Public Participation Geographic Information System and Indigenous Society: New Partnership of Indigenous Peoples in Taiwan

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Taiwan President Chen signed the New Partnership Agreement with aborigines in his 2000 election campaign. The Council of Indigenous Peoples launched a project in 2001 to map the traditional territories of each tribal community. More than 400 aboriginal communities have completed their mapping work. This endeavor will serve as the basis for the implementation of future aboriginal autonomy. The public participation geographic information system (PPGIS) was employed to serve as a platform for participatory discussion. This paper describes the design considerations of the PPGIS, the procedure of PPGIS, and a number of issues regarding indigenous mapping and PPGIS. The paper concludes with the multi-dimensionalities of indigenous mapping.

Key words: *Taiwan, PPGIS, GIS, indigenous people, aborigines, indigenous mapping.*

In 2000, Taiwan's President Chen signed the New Partnership Agreement with aborigines in his election campaign. President Chen said his government will respect and understand the perspectives of the indigenous peoples and recognize their indigenous rights; he also promised to cultivate an equal-treatment relationship. Given the promise from the President, the Council of Indigenous Peoples (CIP) launched a project to map the traditional territories in order to assist policy making such as territory recovery and autonomy. A research team from the Department of Geography, National Taiwan University and other universities was appointed by the CIP to conduct the mapping work. This paper describes the methods that the research team employed and explores the principles considered in implementing the methods. Issues observed from public participation GIS (PPGIS) practice on

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participation, empowerment and indigenous mapping are also discussed.

INDIGENOUS MAPPING

Indigenous mapping has been widely used to reclaim indigenous territory and to rebuild indigenous traditional knowledge (Poole, 1995). The most urgent problem to reclaim territory is to get indigenous peoples and others to respect their land rights and to demonstrate indigenous ability to monitor and protect their land (Laituri, 2002). Jarvis and Stearman (1995) argued that to work with indigenous people is not only to operationalize the demarcation and mapping of their territory, but to help rebuild their fading sense of identity and internal strength. Kemp and Brooke (1995) also stressed that it is not just a question of recovery and recording indigenous knowledge, but also one of respect and revitalization. Laituri (2002) considered indigenous traditional knowledge as extensive and informed in terms of the ecological system, wildlife, fisheries, forests and integrated living systems. Consequently, indigenous mapping can be conceptualized as societal, political, historical, cultural, and ecological practices. The emphases are on the process and results as well. The Eagle Project in Canada is a successful case study on how to integrate traditional knowledge into conventional scientific methodology (Bird, 1995). Its ultimate goal is to assist communities to take control of their own data management by demonstrating and teaching them how to use technology while maintaining traditional knowledge.

In terms of the multidimensional perspectives of indigenous mapping, a more cautious approach is necessary. As Harrison and Haklay (2002) pointed out, lack of awareness or trust, and suspicion about the efficacy of participation will influence public attitudes towards active evolvement. We set up principles, which are explored below, for our indigenous mapping work based on previous research and literature.

Encourage participation

Public participation is the most critical issue in indigenous mapping, and has advantages over interviewing of elders and extraction of secondary data from documents and maps and such. As pointed out by Harris and Weiner (2002), local knowledge is invariably qualitative and spatially imprecise and the decision of territory and traditional knowledge is conflict-ridden and embedded in local politics. Greater participation allows democratic spatial decision-making. Laituri (2002) suggested collecting indigenous information through participatory mapping, interview and field visits. She also stressed that to blend indigenous and western-based knowledge systems is to encourage participatory development and communication through 'knowledge-sharing'. Rybaczuk (2001) suggested that increasing community interaction would extend community awareness and improve community education. Indigenous communities in Taiwan have long been governed by non-

aborigine government and struggled with western capitalism. They are losing their identity and internal strength. Improving community identity becomes one of the major concerns in greater participation. There are different types of participation. Konisky and Beirle (2001) emphasized the importance of public participation and distinguished the nature of public involvement and public participation. They observe that public involvement is often reactive in nature, occurring after a decision has been made and often engaging a small number of participants with insufficient liberation. Weidermann and Femers (1993) explored the degree of public involvement from the least degree of participation, public right to know, to the highest, public decision making. They called it the "public participation ladder". Clearly, to create a supportive climate for public participation is the most critical consideration in designing a participatory-based indigenous mapping.

Appreciate local knowledge

Geertman (2002) assumed that a greater degree of access to relevant information will lead to the consideration of a greater number of alternative scenarios and will result in a better informed public debate. Harrison and Haklay (2002) in their UK PPGIS study found that different user groups have different needs and social attitudes. They impinged on public attitudes to the use of PPGIS in quite subtle ways. Martin and Lemon (2001) argued that there is a great need to improve understanding of local context in order not to disvalue the traditional and vernacular forms of power. Rundstrom (1995) found that the Western or European-derived system for gathering and using geographic information is incompatible with the corresponding system developed by indigenous peoples of the Americas. It will subsume or destroy indigenous cultures.

Taiwan Island is believed to be the origin of the Austronesians (Shutler and Marck, 1975; Bellwood, 1991; Diamond, 2000). There are twelve different indigenous tribes in Taiwan officially at present. Traditional knowledge of each tribe is unique and ambiguous. Researchers must appreciate the local context, respect traditions, and know the history of each indigenous community in order to provide relevant information for discussion and to verify the results.

Empowerment/marginalization consideration

An indigenous mapping project is political because it will empower historically marginalized individuals, communities and peoples. However, empowerment and marginalization represent two sides of a blade. As mentioned by Laituri (2002), efforts to understand and utilize indigenous knowledge remain problematic due to controversy over who should collect such knowledge. Greater participation would moderate the controversy. Elwood (2002) reviewed different definitions of empowerment. He concluded with three groups of empowerment: distributive change, procedural change, and capacity building. Sieber (2002) pointed out that GIS technology can exert disparate effects in different places and across multiple scales. She used a framework called "scaling up" to understand the dimensions of organiza-

tional capacity. Indigenous peoples in Taiwan were disfranchised politically and socially in Japanese colonization (1895-1945). Economic disfranchisement happened after Japanese colonization because of the emergence of Western capitalism. The indigenous peoples thus have long been marginalized economically, politically, and socially. Empowerment consideration becomes one of the important concerns for indigenous mapping.

Acknowledge the nature of indigenous traditional knowledge

The discovery of traditional knowledge is based on the epistemology of indigenous spatial knowledge. Many researchers have found this knowledge is qualitative, spatially imprecise, vital, dynamic, evolving and unstructured in nature (Harris and Weiner, 2002; Weiner and Harris, 2003; Laituri, 2002; Kemp and Brooke, 1995). Laituri (2002) argued that to examine traditional knowledge through Euro-American methodology may abstract such knowledge. To effectively collect and store cognitive, oral, visual, graphical, aural, and narrative forms of knowledge, the process needs to be carefully designed so that the merits of indigenous traditional knowledge are not distorted.

Multi-dimensionalities of indigenous traditional knowledge

Indigenous mapping must not just support "salvage" operations of what now is often referred to as "a rapidly disappearing knowledge base" (Kemp and Brooke, 1995). It should be considered carefully from historical, cultural, social, political, technical, and ecological perspectives (Weiner and Harris, 2003; Weiner et al., 2002; Barndt, 1998; Elwood, 2002; Sieber, 2003; Laituri, 2002).

Sustainability

The ultimate goal of indigenous mapping is to assist the aborigines to construct their own knowledge and to utilize it in daily life. However, existing case studies have demonstrated that communities remain dependent on technical support of experts (Weiner and Harris, 2003). Laituri (2002) even pointed out that many outside researchers come to the reservation and take their knowledge, giving nothing in return. Rybaczuk (2001) pointed out that extending access to both GIS-generated results and the technology can make GIS more community friendly and thus encourage further participation. Weidermann and Femers (1993) believe that transferring of technical competence to the public is one of the empowerment considerations. Sieber (2000) emphasized that the ownership of GIS is essential to successful adoption which rests upon the user's ability to conform to GIS methods. The ultimate aspiration of sustainability is twofold: technology transfer and results feedback. Approaches and technologies should be designed to match the capacity for a community's long-term operation without counting on so-called outsiders. The discovered traditional knowledge should be a feedback to the community for use in improving the community's sustenance, such as co-management of natural resources with government agencies and the promotion of community ecotourism.

Relevant tool employment

The final principle considered is the employment of the relevant method. This method should be able to provide public participation, to represent and store traditional knowledge with multi-dimensionalities, and be easy to diffuse for sustainable operation. Harrison and Hakley (2002) stressed that a relevant system should be interactive and permit users to manipulate data in ways they feel are meaningful and permit community-generated information to be added. Barndt (1998) regarded use of GIS tools as important to successful public participation. PPGIS is a newly developed technology under the concept of 'geographies and the information society' research issues raised by the NCGIA (National Center for Geographic Information and Analysis) in its Varenius Project (Goodchild, et al., 1997). PPGIS combines GIS techniques with participation of all subjects in a study to make GIS a platform for collection, exhibition, exchange of information and scenario analysis. The platform thus enables participants to learn, debate and compromise (Geertman, 2002) so as to reach communication, cooperation, coordination and collaboration. PPGIS is regarded as an efficient tool for public participation, with successful applications including land reform (Harris and Weiner, 2002), community forestry (Kyem, 2002; Jordan, 2002), planning (Geertman, 2002; Talen, 2000; Rydin and Pennington, 2000), city management (Han and Peng, 2003; Gaye and Diallo, 1997), environmental management (Rybaczuk, 2001; Konisky and Beirle, 2001; Weidermann and Femers, 1993; Craig and Dunn, 2003; Sieber, 2002), and resource management (Martin and Lemon, 2001, Bedford et al., 2002).

Sieber (2003) argues that PPGIS has great potential for empowerment because it can build organizational capacity to match the scale of the organization and the scale of the problem and it can assist groups to enhance or diversify their activities because of GIS's designed flexibility. It is evident that PPGIS is able to provide a participation platform, to foster a community's empowerment and to represent and store indigenous traditional knowledge that is qualitative in nature.

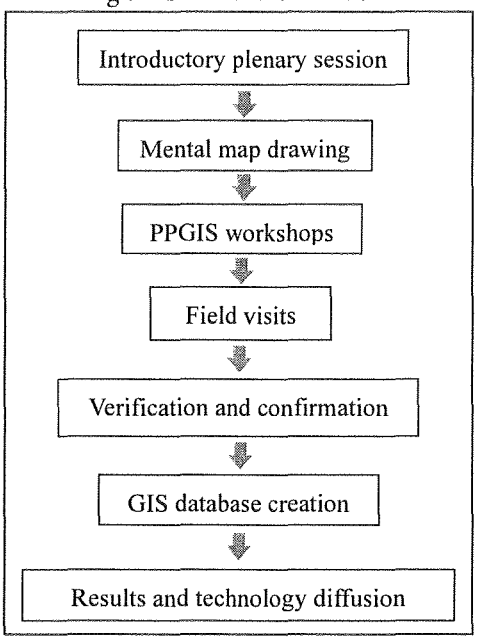
METHODOLOGY

Figure 1 shows the procedure we followed for the indigenous mapping project. The procedure begins with an introductory plenary session. The research team introduces the concept of participatory indigenous mapping and the PPGIS settings that are going to be used for the following workshops. The purpose of the introductory session is to present the merit of the indigenous mapping project on indigenous peoples and to earn the trust of the indigenous communities.

Mental map drawing (Figure 2) is a necessary step before the PPGIS workshop. The mental map serves as a complementary interpretation of spatial mental structure. It can induce traditional knowledge from memory. The elements drawn on the map can be used to identify information needed in the PPGIS setting. It will come

closer to the way that indigenous people conceive their territories. Jordan (2002) maintains that PPGIS should be viewed primarily as a consultative, participatory methodology rather than a predominantly technological aid. Information provided by PPGIS should not be predominately determined by GIS experts. Mental map drawing can overcome this deficiency and meet the principle of the appreciation of local knowledge. Mental map drawing can also encourage participation. The aborigines have a diverse range of computer literacy; free-hand mental map drawing is therefore a friendly starting point for the following PPGIS work.

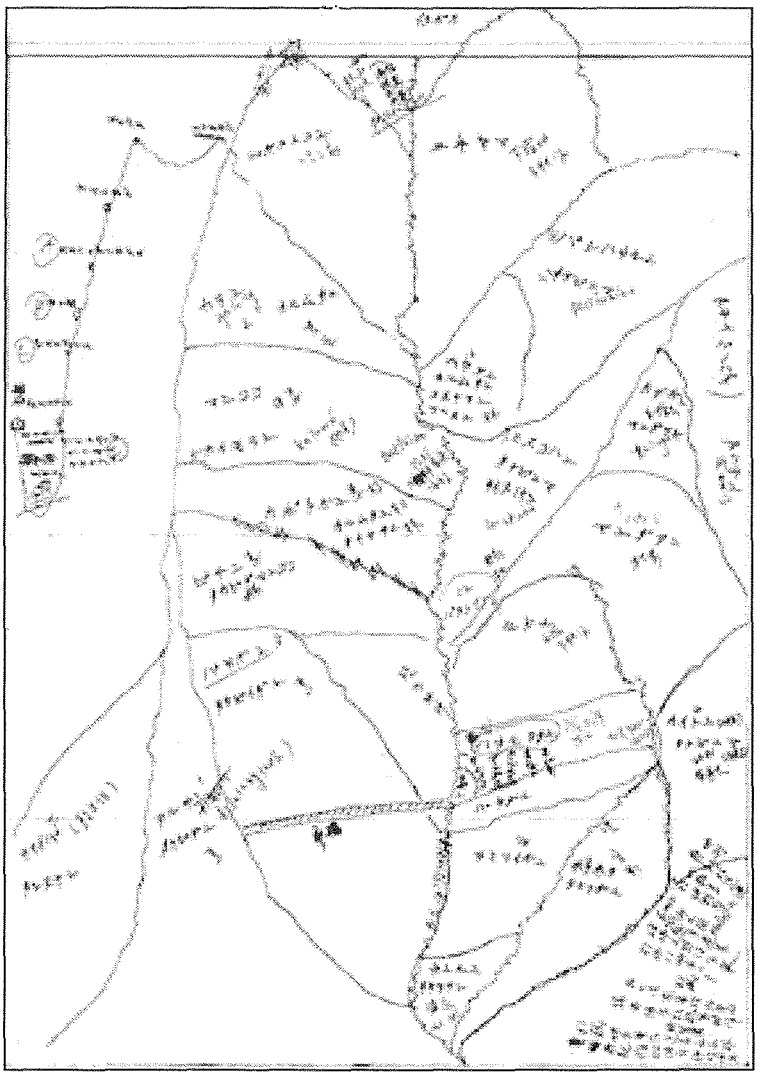
Figure 1: PPGIS Procedure.



The next steps are a series of PPGIS workshops, which provide platforms for public discussion and debate. PPGIS has been widely used in many applications such as land appraisal, community forestry, urban planning and so on. However, PPGIS in the field of indigenous mapping is still in its infancy. We carefully designed a PPGIS and modified it iteratively in order to fulfill the requirement of the setup principles. We compiled original data and turned them into relevant and comprehensive information. For instance, we used a digital elevation model (DEM) draped with high resolution satellite imagery or aerial photos to provide a virtual environment (VE). This is especially relevant for the mountainous terrain in which the aborigines live. Plain maps such as topological maps or printed maps are also included for those who do not have much direct field experience. The interrelationship between VE and maps was provided by the GIS functionality. In addition to VE and maps, the system can display video, audio, image and sketch information. These data were or-

ganized in terms of the places they addressed in order to broaden the access of digital information that we provided and to encourage greater participation. Also to solicit greater participation, one or two large video boards were connected to the computers. Information requested by participants was instantly organized and displayed. Two or three of our team members served as facilitators to assist interpretation of the displayed information. Participants addressed their issues freely. After the participants reached a consensus, the system recorded the results interactively.

Figure 2: An example of mental map by a Maryuan elder.



Field visits in the territory were conducted on a needs basis after each workshop discussion. Global positioning system (GPS) technology was employed to assist field verification. Field interviews provided an opportunity to restore traditional knowledge and to encourage participation.

All collected information was compiled and organized by the research team after the workshop. They were shown in the next workshop to be verified and confirmed by the participants, who might or might not have attended the previous workshop. This is a critical step stressed by Jordan (2002) in his Nepal case study. According to him, PPGIS should start with the public participation procedure and intrinsically involve feedback to and from participants. It is almost impossible for community members to attend all workshops. They attend workshops irregularly. Presenting the up-to-date results provided a learning opportunity, thus encouraging participation in the following workshops.

The collected traditional knowledge is organized into text report, atlas and GIS database. Text report and atlas are in static form. The GIS database is in a web-based system on CD disks. The web-base system has the benefits of presenting dynamic and qualitative-oriented traditional knowledge in multi-media, besides being an easy operation. All materials are distributed to the corresponding indigenous communities only, because of concerns over the copyright of traditional knowledge.

RESULTS AND DISCUSSION

The PPGIS is now functioning as a comprehensive method for indigenous mapping. About 464 indigenous communities have completed the mapping work in the last three years. These communities belong to twelve different tribes and are located in fifty five counties of Taiwan. About 3700 native place names have been collected with folk stories, myths and oral tales attached to them. Some communities have well-defined territory boundaries or boundaries of hunting/cultivating territories. The initial objectives of this indigenous mapping project have been met. Indigenous people have acknowledged the merit of public participation and the value of traditional knowledge. By employing GIS technology, traditional knowledge can be geo-referenced and organized more precisely. With this aspect, traditional knowledge has great potential to be integrated with scientific knowledge, although the integration process remains controversial. As Poole (1995) pointed out, GIS can be used imaginatively to conserve traditional knowledge and to engage all generations in that process.

This project has helped building up the aborigines' ability and self-confidence. Following the established traditional knowledge, residents of the community have well understood the resources available in their territory, making them confident in negotiating public affairs, such as the case of a newly proposed Maqaw National Park which may become the seventh national park in Taiwan. The proposed bound-

ary of the park falls in the Atayal's territory. The indigenous communities showed dramatically different attitudes compared with the establishment of the previous six national parks. They are no longer quiet and passive. Instead, they claimed their land rights and asked for co-management of timberland and fauna and flora. The effect of empowerment has emerged.

Cultural, social, historical and spatial differences exist among communities and even tribes. Information and GIS functions required by different communities are different. Case studies of Smangus, Maryuan and Kuskus communities show dramatic differences on perceiving VE. We suspect that this is highly related to their historical background. The Maryuan were removed by force from their original territory to the current location as part of Japanese colonization efforts. Most villagers have little experience in their original territory. The Kuskus community has a long history of living and working with non-aborigines. Villagers are more educated in general. They appear to be more comfortable with plain maps than VE in PPGIS practice. We suspect that the traditional knowledge of Kuskus villagers comes from secondary data sources such as historical documents or maps more than direct experience. The Smangus is a typical indigenous community. Villagers still preserve indigenous ways of living. They are most familiar with their territory. VE becomes the most useful tool for invoking their traditional knowledge.

Local indigenous communities interpret the indigenous mapping project differently. Some communities focus on historical and cultural perspectives. They emphasize the restoration of their culture and history. Another community considers the indigenous mapping project as a means of territory recovery. They tend to exaggerate the size of their territories. As a result, different communities show different degrees of enthusiasm for the project. The research team, therefore, has to strive harder to encourage participation from those communities that are less enthusiastic.

A number of issues have been raised from the PPGIS practice which still remain problematic. First, because the aborigines came to Taiwan over 5000 years ago, it is difficult to define a temporal scale for the mapping work. Indigenous elders passed away rapidly in recent years. The oldest person is even younger than 60 in some communities. It is difficult to recall any events that happened long ago. We set the Japanese colonization as the temporal bound of the mapping work. However, it more or less ignores the historical and cultural aspects of indigenous mapping.

Second, there are twelve different tribes in Taiwan with different social structures. For instance, the Bunun is a clan-based tribe. The hierarchical social structure ranges from tribe, sub-tribes to clans. It may be necessary to set up a social scale for traditional knowledge collection. Inadequate scale will reduce the completeness of the traditional knowledge.

Third, indigenous boundaries are dynamic and vague at times. They are often a result of compromise between communities. Will the introduction of the new technology with high precision incite another conflict among communities or even tribes? There is no answer to the question at this point.

CONCLUSION

PPGIS has proved to be an adequate method for indigenous mapping. With a carefully designed system, PPGIS can provide relevant information to induce relevant traditional knowledge. It is also capable of storing qualitative-oriented traditional knowledge with multi-media technology. Greater participation can be achieved through providing relevant information and feedback to and from participants. The effect of indigenous empowerment has been seen from the case of Maqaw National Park. The diversity of indigenous tribes and even communities is evident. The difference of VE perception by three different communities and the different interpretation of this mapping project are examples. Those issues can be attributed to social, cultural, historical and political perspectives. Indigenous mapping is therefore a multi-dimensional task. In addition to identifying territorial boundaries and traditional knowledge, it must also consider the historical, cultural, societal and political variables.

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