

University Community Engagement with Participatory Mapping and Community Geography

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대학의 지역사회 협력을 위한 참여지도제작과 지역사회지리

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Abstract : Universities pursue education, research, and service as their three major missions. Service-learning is a way to deliver service which combines practical learning with community activities. Reciprocal relationships become important for equal and sustainable university community partnership. Social problems are often the subject with critical perspective in community engaged service-learning. Geography has a tradition addressing community issues with fieldwork and mapping. Community mapping becomes widely adopted with the aid of geographic information technology. University and community participate together in data collection and mapping for urban poverty and indigenous rights in developed and developing countries. Environmental justice is a growing concern in which local knowledge is emphasized and marginalized communities become visible in the decision-making process. For effective learning and community empowerment, data collection and mapping need to be separated for extensive use not overwhelmed by technical skills. Socially relevant issues are another to bring attention and participation from wider communities. Community geography in such direction can play a role to fulfill university social responsibility toward sustainable future.

Key Words : Service-learning, Community engagement, Participatory mapping, Community geography, Social responsibility

요약 : 대학은 교육, 연구, 실천을 3가지 사명으로 추구한다. 서비스-러닝은 교실 학습과 지역사회 활동을 결합하여 참여를 실행하는 한 방법이다. 지역사회 협력의 서비스-러닝은 종종 사회 문제를 다루며 비판적 접근을 더하고, 지역사회와의 호혜적 관계는 평등하고 지속가능한 대학-지역사회의 파트너십을 유지하는데 중요하다. 지리학은 현장 답사와 지도 제작으로 지역사회의 문제를 해결하는 데 관심을 기울여 왔다. 지역사회 지도 제작은 지리정보기술의 사용과 함께 더욱 확대되었다. 대학과 지역사회는 다양한 지역 및 글로벌 문제에 대한 자료 수집과 지도 제작에 함께 참여한다. 선진국과 개발도상국에서 도시 빈곤 문제와 원주민 권리는 주요 관심 사례이며, 환경 정의는 주변화된 지역사회를 의사 결정 과정에서 가시화하며 지역 지식을 인정하는 측면에서 중요한 주제로 다루어진다. 대학-지역사회 협력을 참여와 지도화를 통해 확대하기 위해서는 두 가지를 고려할 필요가 있다. 첫째는 지속가능한 학습 효과와 지역사회 역량 강화를 위해 자료 수집과 지도제작을 분리하여 고려함으로써 기술적인 부담을 피할 수 있다. 둘째는 지역사회에서 사회적으로 적합한 주제를 발굴함으로써 더 많은 관심과 참여를 이끌어낼 수 있다. 이러한 방향의 지역사회지리학은 대학이 지역사회의 책무를 다하며 지속가능한 미래로 나아가는데 보다 큰 역할을 할 수 있을 것이다.

주요어 : 서비스-러닝, 지역사회협력, 참여지도제작, 지역사회지리, 사회적 책무

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I. Introduction

Universities traditionally have education, research, and service as their major mission. Service was added lately among them. As university education expanded in enrollment, service has been conducted by working with communities for practical learning and to make education and research more effective. Combining learning with service, service-learning has become widely adopted to reflect real world conditions and changes into classroom teaching and learning (GUNI, 2017; Shek *et al.*, 2017).

In the neoliberal situation, the highly competitive society has increased poverty and inequality. Universities make efforts to secure finances and practical training for employment (Butin, 2006; Fulco and Novell, 2019). In these situations, service-learning emphasizes experiences with critical perspective focusing on social issues and environmental problems. Broadly, universities have expanded service-learning to wider community engagement to strengthen their social responsibilities (Kellogg Commission, 2002; Kagan and Diamond, 2019).

In the process of university-community engagement, students can develop problem-solving, communication and collaboration skills and the community is provided with necessary services. These bring more attention to the original goals of higher education more attentive to society while improving the quality of education (Jacoby and Howard, 2015; Furco and Norvell, 2019). Participation is an important aspect for effective and sustainable partnership and reciprocity with community. Various efforts have been exerted in course offering and participatory approaches under these community engaged service-learning contexts (Yamamura and Koth, 2018).

Geography has a long history of learning with community engagement through fieldwork and mapping as methods which expand recently with the use of geographic information systems (Elwood and Wilson, 2017; Trudeau *et al.*, 2018). Geography's participatory 'out in the world' approach and its disciplinary character offer strategies that can recover the public purpose in education and foster collaboration among students,

universities, and their communities (McEwen, 2013; Sheppard, 2013; Rock, 2021). Recently, participation, mapping, engagement, and community development are intermingled together to develop into community geography as a subfield in geography. Place concerned participatory mapping establishes firmly in community geography and provides a good example of practicing university-community engagement as other academic fields may emulate.

This paper introduces the evolution of service-learning to university-community engagement and the efforts in geography with its fieldwork and participatory mapping to develop into community geography. The participatory approach with mapping provides a possible avenue for reciprocal partnership between university and community. It also reveals other aspects to be thought out for further development. One is the importance of distinguishing mapping skills from participatory collaboration; the other is selecting socially relevant issues for wider attention and participation. Such efforts will establish community geography to be associated with wider notion of service-learning and community engagement, and the university and community partnerships leading to sustainable development.

II. Service-Learning, Community Engagement and Geography

1. From Service-Learning to Critical and Community Engagement

Service-learning is a form of pedagogy that combines community service with classroom learning (Fig. 1). It is premised on experiential education focusing not only for job preparation but for preparing students to practical community-based problem solving (Bringle and Hatcher, 1996). It is grounded in American higher education's long tradition of public purpose and experiential education (Jacoby and Howard, 2015). In the early 1960s, the Peace Corps and Volunteers in Service to America supported service-learning in its

beginning. The emphasis was often on doing good or helping others rather than on engaging students in work with others to address community problems,

Since the 1990s, service-learning began to be integrated into curriculum across disciplines and universities began to form partnerships with their surrounding communities based on collaborative works to be done by university and for community (Furco and Norvell, 2019). The scope of service-learning is broadened to more on social issues and local problems. The distinction between service-learning and critical service-learning can be its attention to the distribution of power in society, social improvement, and its focus on developing authentic relationships between universities and the communities involved (Mitchell, 2008).

Rededicating universities to their public purposes, service-learning has been reframed in community engagement which entails two-way partnership based on shared interests and assets rather than one-way model that universities solve community problems (Hartley and Saltmarsh, 2016). Community engagement is defined as learning and community-based research that engage academic expertise in partnership and reciprocity with local residents to address real world issues. Personal and social responsibility become as essential learning outcomes anchored in active involvement with diverse communities and real world challenges (Hartley and Saltmarsh, 2016).

Students are often disengaged from communities, politics, and the environment, despite intensifying global interdependence and the growing complexity of

economic, political, social, and environmental problems (Kellogg Commission, 2002; Jacoby and Howard, 2015). Overcoming this disengagement is a responsibility of higher education institutions. Development of interpersonal communication skills in combination with academic learning and increased student motivation is a frequently observed result of community engagement (Yamamura and Koth, 2018).

Community engagement may encourage heightened levels of moral and civic responsibility. The incorporation of service in university education is critical not only for educational reform enhancing students' sense of civic responsibility but for community service meeting community needs (Bringle and Hatcher, 1996). The establishment of university-community partnerships benefits students in need of experience and faculties to their courses and fulfillment of community service requirements as part of their academic duties. Also, communities and public agencies are willing to engage in partnerships to achieve their project objectives from universities for local enhancement.

2. Place-based Community Engagement and Geography

The essence of community engagement is that students combine academic study with some form of practical involvement with a community usually close to the university. Students undertake extended field experiences or investigations in community settings. Works incorporated into their education tend to be those related to course

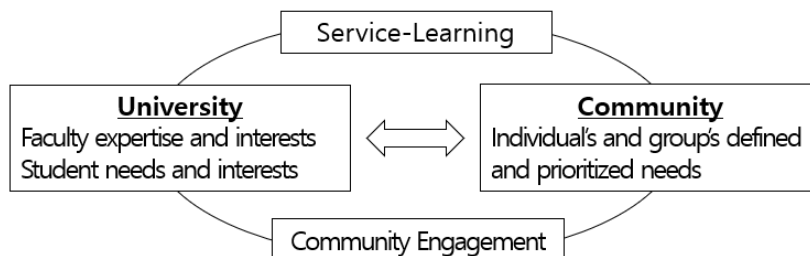


Fig. 1. University-Community Partnership

Source : modified from Dorsey, 2001.

objectives in theme. But for lasting social change from the community side, a place-based community engagement is a strategy that more fully maximize university and community resources with mutual benefits (Yamamura and Koth, 2018).

Most universities and community organizations face significant challenges in deciding with whom to partner and why and those tend to be a semester and/or specific theme among diverse community problems waiting for certain improvement (Bringle and Hatcher, 1996). Focusing on an established geographic area can make it easier to decide where to deploy university resources. By narrowing the focus in area, universities and community partners may increase their ability to form strong and sustainable partnerships that are of greater value to all stakeholders. Place-based community engagement provides universities with a coherent large story for communicating their commitment to engaging in the wider community (Israel, 2012). It may enable to attain greater external visibility among students, community organizations and local governments easy to support those community works.

The wider and long-term place-based community engagement presents a chance for university and community to deepen and enhance partnerships. Knowing that the university has made a long-term commitment to support their mission and build their organizational capacity, community partners are also likely to commit to develop relationships with university. As relationships between university and community strengthen, the depth and sophistication of shared projects can grow and attain stronger results. Universities through their expansive commitment to community engagement can get support from foundations, corporations, and/or governments. University community engagement tends to focus more on the learning experiences for the university side rather than on community impact. Many funders may want to place more of an equal emphasis on the university and the community (Yamamura and Koth, 2018).

Another challenge is the short term, sporadic nature of many universities community engagement (Yamamura

and Koth, 2018). After the academic term ends, student involvements at community sites disappear and the projects are difficult to keep working. By focusing on one place, place-based engagement increases the continuity of collaboration since all aspects of the community allow diverse academic fields find their participation in their class teaching as well as research opportunities (Israel, 2012). The accumulated knowledge about the community brings further development for courses and research. The outcomes allow to establish shared visions and these processes are to increase trust among all those involved to move forward (Yamamura and Koth, 2018).

The transformative efforts in university education and local transformation may face numerous trials-and-errors. Therefore, the success of community engagement requires university to educate students and community to have positive impacts particularly on those who experience marginalization as emphasized in critical service-learning. The place-based long-term reciprocal partnership between university and community leads to sustainability through which the boundaries between them lowered to be an expanded community.

Community engagement is closely related to geography fieldwork participating in local and global regions with regards to environment and society (Grabbatin and Fickey, 2012). Fieldwork is easy to lead to a new learning away from the traditional lecture. However, community engagement in geography takes a wide variety of forms without much recognition of service learning and social responsibility (Bednarz *et al.*, 2008). In fact, the issue of civic responsibility has long been a guiding theme for geography educators. The interactions between university and community can be viewed as integral in a range of ways to the promotion of responsible citizenship (Dorsey, 2001; McEwen, 2013).

Given the considerable overlap between service-learning and geography, the way to incorporate service-learning into geography courses needs to be articulated. Geographers have always conducted fieldwork; service-based learning and other forms of community engagement can be used to encourage students to

participate in communities while offering service to them. Community engagement offers students opportunities to collaborate with communities to understand and help to resolve the problems they face. This is a hallmark feature of applied geography: addressing societal problems with the spatial perspective of geography (Klein *et al.*, 2011; Hooyka, 2021).

The work of radical urban geographer William Bunge challenging the inequality and exploitation in Detroit exemplifies a longstanding concern in geography with the direct experiential knowledge in research and the social responsibility of academic researchers (Bunge, 2011). Bunge's legacy of urban expedition in Detroit has been continued while not that prevalent yet in urban poverty and counter-mapping study of developed and developing countries (Yapa, 2009; Avila *et al.*, 2021). Geographers' traditional concern with the societal impacts of academic research and teaching needs to be incorporated as a means of achieving student-centered learning and socially relevant research. It requires to fit community engagement within the geography curriculum (Yarwood, 2005).

Whatever the form of community engagement being undertaken, the two principal goals to be reminded are to enhance student learning in geography and to meet community needs. Fieldwork in geography as an experiential learning may expand to include questions asking where problems exist and solutions to be figured out. These spatial perspective and analysis may be expressed cartographically by paper or digital maps. Maps will expose local problems or issues to public, thus bringing wider concern and participation, and leading to bottom-up solutions.

III. Participatory Mapping and Community Mapping

1. Participation and Mapping

There has been an increasing emphasis on community-based research and teaching for effective learning and

community partnership (Kendon and Elwood, 2009; Jung, 2018). Participatory approach appeals to academics concerned with the relevance of their disciplinary knowledge, pedagogical developments, and responsibility in society (Rees *et al.*, 2020). This approach challenges the tendency for university researchers to be away from communities where they are involved without giving back what they have learned in meaningful manner. Participatory and action-oriented approaches can enable scholars to play a catalyst role in relationship to community-initiated social action projects (Elwood, 2009).

Recent discussions of participation and participatory approach reflect academic concerns with the worldwide shifts in the rise of civil society and calls for democracy, citizenship, and environmental sustainability (McEwen, 2013; Miller, 2013). Many higher education institutions in both the global North and South are actively exploring how they can enhance and promote the overall quality and impact of participation within their societies. In these active learning approaches, participatory action research (PAR) emphasizes experiential and collaborative knowledge production. The goal of participatory action research is not just to describe or analyze social reality, but to change it better. Participatory methods generate and use information to inform social and/or environmental action and change.

Maps are powerful in which they locate where the problems are and further disclose what are the causes of such problems not usually seen in everyday lives. Often maps reveal social dimension including and excluding peoples and territories (Wood, 2010). For example, a map of car accidents of Black children in a place does not simply display a distribution but locates crime scenes. The accidents imply the socio-economic aspects related with poverty (Fig. 2).

Traditionally, participatory mapping has roots in concerned local matters (Cochrane and Corbett, 2020). In developed regions, community mapping was begun with deficit and asset mapping from the 1970s. It was an approach dealing with the problem when the deindustrialized economy destines poor sections of industrial city and a methodology for conceptual drawing



Fig. 2. Map showing the Location of Car Accidents

Source : Wood, 2010.

of community needs, blights, and skills, abilities as a means of improving community stability and development (Kretzmann and McNight, 1993). The perceived and labeled target groups in terms of deficits such as poverty, unemployment, and lack of education were the focus of concern, but some of the development workers and community members began to realize the strengths and potentials such as knowledge, skills, and other kinds of human, cultural, social, or material resources possessed by communities. The deficit approach fails to consider the agency of disadvantaged people and a relationship of power and inequality existing in the industrial development path (Russell, 2020). These concerns are addressed in deficit and asset mapping not in precise cartography but in representational drawing. It is a very empowering discourse escaping poor and disadvantaged groups into a community with possibilities. Mapping community's potential is a way of reversing disempowerment to empowerment by capturing the assets in local communities (Missingham, 2017).

Similar efforts began in rural areas of the developing countries as participatory ethnographic work, a means of unearthing and revealing local knowledge and

empowering local people in response to government and business-oriented policy formulation (Chambers, 2006). Participatory mapping has been used to document traditional cultural sites and land use for preservation, and transmission of culture, knowledge, and language (Peluso, 1995; Weyer *et al.*, 2019; Sletto, 2020). Local indigenous knowledge expressed in maps is used to defend community land rights and resources against government agencies and resource extraction companies (Peluso, 1995; Chambers, 2006). The maps are various from hand drawn ground maps and paper maps not like the ones with the precise cartographic sense to current web-based participatory GIS maps (Reid and Sieber, 2020).

These participatory mapping based on local place-specific knowledge from communities highlights participation, democracy, empowerment, local knowledge, and challenges to existing power relations. These concepts are the way community development professionals understand communities and also shape the way community members identify themselves and understand their place in society. Such positive impacts of participatory mapping have gained its popularity with the development of GIS technology.

2. Participatory GIS and Community Mapping

Mapping has long been closely associated with geography, visually representing physical and human worlds. Map-making remained in the domain of experts for centuries until the advent of new mapping technologies which have widened the possibilities for map making from experts and non-experts alike (Wood, 2010). It evolves into another stage, digital maps. The rapid growth of GIS in the 1970s and 1980s had a great impact on map making as well as geographical analyses. To represent geographical phenomena, the digital has merits of precise, fast, standard, and replication. It gave rise to a new integrated and scientific geography and caused a stimulating impetus in the geography community (Mukherjee, 2015).

The term participatory GIS originated at two meetings of the National Center for Geographic Information and Analysis (NCGIA) as participants struggled to frame the next generation of GIS (Kyem, 2021). To ground technical advancements in social and political contexts, these meetings grew to developing applications that the next generation of GIS should be more inclusive to official and non-official information (Sui *et al.*, 2013). The resulting definition of participatory public GIS (PPGIS) follows normatively on pragmatic approaches to engage the public in applications of GIS with the goals of improving the transparency and influencing government policy. One of the widely used GIS application is found in community development planning (Brown *et al.*, 2020).

However, critiques countered the intellectual, social, political, and technological impacts of this limited instrumental as a failure (Pickles, 1995). It was argued that the data storage and processing techniques inherent in GIS are part of an empiricist and positivist logic. GIS is a means of leading the geography discipline back to a methodology on the antidemocratic nature by the differential access to the technology. Simply widening participation in map-making does not necessarily

democratize the knowledge production process. Critiques are prevalent on both practical and epistemological implications of GIS (Elwood and Wilson, 2017).

Due to its technological characteristics, GIS possessed a tendency to privilege certain classes and certain kinds of knowledge, thereby excluding other forms of knowledge and logic. Various realms of marginalization or underrepresentation are explored (Chambers, 2006; Nyerges *et al.*, 2011; Sui *et al.*, 2013). Some apprehension expressed that participatory GIS applications tend to overrepresent the advantaged such as the haves in U.S. suburbs and underrepresent marginalized peoples such as the have-nots in communities without even the basic necessities (Brown *et al.*, 2020). As a result, researchers have increased the number of nontraditional participatory GIS applications, largely in developing countries. The forefront example is the counter mapping emerged to contest the government drawn boundary maps in land use and indigenous rights (Peluso, 1995). Participatory GIS involves diverse actors and attempts to represent the realities in various contexts that have not received much attention.

As critical in evaluating the applications and processes, participatory GIS maps seek to be effective in advancing the mapping needs of the public (Boll-Bosse and Hankins, 2018). Many of the early participatory GIS efforts were exploratory case studies providing the social narratives in maps. Participatory GIS research itself has undergone an evolution as participants seek to formalize the process of community development. These included studies of GIS by marginalized communities, nongovernmental organizations (NGOs), urban community-based organizations, and peoples and native groups in developing countries.

Geographers explore participatory mapping in a way that allows research subjects effective by overcoming the traditional hierarchies of researcher and researched. In turn, the marginalized or traditionally hard to reach groups generally appreciate these approaches recognizing and valuing their knowledge and enabling them to work towards appropriate social and/or environmental

change on their own terms. What is required are critically trained geographers who take seriously both the conventions of professional cartography and the power relations embedded in and reflected in the maps and map-making process (Kindon and Elwood, 2009).

With respect to easy data input, manage, and sharing the outputs within and over community members, the goal of participatory GIS activities by members of local communities and nonprofit organizations become apparent collectively voice local issues to get wider attention. There are numerous names of such mapping as 'community mapping', 'public participatory mapping', and 'citizen mapping' (Schlemper *et al.*, 2018; Kyem, 2021). Community mapping asks participants to share their experience, their values, and their vision about a particular place and shares the maps with the public (Lydon, 2003). Community mapping affirms locally derived knowledge aided by new mapping technologies. Multiple and marginalized groups can participate in community mapping including school children, women, indigenous peoples, and working-class community members (Lin, 2014).

Community mapping in general combines conventional participatory field methods with a GIS component. These earlier works showed the possibilities of GIS for diverse grassroots implementation and these efforts are able to expand with the use of web-based geographic information system. It becomes now increasingly Internet-based in urban and industrialized regions. In the future, it is likely that the Internet with associated spatial multimedia will become the dominant community mapping platform (Brown *et al.*, 2020). Web-based mapping services are widely available overcoming the technological barrier, place and context become important more than ever.

The backbone of community mapping is participation and bottom-up social justice orientation. A community map should be a map produced collaboratively by residents of a particular locale featuring local knowledge and resources (Sieber, 2006). Place-based approach that navigates local issues and power relations should be the

basic of specific community map production and implementation. Community maps provide the potential for social change or at least the judicious reallocation of resources (Parker, 2006). This is the future direction of participatory community mapping.

IV. Toward an Engaged Community Geography

1. Empowerment and Social Change

The modern history of most maps and GIS is the outcome of government programs such as territorial boundaries, administering resources, or property registers. These programs tend to be top-down geographic experts analyzing data and cartographically informing stakeholders (Dalton and Stallmann, 2018). Participatory and inclusive processes are necessary for effective and fair decision-making. Maps also have been a tool of the communities to secure legal control over resources and rights through the process of map making. Map-making process often builds capacity for communities assembling local knowledge and enhancing political consciousness and mobilization (Corbett *et al.*, 2016).

Empowerment is an essential byproduct of community mapping. In some cases, empowerment is defined as social or procedural change in which communities or citizens gain greater control over resources and legitimacy in decision making (Elwood, 2009). Other research describes empowerment as building capacities or human capital for collective action in which communities acquire skills, knowledge, or politicized consciousness that informs or inspires collective action (Parker, 2006). These definitions can connect three activities commonly discussed in the community mapping literature to concretized conception of empowerment: a) the ability to self-define and represent place, b) the acquisition of control over natural or other resources, and c) the mobilization of collective action (Elwood, 2009).

The ability to self-represent a community through

mapping process can strengthen community identity and the represented identity often reflect and reinforce knowledge and perception of local place. It can challenge traditional maps hiding some peoples or resources, heighten place consciousness, and counter deficit maps. For example, some inner-city neighborhood groups have created asset maps that feature local resources and potentials in contrast to government maps that highlight problems such as criminal activity and poverty (Kretzmann and McKnight, 1993). By making maps, neighborhoods understand and display their own conceptions and repudiate other representations of their community such as those proposed by government and/or developers (Elwood and Wilson, 2017). This gives them legitimacy and enhanced effectiveness in negotiations with government and business. In drawing maps that include history, places of value, and land use traditions, local indigenous communities imprint their existence in visual form and actively resist their marginalization.

Community mapping can produce two related forms of empowerment: the capacity for collective action and procedural social change. The empowerment outcomes range from the material such as maps and to the discursive such as expanded participation, social inclusion and capacity, equity and redistribution, and increased democracy (Parker, 2006). Community maps provide a medium for community interaction, consciousness-raising, and conceivably action. By mapping the localities, communities may reclaim the territory for themselves figuratively and literally. However, the mapping process and product can also be binding, exclusionary, or dis-empowering at various scales and in many ways. For example, building technological capacity in a community business organization may allow that organization to advance its goal of creating a historic district while marginalizing a particular community or group (Sieber, 2006).

The goals of activists and members of marginalized

communities can be far more confrontational. The idea-cum-practice of ‘counter-mapping’ was first used to refer the grassroots map-making by an indigenous people in Indonesia (Peluso, 1995). The reasons for community mapping conducted by native peoples in developing countries illustrate a more activist stance such as protecting traditional land, recognition of land rights, gathering traditional knowledge, and achieving social justice (Weyer *et al.*, 2019; Sletto, 2020). It involves the efforts that fundamentally question the assumptions or biases of cartographic conventions, and challenge predominant power effects of mapping, and engage in ways that disclose power relations through mapping (Dalton and Stallmann, 2018).

Empowerment is often referred to as both an outcome and a process. The themes of inclusion and transparency are implicit in the practice of community mapping (Parker, 2006; Corbett *et al.*, 2016). Mapping creates a feeling of territory, leading to the organization for collective action against resource usurpers. Community mapping tends to integrate broader societal goals such as community development, sustainable development, and environmental preservation (Elwood 2009; Lopez, 2020). It provides a unique approach for engaging the public in decision making to allow participants to combine complex spatial information and local knowledge and analyze alternatives through which individuals and groups are empowered.

There are many successes in geospatial technology diffusion since the 1990s, particularly utilizing the geoweb services. Participatory community mapping can make a contribution to building maps in which local indigenous information and knowledge are represented beyond the conventional and hegemonic representation. In this way, community mapping aims to contribute to the processes of uncovering forgotten issues and hidden power structures as a necessary condition for social change otherwise invisible in the dominant discourses (Parker, 2006; Corbett *et al.*, 2016).

2. Social Relevance and Environmental Issues as an Example

Over the last two decades, increasing interest in participatory mapping has evolved significantly in various applications. Participatory mapping projects proliferated since the 1990s, aiming to generate spaces for a collective exchange of narratives and representations confronting the logic of hegemonic discourses. It is the recognition that the use and integration of non-expert, place-based knowledge and experience can help address complex local problems and enhance bottom-up searches for solutions. Their work “exemplifies longstanding discussions in geography about the significance of direct experiential knowledge in research, and the responsibility of academic researchers to illustrate and challenge inequality and exploitation” (Kindon and Elwood, 2009:21).

Participatory GIS in the mid-1990s is emerged from the concerns of the societal impact of increasing use of GIS by governments and large corporations in planning and management. While the move to GIS quickened decision-making processes, it marginalized communities and individuals who did not have access to the systems or to the information that they contain. Participatory applications of GIS try to rectify the authoritative use of GIS by providing access to technology and information. Two related terms are used to dealing with the benefits from more equitable access: Participatory GIS (PGIS) and Public Participation GIS (PPGIS). These two areas of practice and research are similar in their methods and overall aims, although the PGIS has stronger emphasis on applications in the global South and the PPGIS is linked to urban planning practice in the global North (Verplanke *et al.*, 2016; Weyer *et al.*, 2019). In both, there are explicit attempts to represent local needs and voices especially of marginalized groups and issues in the mapping process.

Both areas express sturdy concerns with social and environmental justice calling for applications that are participatory, democratic, and objective clarification of the problem and find ways to resolve them. Most

community mapping projects use mixed methodologies for diverse subjects (Robinson *et al.*, 2017). Community asset maps are often drawn with urban projects such as the renovation of underutilized space or the building of community green space. A students’ mapping project deals with an abandoned stream park in a city to urge the town council and other organizations to implement a regional creek restoration project. In developing countries, indigenous peoples map their territories to create conservation and development activities often with agencies. During the mapping process, locals join together to uncover the hidden aspects to be recognized by the public, empower less privileged groups in society, and confront against the outside encroachment on local community (Brown *et al.*, 2020; Kyem, 2021).

To make the community mapping socially relevant and widely adapted, it is important to distinguish participatory and collaborative mapping (Pedregal *et al.*, 2020). Participatory mapping emphasizes public participation to gather local community data. It would be a standalone activity before the preparation processes for later map-making. Certain local area would have problems to be found and reduced, and assets with development potential. Figuring out problems and potentials is an important first step, and community members begin to collect local data. The data could be useful by themselves and for map-making. Local empowerment is the following during the process. Collaborative mapping focuses on discussing and reorganizing the collected data and disseminating them in a form of map. The development of Internet provides online environment in cloud storage and presentation to wider public. To be mapped are the participatory local data as well as available table and/or paper map data, and maps are shared online over local and global communities (Denwood *et al.*, 2022).

Internet web mapping enhances the visibility and ease of practices integrating and sharing geographic information. The distinction between participatory mapping processes and collaborative mapping practices are related to web mapping application available in

several public and private web services.¹⁾ Both participatory and collaborative mapping is dependent upon voluntary community contributions to geographic and cartographic data production, and the local participation and collaborative mapping are combined into an enlarged web-based participatory community mapping practice (Pedregal *et al.*, 2020). The use of digital cartography in combination with internet technology, for example Google My Maps or others, has greatly expanded community mapping practice given the efficiency in spatial data integration, storage, analyses and sharing on the web services (Brown and Kytta, 2018).

Environmental justice is a widely acknowledged field in the community mapping both in developed and developing countries (Haklay and Francis, 2018; Avila *et al.*, 2021). Environmental justice discourse has diverse themes and issues, and many of its everyday manifestations are locally based and experienced in the interaction of communities and the local geographic context. Maps are a highly effective tool when facing local environmental issues. They can help in collecting facts about an area, bring issues to the table, allow for comparison between areas, function as a tool of communication with local decision makers, and identify key issues for action (Haklay and Francis, 2018). While the environmental topics range from air pollution and urban dereliction to outdoor recreation, mineral extraction, and the wider impact of deforestation and climate change, the list of social dimensions included in environmental justice discourse are diverse such as class, ethnicity, and inter-generational distribution (Sieber, 2006; Kyem, 2021).

Mapping has played an important part in understanding and demonstrating the patterns of exposure and benefits throughout the development of environmental justice discourse (Temper *et al.*, 2015). The linkage between participatory processes and applications of GIS operates in the area of environmental justice community mapping. Participatory mapping is particularly important to emphasize as these are the situations in

which community mobilization occurs around the process of gathering evidence. Mapping about local environmental issues, the use of Geographic Information Systems is useful for integrating and overlapping data for environmental inequalities.

Three specific environmental issue examples will be helpful to clarify diverse community mapping process and benefits: a) the participatory data collection and reorganize them into relevant categories with respect to resolving water conflicts (Pedregal *et al.*, 2020), b) a counter-mapping case in Mexico mobilizing against the designated location by government for the solar energy generation facilities (Avila *et al.*, 2021), and c) exposing the government collected data and maps to general public for raising concern with local environmental problem as is spring water pollution and diminishing availability along the coastal area in Jeju island.

First, the environmental justice example of Andalusia region in Spain shows how the water conflicts are presented in web-based mapping. The researchers designed a methodology to collect the experiences and opinions of local organizations, through a participatory and inclusive processes that included mapping workshops and in-depth interviews to environmental activists with respect to diverse topics such as causes of surface and underground water pollution. Initially, the sources of pollution are various such as urban land use, agricultural and mining activities, toxic wastes, irrigated land, and others. They are too numerous and often not mutually exclusive. This is the case that the local knowledge of participants is assembled and then redefined and co-produced with the water frameworks of upper level government of Spain and EU to socially acceptable categories.

The simplified and easy to follow categories of water pollution sources are agreeable to get wider public attention and to implement pollution reduction in policy proposal. Also, the categories could accept additional local data into them and ready to be put into available web-based mapping services.

Second, the counter-mapping example in Mexico's

Table 1. Modification of category as sources of the pollution in water conflict

Initial Proposal	Final Proposal
Main typology: Pollution of surface, underground waters	Type: Pollution
Secondary typology: Urban and industrial waste; Toxic and hazardous waste landfill; Transport infrastructure; Polluted, Irrigated land; Other agricultural and forestry activities	Subtype: Waste (urban, industrial, desalination) Landfill and waste disposal facilities Diffuse source (agricultural, urban, transport, mines, polluted land)

Source: Pedregal *et al.* (2020) with minor modification.

wind and solar power plants location is to reveal that the state's geography of optimal plants designation causes deforestation affected by the siting of facilities as well as the transmission lines associated with them without considering communities land use and local knowledge (Avila *et al.*, 2021). The forests are bio-culturally important to localities, and the counter-mapping efforts to make alternative maps by communities and local organizations play critical roles in contesting and shaping the low-carbon policy formation.

The counter-mapping coined in the situation that Indonesian government draws boundaries for commercial timber harvesting is to portray the impingement of indigenous peoples' rights and their usurpation into maps to address their voices and rights (Peluso, 1995). It began in the early 1990s is still an important cartographic tool in developing countries to stand against environmental change and the injustice embedded in government produced maps. Government maps along with the influence of market capitalism tend to obscure communal institutions, indigenous livelihoods and bio-cultural dimensions of specific locales. It is an important practice for communities mobilizing in prevention and reaction to the injustices on the ground (Lin, 2014).

Counter-mapping is a powerful tool to act against top-down approach revealing local knowledge and relevant data available from the field (Dalton and Stallmann, 2018). It is popular not only in developing, but also in developed countries. For example, lower-income areas contain a disproportionate number of the city's waste facilities and environment friendly businesses

are concentrated in higher income areas. The maps displaying such distribution foster political consciousness among community members, leading them to act upon such injustice (Parker, 2006).

Third, the government published documents including data and published maps are usually difficult to access. The booklets are not often posted on the homepage and published in few copies only available in limited institutions. Community mapping plays a role to portray paper maps available but limited in accessibility in addition to the participatory inputs such as local knowledge, observation, and interview. In particular, web-based community mapping accepts various data in collaborative mapping process and disseminates them to wider public via Internet. The underground water depletion and pollution in coastal area of Jeju island, Korea is a case of environmental issue among locals and government whether the cause is tourism related land use expansion and government pays attention to preserving them (Fig. 3).

The local government had a survey for all the over 500 sites with about 30 variables including precise location, the water availability, pollutants in quantity and variety, current use and usability, and the causes of pollution and depletion. These data were collected from field survey and localities' experience and knowledge. The thick booklet has numerous maps showing the current state of the important water source for everyday non-drinking use. But it is almost unknown to localities whether such survey was conducted and where and how the serious conditions are among the over 500 spring waters.²⁾ In this situation,

problems and works toward systemic change. In line with long traditions of geography work in pragmatism and participatory research, community geography commits convening a set of actors to put efforts to uncovering and resolving social problems such as social exclusion, economic exploitation, and environmental degradation which are representative of all affected groups (Fischer *et al.*, 2021).

Community geography focusing on community matters demonstrates a shift in geographic research trends toward providing benefits to the community/ies and to the university and students (Lopez, 2020). The collaboration between academic scholars and locals results in mutually beneficial and co-produced knowledge (Israel, 2012; Shannon *et al.*, 2021). In these regards, community geography is closely aligned with service-learning, in particular critical service-learning which emphasizes reflection and reciprocal relationship pursue effective learning and community development toward positive social change. The two distinctive facets of practice, reflection and reciprocity are identifiable in community geography based on the participatory GIS and community mapping (Rees *et al.*, 2020; Barrett and Bosse, 2021).

Within the geography service-learning literature, important components of community geography are geographic information systems and web mapping, particularly because of the tangible and visual products as outcomes of service-learning process that can be shared to support local organizations and communities (Gilbert and Krygier 2007; Hawthorne *et al.*, 2014; Jung, 2018). However, the main problem with developing a service-learning geography course is that it often excludes students who have a passion for community issues but lack the necessary technical skills. Around student-driven community geography, this exclusion occurs not only some geography majors but also students from other disciplines who may never have GIS training. It also excludes many community members who lack GIS or advanced computer skills while it has the potential to empower them (Weiner *et al.*, 2002; Sui *et al.*, 2013).

In GIS heavy community geography projects, it is important not to allow the technology imbalance to overshadow the learning process and social change (Sieber, 2006; Boll-Bosse and Hankins, 2018). This is similar to the distinction between participation and technical skills suggested for wider expansion of community

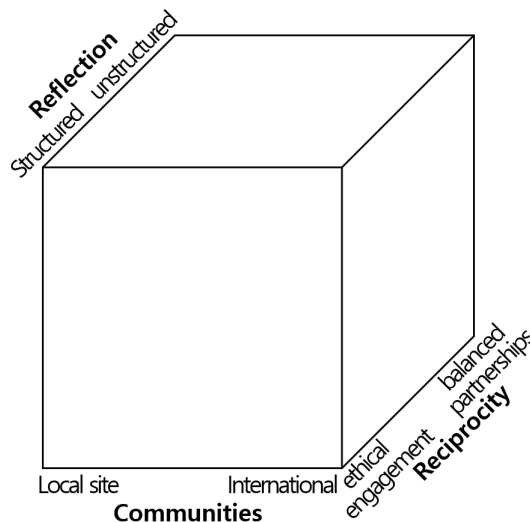


Fig. 4. Three Dimensions of Community Geography

Source : Rees *et al.* (2020) with re-ordering the dimension.

mapping. Fortunately, a number of web-based options have emerged to allow students and community members to demonstrate spatial competency without a heavy technical requirement. There are a number of online mapping tools available today with low barriers to entry, so that students and citizen groups alike can communicate the spatial nature of community topics with civic responsibility without specialized knowledge in technical skills (Gilbert and Krygier, 2007; Kyem, 2021). Community engagement is foremost valuable quality to find socially relevant issues and disseminate them to general public for desirable social change.

Similar to the recent lowered technical barriers with web mapping in community geography, some scholars contend that the practices of service-learning are often problematic in that they may reinforce social inequalities and hierarchies between students, faculty, universities and communities. This is the case approaching urban problems with deficit model of thinking and failure to engage in critical questions about poverty and inequality with political economic dimension (Mitchell, 2008; Cahuas and Levkoe, 2017). For these reasons, service-learning turns toward critical service-learning in which critical service-learning questions the power distribution in society and focuses on social change based on authentic relationships between higher education institutions and the communities served (Mitchell, 2008).

Critical service-learning is a progression of traditional service-learning as it uncovers the hidden power structure embedded in society (Cahuas and Levkoe, 2017). They call into question service-learning programs that do not advocate for social change. Also needed is an attempt to change service-learning which succeeds within the institutional limitations and power structures. Most studies of service-learning in geography focus often on student learning and evaluation, not the impact on the university, faculty, and community partners. A handful of community geographers have recently published accounts of more critical service-learning which recognize the power dynamics and challenges inherent in place-based research and learning between students, universities,

and communities (Moore-Cherry *et al.*, 2016; Block *et al.* 2018; Trudeau *et al.*, 2018; Kwon, 2022).

Community geography shares the critical approach with critical service-learning to social change, often emphasizing the community problems and alternative development by uncovering the inequitable pattern and structure lying beneath the current *status quo*. In teaming up with community members, geographic methodologies in particular mapping tools are applied to community problems on works which confront under-resourced communities and existing unequal power structures. The community geography co-produced by the academic and the public are mutually beneficial public geographies which accrue to the academic and the public for next progress. Community geography is a service-learning as a subfield in geography being deeply engaged with place for active learning and addressing community development challenges. It is a praxis for reciprocal partnership between university and community and a service mission university supposed to provide to society.

V. Conclusion

Service learning began with applying academic study to relevant community practices working with local members. It has gained popularity in diverse disciplines including geography as it promotes student learning and socially relevant research for local empowerment and development. In a similar vein, the community-based participatory research is concerned with developing worthwhile practical knowing grounded in a real worldview. The praxis shifts a course from learning about communities to identify community issues and solutions (Fischer *et al.*, 2021). Participatory community research during the de-industrializing 1970s developed a method of deficit and asset mapping. These research and practices produced representational drawing, not a precise map but being able to raise a problem and find solution with bottom-up approach.

In geography, the pioneering work of William Bunge which challenged inequality and exploitation in Detroit exemplifies longstanding concern with the direct experiential knowledge and responsibility of academic research. With a long tradition of field work and radical approaches coupled with a participatory turn, geography is well-suited with service-learning and community engagement in higher education. Participatory mapping provides one promising avenue for community engaged service-learning which integrates diverse effort and work into visual outputs. The rapid growth of GIS has further facilitated such development. But the GIS applications mostly instituted in governments and corporations dismissed the existence and voices of underrepresented groups.

After the surge of societal concern, the participatory GIS has burgeoned in urban planning and counter-mapping for indigenous rights in which local data and knowledge are incorporated into maps in Global North and South. Community mapping has become popular as citizen science where residents of particular locales collaborate with universities to make maps for local matters. The importance of community mapping is in the participatory map making process. Community map reflects a collective work that attempts to represent community identity in a localized area. It is not just a map but attentive process negotiating disputes raised in a specific place. During these participatory and collective efforts, empowerment and social change would come in order leading to community development.

The focus on participatory work on socially relevant issues is best illustrated in counter-mapping. It is an effort to collect indigenous peoples' local knowledges and human rights to confront with the dominant maps defined by government and corporations. The web-based services allow community mapping easy to present poverty and embedded social inequality and environmental injustice, and to incorporate local knowledge into visible maps without much specialized skills. Participatory community mapping is the most tangible way to bring community and geography together. With the aid of

web-based mapping service, community mapping expands its horizon into community geography including not only map making but also place-based community problem raising and solution finding.

Geography education is closely connected with community-engaged teaching and research. Community geographers share a common commitment to develop alternative learning that explicitly values its concern with social inequality, environmental justice, and others in spatial contexts. And research needs to emphasize the integration of community in each phase of the process from data collection to mapping through which communities get empowered and informed to social and political action.

Geography renews engagement with localities through community geography in which university and community partnership is strengthened and affects positive social change. The collaboration between the academic and the public results in mutually beneficial co-produced knowledge which is reciprocity and reflection what the critical service-learning is pursuing. In this regard, community geography is a praxis of service-learning, in particular critical service-learning emphasizing problem finding and proposing solution for effective learning and social change in local conditions. The community engaged practice of mapping process in geography is an active example useful to other disciplines devising and implementing their ways of community engagement. Diverse and various community engagement works across disciplines and universities will reinstate the service to one of the original university missions.

Notes

- 1) There are several web-based mapping services freely available including Ushahidi (<https://www.ushahidi.com>) for the referenced case, ArcGIS storymaps (<https://storymaps.arcgis.com>), OpenStreetMap (<https://www.openstreetmap.org>), Mappler (<http://cmckorea.org>), and

others.

- 2) A university professor of the region who has strong interests in local water issue, even had a difficulty to get a copy of the booklet. The report has numerous maps with precise location and attributes including technical data as well as local residents' knowledge about the usage and sources of contamination and depletion. The local knowledge shared across communities by maps might allow to refine each localities' opinion about the causes of degradation.

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