THE DISCUSSION ABOUT THE DEVELOPMENT AND APPLICATION OF PPGIS IN CHINA

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ABSTRACT

1. The significance of the development and application of PPGIS in China

   1) It is helpful to carry out the people oriented thinking of manage state affairs, mobilize the consciousness of democracy of the public, and promote the development of democracy.

   2) It is helpful to explore the new mechanism of social function, and promote the standardization of the management behavior, the socialization of the management manner, and the modernization of the management measure.

   3) It is helpful to integrate varies of subjects, and promote the development of GIS.

2. The theory and key technology of PPGIS

   1) The construction of theory frame of PPGIS.

   2) The study of the technique and method of PPGIS.

   3) The study of the organization and application method of PPGIS.

3. The application foundation of PPGIS in China

   1) The project of digital city gets its first effect. The government and experts pay great attention to the construction of digital city.

   2) The infrastructure construction of digital city gets its first scale: 3S technology is widely used; the communication optical cable covers great and has a wide range.

   3) Websites construction develops greatly, and there is a large number of government websites.

   4) The application system of digital city information develops rapidly. Many cities construct some professional databases and application and development systems in succession; and they can accumulate experience and data for the development of digital city.

4. The application study of PPGIS in China

   1) Improve the government’s recognition, strengthen the theory and technical research.

   2) At the phase of the administration decision-making confirm develop aim, increase the prophase public participation and solicit public order widely.

   3) At the phase of choosing best decision-making scheme, cooperating with public attention system, adopting anaphase public participation.

   4) Some regions and fields, which have good condition, can attempt combine with field experts’ study to develop the deep application of PPGIS.

With the development of the information industry at full speed and the promotion of the information-based process of national economy of our country, foundation geographical information has become the spatial support information of macroscopical decision and management, micro production and construction and daily life need. But it is quite a long distance walk to make geographical information in deed enter huge numbers of families in our country. Public Participatory Geographic Information System (short for PPGIS) that has just appeared in the world at present is an important way and a starting point of entering common people's family of geographic information science.

1. The Definition of the Public Participatory Geographic Information System (PPGIS )

At present, there is not an accepted definition of Public Participatory Geographic Information (PPGIS) which is more
scientific and more unified. Some experts think that PPGIS is the integration on a certain concrete geographical space of social behavior and technology. These social behaviors include participating in behavior, common people's organization, executive decision, Internet, etc. The content of technology includes computer, hardware, software, digitized information, network, etc. (Niles and Hanson 2001).

In 2002, at the first international conference of Public Participatory Geographic Information which was held in Rutgers, the experts gave the definition of Public Participatory Geographic Information Science (PPGIScience) is:

(1) It is a kind of study on geographical information or the technology of geographical information system; (2) It can be used by individual as well as by common public of grass root; (3) It is a public course(data obtaining, drawing maps, analyzing and making policy) which participate in and influence their life (David Tulloch).

Providing fourteen guidelines of PPGIS according to Doug Aberley and Renee Sieber, we can sum up the meanings of the Public Participatory Geographical Information System tentatively:

The Public Participatory Geographic Information System is the research between social science and natural science stepping interrelated social theory and method which is produced by planning, anthropology, geography, social work and other social science. It is the combination of social behavior and GIS technology on a certain geographical space. The public has the right and opportunity of obtaining and exchanging the data or information and participating in or share the GIS then participating in decision. It reflected the partnership among individual, society, non-government organization, academic organization, religious organization, government and private organization; its purpose is to promote the democratic of the society, the ecological sustainable development and the quality of living.

The characteristics of the Public Participatory Geographic Information System (PPGIS) are as follows:

First, people oriented, and regard people as the centre. PPGIS is the integration of social behavior and related technology in a certain specific geographical area, the distinctness from the traditional GIS is the public participation. In PPGIS, the technology is not the core but the tool used by people, and the public participation is the center of PPGIS and the core is the people. None link of the good PPGIS can do with out the public. It is not merely the things of policymakers and experts but all need public participation from the system design to making policy finally and even system maintaining.

Second, it is based on the web. Traditional GIS relies on GUI to make the users and system carry on mutually, and PPGIS supports a series of mutual methods from face-to-face touching to based on function of the network and depend on the network even more. It realizes the obtaining, sharing and mutual dealing of the geographical data of information system through the network. It can make the participant on the net (include the wireless network) alternately deal with geographical information data and map and can do various kinds of GIS functions such as space searching and space analyzing through the network browser and other network function, and can express their suggestions freely. So, the network becomes a platform of PPGIS.

Third, it is based on the map. PPGIS lets more and more public participate in the analysis and settlement of the problems correlated with geographical space position. And the map is the most ocular and appropriate expression of geographical information, and is the final vision result of geographical information. Map can transmit more and more abundant knowledge and information that people easier to understand faster and more directly. To most of the public, they are not interested in the figure and form. But people will feel friendly and familiar when a map as one decision
behavior of spot showing in front of them. In terms of operating technology, visual maps make the public do scaling, clicking in order to obtain the wanted message conveniently at screen too. In addition, visualization technology is the main characteristic of PPGIS.

2. The Current Situation of the Development of the Public Participatory Geographic Information System (PPGIS) in Domestic and International

2.1 The status of the research of the Public Participatory Geographic Information System (PPGIS) in domestic and international

The concept of Public Participatory was put forward earlier. Willeke was made out-of-bounds the concept of Public Participatory in 1974. Sewell and Coppock (1977) had put forward the definition of Public. But the combination of Public Participatory and the geographical information system is the thing in recent years. The first regular PPGIS academy meeting was held in North America in 1993. The issue of GIS and democracy was put forward in 1996. The processes of policy establish about questions of the space analyzing was put forward in 1999, the meeting taking geographical information and society as theme was held at the same time[1].

Nowadays, the Public Participatory Geographic Information System annual meeting is held every year. The first annual meeting of the Public Participatory Geographic Information System was hosted by URISA (the Urban and Regional Information System Association) in Rutgers University in New Brunswick of U.S.A.’s New Jersey in July twenty to twenty-two of 2002. The second circle annual meeting is held in Oregon Polish national university of Poland. The third circle annual meeting was held in Madison Wisconsin-Madison University in Wisconsin in July of 2004. We can say that there are some results of which make people gratifying every year, and there are some breakthroughs about the research to some extent not only in theory but also in practical system. However, there are still a lot of problems in PPGIS studies need to be solved: the problem of discipline orientation, the problem of setting up and consummating the frame of the theory, the problem of setting up the relevant techno-system and so on.

In our country, PPGIS has not been thought much yet at present. With the foundation of market economic system, it is a common understanding to improve the management degree of public participation. But come to look at present, the policymaker has not yet realized that to adopt many kinds of technological means to promote the public participation. In addition, domain expert has not realized the prospect of the application of GIS technology in the public participation yet. Although some scholar (Taiwan) puts forward the GIS application and meaning in the social aspect of humanity, and some scholar puts forward the issue in planning field and the public participation, there is not theoretical study to put forward to. So, on the whole, PPGIS theoretical research of our country is at the embryonic stage.

2.2 The current situation of the application of the Public Participatory GIS technology in the world

In the world, the characteristics of the application of PPGIS are as follows:

First, the social foundation is good and the government pays much attention to it. Various fields of the society pay much attention to Public Participation course; and there are a lot of relevant request of laws and regulations. People think that the Public Participation can save time and expenses, can predict the questions and receive the public responses, can establish friendly connections with the public in order to deal with the crisis better, can make the decision more constructive and easier to accept, can strengthen the duty sense and the consciousness of being the democratic member of the community, can lay good foundation for the decision project implementation environment (such as master plan)
in future, and can promote the sustainable development. So, they think that the Public Participation is a carrier with strategic significance; it is a course advancing constantly; it is the indispensable component of the decision (program or plan) and is a precondition of the democracy\(^1\).

For example, Slaithwaite is one of the cities which are the first to use the PPGIS which based on auxiliary environmental decision of local government with the network to plan in the world. The users can choose some characteristics at local map through the webpage which are built by the government and can refer the things they care about through the command form to the government\(^8\).

Second, the technological means is more various, and the effect of participation is obvious. For example, the work group led by Professor Kodmany in Chicago Illinois University carried on the planning of the Pilsen community of Chicago in 1998\(\)Kodmany, 2000\). The work group selected GIS and painter's sketch as the tools of visualization to assist the community members participating in planning. Any participant can watch the pictures that is interested in GIS database through the operation of the work group, can put forward one's own questions and ideas, also can put forward one's own solutions and make the drawer draw the sketch in order to observe the results\(^2\).

Third, the passion of the university and scientific research institution is higher, and the puts is more. Except the Illinois University above-mentioned, a lot of research institutions devoted to the research and development of PPGIS practical project. The department of geography in British Liz University carried on a project (Caver et al, 1999) named as "true planning" (Planning For Real) to study the online public participation. Its purpose is to impel the public participate in the environment rebuild planning of Slaithwaite community of ZkmZ through WebGIS\(^2\). In addition, Leeds University also developed the project of the public participatory GIS of criminal activity in Leeds area, and the local can feed back the criminal information of this area on the net. They use a painting brush tool (Spray Can Tool) which offered by system to spray colors to the unsafe areas they thought in the map at screen and to deliver their own views.

However, on the whole, because of the limitations of the theory and technological condition, the degree of public participation in PPGIS project is not so deep. It has not really reflected the essence of public participation yet. If we divide the degrees of public participation of PPGIS into five degrees, PPGIS project at present is in the third at most. There are some mutual functions, obtaining some information from participant; the information outputted is worth utilizing collectively partly\(^7\).

2.3 The current situation of the application of the Public Participatory Geographic Information System in our country

Compared with it, the technological method of public participation of our country still remains in primary stage. The questions of the idea and system are ultimate reasons. Certainly, the backward technological method of public participation is a great obstacle too. At present, several questions exist in the public participation of our country.

First, the recognition is not enough, and the cognition is incompletely. For a long time, the public gets used to regarding all questions as the government's responsibility. And the government and the policymakers didn't really put the owner of the city --the public--in the first place. On concept, project and decision unit consider the public as the opposite generally, and consider the negative factors more but the positive factors insufficiently\(^2\).

Second, the level is lower, and the technological means is single. The most purpose of using various technological methods of public participation is to offer a democratic decision-making environment to the public abroad; and the
public has the rights of assistant decision in the participatory course. In our country, for many years it been designed
and developed by the staff member of GIS all the time, the government makes policy, and the public only "studies" the
scheme after the policy made. Such "passive" "receiving" and "approving" is called "symbolic participation" by Sherry
Arnstein. At present, there are only two kinds of technological means of public participation in our country: the poll and
the achievement show. The policy makers often regard the poll as the supplementary means only, and also the
investigation result has one-sidedness and is very difficult to be paid attention to. Decision achievement show is only
limited to the final exhibition of achievement, and the public just passively understand and accept the decision results.
For example, Shenzhen Realty Information Web offered a simple common webpage of planning achievement based on
WebGIS technology. It only offers the simple functions, such as simple scaling, roaming of the planning drawing, etc. [2]

Third, it is strongly professional and difficult to understand for the public. For a long time, a lot of GIS workers think
that GIS is a technological trade with very strong professional lines, and can't be decided by the citizens as the layman.
So, GIS work of our country is far away from ordinary masses. At present, the only several public participatory
technologies have obvious specialized marking too. For example, the questions in questionnaire and the drawings and
characters in the show of achievement and so on are more professional and it makes the citizens difficult to understand.
It also has reflected that the policymaker has not grasped the technology and tools of communicating with the public
effectively [2].

3. Several Problems Needed to be Solved in Public Participatory Geographic Information System

Public Participatory Geographic Information System (PPGIS) is a new developing discipline, and a lot of theories and
practices of it all remain to be probed into and excavated.

3.1 The construction of the theory frame of the Public Participatory Geographic Information System

At present, PPGIS is still at the stage of theory discussion, and there isn’t any recognized systemic discussion about the
extension and intension of PPGIS. The problems such as the position of PPGIS in GIS theory and technical
development, the scientific definition of PPGIS, the discipline orients and characteristics of PPGIS, public range,
meaning and essence of the public participation and range and mode of the public participation and so on are not yet
very good settlement. The author thinks that the PPGIS should structure the theory frame as follows( Figure 1).

3.2 The study of technological method of Public Participatory Geographic Information (PPGIS)

The foundation of PPGIS should mainly solve several problems as follows: the data share based on the mutual
operating, Web GIS, the network supports, public education and interface design( Figure 2).

It is Web GIS technology that plays a supporting role in PPGIS [8]. GIS can expand through WWW function, and
distribute GIS service to different node. Users can carry on various kinds of GIS functions and operate and publish the
personal view through WebGIS website from any node of WWW, and guarantee the decision-making process that is
friendlier, more mutual, more transparent, and democratized further finally (Cavel et al, 1999).

Because the public participatory is to face the ordinary public, compared with generally professional GIS technology,
the Public Participatory GIS should adopt some new technological methods. For example, chaining sound, photo,
remote sensing image, video cartoon, etc. on GIS not only make the information that the public can receive rich and
varied, but also impel the public more interested and better to perceive the space that they belong to. The integration of GIS and multimedia has sizable potentiality to expand the knowledge foundation of public participation (Shiffer, 1998). In addition, gathering and dealing with a large amount of numerous and complicated information from different space-time also must use data warehouse, knowledge find technology and data mining technology. Besides, PPGIS system should realize the integration in three-dimensional GIS, virtual reality technology even wireless GIS technology, etc.

3.3 The study of organization and implement method of Public Participatory Geographical Information System

Public Participatory Geographical Information System is systems engineering. Different organization and different people play different roles in this system. Public Participatory Geographical Information System work includes two heavy aspects by the look of macroscopic: the technological organization work and non-technological organization
work. For domain expert, the technological organization work is relatively familiar. We have a set of implementing methods of organization to the application in each field of GIS through GIS theoretical research and project for many years. We call this link as technological organization work for the moment. We call that non-technological organization work in addition. In fact the two have the one that cross, even more especially for Geographical Information System participated in the whole journey. The main target of the non-technological organization work is the public, the main content of working works for social work, management work. So, the study on this question certainly will involve relevant theories of management science, organization science, social science even psychology science.

![Figure 2: the technical support of PPGIS](image-url)

**The technique of GIS**

**The technique of multimedia**

**The technique of network**

**The technique of web GIS**

**The technique of three-dimension**

**The technique of virtual reality**

**The technique of data mining**

### 4. The Discussion of the Development and Application of PPGIS in China

#### 4.1 The significance of PPGIS in our country

#### 4.1.1 It is helpful to carry out the people oriented thinking of managing state affairs, mobilize the consciousness of democracy of the public, and promote the development of democracy.

Humanization and individualized characteristic of modern technology make mankind rule the social behavior of modern human with the ethics idea which aims to "respect personal humane experience ". The culture or social phenomenon "consulted" in public participation of a kind of the whole society is rising. Compared with the GIS application which taking expert's leading factor as the centre, PPGIS is that people oriented, and regard people as the centre. The key question that PPGIS studied is the role in democratic management of GIS (Obermeyer, 1999), especially the role in the policy formulation process on relevant space analyzing (NCGIA, 1996). PPGIS based on Internet, can produce an open transparent environment for people to study, understand and devote to managing decision-making process. It helps the public to participate in decision and offers the public an effective method of participating in the great social decision behavior. And then strengthen high sense of responsibility as masters and democratic consciousness which are regarded as community members. Its result is to excite the masses of citizen stratum participate in government and political
affairs hospitably and to cause democratization of decision-making process.

4.1.2 It is helpful to explore the new mechanism of social function, and promote the standardization of the management behavior, the socialization of the management manner, and the modernization of the management measure.

PPGIS is helpful to seek the social development model of according with the sustainable development principle. It is the work for goal for the community development to explore social operating mechanism and management mechanism corresponding with sustainable development principle and to improve utilization ratio of resource.

Social operating mechanism and management mechanism are the important reasons causing no sustainable development. Administrative management work is the important embodiment of social operating mechanism. It should strengthen the openness and public participation according to the principles of making government affairs public, democratic decision-making and supervising effectively. At present, it has already carried out these principles to the management work in some places, such as hearing of witnesses, common show and so on to improve decision transparency. But these measures can't reflect public subject function yet. The application of PPGIS helps to set up new social operating mechanism, to fully reflect the management behavior standardization, management mode socialization and management means modernization \[^2\].

4.1.3 It is helpful to integrate varies of subjects, and promote the development of GIS.

PPGIS is the integration of the social behavior and GIS technology. It involves various kinds of knowledge, tools, methods, even different discipline aspects such as natural science, human social science, engineering science etc. It contains not only traditional GIS theory and technology, computer network and communication technology but also the public participation, social support, civil rights and social civilization and so on in the area relating to sociology and management \[^3\]. So, the Public Participation Geographical Information System (PPGIS) reflects multi-discipline integration. Similarly, PPGIS has widened the field of Geographical Information Science. In order to let more ordinary masses participate in GIS, We should improve on technology adapted to the public participation. It will be favorable to the development of geographical information technology and industry, and thus it will widen the application field of Geographical Information Science and excavate its potentiality.

4.2 The expectation of the application of PPGIS in China

The application foundation of PPGIS in China is better: 1. The project of digital city gets its first effect. The government and experts pay great attention to the construction of digital city. 2. The infrastructure construction of digital city gets its first scale: 3S technology is widely used; the communication optical cable covers great and has a wide range. 3. Websites construction develops greatly, and there is a large number of government websites. 4. The application system of digital city information develops rapidly. Many cities construct some professional databases and application and development systems in succession; and they can accumulate experience and data for the development of digital city.

However, the potential of GIS construction has not really exerted yet. Especially in the aspect of pushing democratic management, it has not yet developed its function. Therefore, we will advance the public participation in the management decision work of our country on existing foundation. Specifically, it may start as following aspects:
4.2.1 Improve the government’s recognition; strengthen the theory and technical research.

The key whether PPGIS can get develop and application in our country is system and concept. It decides that whether government and domain experts may adopt more effect methods and means to accelerate citizens to participate in and assist decision-making. All levels of our country attach importance to the construction of GIS. The Construction Department brought forward the project of “City Digitizing Engineering” in 1999. However, Government pays attention and put in is technical layer surface, not democratic management and social behavior layer surface, do not know the meaning of PPGIS from social operation mechanism and management mechanism altitude.

4.2.2 Adding prophase public participation and widely getting public wills in the stage of ascertaining developing target of administration decision-making

In our country, the application of public participation is mainly in the term of collecting thoughts in prophase of decision-making now. The participatory forms which include questionnaire, colloquia, etc belong to this term. But the level of these methods is low, and their effect is not obvious. The importing of PPGIS technology can widely improve the frontal status. Because GIS supply such a tool which makes citizen know the actuality of their city, namely give public interest and chance to touch the complex and great spatial information of city, and deeply understand very side of cities' status through visually analyzing the information. The public can bring forward their valuable opinions based on these. This opinion is very significant for decision-making of democracy.

Under this pattern, technique units need building proper city GIS database system and widely communicating with public to get valuable public will. Decision-making units (government) should assist technique units to collect base data, organize public to participate in campaigns, and make the last decision based on the public will. The public is not able to learn the special knowledge of GIS, they just need to bring forward their opinions and advices based on knowing the content and technology which GIS express, and participate in the last decision-making. Adopting this model is the better choice of applying PPGIS now in our country, it accord with our country's actuality. The technique of WebGIS supplies visual language of spatial information and alternating analysis to the public, it can widely improve the interesting and degree which public participate in [2].

4.2.3 In the stage of choosing better decision-making project, cooperating with system of public show, adopting anaphase public participating.

Public show is one important part of our country's public participation, and it is established as a system in some domains (such as ShenZhen's layout job) of some cities. But the main thing shown to the public is the final production and the level of this participating is very low. But in the stage of choosing better project, we must more adopt system of public show, make the public assist to choose decision-making project. As a visual tool, GIS is able to strengthen common public's understanding of technique job, for example, a layout map is very special and 'mystic' to many public, but GIS software can use intuitionist and three-dimensional mode to add the degree of public's understanding. In addition, common techniques cannot compare with the strong analysis tools which GIS supplies.

At present, many management departments such as urban planning in our country have set up City Management Information System based on GIS. Its database is mainly depended on the fruits of numeralization. It has made a good foundation for us to do the work of PPGIS. Concretely, when the system is designed, the principle for design should be changed from facing the supervisor to the public. During the stage of project optimization, the public participation should be strengthened to create a democratic Policy-making circumstance. Currently, the ShenZhen Real Estate
Information network has provided a simple public webpage based on WebGIS technology for planning production which just offer simple function about programming drawing making and rambling and so on, but it really represents a developing aspect ---public display depended on WebGIS.

4.2.4 Some regions and domains which have good conditions can carry on the deep application experiment of PPGIS with the investigation of domain experts.

Today, the public participatory technique that based on WebGIS is a new research task in the world. We can first try to do some simple application, for example, the regions and departments can use foreign advanced experience for reference, develop the tentative job of deep application of PPGIS, in which government understands in exact place, public base is better, the construction of information is well, modernization of manage means is good, democracy management development is well, socialization of manage means is good. For example, we can adopt this means in some cities' residential area programming job. The dwellers in the residential areas sometimes take active part in the construction of residential areas. Their master consciousness is very strong. The democracy management consciousness of residential areas' managers is also very strong and the residential areas' network construction and base geography information construction is usually good. On this condition, if GIS experts develop a better PPGIS, we can carry on public participatory job. The dwellers can not only participate in some decision-making's prophase job and anaphase performing in public, but also participate in the data collection and database construction from the first time of GIS database construction. They can supply much fuller and accurate region information and they can use the debate area or dummy council chamber developed by PPGIS to appear their opinion at any time in the process of decision-making. And they can advance settlement project at the base of dwellers' process of spatial analysis and using the means of web voting to carry on the last decision-making or chose the better project.

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