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Participatory Uses of Geospatial Technologies to Leverage Multiple Knowledge Systems within Development Contexts: A Case Study from the Peruvian Amazon

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Summary. — Participatory approaches have proven effective at producing more inclusive and democratic forms of development, in which marginalized groups are given increased recognition. However, these approaches can also reinforce social hierarchies and political exclusion if they are not developed and implemented carefully. In particular, participatory approaches can be problematic if they too simplistically conceptualize democratic engagement as the folding of individuals into pre-existing governance structures. Utilizing a combination of feminist and postcolonial theories, this paper argues that practitioners of participatory methods must extend their thinking to the ways in which their projects foster engagement across multiple social and epistemological perspectives.
Participatory geographic information systems (PGIS) methodologies are particularly effective at enabling these cross-perspectival engagements—geospatial technologies have unique capabilities for storing and visualizing knowledge from different types of knowledge systems. These different forms of knowledge can not only be visualized as multi-facetted and multi-scalar layers, but they can be directly placed in conversation with one another within the space of the map. In this way, they can be used to fundamentally transform historically unjust governance practices, rather than simply folding new subjects into unjust political structures. The authors examine these claims in the context of a case study with the Maijuna indigenous group of the northeastern Peruvian Amazon. The authors collaborated with the Maijuna to create and use a digital, spatial database to influence policy decisions about land tenure and environmental management. We show that geospatial technologies were uniquely capable of encouraging dialog and integration across indigenous, Western scientific, and state-based perspectives of the Amazon. These technologies are particularly effective at empowering traditionally marginalized perspectives within governance processes. This project therefore offers lessons about the benefits and dangers of geospatial technologies and methodologies for improving the democratic potential of development.

Key words — digital empowerment, geographic information systems, geospatial Web, indigenous resistance, participatory research

1. INTRODUCTION

On June 17, 2015, the government of Peru approved the establishment of the 391,039 hectare *Área de Conservación Regional Maijuna Kichwa* (ACR; Maijuna Kichwa Regional Conservation Area) located in the northeastern Peruvian Amazon (*Diario Oficial El Peruan*, 2015). This ACR was designed, in part, based on the scientific results of a biological inventory which revealed that the area was home to a highly diverse set of flora and fauna (Gilmore *et al*., 2010). The area contained a previously unclassified and unreported habitat—a complex of high terraces—with new, rare, and specialized species. The approval of the ACR was an important step forward in the protection of these unique and diverse ecosystems, particularly given increasing pressures from loggers and poachers (Gilmore & Young, 2012) as well as a proposed road through the area (Gilmore *et al*., 2010).

This administrative classification and demarcation of land by governments is a longstanding practice in the process of development. Nation-states have long used cartographic techniques to explore new areas of the world, to claim these areas for themselves, and to divide these areas into administrative zones so that they can be better managed (Pickles, 2003). The Amazon has been subject to many different mappings throughout its history. However, the process that went into the creation of this particular ACR does differ from these historical mappings in one fundamental aspect—it was initiated by and reflected the interests of indigenous communities in the Amazon. This project used a digital mapping tool, called a geographic information system (GIS), to place indigenous and scientific knowledge of the rainforest in dialog with one another and then to represent that dialog in a format recognized by the Peruvian government. This ability of an indigenous people to represent their histories within a format that is recognized as important by governmental actors stands in stark contrast to a colonial history of erasing indigenous peoples from official maps.

This project's success was realized through the combination of GIS with participatory methods designed to increase the participation of marginalized peoples in political life.

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Development practitioners and scholars have had a strong interest in participatory methodologies and governance models for several decades, emphasizing the importance of participation for achieving development that is consistent with the normative goals of democratic societies (Gaventa & Barrett, 2012). Participatory approaches have proven effective at producing more inclusive and cohesive political processes, in which marginalized groups are given increased recognition. However, these positive effects are not always realized. Participatory projects are difficult to implement and can result in further marginalization for some groups (Morales & Harris, 2014). For example, the type of democracy modeled through participatory methods can be marginalizing for some groups, since it folds them into structures of governance without ever adapting those structures to the unique cultural, political, or social perspectives of those groups. In such cases, participatory approaches result in assimilation, rather than empowerment. Therefore, if participatory projects are not designed carefully they end up reinforcing social hierarchies and political exclusion—the exact opposite results of their original intent (Gaventa & Barrett, 2012).

This paper argues that the inclusion of spatial methods and technologies within participatory projects can improve the likelihood that those projects will result in positive forms of political inclusion, rather than exclusion. However, it argues that these projects should not be understood as a means of increasing the number of people participating in governance processes, but rather as a method for increasing interactions between different social perspectives and epistemological viewpoints. GIS-based projects can be particularly effective at producing recognition and conversation between different knowledge systems due to their unique ability to visualize differing connections to place within a single space. To make this argument the paper draws on the case study introduced above, in which the Maijuna indigenous peoples of Peru carried out a participatory GIS (PGIS) project to encourage cultural and biological inventories of their land and, ultimately, to influence the creation and design of an ACR (Gilmore *et al.*, 2010). In addition to producing these political victories, the PGIS project also produced other important outcomes, including the development of positive emotions and political bonds, the performance of traditional ways of knowing the forest, and the intra- and inter-communal dissemination of knowledge (Young & Gilmore, 2013). These results can have lasting and positive impacts on the Maijuna's continued participation in governance and natural resource management processes (Morales & Harris, 2014). All of these outcomes were a result of the unique ability of GIS to support conversations between different knowledge systems. In this case GIS, as a digital and cartographic medium, encouraged a highly productive conversation between indigenous, Western scientific, and governmental views of the rainforest. This methodology therefore offers powerful possibilities for development projects, enabling them to inclusively bridge different knowledge systems in order to effectively manage cultural and biological resources.

This paper explores these capabilities of PGIS projects, to offer a case study for practitioners and communities wishing to initiate similar interepistemological, or cross-knowledge system, work. The second section of the paper offers a brief history of the applied uses of geospatial technologies, with a particular focus on ways in which indigenous communities have appropriated these technologies for the purposes of counter-mapping. This section illustrates how GIS, as a set of technologies and social practices, has a history that makes it uniquely capable of bridging different perspectives. However, it also argues that this unique capability of GIS is undertheorized by PGIS practitioners, who often prefer to exclusively frame GIS work within theories of democratic participation and access to institutional capacity. To overcome this limitation, the third section builds a theoretical framework for understanding GIS as a system capable of bridging different social and epistemological perspectives in order to build common notions of governance between different groups. We argue that this theoretical framework offers a more robust method for understanding the political effects of participatory projects within development contexts, as compared to more standard narratives of democratic participation. In particular, this perspective does a better job of analyzing the assimilatory dangers of participation in these projects within areas that have experienced colonial histories. The fourth section then describes our case study with the Maijuna. From here, the fifth section ties this case study back to the paper's theoretical framework. This section provides a discussion of how our digital mapping techniques provided an important space for discussions between knowledge systems about territorial and environmental classifications, and therefore produced common notions of the environment that could be used to tie Maijuna, scientists, and governmental actors together in mutually empowering relationships. We conclude the paper by extending this discussion of geospatial technologies into the broader realm of digital politics, and outline questions for future studies of the relationship between development and digital technologies.

2. HISTORICAL DEVELOPMENT OF GEOSPATIAL TECHNOLOGIES

While the history of cartography is quite old, the origins of digital mapping technologies can be most directly tied to the invention of the Canadian Geographic Information System (CGIS) in the 1960s (Coppock & Rhind, 1991). GIS technology was further advanced by a wide range of organizations through the 1980s, including the Harvard Laboratory for Computer Graphics, the US Bureau of the Census, the US Geological Survey, and the Environmental Systems Research Institute (ESRI), among others. GIS can be described as computerized systems designed to store, manage, analyze, and represent spatial data (Maantay & Ziegler, 2006). In order to accomplish these tasks this system integrates a number of different components, including spatial data, specialized hardware and software, standards and practices, and trained users. GIS are based on relational databases which connect attribute information (i.e., a description of an object in space) with locational information (i.e., geospatial coordinates).

GIS became increasingly popular in the 1980s and were particularly influential within the discipline of geography. Geospatial technologies and methods also spread to other disciplines and organizations, including international development, urban planning, ecology and environmental management, governmental organizations, and private corporations. As a result, the technology has been applied to complete a wide range of tasks, from corporate logistics and land use management to military planning and disease surveillance. Most recently the geospatial capabilities of GIS have also been integrated into many Web-based and mobile platforms, further expanding the technology's ubiquity (Elwood, 2010; Elwood, Goodchild, & Sui, 2013; Kitchin & Dodge, 2011; Leszczynski & Wilson, 2013; Sui, 2011; Turner, 2006). Like with the emergence of Web 2.0 technologies more generally, these technologies are enabling many social and political