the current situation of the project and resource conditions. This paper mainly focuses on the use of GIS technology in the completion of the current situation of land use in the village, the location of permanent basic farmland indicators, the ecological protection red line, the statistics of conflicting patches, etc. In this paper, we would like to make some limited discussion on the use of GIS technology in the village area.

2 GIS and current status combing work

2.1 The concept of GIS

GIS is an evolving concept, and the father of GIS, Roger Tomlinson (1966), first proposed GIS as a digital system for analysing and manipulating geographic data in a comprehensive manner. At present, experts and scholars worldwide prefer the definition of GIS by the Federal Institute for the Coordination of Digital Maps (FICCDC): "a system consisting of computer hardware, software, and different methods designed to support the acquisition, management, processing, analysis, modelling, and display of spatial data in order to solve complex planning and management problems. " .

2.2 Specific uses of GIS in status quo research and analysis

(1) Status quo research stage: GIS can be used to manage the status quo data (e.g., land use status quo data, road data, municipal facilities data, etc.). Use handheld GIS equipment to assist in site investigation. Handheld devices integrating GPS, RS and GIS can tell the planner the location and surrounding geographic environment, as well as relevant geographic data, so that the planner can grasp the site situation faster and more accurately.

(2) Current situation analysis stage: GIS overlay analysis function can be used to evaluate the suitability of the site; make various types of current situation drawings; use the spatial statistics function to explore the spatial distribution pattern of geographic things; analyse the spatial structure; simulate three-dimensional terrain and

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landscape, virtual city scenes; analyse the landscape view domain to produce urban evolution animation, etc.

3 The Third National Land Survey

Land resources are the important material basis for national economic construction and the fundamental of land spatial planning. The basic survey and special survey of national land resources is the basis for the evaluation of the bearing capacity of resources and environment and is of great significance to the good spatial planning of the national land. The main task of the survey of national land resources is to find out the distribution and scope of various land use patterns projected on the surface as well as the basic situation of development, utilization and protection, and to grasp the most basic national background situation of national land resources and common features.

3.1 Overview of the "Three Surveys"

As a major national survey, the Third National Land Survey (NLS-3) aims to comprehensively refine and improve the national basic land use data based on the results of the Second National Land Survey (NLS-2). The purpose is to comprehensively refine and improve the basic data of national land use based on the results of the Second National Land Survey (referred to as "Second Survey"). The "Three Surveys" is an extremely important basic national survey of China's development into a new era, which is related to the overall situation of ecological civilization construction; it is related to a series of the most basic natural resource conditions, national conditions and national strength after the first century goal is achieved and towards the second century goal of modernization; it is also the most complex and important survey of the entire natural resource system. It is also the most complex and important basic work of the whole natural resource system^[1].

3.2 "Three tuning" important features

(1) The results of the "three surveys" are more realistic and reliable. Since the launch of the "three surveys" in 2017, the initial survey results were formed at the end of 2019, and the "three surveys" results were finally formed with December 31, 2019 as the unified point of time through the unified point of time update work. The whole survey process makes full use of satellite remote sensing technology and "Internet evidence" technology, adopts the integration of internal and external database construction technology, takes counties (districts) as the survey unit, and the results pass county-level self-inspection, provincial pre-inspection, national verification and multiple rounds of inspection, so the results are true, accurate and reliable.

(2) The survey results cover the whole area: the classification of land use status quo is a classification of land use types from the perspective of resource development and utilization, which is a classification with relatively wide coverage and the largest number of

resource types. The "three surveys" work classification is in line with the current land use classification system.

The working classification is based on GB /T 21010-2017 "Land Use Status Classification", and some of the land types have been refined and consolidated, with 12 primary and 73 secondary classifications. The primary classification includes wetland, arable land, plantation land, forest land, grassland, commercial and service land, industrial and mining land, residential land, public administration and public service land, special land, transportation land, water and water conservancy facilities land, and other land. The survey results formed based on this cover the whole area and all elements.

(3) More detailed survey content: the Second National Land Survey (abbreviated as "Second Survey") and the change surveys in the past years did not carry out the detailed work of land use within the urban and village areas, in order to improve the level of natural resource management and achieve accurate management, the Third National Land Survey (abbreviated as In order to improve natural resources management and achieve accurate management, the Third National Land Survey (the "Survey") explicitly proposes to conduct "survey on the current status of land use in urban and village areas", and to find out the land use status of commercial services, industry, storage and other land types in urban and village areas. In addition, the "three surveys" labelled some land attributes, such as cultivated land with planting attributes and plantation attributes^[2].

(4) The importance of agriculture and ecosystems: the "three surveys" pay more attention to the ecosystem, adding a class of wetlands; and improve the accuracy of agricultural applications of the survey. The "three surveys" are oriented to the fine management of natural resources and the evaluation of land conservation and intensification, and expand the content of special surveys, including the detailed survey of arable land, the survey and evaluation of the quality level of arable land and the evaluation survey of the grading of arable land, so as to provide support for the "trinity" of arable land quantity, quality and ecology It provides support for the "three-in-one" protection and management of arable land in terms of quantity, quality and ecology. This is especially important for the in-depth development of village territorial spatial planning to lay an important foundation for the current situation.

GIS system has natural advantages in data collection, processing, analysis and visualization expression, which becomes an important tool for the current state of the land resources investigation. In the initial stage of the current situation investigation of national land resources, the powerful data organization and management capability of GIS system can be used to establish the spatial database of national land resources and provide data basis for national land spatial planning.

4 Sorting out the current situation of land and space utilization in the village area

The main vector data covered by the territorial spatial planning include the current status data of land use and planning data. The specific data are as follows: (1) the data of the Third National Land Survey; (2) ecological red line; (3) permanent basic farmland; (4) arable land use, etc.; (5) forestry small class surface; (6) land use control; (7) land change database; (8) land supply data; (9) land use planning data; (10) urban general planning data; (11) urban control planning data; (12) urban elastic development zone; (13) mineral resources distribution data; (14) other special planning data, etc. This paper mainly deals with the use and analysis of the first three status quo databases [3].

The work of sorting out the current situation of land and space utilization at the village level includes the following contents: integration of land and space data of the base period of village land and space, location of permanent basic farmland indicators, location of ecological protection red line, statistics of conflicting patches of ecological protection and basic farmland protection, etc. And the completion of these elements needs to take advantage of GIS technology to achieve. The author will take Feng Sheng Village in Xiao chang County, Hubei Province and Pan Long Village in Shen nong jia Forestry District, Hubei Province as examples, to start specific discussions respectively.

4.1 Village land use in the base period

In order to sort out the land use categories and scale of the village area, it is necessary to retrieve and integrate the "three surveys" data on the GIS platform: since the land use classification used in the "three surveys" data is the status quo land use classification system (12 primary classifications, 73 secondary classifications), and the land use classification of land spatial planning (24 primary classes, 106 secondary classes, 39 tertiary classes), it is impossible to correspond to all the data. (12 primary, 73 secondary), while the spatial planning of land use classification (24 primary, 106 secondary, 39 tertiary), it is impossible to achieve one-to-one correspondence of all data; therefore, after importing the "three investigations" data on the GIS platform, it is necessary to first apply the base conversion rules: (1) direct conversion (one-to-one or multi-to-one type); (2) refinement of the survey data; and (3) the integration of the "three investigations" data on the GIS platform.); (2) refinement survey (one-to-many) (3) no correspondence (need to refine the survey), the land information can be directly converted directly, and then combined with the site field survey process, the other two cases of land information for conversion, and finally on the basis of the "three investigations" data to form the village area land Based on the data of "three surveys", the base period land data required for spatial planning can be formed, and then the statistical table and the land status map can be completed by using GIS

platform to classify the current land status of village land space [4].

Table1. Statistics of land use classification in Fong sheng Village in the base period of the national land space

Land type			Base year	
			Area (ha)	%
Total land area			405	100
Agricultural and forestry land	Arable land	Water Field	101	25
		Dry land	94.5	23.3
		Subtotal	195	48.3
	Garden	Orchard	38	9.27
		Other gardens	9.3	2.3
	Wood land	Tree woodland	12.7	3.12
		Other forest land	24.5	6.04
		Rural Roads	17.27	4.26
	Other agricultural land	Pond water surface	46.2	11.4
		Ditch	11.31	2.79
		Agricultural land for facilities	3.9	0.98
	Subtotal			359
Construction Land	Rural Residential Land	Rural residential land	30.5	7.53
	Public Facility Land	Land for Office, Business Service, Science, Education, Culture and Health	4.64	0.65
	Industrial Land Special Sites	Industrial land	2.81	0.7
		Highways	4.55	1.13
Subtotal			40.6	10.0
Nature Conservation and Preservation	Terrestrial waters	River waters	6.14	1.51
	Subtotal			6.14

4.2 Permanent basic farmland

After completing the integration of the village land space base period land data of Feng Sheng village, then retrieve the village permanent basic farmland index data from the upper planning database, we can know that the total amount of basic farmland control in Feng Sheng village is 192.29 hectares; then import the GIS drawings of permanent basic farmland in Feng Sheng village into the village land space base period land map for overlay, if the land space base period land and permanent basic farmland land overlap If the location of the base period land and permanent basic farmland overlap is not arable land type, it is the land conflict patch, and these patches are also the place where the permanent basic farmland is occupied, and finally the conflict patches can be classified and

counted by GIS platform to get the classification statistics of occupied permanent basic farmland in Feng Sheng Village. As shown in Table 2, it can be clearly seen that about 20.33 hectares of permanent basic farmland in Feng sheng Village, which was designated in the above plan, were occupied (10.57% of the total), and the most occupied were garden land and forest land (about 90%), i.e. non-construction land; according to the basic principle of "the total amount of basic farmland remains unchanged", in the later planning In accordance with the basic principle of "the total amount of basic farmland remains unchanged", direct reclamation to basic farmland can be considered at the later planning stage^[5]. Others are rural homesteads and other construction sites that occupy basic farmland. For these land indicators, in the later planning stage, we can consider moving them out of the basic farmland indicators and select other sites to be allocated to basic farmland, to finally achieve the "balance" of basic farmland.

Table2. Classification statistics of basic farmland occupation in Feng sheng Village

Land type	Area of occupied basic farmland (m ²)	Percent (%)
Fruit Garden	21037	184732 m ² (91%)
Tea Plantation	1016	
Other gardens	31554	
Other forest land	104822	
Tree woodland	15684	
Other Grassland	611	
Farming ponds	537	
Agricultural land for facilities	2803	
Special Sites	6578	
Rural residential land	8820	18546 m ² (9%)
Highway land	9229	
Urban and village road land	587	
Total	203278	100%

4.3 Ecological Protection Red Line

After completing the integration of the village territorial space base period site data of Pan Long Village, and then retrieving the village ecological protection red line data from the upper planning database, we can learn that the total area of Pan Long Village ecological protection zone is 12022.65 hectares. The GIS drawing of the ecological protection red line of Pan Long Village can then be imported into the village area of the spatial base period site map overlay, if the location of the spatial base period site and the ecological protection red line overlap is the type of dry land, rural residential land and mining land, that is, land conflict patches, these patches are also the ecological environment protection zone is occupied, and finally the conflict patches can be classified through the GIS platform statistics Finally, we can get the classification statistics of the occupied ecological

protection red line in Pan Long Village through GIS platform. As shown in Table 3, it can be clearly seen that about 90616 square meters in the ecological protection zone of Pan Long Village designated in the above plan are occupied (0.75% of the total); according to the basic principle of "the ecological protection red line will only increase but not decrease", all these sites should be withdrawn in the later planning stage.

Table3. Classification statistics of ecological protection red line occupation in Pan Long Village

Land type	Area occupied by ecological protection red line (m ²)
Dry land	70327
Rural residential land	10509
Mining land	9780
Total	90616

5 Conclusion

Village territorial spatial planning involves rural revitalization and the personal interests of the majority of farmers, so to do a good job of planning, it is the biggest prerequisite to get a clear picture of the family background; the current village planning work is different from the past, with more emphasis on "multi-planning", which involves the entire village territorial space and needs to grasp its current situation.

In order to do a good job of sorting out the current state of the village land space, it is necessary to fully combine GIS technology to read the data of the three surveys, the index requirements of the basic farmland and the index requirements of the ecological protection red line; and then obtain the location and area of the basic farmland and the ecological protection red line occupied in the base year through the technology of GIS platform overlay processing data, and finally obtain the most accurate and detailed working base map, so as to better lay an important basic role for the next step of the village land space planning work.

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