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Key issues and priorities in participatory mapping: Toward integration or increased specialization?

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ABSTRACT

The theory and practice of participatory mapping (PM) has expanded significantly over the last two decades with proliferation of a wide range of methods and applications. The potential for synthesis and integration across four broad domains of PM (*indigenous/rural/community*, *urban/regional*, *environmental/natural resource*, and *mapping technology*) was examined at the Participatory Mapping/GIS 2017 conference held at California Polytechnic State University (San Luis Obispo, USA) Jul 31-Aug 3, 2017. At the conference, PM leaders in each of the four domains participated in working groups to: (1) identify the key issues, including "barriers" and "knowledge gaps" that limit effective PM outcomes, and (2) identify the most important research priorities. This paper summarizes the findings of the working groups for the purpose of identifying common and unique challenges across the four PM domains and to discuss the desirability of stronger integration of PM knowledge and practice. In the *indigenous/rural/community* domain, achieving clarity in PM purpose and building trust in the process were identified as the most critical issues; in the *environmental/natural resources* domain, wider use and adoption of PM to inform policy and management decisions through stakeholder engagement was considered most important; and in the *urban/regional* domain, developing urban indicators and adapting PM to complex and heterogeneous urban environments were identified as important needs. The key issue in the domain of *PM technology* was understanding how technology influences PM usability and user behavior for the development and implementation of appropriate PM technology. The most significant cross-cutting theme to emerge across all PM domains was the need to evaluate PM outcomes to provide evidence of success.

1. Introduction

Participatory mapping (PM) is a term that refers to multiple ways humans interact to create and communicate knowledge, experience, and aspirations about the world in maps. Participatory mapping has been defined as the creation of maps by local communities, often with the involvement of supporting organizations including governments, non-governmental organizations, universities, and other actors engaged in the development and land-related planning (Corbett, 2009). Participatory maps—whether crude or sophisticated—are created for a wide range of human/environment applications such as delineating territorial boundaries, identifying important places that sustain livelihoods and quality of life, and communicating preferences about future land use. Over the last two decades, the growth and interest in PM has evolved and progressed from diverse application domains (*indigenous/rural/community development*, *urban/regional planning*, and *environmental/natural resource management)* in recognition of the potential for PM to address complex social issues and problems. A consistent aspiration of PM has been to engage and empower marginalized groups in society through the use of spatial technologies. The proliferation of PM applications has co-evolved with (1) advances in geographic information systems (GIS) technology that provides for the capture, storage, analysis and management of spatial or geographic data, (2) increased demands from under-represented social groups that want greater influence in decisions that affect their lives and livelihoods, and (3) recognition that the use and integration of non-expert, place-based knowledge and experience can help address complex land use problems to become valued, legitimized, and sanctioned.

We use the term participatory mapping (PM) to cover a range of terminology and acronyms including public publication GIS (PPGIS), participatory GIS (PGIS), volunteered geographic information systems (VGI), and participatory three-dimensional modeling (P3DM). Each of these terms have different origins. The term "public participation geographic information systems" (PPGIS) was conceived in 1996 at meetings of the National Center for Geographic Information and Analysis (NCGIA) in the U.S. to describe how GIS technology could support

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public participation for a variety of applications (NCGIA, 1996a; 1996b; Obermeyer, 1998; Sieber, 2006). The term "participatory GIS" or "PGIS" emerged from participatory approaches in rural areas of the global south, the result of merging Participatory Learning and Action (PLA) methods with geographic information technologies (Rambaldi, Kyem Kwaku, Mbile, McCall, & Weiner, 2006; Rambaldi, Corbett et al., 2006). The term volunteered geographic information (VGI) was introduced by Goodchild (2007) to describe the development of tools to create, assemble, and disseminate geographic data provided voluntarily by individuals. Participatory three-dimensional (3D) modeling (P3DM) was conceived as a method to bring GIS to rural communities to bridge the gap between GIS technology and social capacities in marginalized, isolated communities dependent on natural resources (Rambaldi, 2010).

Brown and Kyttä (2014) reviewed PPGIS, PGIS, and VGI concepts and described them on the variables of purpose, sponsors, global and place context, importance of mapped data quality, sampling approach, data collection, data ownership, and dominant mapping technology. They concluded that there was not a bright line between the terms in practice and attributed continuing ambiguity to methodological pluralism in design and implementation concerning what is mapped, who does the mapping, the reason for mapping, the technology used to map, and the location where the mapping is done. Further, participatory mapping can vary dramatically depending on whether the public participation component (the "PP" in PPGIS) or the geographic information system (the "GIS" in PPGIS) component is emphasized in the process (see Schlossberg & Shuford, 2005). This natural tension between the relative importance of technology versus the participatory process is likely to continue as PM represents an uneasy merger of contrasting knowledge paradigms.

Since 1996, there have been multiple book and journal reviews of PM including those by Craig, Harris, and Weiner (2002), McCall (2003), Rambaldi et al. (2006; Rambaldi, Corbett et al., 2006), Sieber (2006), Dunn (2007), McCall and Dunn (2012), Brown and Kyttä (2014), Brown and Fagerholm (2015), McCall, Martinez, and Verplanke (2015), Mukherjee (2015), and Pánek, J. (2016), as well as numerous conferences, workshops, symposiums, and conference special sessions with a thematic focus on participatory mapping: U.S. National Center for Geographic Information and Analysis Varenius Workshop 1998; Workshop on Access and Participatory Approaches in Using Geographic information in Spoleto, Italy 2001; International PPGIS Conferences 2002–5; Indigenous Mapping: Mapping for Indigenous Advocacy and Empowerment Conference, Vancouver, BC, 2004; Mapping for Change, Nairobi, Kenya 2005 (Rambaldi et al., 2006a; Rambaldi, Corbett et al., 2006); Workshop on Volunteered Geographic Information, Santa Barbara, CA 2007; Symposium on The Future of PGIS: Learning from Practice?, Enschede, Netherlands, 2013 (Verplanke, McCall, Uberhuaga, Rambaldi, & Haklay, 2016); AAG Special Session: Looking Backward and Forward in Participatory GIS, Chicago, IL 2015; Modern Methods and Tools for Public Participation in Urban Planning, Poznan, Poland 2017.

In 2014, Brown and Kyttä (2014) presented the quantitative results of bibliographic searches that showed an exponential increase in the number of academic publications related to PM, an indicator of the academic and social relevancy of the topic. In the last 4 years, the number of publications related to PM has continued to increase exponentially (see Table 1) as indicated by updated bibliographic search results from the Web of Science, Scopus, and Google Scholar. The largest increase in search hits was associated with the search term "VGI" which increased by more than 500 publications.

The focus of this paper is the Participatory Mapping/GIS Conference 2017 held at California Polytechnic State University in San Louis Obispo, CA Jul 31 – Aug 3, 2017. (http://landscapemapvalues.org/ppgis2017/). The goals of the conference were to bring together an international community of academics, agency planners/managers, non-governmental organizations (NGOs), and PM practitioners to: (1) describe state of knowledge in PM methods, (2) share new mapping applications and technology, and (3) identify best practices, standards, and future research needs. About 60 participants from 10 countries presented PM applications in land/marine management, urban and regional planning, community development and indigenous rights, biodiversity conservation, and participatory mapping technology. From the rainforests of the Amazon and Congo basins, to the European cities of Helsinki and Poznan, to public lands in the U.S. and marine areas in Indonesia, conference attendees shared diverse PM knowledge, experiences, and applications, as well as participating in special workshops on PM software and community mapping methods.

2. Methods

On the final day of conference, participants were requested to attend one of four possible working group thematic sessions covering the following four PM domains: *indigenous/community/rural mapping*; *urban/regional mapping*; *environmental/natural resource mapping*, and *mapping tools and technologies*. Each working session had a facilitator whose role was to conduct a nominal group process (Delbecq, Van de Ven, & Gustafson, 1975) for each of the following two questions:

1) What are the key issues, including "barriers" and/or "knowledge gaps" that limit effective outcomes for participatory mapping in your PM domain?
2) What are the most important research priorities for participatory mapping in your domain?

The nominal group process consisted of four phases: (1) *silent generation of ideas* where the facilitator requested that group participants identify and write down at least two possible answers on note cards; (2) *round-robin listing of ideas* where the facilitator sequentially asked each participant to provide an answer that was recorded on large poster paper; (3) *clarification and discussion* where the facilitator helped generate a final list that the group accepted as an accurate representation of the process; (4) *ranking* where the facilitator asked the group to examine the final list and to individually rank the top choices to generate the perceived most important answers. The ranked responses of the four thematic sessions was the final outcome of the nominal group process. In the final plenary session of the conference, each thematic group reported and discussed their results with all conference participants to identify similarities and differences.

To validate our interpretation and summary of the four working group sessions, a draft of this paper was distributed to conference attendees for review, comment, and refinement. The summary contained in this paper does not reflect a consensus by each and every participant, but rather identifies the broad issues and priorities as reported by the four PM working groups.

3. Results

3.1. Indigenous/rural/community development

An aspiration for participatory mapping has been the empowerment of indigenous, rural, or otherwise disadvantaged communities to overcome historical legacies associated with colonialism, class exploitation, and/or the inequitable distribution of economic, social, and political power; frequently associated with (re-)claiming territory and natural resources. In this context, PM may be viewed as a type of "counter-mapping" (Peluso, 1995) to contest dominant governance structures while advancing progressive social goals. As identified in the "Mapping for Change International Conference" held in 2006, participatory mapping is believed to have the capacity to: (1) enhance capacity in generating, managing, and communicating spatial information; (2) stimulate innovation; and if effective, (3) encourage positive social change. But the use of PM and spatial technology as a counter-measure