Impact of Community-based and Participatory Mapping

Logan Cochrane, Jon Corbett and Peter Keller

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Context

Maps have always been made; they may have been one of the first forms of human communication. Maps exist is many forms, can represent different ideas and are used for many purposes. In choosing what to represent, how to represent it and what not to represent, maps are expressions of power. Indeed, maps have always been "both symbols and instruments of power" (Poole 1995, 1). Historically, map making in its official form was done by the powerful as a means to assert and maintain power and control. Unofficial map making, made by anyone who desired to do so for a myriad of other purposes, existed throughout time but often had limited viewership and impact. Map making that challenged the official version of the map may have been seen, and in some cases continues to be seen, as an act of treason.

Participatory and community-based mapping is similarly not new. As a methodology and practice in the sphere of geography and cartography it is. Maps that were made by members of a community for the community have arguably always been made, be they lines in the sand, lines on the wall, or agreed-upon oral and mental maps of territory, resource-use and beyond. In the last three decades, however, community-based and participatory mapping have taken a new direction whereby the technologies previously utilized by power holders and decision makers started to be used by a wider body of map makers in order to create alternative maps. These maps have been utilized for a variety of purposes, explored in more detail below. Although barriers still exist, community-based and participatory mapping opened new avenues for map making and mapmakers, and therefore new avenues to challenge, assert and transform power and control.

Traditional mapping practices, it has been argued, could not be more different than the new form of mapping that is developed by information provided by and for individuals and communities. Whereas traditional mapping represented the "top-

down, authoritarian, centrist paradigm" wherein experts produce maps used by the individuals and communities, the new world of mapping includes a constant creation of information, flowing in multiple directions, from anyone that wishes to contribute it (Goodchild 2007c, 29). In mapping of this new form it is no longer clear who the producer and consumer are, they may have become indistinguishable (Goodchild 2007c).

Particularly in the last decade and a half community-based and participatory mapping projects have expanded rapidly; spreading "like a pandemic with many variants and applications not only in natural resource management but also in many other domains" (Chambers 2006, 1). According to one assessment, hundreds of academic articles have been published on the subject, and thousands of informally published materials and reports (Brown 2014). Beyond the enthusiasm for mapping of this nature, the progression of community-based and participatory mapping is also related to the diverse way in which maps are trying to be used. Nearly anything can be mapped: heritage, language, conservation, community planning, curriculum, economic development, to name but a few (Lydon 2003). That being said, "cartography is seldom what cartographers say it is" (Harley 1989, 1), which is a critical spirit with which all forms of mapping ought to be viewed. Power is omnipresent in all knowledge, even if indirect, invisible or implied, which includes the power expressed, encoded and embedded in maps (Harley 1989, 3).

Most participatory mapping projects can be categorized under six broad themes, based upon their purpose, namely: (1) to articulate and communicate spatial knowledge to outsiders, (2) to record and archive local knowledge, (3) for land-use planning and resource management, (4) to advocate for change, (5) to increase capacity within communities and (6) to address resource-related conflict (Corbett 2009). For many people this type of mapping is central to recognition and reclamation (Lydon 2002). However, often the 'community' is assumed to be a

singular entity and 'participation' a framework rather than a lived practice. As such, maps made by the community level ought to not be excluded from the criticism that they too are given meaning and use within a socio-cultural context of values and beliefs "that reinforce, and are reinforced by, the act of mapping itself, and the people behind the scenes" (Rundstrom 1991). That being said, many community-based and participatory mapping efforts demonstrate the possibilities of such maps, such as in securing indigenous rights and property (Parker 2006; Peluso 1995).

Community-based and participatory mapping, because of the possibility for it to transform power, has been advocated as a means to foster inclusive, democratic empowerment (Lydon 2002). Indigenous groups have utilized this form of mapping as a means to build capacity to resist colonialism in meaningful ways as well as supporting the revival and recovery of indigenous knowledge (Wilson 2004). The potential to foster such social change has "captured the attention of researchers in diverse disciplines" (Sieber 2006, 491) as well as non-governmental organizations, community organizations and government.

The development of community-based and participatory driven processes as well as information acquisition has led some to conclude that power is shifting to non-specialists. (Ghose 2001a; Harris 1998). Community members not only have greater access to information but are also better able to express their needs, priorities and goals as well as influence policy and management decisions (Wright 2009, 255). Others frame community-based and participatory mapping as a revolution; elites that "exercised dominance over it [cartography] for several hundred years" is slipping from their control (Crampton 2005, 12). When the processes for engagement involve online interactive systems an even wider range of people can participate, beyond those that are able to physically attend meetings (Kyem 2009).

Not all engagement with community-based and participatory mapping, however, has been done for these purposes. Public participation assists decision makers as those involved are more likely to support decisions when they have been consulted, and are less likely to oppose them (Yearly 2003). Part of that shift can be a result of being more informed about the details of policies and policy making and understand the difficulties involved in decision making. Engagement of this sort can also be superficial, or even used falsely, for purposes other than supporting participation (Mccall 2004, 2). Mapping of this nature may also be used to alter participation, both directly and indirectly. The use of the internet, for example, can also limit participation (Kyem 2009).

Research Objectives

Community-based and participatory mapping is diverse, has a wide range of goals and objectives and occurs within different socio-cultural and political contexts. As a result, the impact of this activity is varied and impact assessment must be done on a case-by-case basis. The exploration of literature on community-based and participatory mapping explored in this study seeks to better understand the processes involved, the factors that contribute to success and stated impact. These components will be respectively analyzed in three mapping stages: pre-process, in-process and post-process.

At the outset, an overview of the diverse names, and respective objectives, of participatory mapping manifestations will be presented. Following this some commonly used terminology will be briefly analyzed, including participation and empowerment. As this review of literature seeks to understand impact, some practices utilized to measure it will be introduced. After analyzing success factors and impact in the pre-process, in-process and post-process stages, a discussion will

follow that explores some of the problematic and challenging components of community-based and participatory mapping.

In reviewing several hundred published works, from academia and 'grey' literature, as well as having spoken with a diverse group of mappers it has become clear that impact is not often assessed in a systematic fashion. Many studies make assertions of change or use a limited set of testimonials to prove change has taken place. Very few cases demonstrate on-going monitoring processes took place, in each of the three stages, and therefore impact if often anecdotal. Although community-based and participatory mapping sometimes takes place for the empowerment of those involved, assessment of that is often limited in scope and duration. Following this review, therefore, a framework was developed. The framework does not aim to prescribe how impact ought to be assessed, but it supports those engaging in community-based and participatory mapping to think about questions and processes that will better enable the assessment and communication of impact.

Assessing impact is important in and of itself: it can encourage those involved to reflect upon the successful work they are engaged in, it can encourage similar projects to be started, it can facilitate for funding and it allows for on-going assessment so that unintended changes can be noted and brought into the process and less than desirable outcomes can be re-assessed and processes adjusted. With regard to community-based and participatory mapping specifically, few explore measures of effectiveness, and outcome and evaluation are two of the least understood components of it (Sieber 2006). Despite being widely used and advocated, the "effectiveness of participatory projects remain unsure" (Shih 2004, 9).

If the intended outcome and impact is not understood, the unintended components are even less understood. Some studies suggest these unintended

consequences include increased conflict, changes in land use and ownership, increased state regulation and loss of indigenous conceptions of space (Fox 2003). Other studies suggest these outcomes may not be a result of mapping itself, but a result of previous or on-going socio-cultural and political processes (ReyesGarcía 2012). Mapping may be, at the same time, empowering and marginalizing (Harris 1998), which leads some to emphasize the role of self-determination, as not all individuals and groups want to be included in such mapping projects viewing their situation as having "little to gain and much to lose" (Rundstrom 1991, 8). Evident at this stage is that much more needs to be known with regard to the impact of community-based and participatory mapping projects.

What's in a name?

> Cartography, we see, is never merely the drawing of maps: it is the making of worlds. Deconstructing the map is deconstructing of the society that produced it (Harley 1990, 16)

As non-traditional mapping has developed a number of different approaches, practices and methods have developed. Often times these are distinguished by a unique name. This study uses 'community-based and participatory' throughout, in doing so, however, does not suggest a certain manifestation of mapping is more valid than others. Rather, this terminology is used because it is broad enough to include most forms of mapping projects that exist. This section will outline a number of the approaches, practices and methods so that the diversity is clear from the outset. This section will also act as a reference, if a specific mapping type is mentioned, what that refers to and how it fits within the fold of 'community-based and participatory' mapping.

'Map-making', as opposed to 'mapping', is more inclusive of the process and emphasizes the importance of the process of mapping rather than the outcome of mapping. That terminology has not been used in this study because many of the projects explored do not emphasize the map-making process. In seeking to analyze a broad spectrum of projects that involve community-based work and participatory mapping approaches, the terminology of 'mapping' will be used. The processes and impacts of map-making will be explored throughout and will be identified as such.

Participatory mapping is commonly used in a generic sense to refer to a methodology that shapes the way in which a map is made. Participatory in this

sense is in opposition to the traditional form of mapping that was done by a small group of experts, often on behalf of power holders and decision makers. Participatory, however, can manifest itself in many different ways (a more detailed discussion of this subject is included below). Some forms of 'participatory' mapping include data collection from a wider range of contributors, but the participation is limited to that, whereas other forms are participatory in the design, ownership and development of the entire process and map. 'Participatory' is used in this paper to be inclusive of all these manifestations, while deconstruction of each of the approaches will occur on a case-by-case basis.

Community-based mapping is similar in reaction, or response, to the traditional form of mapping. The use of this terminology generally refers to mapping that occurs within a community, for its own benefit and with its direction; an "alternative, egalitarian counter-culture" to the elitist conventional cartography (Parker 2006, 471). The focus of community mapping is often "a map produced collaboratively by residents of a particular locale, often featuring local knowledge and resources" (Parker 2006, 470), and is the "antithesis of expert-led discourse and development as everyone's views matter and can only enhance the map" (Lydon 2003, 12). Although not all maps explored are exactly of this nature, what differentiates them is that they are maps and mapping projects that involve those within a community in creation process.

Other methodologies, approaches and practices related to community-based and participatory mapping include:

> **Asset Allocation Mapping** (AAM) allows members of a community to make informed decisions with regard to how their resources are distributed and utilized. In doing so, it is not only important to understand

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and evaluate assets, but also to understand the value of those assets to the community itself and to those outside of the community (Corbett 2006, 21).

Bottom-Up GIS (BUGIS) utilizes GIS as a tool to acquire local knowledge and communicate those perceptions; BUGIS is thus both the tool and medium of communication. This process is similar to cognitive mapping but takes place within a GIS spatial language and therefore is more effective for planning purposes (Talen 2007, 280).

Community Information Systems (CIS) allow for local knowledge to be documented on a map-based format, while incorporating a wide range of data types, such as text, photos and video. This information is managed and communicated via an interactive map (Corbett 2006, 21).

Community-Integrated GIS seeks to utilize the technical components of GIS mapping while expanding the availability and access for a greater and more diverse group of participating people. The inclusive approach of community-integrated GIS incorporates multiple perspectives and understandings of landscapes at the same time and facilitates for more democratic decision making. A community-integrated GIS project is not merely a map but is a means through which alternative perspectives can be shared, valued and explored (EmpowermentMarginalizationAndCommunityIntegrated).

Counter Mapping, as a term, was introduced by Peluso and advocated the use of maps by communities as a means to represent themselves, in contrast to others representing them (Peluso 1995). Counter mapping

projects can enable communities to make claims for land and/or resources (Parker 2006). Mapping of this nature empowers people making the map, members of the community itself, to control and (re)present themselves. Many forms of map making have been used, while being referred to as counter mapping, a common theme to counter maps is that they are used to contest or undermine power relationships as well as an effort that questions the assumptions and biases in conventional maps (Harris 2006).

Cultural Mapping is a use of maps that enables marginalized knowledge and history to be collected, recorded and conveyed and shared. This process is owned and driven by the community involved so that representations are appropriate and suitable in order to facilitate communication and place new forms of knowledge and information in formats that are recognized by non-community members. This process can be used to support communities to express their rights, visions and priorities (Corbett 2006, 21).

Indigenous Mapping refers to mapping projects undertaken by indigenous communities to protect, preserve and enhance their way of life. The type of map and information represented on it depends upon the goals and objectives of the indigenous community. Some of examples of this may take the form of collecting data for a land or resource claim, it may re-name maps with indigenous place names and may be used as a language revitalization tool.

Participatory 3D Modeling brings local knowledge onto a geo-referenced relief model with a variety of hands-on interaction. Models are sometimes tools in and of themselves, and other times digitized (Corbett 2006, 9). Mapping projects using this method, for example, have been used to model

climate change impacts, as a visual way to represent the unequal

distribution of potential harm (Piccolella 2013).

Participatory GIS (PGIS) is an approach to GIS with a participatory

methodology. PGIS seeks to incorporate different types of knowledge, local

and expert, qualitative as well as quantitative, and merge them together

(Harris 2003). This not only includes the 'public', as public participation

GIS implies, but includes government, non-government and other

stakeholders in the process.[1] Not all researchers agree with this definition,

and feel PGIS is a means to represent local people's spatial knowledge with

expert skills, rather than input (Corbett 2006).

Public Participation GIS (PPGIS) enables those that commonly do not

have a voice in decision making processes to participate. The

democratization of mapping using spatial information and technology

allows for new knowledge of place to be produced (Brown 2013). This

alternative form of GIS mapping address issues of differential public access

to data, hardware, software and expertise; redress the structural distortion

of knowledge in GIS databases and the perceived exclusion of community

knowledge; and to broaden issues of democratic GIS-based decision-

making (Harris 2003, 1). PPGIS often involves a number of partners and

partnerships, such as non-governmental, university, governmental and

community and attempt to address social issues and challenges (Corbett

2006).

A ground map, although temporary and easily disturbed, allows for more

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[1] Throughout this study "stakeholder" is used as a broad term, inclusive of anyone that has a "stake" in the project, which includes the participants in the project and the community. When "stakeholders" refers to a external parties, that will be clarified, such as "external stakeholders".

democratic interaction and more people are able to add or alter the map. Paper maps, on the other hand, can be more permanent, applicable to communicate with officials and can be used as a monitoring and evaluation tool, however the contribution and alteration process can be more exclusive, and power and control are more concentrated (Chambers 2006). Mapping that is done with GIS and/or GPS requires a greater degree of training and the process may be unknown to many involved, resulting in barriers for participation, yet it allows for greater detail, more precision and the potential for empowerment when using the map to negotiate and interact with officials. Applying these technologies to the internet can both be a means of facilitating participation and a barrier to it. Similarly, the information contributed to a map may change, as participants are aware that anyone might gain access to that information and know who contributed it.

Information technology may be widely available in some parts of the world and within certain sub-sets of society, but not all. As of 2011, slightly more than a third of the world use the internet, with fewer having computers at home and/or internet access at home (Itc 2011). The assumption that computer-based and online mapping processes are democratic may require further reflection, particularly with regard to accessibility within the population and/or community in question. Similarly, options for community mapping platforms that are less cost burdensome, such as using existing web technologies, require skill sets that encourage participation of some and act as a barrier for others. The existence (or persistence) of these barriers has led some to argue that the community-based and participatory mapping is unlikely to become a "science of the masses" (Peluso 1995, 387).

Approaches to mapping not only affect the dynamics of power, participation and use, but also pose challenges of ownership. Information shared on a ground map can stay with the community, assuming photos are not taken. With this

approach ownership is controlled by the participating members, whereas other approaches make ownership a negotiation process. Importantly, with the use of approaches that take information out of community, the holder of information has also changed, even if held in confidentiality, thus altering the power and control dynamics.

Community mapping with specialized technology may require significant financial resources, making certain manifestation of community mapping an option only for those with that capacity. In order to obtain those resources and tools, collaboration might be sought, which has the potential to alter or blur the original agenda (Parker 2006). This may result in elite use, or elite involvement, a criticism lodged by early critical cartographers (Harley 1988), despite the idea that community mapping is the antithesis of the elitist role maps have historically played. Crucial for consideration in an age of swift technical advancement is that "technological progress does not automatically translate into maps that are more relevant in a society" (Harley 1990, 13-4). Some of the problems that existed in traditional maps, such as embedded marginalization and oppression, which were the reasons that the alternative mapping process began, may continue to be present in the community-based and participatory maps (Bunch 2001, 77).

For some, the processes of mapping is elevated over the product, while for others the process is of negligible importance in comparison to the product itself (Rundstrom 1991). There are situations were the objective of community mapping is one which a transformative process, for the participants themselves. In other instances the objective is to create a product that will be used for a specific purpose. Most often, community mapping includes both of these process, whereby participation in mapping can be an empowering, informing and transformative process, while it is also a process that is undertaken for an

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objective that is supported by the end product.

Community mapping may speak to the 'mappability' of a particular place, concept or theme (Hazen 2007), thus limiting the process and the outcome in utilizing mapping. Maps may also speak to what knowledge and information is valued, and not valued or valued unequally, influencing what gets mapped (Hazen 2007). This process is not overcome by engaging in community mapping as 'knowledge' is not singular within community, much knowledge and information is contested within community. On this level, participatory mapping processes may represent a valued knowledge by some of the community, but not all. The crisis of representation that Harley spoke of in 1990 remains, albeit in a different form, a consideration that ought to remain forefront in participatory mapping.

With this diverse array of mapping process, there is a challenge to speak to all of the above while also remaining coherent. In attempting to do this, this work will utilize 'community-based and participatory mapping' as its working term. That is not to suggest that other manifestations and definitions are not considered or included. This term speaks to a broad range of mapping processes that involve participation from traditional non-mappers, or at least non-mappers in the narrow sense of formal map-making, as everyone is a map maker in some shape or form (Lydon 2003). Community-based and participatory mapping, as it is explored below, is inclusive of a variety of mapping approaches and methodologies, although it specifically focuses around discussions of impact. Some forms of mapping speak more to impact than others and may be over-represented in this review of published works than others. The framework (see Appendix 1) has been developed with a holistic vision of community-based and participatory mapping and is not only reflective of those mapping efforts that speak about impact.

Theories of Change

Theories of change attempt to explain why and how change occurs. This brief overview is not meant to present all the theories about why and how change happens. It does, however, present a few key theories so that impact around community-based and participatory mapping can be contextualized within the framework that change may occur in different ways and for different reasons. Our understanding of theories of change influences the way in which we think about change, evaluation and impact. It is therefore important to be thinking about theories of change when considering impact.

Complexity theory has been widely discussed in recent years with regard to understanding how and why change occurs. The theory utilizes development in systems theories, which understands projects or groups as operating in a complex environment influenced by a dynamic set of interactions, feedback mechanisms and relationships. Rather than evaluating an action as a stand-alone entity or as independent, complexity theory suggests projects and groups need to incorporate the complex and dynamic context within which it operates. In doing so, the goals and objectives are adaptive to the system throughout the process. One of the important lessons community-based and participatory mapping projects can learn from complexity theorists is that maps do not exist in isolation and that the wider context within which they are being created needs to be understood, and the processes involved in creating that map need to be adaptive to it.

A number of **behavior change theories** have been proposed, which attempt to understand why behavior changes. On the individual level, an understanding of self-efficacy suggests that a person's assumption of ability influences their ability to complete a particular task. If change is sought with this understanding, it must

include a transformation of the person or people involved. Self-efficacy is an important component of some theories of change, such as the Theory of Planned Behavior. Others suggest that behaviors are learned through observation and reinforcement of that behavior. From the behaviorists it is suggested that in order for change to occur it must be put into action, and reinforced when others engage in that action. In a number of ways this overlaps with the suggestion that self-efficacy is important in fostering individual change, as both believe that action will only be adopted if it is reinforced. The **social learning theory**, on the other hand, proposes that change is influenced by an interaction of environmental, personal and behavioral components. Whereas the behaviorists suggest that change is largely an individual process, the social learning theory incorporates the role and influence of the environment within which that individual is acting.

Theories of change are important for a community-based and participatory mapper for a number of reasons. One reason is that often mapping projects are done to seek a specific change in individual or community action, understanding how and why such change can take place is important in planning the activities and outcomes. These theories are also important as an education tool, as theories of change can inform awareness raising and educational activities.

A specific methodology that incorporates this kind of thinking and approach to planned change is the **Theory of Change** methodology, which supports the planning participation and evaluation of social change. In this methodology, the long-term goals are agreed upon and mapped backwards in order to identify the processes, activities, knowledge and conditions required in order to reach the desired objectives. The process builds upon exploring short-term, intermediate and long-term outcomes and the linkage between the respective stages. Theory of Change is only one such methodology, whereas complexity theory would suggest that the processes suggested may occur in reverse, for example.

Despite it not being a theory of change per se, **problem-based learning** suggests that the most effective way to engage with a subject is to experience it, be that a process or a problem solving effort. This approach can be particularly useful for community-based and participatory mapping projects that emphasize the importance of the process of mapping; in other words the transformation and empowerment of those involved. Problem-based learning facilitates this process as learning experiences for those participating can be matched with motivations and successes in order to improve spatial understanding (Tulloch 2008a, 267).

In many ways problem-based learning parallels community-based and participatory mapping as those involved discover what they know, what they need to know, where the needed information can be gained and how that may lead to the resolution of the problem at hand. Community-based and participatory mapping projects are commonly undertaken for a particular purpose, the utilization of problem-based learning approach can help refine the development of mapping processes and bring all participants together toward a shared vision and plan. As explored below, having a shared vision is one of the important factors that contribute to success and problem-based learning methods facilitate the movement toward that, as well as an understanding of context within which their intended mapping project operates, the skills present amongst participants and the knowledge that is required moving forward (Tulloch 2008a).

A second learning methodology that might be considered in supporting the processes involved in community-based and participatory mapping projects is **experiential learning**. This inquiry-based and participatory methodology facilitates collaboration and engagement in a democratic form of dialogue, engaging in the process as fellow researchers and fellow subjects of research (Heron 1997,

283). In this process, participants involved work together to define the questions that need to be explored and the best method to be used in exploring.

Although the processes involved with community-based and participatory mapping projects are participatory, it is not common that **participatory monitoring and evaluation** frameworks are utilized. Commonly, a subset of individuals, such as academics, experts, authors or consultants, will determine the best way to monitor, evaluate and assess impact. Participatory monitoring and evaluation is a process wherein the participants themselves engage in the monitoring process. Even if it adds tasks to an already often over-burdened group, participatory monitoring and evaluation allows participants to determine the best means to assess their work, adjust processes as they progress and encourage on-going data collection so that impact can be assessed and communicated to internal and external stakeholders. This participatory process can be utilized in conjunction with problem-based and experiential learning methodologies as a way to ensure that activities are as suitable, appropriate and effective as possible. Engaging participants in monitoring and evaluation processes further engage those involved and provide additional motivation as successes are noted throughout the mapping process.

Participation & Participatory

Before plunging into this topic, which is at the core of many discussions of indigenous map-ping, we want to note that the term "participatory" has been overused and abused. In recent years it has been attached to so many disciplines and used as a modifier for such a range of practices that it has been rendered next to meaningless (Chapin 2005, 627)

Participatory projects and research seek to work with those affected by the issue being evaluated, advocated or otherwise, and their participation is suggested as key to social change (Macaulay 1999). Despite being commonly used, defining what participation and participatory means requires clarification. Participation may involve simply knowing, or it may include participation in decision-making; it may be a form of manipulation and it may be a form of citizen control. Understanding the various forms that participation can take informs how varied participatory mapping process can be. Two examples of 'participation ladders' will be explored here, although these two ladders ought to not be considered the only ways that participation can be understood.

Table 1. Ladders of Participation

(Arnstein 1969; Shih 2004)	(Craig 2002)
1. Citizen control 2. Delegated power 3. Partnership 4. Placation 5. Consultation	1. Public participation in final decision 2. Public participation in assessing risk and recommending solutions 3. Public participation in defining interest and determining agenda

6. Informing	4. Public right to object
7. Therapy	5. Informing the public
8. Manipulation	6. Public right to know

Although often advocated as facilitating the highest levels of participation, community-based and participatory mapping projects provide examples from all rungs of the above ladders of participation. The ladders of participation presented in Table 1 have the highest levels of participation at the top of the ladder, and they are noticeably different. Whereas Arnstein and Shih refer to citizen control, Craig lists participation in decision-making, in these two ladders the 'best-case' for participation differ significantly. The bottom of the two ladders is similarly varied, whereas Craig speaks about the right to know, Arnstein and Shih include manipulation as a form of participation. Arguably there are examples of manipulation that are self-described as being participatory mapping projects, and these examples are explored below. Despite the differences in the ladders of participation, what is clear is that participation is not a term that has an agreed upon meaning in practice and that much more reflection is required when community-based mapping projects describe their work as participatory. The form of participation taking place will greatly influence the potential impact of the project, which may be a transformative and empowering process or it may be a means to exert control and disempower.

'Participatory' has become a term that can mean anything, as such the term itself requires reflection and investigation (Macaulay 1999). Some forms of participatory mapping, for example, necessitate that an intermediary, such as a developer or academic, whereby 'participation' in and of itself is modified as additional stakeholders become involved, respectively with their own objectives and motivations for engagement (Sieber 2006). In theory, participatory processes are designed to be biased "in favor of dominated, exploited, poor and otherwise ignored

women and men and groups" (Hall 1992, 16). However, too often participatory action is assumed to have these qualities, while in fact the may simply involve these groups and maintain the biases against such individuals and groups.

One of the double-edged swords to 'participatory' action is that "there are no methodological orthodoxies, no cookbook approaches to follow" (Hall 1992, 20). While the lack of prescriptive methods open doors for new, innovative and revolutionary practices to be attempted, it can also result in methodologies that are taken from past methodologies, resulting in replication of problematic structures under the guise of participation. In some cases, such as agroforest development for example, participation is considered to be a requirement for success. However, this approach is taken not because it is empowering or a more inclusive democratic process, but because it is a cost-effective means to acquire required information (Mbile 2003).

Experiences with participatory approaches in community-based mapping projects, at least in some cases, has been frustrating due to low levels of participation and a lack of interest in this methodology from policy makers (Brown 2013a).

> The substantial interest and investment of funders in community collaboration have been matched by the passion of the people involved in collaborative efforts to make a real difference in their communities. Yet, for a number of reasons, the experience with community participation initiatives in the United States over the last 40 years seems to have generated more frustration than results (LaskerRozD 2003, 15).

Some have suggested that participation may not be as important as some advocate. Accountability to communities, for example, has been suggested as being more

important and having community participation (Anau 2003). Rather, it has been suggested, "it may be more efficient to identify the most qualified individuals locally and give them intensive training to become specialists" (Anau 2003, 1). Some researchers have shifted away from only using 'participatory' methods to including additional methods, such as inviting experts and specific interest groups (Sletto 2009; Zhang 2013). Rather than a community-driven approach that seeks to involve the participation of the 'community', mapping projects have focused upon exerts, similar to a Delphi-style methodology. Examples of this include seeking the participation of people with specific professions, links to an environment, those with vested interests, decision-makers and "knowledgeable community members" (Klain 2012, 105). One of the most widely published public participation GIS mapping academic has also began to diversify the way in which 'participation' takes place in mapping projects. Rather than solely use random samples, a 'volunteer' segment of the community was also included (Brown 2013a) and in another case randomization was used along side site visitors and advertisements (Brown 2013). Interestingly, the results from the two groups were different, which suggests these shifts in methodology, although often minor points in brief methodology sections, can significantly affect the information that is collected, and therefore the conclusions drawn from such projects (Brown 2013a).

It is, some suggest, difficult to find concrete data that shows broad based participation are more effective at achieving the sought after outcomes than other methodologies (LaskerRozD 2003). The literature suggests that participation help "create a shared understanding of problems and vision for positive change", which can facilitate an empowering process (Corbett 2003, 61). Yet, the ambiguity results in unrealistic expectations for those involved with community-based and participatory mapping projects, resulting not only in frustration for researchers but participants as well (LaskerRozD 2003).

Participation is a form of power; and participatory methodologies provide an avenue through which power relationships can be navigated and negotiated (MikeKesby 2005). One outcome could be shared control (Wang 2008a), although this is not always the case. Not all participatory projects result in desired change, some may result in increased internal conflict (Corbett 2003; Pramono 2006), or a loss of power and control, such as through increased state regulation and privatization (Fox 2003).

Examples of 'participatory' mapping also include examples where participants have to be convinced in order to participate (RamirezGomez 2013). In this case, for example, promises were made in the negotiation period as a means to convince the community to participate, which included training, transportation, building materials and monetary contributions (RamirezGomez 2013). In these cases it is clear that the objectives and vision of the mapping work is not driven by the community itself, rather they are brought into a vision determined by outsiders. Negotiating the goals as equals would enable for a higher level of participation to take place (Macaulay 1999), yet this form of participation needs to also be recognized for what it is: negotiated goals, rather than community set, driven and owned goals. In other cases, participatory mapping projects have been originated, driven and owned by communities and have been instrumental in making claims for land and resources (Stocks 2003).

One of the deconstructions of 'participation' is who actually participates. Often there is an assumption that communities are homogenous bodies acting with a singular objective and vision. These generalizations may include the poor, indigenous communities, marginalized persons or more broadly 'community'. Participatory mapping projects do not involve every person in a community and therefore some people are not participating, which may be marginalized groups within the community, or specific voices of the community, such as women, youth or children

(Corbett 2003). Others may be excluded due to barriers, such as a lack of internet access or a lack of familiarity with online applications (Brown 2009). In one study, a full quarter of invited participants refused as they felt they were not able to contribute, while approximately another tenth of the participants said they were too busy and refused (Brown 2009). Studies such as these demonstrate that even those methodologies that are participatory may not actually result in participation.

Participatory methodologies, as a result of their suggested potential for transformative, empowering and inclusive democratic decision-making outcomes, have become widely adopted. Some suggest that participation, despite its revolutionary roots, is becoming "increasingly prescriptive, standardized and inflexible", partially as a result of the movement to universally apply, replicate and scale-up participatory processes (Corbett 2003). The appearance of participation, uncritically accepted as the best-practice, can be an "opiate of the masses", whereby participation is a means to legitimize decision-making (Mccall 2004, 4).

When participatory methods are conducted in a fashion that enables a high level of participation and includes a broad spectrum of those involved, that mapping effort may also neglect to fully recognize the history, skills, knowledge and background that the community and its members have with regard to the map, mapping and information involved (Chambers 2006). In many cases this will occur when experts, academics or stakeholders make assumptions about what the best map ought to look like, about who is best able to make maps and how much input those not familiar with mapping ought to have (Chambers 2006).

Participatory mapping can give voice to minority groups, it can express history that is often unheard and it can be a means through which marginalized and oppressed people seek recognition and retribution. However, participatory mapping is not exclusive to these uses. New technologies used to create and present maps

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processes information, but do not acquire it (Poole 1995). Passive technologies that, in and of themselves, are not driven by ethics, thus returning mapping process to the challenge posed by Harley of addressing the ethical failure of maps (Harley 1990).

The objective of this brief overview of participation it to make clear that 'participation' and 'participatory' approaches require much more thought, reflection and criticism in community-based and participatory mapping projects than they are currently given. The focus of this literature review is on the impact of mapping projects, of which participation plays an important role. That being said, the emphasis in analyzing the degree of participation in mapping projects will not be primary in this study.

Empowerment

Empowerment, like participation, is a subject about which much ink has been spilled and doctoral theses dedicated to (Corbett 2003). This overview will not explore the term in great detail, however the objective of this section is to provide a brief introduction to the meanings of empowerment and how empowerment manifests itself within community-based and participatory mapping literature.

Empowerment is often an objective of community-based and participatory mapping. Many such projects assert that empowerment was an outcome of the mapping project. However, few define what empowerment actually means, how it comes about, how that empowerment interacts with the power of others, and for how long such empowerment continues. That is not to say that empowerment is definition-less, it has been widely defined. Rather, community-based and participatory mapping projects commonly do not dwell upon these questions while engaging in empowering participants. One example of this comes from a special session of the National Center for Geographic Information and Analysis wherein three-quarters of the presented papers claimed that empowerment was an outcome, however "there was little or no explanation given in these papers as to what was meant by the term empowerment and how empowerment was to be identified" (Corbett 2003, 45). Elwood, as another example, states that there are "a dearth of studies that explicitly conceptualize empowerment in the examinations of the impacts of GIS" (Elwood 2002, 906) and the criticism of poor conceptualizations of empowerment within community-based and participatory mapping is a trend that has continued (Bryan 2011).

Empowerment has been defined in social, economic, political and personal transformations. Often these conceptualizations are in relation to a singular event.

This, however, may miss a key factor in the empowerment question, as power is not something that is given to some without effect upon others and power is not a static entity, it therefore must be understood within historical and potential future changes (Roy 2010a). Empowerment has been described as being "common parlance yet remains poorly theorized" (MikeKesby 2005, 2051). Another states that the "discourse on PGIS offers no commonly accepted operational definition of empowerment nor does it establish a clear link between empowerment and PGIS (Corbett 2005, 92).

Not all uses of community-based and participatory processes seek to empower participants. Some are primary to inform and/or be an object of study in and of itself (Brown 2009a). It ought not, therefore, be assumed that all community-based and participatory projects set out to empower those involved or that empowerment necessarily is one of the in-process or post-process impacts.

For those community-based and participatory projects that do seek to empower those involved, there are a few cases where empowerment could be qualified. One study, for example, specifies an empowerment of increasing social influence or political power, disempowerment a decline of such influence or power and 'empowerment capacity' as the "internal condition of an individual or community that influence their empowerment" (Corbett 2003, 49). Within that particular study, it was demonstrated that participants and communities were empowered and their empowerment capacity was increased; individuals were more empowered by skills and processes whereas for communities it was information and tools (Corbett 2003, 3). At the same time, other individuals and communities were disempowered as a result, and it is uncertain how lasting those (dis)empowerment changes will be or how significant they are (Corbett 2003).

How those processes manifest themselves are dependent upon the socio-cultural, political, historical, economic and technological conditions of that particular place and time (Corbett 2003; Harris 1998). As Corbett finds,

> Empowerment is largely dependent upon pre-existing conditions in individuals and communities. The higher the empowerment capacity an individual or community already had, the more likely they were to use the PGIMS project to further empower themselves (Corbett 2003, 217).

More than a decade and a half ago it was argued that empowerment is not a process whereby a person or a group of people gain empowerment. Rather, activity such as community-based and participatory mapping "simultaneously marginalizes and empowers people and communities" (Harris 1998, 69). The (dis)empowering nature of community-based and participatory mapping has been observed in practice in a wide range of settings. Sometimes these changes are as intended, such as shifting power and power relations with regard to rights to land and resources, particularly as maps are a means through which communities can speak the same 'language' of the holders of power (Pramono 2006). In other instances, mapping can result in unintended shifts of power that can create conflict (Anau 2003; Fox 1998; Hodgson 2002; Wright 2009). In other ways, mapping can both empower and disempower, in different forms. At the same time a community may gain political power while also be disempowered by the way in which mapping records, presents and shares indigenous knowledge (Pramono 2006). Others have suggested that common cartographic process may be toxic to indigenous people (Rundstrom 1995). The costs of empowerment have also been suggested as increased state control and regulation as well as neoliberal approaches to property ownership, which can negatively access and control of land and resources (Bryan 2011). Those disempowering changes may take place at the same time as increased political power for individuals and communities.

Change in power and power relationships may only be temporary in nature; changes may be practically meaningless unless connected with the processes that determine power and power relationships for an individual, group or community (Corbett 2005, 93). Empowerment is not necessarily a positive change; marginalization may be shifted while new elites and power holders gain prominence. An example of this is the empowerment of youth, who may be more familiar with technology and may be more literate than other members of certain societies. As a result of their training, knowledge and newfound position, "they often become new elites" and on occasion "these young people are in conflicts with incumbent elites" (Pramono 2006, 9). In addition to conflict between individuals, the empowerment of individuals within a community can conflict with community empowerment (Corbett 2003).

Criticism of empowerment, be that a lack of coherence in using the term, insufficient tracking of changes to power or unintended outcomes, are not reasons to forget or forgo the objective of empowerment. In some cases, community-based and participatory mapping projects appear to have not sufficiently understood the investment empowerment may take in order to be actualized; rather than understanding empowerment as a complex and complicated process, additional training, repeated training and on-going support was viewed, at least in one case, as potentially having had "compromising our goal of empowering communities" (Anau 2003, 2). Community-based and participatory mapping projects can empower those that are marginalized in society (Corbett 2003). One of the reasons this does not occur is due to poor methodology and practice of participation, as explored above. A second reason is the expectations of stakeholders, researchers and experts that empowerment is a simple process, akin to the provision of goods. Third, (dis)empowerment may manifest itself in unforeseen ways during the mapping process or as an outcome of it. Despite not being exhaustive, these three reasons indicate that empowerment is far more probable when those involved consider the

exact nature and meaning of empowerment for their particular work, including the processes involved in adjusting power and power relationships and the context within which those relationship exist.

As stated at the outset of this section, the objective in including this overview of empowerment is not to attempt a definition, to prescribe metrics by which it can be measured or to suggests ways that the complex nature of (dis)empowerment can be better understood. Instead, this section has been included because of the pervasive nature of empowerment within community-based and participatory mapping projects and the limited degree of critical reflection of it within them. Empowerment will resurface throughout this work, particularly as many projects state empowerment is one of their impacts, however the focus of the content below will be how impact was understood by the project itself, rather than an assessment of empowerment and power shifting process within each of the studies. Other publications can be read with regard to empowerment for a more detailed assessment (Corbett 2003; DiGessaStefano 2008).

Uses & Case Studies

Community-based and participatory mapping is diverse; geographically, its objectives, the platforms, who participates and the unique socio-cultural and political contexts within which they operate. As a result, it is problematic to make assumptions about what community-mapping is and is not. Before delving into an analysis of the stages that such mapping projects go through (pre-process, in-process and post-process), this section will outline some examples of community-based and participatory mapping. These examples do not represent all manifestations, but provide an introduction to the diversity of practices, objectives, processes and platforms that shape community-based and participatory mapping work.

Community-based and participatory mapping may be built around a set of practices, such as collecting and communicating a specific subset of information in order to hold institutions accountable (Parker 2006). In South Africa a myriad of practices were combined, which included interviews, workshops, walks and boundary identification in order to bring forth local knowledge and have those perspectives be voiced while land reform in the post-apartheid state was on-going (Harris 1998; Weiner 1995). Yet others used participatory mapping to create activity spaces in order to understand personal experience of place and degrees of mobility for individuals living with serious mental illness (Townley 2009a).

Mapping has been used to inform people on a wide range of subjects, from potential impacts of climate change (Piccolella 2013) to supporting zoning decisions, such as the creation of national parks (Zhang 2013). Community-based and participatory mapping has even been engaged in tracking, reporting and solving criminal activity (Wang 2012). Examples of the latter include the Citizen Law Enforcement Analysis

and Reporting MAP, of the Chicago Police Department, and IdentifyLA, which supports the identification of missing persons and enables people to participate in the solving of pending cases (Wang 2012, 168).

A mapping project may seek to understand vulnerability as a means to enhance emergency planning and response (Morrow 1999), or as a means to address systematic vulnerability (Gaillard 2013). Youth may utilize maps to advocate for a particular change or community development and First Nations may map to develop resource management plans (Lydon 2003) and record indigenous knowledge (Mccall 2003). In other instances, former asbestos-exposed employees used mapping to collect and communicate evidence about the link between their exposure and disease burden, as a means to support claims for compensation (Keith 2004). Others have used mapping to advocate for more just redistribution of land and management of resources (KyemP 2004).

Some participatory mapping projects have an objective that is for the indirect benefit of those involved, whereby their participation largely takes the form of information sharing and collection for decision makers. This approach was taken in the Lake Chad basin in order to support the optimization of public health resources for pastoral communities (Wiese 2004). The geographical data that was collected sought only to understand the daily life of pastoralists and "determine their capacities to make use of primary health care", rather than involve them in the decision making process (Wiese 2004, 452). In another example, community mapping was done in order to understand livelihood within a watershed area, which was done to support the expert mapping (Cinderby 2011). In these cases, community-based and participatory mapping are often linked to specific research questions and seek to contribute knowledge, although may not involve those being studied in shaping the outcomes.

Other mapping projects have much more revolutionary objectives. The Denver Atlas, for example, sought to take GIS mapping outside of the university and (produce a subversive cartography that had the potential to significantly change local perceptions of urban space and (as a result) reshape local politics in directions favorable to the community partners" (Robinson 2007, 22). The Denver Atlas, driven by community-organizations and activists, involved a process of map making regarding "low-income, marginalized" people but was not one that had a high level of participation from members of those groups (Robinson 2007, 22). That is not to suggest the maps did not have an important impact, the activists involved were able to engage (and embarrass) the decision makers in the city and influence the adjustment of development plans.

The process of map making may be done in order to build the capacity, skills and knowledge of a particular group or community (Parker 2006). Within those processes values may differ and conflicts emerge, while some have suggested that the mapping technology itself can be utilized to explore, understand and address these potentially problematic areas (KyemP 2004). This form of conflict resolution within a group of participants is one of the ways in which community-based and participatory mapping has been used, primarily to reduce or prevent conflict (DiGessaStefano 2008; Fox 2008; Mccall 2003). An example of how this might take place is a mapping project that places competing demands and exploring different scenarios for potential resources allocation, such a process may facilitate for shared understanding and enhance the possibility of compromise in conflict resolution (KyemP 2004). Mapping can, however, foster or create conflict. In some cases, such as projects in areas where pastoralism is a common livelihood, mapping can result in increased conflict, privatization and loss of common property (Wright 2009). Similar concerns have been voiced about the negative impact of such processes. While being utilized to resolve conflict or advocate for rights with indigenous land and resource rights, the access to land and resources may be negatively affected as a result (Bryan 2011).

Some mapping projects involve public participation, although with specific research questions being asked, such as landscape values (Brown 2006) spatial attributes (Brown 2006a) as well as suitability for zoning developments based upon priorities for land use (Zhang 2013). Some of these projects involve random sampling in seeking participation (Brown 2012b), while others work with experts and knowledge holders (Sletto 2009). Other processes seek to engage in community-based and participatory mapping by involving relevant organizations. An example of this comes from Phoenix where this approach was taken in order to develop spatial data on information availability by collecting data on efforts to inform the public about water issues (Cutts 2011).

The way in which maps can be expressed has changed dramatically with advancements in information technology, and as such the platforms upon which mapping projects take place is varied. Despite not being a systematic effort, a collective of individuals have taken advantage of the ability to volunteer geographic information and edit existing information of online maps as a means to counter both the State of Israel and the Palestinian leadership (Quiquivix 2014). Online mapping and counter mapping, in a sense, has become a new "battlefield in the conflict", which is an activity that has been suggested as potentially supporting the demands for justice by refugees (Quiquivix 2014, 445). Counter mapping of this sort has also been done in oral and with ephemeral maps, such as the on-going use of Inuktitut place names in northern Canada instead of those officially sanctioned by the government (Rundstrom 1991).

Individuals and communities have also used more tactile mapping approaches, such as using layers of carton boards to create three dimensional map models. Such models facilitate for discussion of landscape that emphasizes the role of contour and elevation, and as such accessibility and vulnerability. In one case this was done to

explore the impact of sea level rise and the challenges such a change might bring about (Piccolella 2013). This form of map may be the end product in and of itself, or it may be digitalized and mapped according to GIS coordinates.

With this diversity of practice, objective, process and platform some are concerned that the critical assessment of community-based and participatory mapping may be lost amidst the enthusiasm for it. Mapping is "not a panacea, and must not undermine the robust debate on the political economy of GIS, its epistemology, and the philosophy and practice of GIScience" (Craig 2002, 5). This concern needs to be reemphasized today, as community-based and participatory mappers become more common, which thousands of mapping projects being published about (Brown 2014), while the criticism that brought about alternative mapping practices is considered less often.

Evaluation Methodologies

Assessing the impact of community-based and participatory mapping projects necessitates evaluation. That may include an assessment of the design, an evaluation of the process as well as the impact. Although impact is the focus of this study, design and process are key components in understanding effectiveness and focal to re-designing and adjusting processes so that improvements can be made. Many traditional evaluation methodologies outline phases, which are conducted in a linear fashion. When evaluation is interlinked with on-going monitoring activities the evaluation process can be continuous, enabling projects to respond to changes, unintended outcomes and adjust processes while they occur, rather than as a post-process finding.

Monitoring requires that specific components be tracked as the project progress, ideally measuring change from a baseline assessment and historical contextualization. Determining what these components are entails exploring, and sometimes determining, what the main issues and questions are. Within community-based and participatory mapping much of the energy has been focused on "spatial data collection and analysis" while the focus of evaluation "has been on the PPGIS tools and technology, rather than outcomes of the participation process" (Brown 2014, 134). One of the common perceptions is that evaluation is simply a tool done for the sake of donors and that it takes time, energy and resources away from the 'real work'. Recognizing the value that on-going monitoring and evaluation offers for a project, which includes a means for on-going improvement of the task at hand, can act as a motivating factor for individuals within such a project to engage and invest in these processes.

Evaluation may be thought of as a technocratic endeavor wherein prescribed and rigid metrics are followed and reported on. In many community-based and participatory mapping projects this is not the case (Catley 2013), and even within projects that have international standards, such as for health related projects, there is great room for ingenuity, innovation and creativity. One way to foster this is through participatory monitoring and evaluation approaches, which enable those involved in the project to frame the way in which monitoring and evaluation will occur, and as such the best way that those processes can benefit the project.

In the past, evaluation often reported on the completion of tasks, such as offering training to fifty individuals. It is becoming more common, and is far more informative, to try and evaluate what that training changed for the fifty people involved. This is impact evaluation. This ought not suggest that process evaluation is unimportant, because it is the effective and appropriate function of processes that lend towards positive impact. Community-based and participatory mapping projects will face the same critical skepticism and doubt, including those participating in them, unless and until evaluation processes can demonstrate successful processes and positive impact (Catley 2013), a process that can be incorporated into the project operations (Mackenzie 2012). These are referred to as operational processes, operational outputs and outcomes and impact, which are known through process indicators and outcome and impact indicators.

Evaluation can inform the extent of continued relevance has, in other words determining if the project continues to meet the needs, priorities and objectives. It can also indicate the results, meaning the degree to which a project achieved its goals and what impact the project had, including intended and unintended changes. An evaluation may also demonstrate the cost-effectiveness of a project, in other words knowing if the project is an appropriate and effective way to achieve the

goals and objectives from a financial perspective. Monitoring and evaluation also supports accountability, transparency and learning.

This section is not meant to act as a guide to monitoring and evaluation, other works are available that can be referenced for that purpose (Catley; Ifad 2009; Ifad 2010; Ifad 2010a). What this section aims to do is overview some of the techniques involved in monitoring and evaluation, which are fundamental in assessing impact. The methods that follow are not exhaustive, however it is hoped that this presentation provides ample food for thought when considering why and how evaluation ought to take place.

One of the way that indicators and objectives can be identified is using **problem trees**. Using this approach, participants start with a central problem and explore its causes and impacts. After having mapped out the problem, the causes and impacts can be collectively ranked for prioritization, and connected to demonstrated their connectivity to others. Having gone through this process, the group will be better able to determine objectives and steps required for change. These objectives should then be considered within the overall objectives so that strategic choices can be made with regard to available time and resources so that the both the operational plan and the evaluation plan are practical and achievable.

Process evaluation is conducted in order to assess the design, activities and implementation of a project. This form of evaluation supports participants involved in the project understand procedure, method and progression of the work. Although this will not explore the impact, process evaluation is crucial in ensuring that the project is being done in an efficient, effective and appropriate manner. This might mean, for example, ensuring that participation is truly participatory, or that the benefits of the project are manifesting in the planned fashion. Despite not outlining impact, it does enable participants to assess the quality, while also facilitating for

adjustments to the processes in order to improve upon on-going activity. Process evaluation also provides important lesson learning for future activities and projects.

Some of the questions that might be explored within a process evaluation may include:

- Are the strategies aligned with objectives and activities?
- Who is participating? Who is not participating?
- Who makes decisions? What is the role of stakeholders?
- Who is benefiting? Who is being harmed?
- Is the work cultural appropriate and inclusive of all members of society?
- Was training offered in an appropriate and thorough way?
- What are the barriers and challenges in implementation?

Whereas impact evaluation seeks to understand the changes that were brought about, process evaluation explores the way in which a project is implemented (Catley 2013). A process evaluation provides a "frame of reference for asking questions about project implementation and results" (Robinson 2011, 811), while recognizing the diversity of stakeholders within a project (including participants and the community) and being relevant to each of the respective information needs (Robinson 2011, 814).

Since participation is a critical component of community-based and participatory mapping work, **assessing the level of participation** may be of particular interest. Some of the considerations in assessing participation may not relate specifically to the participatory process, but the structures around which participation occurs. For example, the location of the meetings and the time of day will enable participation for some and act as a barrier for participation for others. The arrangement of the participation may reinforce power hierarchies, or it may encourage engagement. As explored above, the nature of participation varies significantly, and should be one component of the process evaluation.

Impact evaluation, on the other hand, seeks to understand, what changes resulted from the activities that took place. This includes the intended and unintended changes, and moves beyond outcome evaluation, which is a summation of planned activities that were completed (Robinson 2011). Assessing change in community-based and participatory mapping projects has included, for example, observation, focus groups, surveys and interviews (Trudge 2010), although additional methods will be explored below. Evaluation approaches for assessing impact can be qualitative and quantitative in nature and can be entirely driven by community-defined indicators (Catley 2013). Determining what to measure in this way can provide different indicators than participatory monitoring and evaluation because community-defined indicators come from a wider audience (inclusive of everyone involved in the change) rather than being limited to those participating in the project itself. Community-defined impact indicators can also be re-defined throughout the process, such as at the outset, in the midst and after completion of a particular set of activities (Catley 2013).

Community-based and participatory mapping often seeks to change complex social problems, which are often not easily measurable. This, however, should not discourage those involved in such projects from considering participatory monitoring and evaluation processes. Advocacy for policy change, for example, may seem difficult to evaluate, and without doubt it is challenging. However, such a project might assess change in the reports of the respective policy-making body as a result of the advocacy work. It might also include the influence that advocacy had in meetings (gaining supporters and advocates within that body) as well as actualized change in policy. Indicators of this nature often take the form of **qualitative monitoring**, as opposed to quantitative monitoring, which often takes the form of numerical measures.

There are a number of qualitative monitoring tools that can support monitoring and evaluation process, which may speak to process evaluation as well as outcome and impact evaluation. Some of these techniques include:

Case stories and narratives: This provides detailed information about the project from experiential perspectives. Case stories and narrative have been used in a quantitative fashion, however they are commonly used qualitatively. Case stories and narrative provide a unique exploration of what occurred, and may be particularly useful when the project is unique or operates in a highly unpredictable context. Case studies and narrative may also be a particularly useful way to communication impact for certain stakeholders.

Selected interviews: Interviews with selected individuals can provide important insight into some of the less visible impacts that community-based and participatory mapping has. Selected interviews might include community members, mapping participants and decision-makers. However, this data is not generalizable, it can provide important and useful insight on impact.

Random interviews / survey: Random interviews, which may include mapping participants, can help to mitigate potential bias in selecting interviewees. Unless a statically significant amount, these findings are not generalizable, but can provide valuable information about impact.

Analysis of historical trends: Some forms of community-based and participatory mapping may require innovative forms of evaluation to capture and communicate impacts. Historical trends can highlight changes that may

have normally taken place, but changed, and help predict future impact. Evaluation of this form could be daily routines, seasonal calendars or annual calendars and will need to be adjusted according to the project at hand.

Expert testimonials: Similar to selected interviews, expert testimonials differ in that key knowledge holders are asked to specifically speak about the impact of a particular project, including those outside of the project itself. An expert testimonial is the opinion of that knowledge holder, rather than an expert tasked with doing the evaluation. This form of evaluation is often used in conjunction with others, rather than as a stand-alone evaluation.

Quantitative tools to support the evaluation process can be effective tools in expressing impact and often use numbers, indexes, ratios and percentages to justify and communicate change. **Quantitative evaluation** is commonly used, but can require a significant amount of time and resources to implement. Ideally both quantitative and qualitative techniques are used, as a means to validate and triangulate the information collected. Some quantitative evaluation approaches include:

Causal inference: Seeks to understand the way in which things are related, and how a change in one (such as a project activity) can result in change in another. Causal inference moves beyond correlation, which suggests a relationship between changes but may not be a cause of that change. Causation seeks to understand how one change is related to other change. This form of monitoring, most often quantitative, such as using randomized statistically significant experiments, uses panel data or surveys.

Ranking and scoring methods: This is a method of collecting information that explores importance, values, options, preference or priorities and is often done with a statistically significant random sample of the population involved in the change. Change can be measured through before and after scoring or as a post-activity assessment. Different forms of ranking may be used, such as pairing, matrix, scoring and weighted scoring. The respective approach taken will need to be determined by those involved, based upon what is feasible, practical and informative.

Change against baseline: A baseline is a collection of data representing a situation before an activity takes place. Follow-up data is collected during and/or after that activity in order to assess the change that took place. This type of evaluation is applicable to a wide range of project types, but needs to be thoroughly considered at the outset, so as to allow for data collection before activity takes place. When done, this can be an important tool to justify and communicate impact.

Utilization: This form of evaluation starts off with the assumption that impact should primarily be assessed based upon the usefulness of the project, from the perspective of its users. In the case of community-based and participatory mapping this might be a specific sub-population or the entire community, but is not limited to those participating in the project implementation. That being said, this evaluation focuses upon usefulness or impact of the project for those that have used or been affected by the project.

Sampling: A sample-based evaluation often involves an investigation of a significant segment of the population affected by the potential change in order to allow for justified generalizations about the entire group. This process may be blind as well as randomized. There are a number of sampling

techniques that can be used for different purposes, such as probability
sampling, purposeful sampling and convenience sampling.

An important consideration in deciding which evaluation tool(s) to use is which
one(s) are more appropriate, which is one form of **validation** in evaluation. A
second form of validation in evaluation is ensuring that the data collected is
accurate. Validation can be assessed by examining the methods that were used for
data collection as well as with **triangulation**, which enhances the understanding of
impact through with the use of more than one data source to confirm the
conclusions being made. Triangulation may be methodological, by using more than
one method to collect data, although it can also be done by using multiple data
collectors and by using multiple theories for interpretation.

The above-mentioned tools for monitoring and evaluation are not limited to specific
project activities. **Collective Impact** approaches enable multiple groups and
organizations to collectively address a complex challenge, and can be measured at
the collective level. Examples of this might include shifting community-wide
outcomes or affecting community-wide impact, such as address unemployment or
crime. This approach may be particularly useful when thinking about diverse
members and activities collaborating in a mapping project. Assessing the collective
impact, even if it approaches the question from a different angle, often utilizes a
mixture of the tools and techniques mentioned in this section.

In community-based and participatory mapping it may be essential to use a mixture
of qualitative and quantitative methods as a range of tools are commonly used. The
impact of technical GIS work may be evaluated through usability, usage and
accuracy while socio-cultural and political impacts may require quantitative
evaluations in order to assess impact (Robbins 2003). One of the concerns in
randomized sampling in participatory mapping is that not everyone engages in the

process, and the results are therefore not representative of the entire body being sampled, which leads some to suggest the use of both random and purposeful sampling (Brown 2009). On the other hand, quantitative information may not be able to answer all the important questions about impact, and therefore must be balanced with qualitative information (Robinson 2011). Based on the review of community-based and participatory publications, explored in detail below, impact is best assessed, understood and communicated when done with multiple methods that include both qualitative and quantitative approaches.

Pre-process

The pre-process of community-based and participatory mapping, as it is used in this study, refers to the agenda-setting, idea development and planning stages of the project. Although these are "activities" that could be considered in-process, this report differentiates pre-process from in-process by separating those activities that occur after the on-set of project implementation from those that occur before. Despite being an arbitrary setting of categories, this division enables for the understanding of impact within community-based and participatory mapping to be contextualized in three phases. However, the impact of one phase is not suggested, by this categorization, to not be influential or to be unimportant during other phases. Rather, this categorization helps to analyze how impact is being thought about, assessed and communicated within community-based and participatory mapping within these respective phases.

Within each of the three sections, the analysis is divided into sections: contributing factors for success, evaluation and impact. One of the trends that emerged, in categorizing community-based and participatory mapping in this way, is that there is much more description about the contributing factors for success in the pre-process phase than the other two while there is a very limited exploration of impact. In the post-process stage, the opposite is true; impact is explored in greater detail while contributing factors for success are brief. In all three phases details of the evaluation were few and far between.

Every community-based and participatory mapping project has a purpose or a reason for coming into being. This might be to provide additional information in order to include missing information (King 2002), to discover new information (Mapedza 2003), to further detail available information (Nackoney 2013) or to

secure rights and resources (Stocks 2003), to name just a few. However, as Stocks points out, much more is needed to achieve these results than maps. In order for community-based and participatory mapping to achieve its respective objectives it must take into account the processes required, in its most holistic form, for the objective to be achieved.

Planning that occurs in the pre-process stage can determine how the project is implemented. This might be fraught with cultural assumptions, hierarchies of power and influence the level of participation (Lydon 2002). Since the activities can be empowering and marginalizing at the same time, it is critical that the planning process be analyzed in order to understand who benefits from the project and why (Craig 2002). When working with a 'community', there is a "tendency to overlook and thus discredit the knowledge and property claims of women, minorities and other vulnerable and disenfranchised groups" (Hodgson 2002, 81). The worldview(s) that set this stage are often not reflected upon, however thinking about them is imperative (Wright 2009).

> … in the rush to use the latest technologies in support of favorite indigenous causes, what is frequently forgotten is that power is not a free good. It comes only at the cost of wresting it from those who have it, and it is nearly always a long and complex process in which maps are only the beginning. (Stocks 2003, 347)

Mapping is just as political and economic as it is cultural (Hodgson 2002), yet not often planned as such. The decisions about what data to collect, how to collect it, how to weight the information and what to input into models are based upon an understanding of what is important and why (Wright 2009).

An example of how influential this pre-process stage can be is within one participatory mapping project in Otago (Brown 2013). In this case the objectives, methodology, user websites, map design, marker type and style, collected user information and area for mapping were determined at the outset, without input from the population that was engaged to do the mapping. While some projects seek to provide information for a planning body, others want to counter it. The Denver Atlas was "designed, in part, as a specific response to the "authoritative" mapping and planning" and "aimed to bring new voices to Denver's downtown development discussions, and to do so in such a way that built and deployed the impressive power of community-based counter-mapping" (Robinson 2007, 21).

In other instances, however, pre-planning outlines a process whereby the mapping is considered to one step, or a tool toward another objective. Mapping boundaries, place-names and land use, for example, was considered in one project as only one element in the process of institutional development (Stocks 2003). In another the mapping was considered a tool that would not improve communication as a stand-alone project, and was therefore used to begin a conversation (Wright 2009). Along these lines, mapping technologies themselves do not facilitate participatory processes, indeed they can restrict participation, and therefore it is the processes involved in using this tool that shape its impact (King 2002). If the pre-process stage allows for it, the mapping process may indicate that mapping is not the preferred means to express the particular information being explored, and another mode of communicating that data develops (Steinbuck 2013).

Whether it is an individual, group or community, the availability and access to resources will greatly influence the project. However, innovative models suggest that where there is a will, there is a way. Open-source software and balloon-kite aerial photography for environmental activism (Warren 2010) is just one example of such ingenuity.

Contributing factors for success

> The steps in making a map - selection, omission, simplification, classification, the creation of hierarchies, and 'symbolization' - are all inherently rhetorical. In their intentions as much as in their applications they signify subjective human purposes (Harley 1989, 11)

One of the most important factors that contribute to success in the pre-planning stage is the outlining and agreement of **clear objectives**. Having all participants understand why a map is being made, what the purpose of the map is and what goals the activities have, allow for strategic, practical and effective plans to be made. Doing so also provides a shared vision to encourage and motivate those people involved with the project. It also allows for re-focusing when new questions, challenges, ideas and directions are encountered during the in-process phase. "Unless you know specifically what you are trying to achieve, you are unlikely to achieve it" (Catley 2013, 20).

Having clear objectives is particularly important because different groups within society may have different objectives for mapping, which may pose significant dilemmas. In Tanzania, for example, land registration, conservation, wildlife management and pastoralist land protection may each respectively be 'counter maps' and have community-based and participatory mapping processes, yet be in opposition to one another (Hodgson 2002). Even if these processes are transparent and acceptable within local contexts (Mccall 2003), the outcomes of these differing objectives may oppose one another. An objective, in this sense, is important, however it also must be contextualized; being participatory and community-based does not mean it is the only, or correct, approach.

Contextualization influences implementation, success and impact. Understanding the socio-cultural, political and economic spheres, and their respective motivations, is one component of this (Bunch 2001, 71). A well designed and planned project, such as one that seeks diverse community participation, may not materialize in practice due to socio-cultural norms (Nackoney 2013, 167). Some of these factors might include: participants unprepared to use gained power, failure to involve participants, operating within a structure unrecognized by participants, and unknown disparities and disputes (Sieber 2006). Success requires, at a minimum, that these "contexts must be acknowledged" (Sieber 2006, 500). Contextualization also considers the time and place within which a project operates; in one place community-based and participatory mapping may have government support, in another it may be criminalized (DiGessaStefano 2008, 14).

One less discussed component is the way in which the map being produced will be viewed. With respect to the objectives, this may include decision makers, the community, the participants themselves, or all of the above. Participants may emphasize the importance of accurate information (Corbett 2003, 164) and data may suggest that volunteered data can be highly accurate (Haklay 2010; Haklay 2010a), others will questions the accuracy (Goodchild 2008) and provide examples for caution in assuming spatial accuracy (Brown 2012). The reasons for participating range from altruism, professionalism, personal interest, social motivation, social status, creativity as well as motivations that include mischief, agendas and malice (Coleman 2009a). With regard to accuracy, contextualization is not limited to validity, but also relates to how that information is perceived. Furthermore, how that perspective changes as mapping technologies changes (Goodchild 2008).

An example of how contextualization of perception is important is the way in which mapping tools might be used. A project may utilize Google Maps because of its ease of use, however traditional mapping bodies, which may be a target of the information, may view the Google Maps platform as not being an authority or accurate mapping platform (Goodchild 2007b). A second example is that some objectives may require that a specific mapping format is required in order to be considered, such as by a governmental body (Mccall 2005). Alternatively, accuracy may not be the objective, nor may it be a critical factor for success. Many community-based and participatory mapping projects are not precise; they are fuzzy, ambiguous and precision may even be counter productive for certain objectives (Mccall 2006, 119).

Having knowledge of the context is what supports success, how one responds and reacts to that knowledge differs based on the objectives. Participants within a mapping project are, most likely, connected in some form; brought together around a particular issue, for example. These wider social connections are important to reflect upon. For example, the Green Map is linked to Local Agenda 21, community cycling mapping to the opposition of car culture, parish mapping to local creativity and innovation, and so forth (Perkins 2007a, 136). Every mapping project, even if occurring locally, is probably supported by a larger worldview that connects those interested in the subject. A lack of self-reflection of worldview resulted in challenges for the Portland GreenMap, as the map was "embedded in a particular environmental discourse" and did not "address cultural, interest, or knowledge barriers in interpretation (Parker 2006, 477).

> To discover these rules, we have to read between the lines of technical procedures or of the map's topographic content. They are related to values, such as those of ethnicity, politics, religion, or social class, and they are also embedded in the map-producing society at large. (Harley 1989, 5)

When contextualization is taken into account, community-based and participatory mapping projects can reduce conflict, mediate conflict and support negotiation within conflict settings (Mccall 2003). They can be a "productive medium for mutual learning, for combining and reconsidering multiple ways of knowing about landscapes and ecosystems" (Wright 2009, 267). In the social sphere, mapping has the potential to highlight commonly unmapped information, such as exclusion and discrimination and develop awareness (Mccall 2003).

Establishing the objectives and contextualizing that within the wider environment leads to next factor for success, which is a thorough analysis and development of the **process**. Some community maps may be more useful to outsiders than they are for community members (Corbett 2003, 151), raising questions about for whom the process took place. While some suggest that community-based and participatory mapping is "compatible" with local concerns (Eades 2010, 2), others suggest it is detrimental (Rundstrom 1995; Sletto 2009) or that current mapping options insufficiently represent the information that needs to be expressed (Pramono 2006). If the approach is deemed useful, it must be considered a priority to the community; when other needs are paramount and the participants have to be convinced to take part, the process may be problematic (RamirezGomez 2013, 7).

Familiarity with the process can be just as important for success as the process itself. Since the "knowledge, expertise, and resources of the involved community are often key to successful research" (Macaulay 1999, 774), those participating need to understand the process and feel comfortable with it. This may include having a conversation about other potential ways of approaching "knowledge", "technology" and "mapping" that might be representative of the community

participation and information sought after. Mapping that does not reconsider these questions may recreate and entrench some of the forms of power and control that are trying to be changed (Robyn 2003). In order to be successful "it has to be placed in a well thought out and demand-driven process based on the proactive collaboration of the custodians of local and traditional knowledge" (Rambaldi 2006, 4). Familiarity is also required for those newly engaging with participatory processes, as these may involve significantly more data than anticipated, which can pose challenges for analysis and use of that information (Mbile 2003).

When familiar and comfortable with the process, it must manifest the **level of participation** that is required and expected. "Participation cuts across the process from gaining a clear understanding of the existing legal and regulatory frameworks, to jointly setting project objectives, defining strategies and choosing appropriate geo-spatial information management tools" (Rambaldi 2006, 4). One non-governmental organization in Indonesia has been using community-based and participatory mapping and finds that key to its success is working with, rather than in competition to, local institutions and having active participation from the community (Warren 2005). As with all forms of participation, there are choices to be made. In the Indonesian example, the utilization of traditional structures may result in a lack of participation by some, and an entrenchment of positions of power for others. On the other hand, mapping outside of traditional structures, or in opposition to them, may result in low levels of participation, which may be just as unrepresentative.

Participation is suggested to be an empowering process (Parker 2006). However, participatory community maps may still lack true participation of representative members of community, which may result in the exclusion of certain parts of the community (Bunch 2001). Efforts to increase participation and enhance

representativeness may be costly and still experience low levels of participation (Brown 2013b). Alternatively, the result may be participation of a particular segment of society, such as one mapping experience resulting in contributions largely from "middle class, affluent, Caucasian community members, who were at least partially invested in environmental causes" (Parker 2006, 474).

Being **representative** is a critical component of successful participation because views within a community differ significantly. On example of how significant this difference can be is with gender, which included the area mapped, landmarks identified, uses of the landscape and livelihood (Kalibo 2007, 148). Variation continues with age groups, education level, interest and familiarity with the area being mapped (Brown 2009). This may extend to geographic literacy and access to and familiarity with technology, the latter of which is linked with income and level of education (Beverly 2008). Being representative does not mean that everyone must be included at all times, as this may be an impossible task (LaskerRozD 2003), however it does show how findings should be communicated, and that the degree of representativeness should be transparent, as it can greatly influence the outcomes.

Achieving mapping goals requires that the **expectations of community change** be realistic. Overly optimistic expectations may result in a loss of motivation when those changes do not materialize as projected. On the other hand, expectations that are too low may not provide sufficient motivation to garner the required community support. One of these challenges is working through the possibilities of mapping, while recognizing areas of change outside of it (Ghose 2001a). A lack of realistic expectations can result in different visions of what community-based and participatory mapping will accomplish (RamirezGomez 2013). It should also be made clear to participants that change is not always positive, and that unexpected and unintended changes may come about (Pramono 2006).

The role of **funding** was not often mentioned in detail, despite many mapping technologies being costly. In many instances, projects involved academics, who often have funding and institutional support to engage in the work. Some systems have been implemented at low cost, however funding is a challenge for most community-based and participatory projects. Having funding can be one of the factors for success, particularly when costly technology is involved. Expensive software and hardware, data management and required skills are difficult to operate on an entirely voluntary budget. Some of these technologies have an anti-democratic potential because of these barriers (Robinson 2007, 5).

Champions, those who support, advocate or promote a community-based and participatory mapping project, are an important contributing factor for success. When those champions happen to be in positions of power, such as the Mayor's Office, can have a positive influence on the project, and potentially help in other areas, such as funding (Ghose 2001). Information that is required may exist in a number of institutions, champions can play an important role in building relationships and mechanisms for information sharing (Ghose 2001a). Community-based projects that involve outsiders, external experts or academics are unlikely to be successful without champions from within the community (RamirezGomez 2013, 19).

One of the pre-process decisions that sets the stage for potential success or failure is how information is owned, and by whom. "It is important to consider how community members wish to have information recorded and disseminated" (Ifad 2010, 8), lest those involve feel they are being abused and the information they are providing is misused. **Ownership**, however, is not always straightforward. Community leaders, researchers, government, non-governmental organizations and donors may respectively have opinions with regard to how data ought to be owned, a process that require care attention and agreement by all involved (Mackenzie

2012). This is becoming increasingly important as ownership is crossing boundaries with privacy with new mobile technologies (Christin 2011, 1928).

Not all projects run into disputes about ownership, particularly when ownership is built into the pre-process planning. Ownership and usage agreements have been arranged in ways that are beneficial for all involved (RamirezGomez 2013). In addition to information and intellectual ownership, participants and communities can take ownership of the mapping process itself (Nackoney 2013).

Sometimes negotiations result in ownership arrangements that may stifle the potential impact of the community-based and participatory mapping process entirely. In one instance a community granted permission to distribute maps, but many did not want that information shared with the government. Recognizing that once maps were distributed government officials could gain access to them, the community decided to retain maps in their possession to share as appropriate. As a result of the remote location of the community, however, the map has had limited practical use, "leaving the multi-year mapping project largely futile" (Fox 2008, 205). This emphasizes the importance of considering ownership in the early pre-process phase.

Making mapping tools available and accessible to the public provide opportunities for their use, however "little effort to date has been put into addressing the communication and discussion needs of participatory planning" (Tang 2005). **Communication** is an important internal and external component that enhances the potential for project success. A good communication strategy not only understands the content and audience, but also is driven by **transparency** (Drew 2004).

Poor communication and a lack of transparency can negatively impact the trust that participants and the audience for communication have for the project. Building trust, through communication and transparency, as well as other important processes, is a "critical ingredient" in community-based and participatory mapping (Corbett 2006, 16). Trust is where community mapping begins (Amsden 2005a), which includes being open about ethical dilemmas, such as researcher versus community demands (Elwood 2007).

Although many recognize that community-based and participatory mapping will only be successful if the participants are respected as knowledge-holders (Amsden 2005a), the process of ensuring participants were treated as experts is often not described. This form of **respect** moves a level beyond participation, but shows socio-cultural awareness and understanding through the way in which the project operates. It also includes ensuring the required time is invested so that the objectives can be achieved, rather than externally set timelines and agendas (Corbett 2006).

The pre-process stage must consider the way in which **power** can shift as a result of the activities. As discussed above, empowerment can be an outcome, while at the same time marginalizing others. Power may manifest itself in different ways, such as building capacity to resolve conflict, take collective action (DiGessaStefano 2008, 15) or deal with external power-holders (Warren 2005, 35). Participation-driven empowerment can be an "illusion of control" (Sieber 2006, 491). Some suggest that "community mapping is much less frequent or emancipatory than might be expected" (Perkins 2007a, 127). Empowerment is one of the expectations that must be attainable, rather than idealized.

Evaluation / Strategy

> We can therefore now only speak of potential benefits to communities as a result of the application of this methodology. Intentions and plans do not benefit communities by themselves, their effective implementations do. (Mbile 2003, 6)

Many community-based and participatory mapping projects consider evaluation to be a concluding activity. IFAD, for example, in a publication on participatory mapping list evaluation as the final step of a circular process (Ifad 2010a), its publication on communications and community mapping places a greater emphasis on the role and on-going importance of monitoring and evaluation (Ifad 2010). Evaluation only after the mapping phase and map use phase will, by its very nature, be limited and limiting, rather than encouraging on-going reflection, and improvement as a primary processes within all stages. As IFAD correctly makes not, evaluation beyond qualitative experiential data requires baseline information so that components as wide ranging as empowerment and greater control of land and resources can be assessed (Ifad 2010a). However, evaluation ought to not be limited to one part of the process cycle and should be an on-going exploration.

There are very few examples from the literature that thoroughly evaluate the pre-process phase. This may be because they are too short-term (LaskerRozD 2003) or that during the initial stages evaluation is not a consideration. When evaluations do take place they often focus "more on their ultimate goals than on the impact of the collaborative process in achieving those goals" (LaskerRozD 2003, 15). When the pre-process is described, it is often in the form of activity summation, such as the criteria, technique and data collection tools (Zhang 2013), although little discussion is offered about the effectiveness and impact of these pre-process activities.

Impact

> There is an implicit, sometimes explicit, assumption that using GIS at this
> local level is both efficient and effective, in that it is believed to
> simultaneously deal with the planning content, answer the questions asked
> of the geo-information, and also address and satisfy the local stakeholders'
> underlying interests. (Mccall 2003, 550)

Just as the literature is brief on the evaluation of the pre-process phase, so too is it
with regard to outlining the impacts that results from pre-process activities. That
being said, some consider the mapping process to be an end in and of itself (Lydon
2003, 21), that is often not accompanied with assessment of impact.

Some important exceptions indicate a more reflective approach to the pre-process
activities, yet do not offer justification for potential impact beyond assertion. Many
projects across the world have taken place by, or in partnership with, Green Maps.
Their Impacts report highlights a wide variety of mapping projects, however data
about monitoring change and linkage to change is limited to brief narrative
(GreenMap 2009). Participation, for example, is believed to be important in
"building local capacity, empowering communities, facilitating communication,
breaking down entrenched power structures, and fostering democratic institutions"
(Chapin 2005, 628). Maps have "shown themselves to be useful tools, increasing the
users' capacity to advocate, lobby, plan, manage and monitor territorial and land-
related issues within the mapped area" (DiGessaStefano 2008, 14). If this occurred,
how it happened, to what extent change occurred and for how long, is not explored,
however. Critical reflection of mapping resulted in some wondering if the reason for
change was the mapping process or the creation of a group that came together to

make the map (Hoyt 2011). Even if some may doubt the importance of this questioning, it does call into question the assumed impact of community-based and participatory mapping and suggests much more needs to be known before assumptions of causation are made.

In-process

The in-process phase refers to those activities that occur while the mapping is taking place. Some of the literature refers to in-process activities as the processes of production. Factors for success and impact were addressed in a more equal fashion in the literature with regard to this phase. The methods, processes and techniques of in-process evaluation, however, were uncommon. This occurred despite recognition that processes and activities of the in-process phase influence the way community-based and participatory mapping takes place, how it is used and its impact (Elwood 2000).

An in-process activity, for example, includes data collection. This may be a description of how activities were managed, recorded, tools that were used, features being mapped and the way in which that mapping took place (Brown 2006; Dongus 2007). It may outline how meetings were conducted, who participated and how often mapping events took place (Yearley 2003). Information about the mapping processes are often provided in the in-process descriptions, such as the use of aerial photographs (Mapedza 2003) or 3D mapping (Piccolella 2013).

Other processes are designed for a specific purpose and to achieve particular outcomes by researchers. For example, this may include collecting information with the community to improve accuracy (Carter 2007) or from the public to learn about landscape values (Beverly 2008) or with regard to development preferences to inform tourism and residential development planning (Brown 2006). In that mapping project individual maps were randomly mailed to residents of the area, the data is sent back, analyzed and presented as a collective expression of values and preferences. Another example is a project that collected data, using participatory methods, in order to improve urban mosquito larval control (Dongus 2007).

Although participatory research methods were used to collect the data, these projects are often low on the ladder of participation. That being said, they may achieve their goals and be important tools to support decision making. In the latter example, the community-based and participatory mapping project resulted in complete coverage of mosquito larval habitat surveillance and control (Dongus 2007).

For some community-based and participatory mapping projects the process is considered an end in and of itself (Lydon 2003). The process is suggested to be a transformative (Wright 2009) and potentially empowering process. That being said, the in-process activities that are undertaken, be that mapping itself, discussions, participation or otherwise, are often not contextualized in terms of what the expected transformation is, or when and how empowerment occurs (Corbett 2003). More commonly than evaluating the process when unexpected or less than desirable outcomes emerge, is a change of the tool being used, such as a shift from paper-based mapping to online mapping (Beverly 2008).

Often the processes of participation are described in scientific and academic terms, such as being "carried-out as normal involving a representative sample of the entire village" (Mbile 2003) without exploring the dynamics of it. Occasionally the description of the in-process will include self-reflection of the process, which may highlight problematic or challenging areas. This might include noting a plan to include women and children in the process, which did not manifest itself in practice (Nackoney 2013). Some projects interact with different groups within the community separately in order to ensure that all voices are expressed, even if they cannot be expressed in an interactive forum (Mapedza 2003).

Contributing factors for success

'Success' in community-based and participatory mapping is hard to define. A project may not reach its intended objectives, but be successful in unintended ways. The outcomes and impact are also influenced by activities outside of the project itself, as it operates in a complex environment. When seeking to change a law or policy, for example, the political context involved governmental openness, resources, ability to engage and participate in decision making processes, the government's perception of, and experience with, community-based and participatory mapping, to name a few (Ghose 2001a). Thus far 'success' has not been defined for the purposes of outlining the contributing factors for success, which was purposeful. The reason for doing so is that 'success' ought to not be confined to a certain set of parameters. Instead this study vaguely uses the term 'success' and uses the myriad of ways in which success, and the factors that contribute to it, are articulated within the literature.

The information collected for a map might be ground breaking and have the potential to revolutionize the way a problem is thought about or decided upon. However, if that information is not presented in a way that is understandable, it will not have the impact that it could potentially have. **Usability**, therefore, is a key component that contributes to success. This refers to the usability of a map in collecting information, inputting information, altering information, understanding information and communicating a particular message.

Interacting with information and the system within which that information is housed is a common measure of usability (Hacklay 2002). The functionality of a system, meaning the completion of tasks as needed in an efficient fashion, is another measure of usability. However, a wide range of measures can also be considered, such as: learnability, memorability, satisfaction and flexibility (Hacklay 2002).

Usability also includes assessing the information and map as a communication tool. This includes evaluating how the presentation of data affects the type and amount of information that is absorbed by a viewer. Some maps, for example, what to demonstrate complexity, but in doing so create a map that is too complex to convey its own message. 'Cleaning' information in order eliminate irrelevant information or data that falls outside of the area/issue at hand has been one approach in dealing with large volumes of data while striving toward creating a map that is usable (Brown 2013).

Usability is particularly important for participatory projects since the nature of the enterprise is to encourage everyone to be able to contribute. However, mapping systems can be complex and facilitating for usability may require training for the use of the tool involved. Experts and practitioners are often "unaware that they are imposing their wares" (Chapin 2005), and those that are participating are effectively barred from participating. "The prior knowledge and the abilities of the map user influence the efficiency and success rate", which includes a diverse range of required knowledge and skills beyond mapping in order to engage within a process that uses mapping.

A diverse array of participants that engage within participatory mapping projects may be evidence that this approach enables more inclusive input, however this assumes that participants have sufficiently map literacy to actively engage with the process. This consists of map knowledge, comprehension, application, analysis, synthesis, evaluation and may require participants to engage in recognition, reorganization, detection, estimation, decoding visual patterns, parsing spatial relationships and beyond (Clarke 2003). As such, making maps more user friendly and visually appealing may draw participants into the process, their participation will be determined by the knowledge and skills of mapping itself.

Participation can be looked at from different perspectives. One contributing factor for success in community-based and participatory mapping projects is the level of **inclusivity** in the participation process. Being inclusive means understanding who participates, and who does not, as well as whose knowledge and perception is expressed, and whose is not. Inclusivity may be negatively affected by pre-set or pre-determined agendas (Parker 2006) as well as the participatory process itself (King 2002). Regardless of the number of people involved, the relationships between those participating will influence the outcome and impact (Sieber 2006).

Inclusivity includes understanding that not all people want the information they share to be public knowledge. Marginalized groups may be expected to share all the information they possess, while retaining control and ownership of knowledge may conflict with engaging in participatory mapping (Edmunds 2002). Often a refusal of participation based upon a systematic barrier to inclusive approaches of knowledge control and ownership may not be known. When surveys are mailed out (Brown 2004), for example, such concerns may result in a lack of participation by simply not competing the task. Similar challenges may arise with online mapping, as a silent refusal to participate based upon a lack of inclusivity is unheard. Some forms of engagement may be avoided out of fear of bias creation, however, if such a process supports more inclusive participation it might be done, recognized and later investigated (Cinderby 2008). If local people do not have control of their maps, they may not be any better off than they were before their lands were mapped (Fox 2008, 210).

Having inclusive participation is not a simple task. One experience found that too much time was spent facilitating community participation in a technical way and too little on the challenging components of ensuring accountability and ownership (Anau 2003). That community-based and participatory mapping project concludes that care must be taken in allowing success in one realm to substitute for success in

another, as "much attention should be given to enabling communities to empower themselves in these contexts, as to the maps" (Anau 2003, 3).

Participation is also a process, and a process that can be "constrained by limited financial and human resources, lack of community organizing skills and conflicting priorities" (Parker 2006, 474). **Participatory processes** refer to how the participation actually occurs, rather than the theory upon which it is based. Some practical experiences of community-based and participatory mapping projects suggests that certain technologies, as a result of their complexity and cost, create barriers for actualized participation of the group as a whole (Ghose 2001; Ghose 2001a).

Some participatory processes end up being representative of only a segment of society. Those participating might be educated, urban members of subethnic groups, "representing "local" situations of which they may no longer be a permanent part" (Peluso 1995, 400). This may be intentional, in order to present a particular voice that is missing from a conversation, or it may be unintentional. One project reported that a major weakness and learning opportunity in their experience was defining participation and how that operates with regard to research and advocacy (Amsden 2005a). Understanding how participation works, why it is being used and the barriers to participation while in-process, or ideally previous to it, allows these challenges to be addressed before it is too late.

The process of participation is also influenced by power, which is often unacknowledged. A mapping project that brought together diverse stakeholders (Bunch 2001), does not discuss the potential role and impact of bringing together individuals and groups that may oppose one another, and may also have significantly different power dynamics. That study concludes that the activities were not "tied to the mandate of any particular agency" and therefore "generated a more

appropriate (i.e., less disciplinary and less jurisdictional) model" (Bunch 2001, 81). It is not explored why or how this was the case, or if the hierarchies of power that normally exist manifested themselves indirectly during the process. That is not to suggest that the project did not, as it concludes, create an improved process, indeed it may have. Rather, it is to suggest that participatory processes must also critically reflect upon what may hinder participation with the structures of the mapping (Ghose 2001a). Dominant groups set the terms of communication to meet their own interests, and further isolate non-dominant groups by using the language of the dominant group, such as technical terminology (Edmunds 2002). The democratic assumption may be flawed and "impossible to achieve" as power hierarchies and differences affect the participatory processes (Edmunds 2002, 2). Instead, "we need to assume that we can only work towards this idea" and be "vigilantly alert to and deal explicitly with power differences" (Edmunds 2002, 2).

Some community-based and participatory projects have opted for a less technical mapping process and mapped outcome, even if that may not lend toward 'speaking the language' of decision makers, in order to facilitate a more participatory process (Hawthorne 2008). All forms of mapping, even those of the low-tech sort, can be influenced by 'intensive-mappers', who contribute a disproportionate amount of information. In one case, seven individuals accounted for more markers on a map than the other fifty (Brown 2012b).

Keeping participants encouraged, enthused and motivated is an important factor for long-term success, which can be supported through a **progression of small successes**. Rather than only having one large objective, the project may have a series of smaller success that can be celebrated. These small successes should be set up so that different stakeholders view the successes as important to them, as 'success' may differ for those involved. A research objective, for example, may differ from a community-determined success, which may also differ from what the

government or donors view as a positive outcome (Mackenzie 2012). This is not problematic per se, however the progress of small success ought to reflect this diversity so as to be relevant to all parties involved.

Contextualization was noted as important for success in the pre-process phase, while **engagement**, based upon that contextualization, seems key for the in-process phase. Engaging audiences, as most projects speak to multiple audiences, requires making the information appealing; certainly "story-making by mapmakers has significant ramifications for public involvement, trust, confidence, and decision making" (Wright 2009, 268). An example of a narrow level of engagement that negatively affected the impact of a project is that of the Portland Green Map. In this particular example the content and context were "embedded in a particular environmental discourse of varying familiarity and palatability to Portland residents" (Parker 2006, 477). Due to the limited scope of engagement with the community, a number of disconnects emerged, which pushed people away from the project.

Well thought out forms of engagement are important for mapping even when participatory methods are used as a data collection tool. Workshops held in secondary schools, for example, interacted with the target audience based upon the socio-cultural and age-based contexts by having gender-specific and age-specific groups (Power 2007). The sessions were facilitated by a person of the same gender as the respective groups, and were conducted in the local language, an approach that was developed after pilot workshops were held (Power 2007). Sensitivity to how engagement took place, in this example, was particularly important as youth were being asked to map places of risk.

When and where **accuracy** is deemed important, there are participatory methods that can be used to verify information. This might include having follow-up meetings

to re-analyze the mapped information (Power 2007) or it might include sending individual maps from a mapping session to everyone that took part so as to provide feedback (Yearley 2003). This can also be done when mapping as a group is not done digitally, but that information is later digitalized, so that all participants are given an opportunity to provide feedback to the digitalized version. Doing so not only adds a process that improves accuracy, it can also be a means of increasing ownership.

One component that allows for mapping success, which is often not explored during the in-process stage, or the pre-process stage, is the state and capacity of the implementing body (hereafter referred to as the organization). Recognizing the diversity of mappers and mapping groups, the **organization** group, or institution itself is a foundation factor for success (Ganapati 2011). An organization may be open to new ideas, have a core leadership group, be flexible and accountable, or it may not. Similarly, the organization map have depth of experience, capacity and collective knowledge, which have a "tremendous influence on the way an organization is able (and chooses) to negotiate system of participatory planning" (Elwood 2000, 21).

High rates of turnover of participating members can harm the process, as agreed upon objectives may become contested and experience is lost (Elwood 2000). Organizational stability enables activities to be completed according to the agreed upon plan, whereas instability requires on-going training, updating and re-visiting of objectives and mission. After having conducted fifteen participatory mapping projects, one researcher concludes that the work "has not substantively increased the level of public impact in decision making" (Brown 2012a, 317). Two of the areas highlighted as causing this are social and institutional constraints.

Since a great number of community-based and participatory mapping projects aim to be empowering, the actualization of **empowerment** is a key factor that contributes to success. One way empowering processes may be invested in is by including non-mapping methods. An example of this comes from an experience with GIS, which can be highly accurate to support travel, but does not impart other forms of essential knowledge, such as how to travel safely (Aporta 2005). In this case, knowledge is learned through years of tutoring and experience; "knowledge that cannot be acquired from books, maps, or electronics" (Aporta 2005, 730). Acknowledging the superiority and necessity of this form of knowledge within the project can be empowering for those that reconnect with, and value, knowledge holders.

Community-based and participatory mapping projects have a stated objective of re-drawing boundaries, for example, but may at the same time foster a space wherein identity can be reborn and rekindled (Sletto 2009; Stocks 2003). Mapping can act as a means of educating new generations about the past, and the meaning of place to the elders and community. Interacting with the youth can act as a bridge to a modern identity, one that links generations together with shared vision and understanding (Sletto 2009). These transformations that take place, often being unplanned and even unnoticed at the time, may be the most influential processes that result from the mapping exercise. When engaging different groups, or conflicting groups, within a community, these empowering processes can build a shared understanding and agreed upon vision for the future that extends beyond the pages of the map (Gaillard 2013).

Some of the empowering processes mentioned above are **unintended outcomes and unintended impacts**. Other such examples include unforeseen social challenges being identified during the mapping process (Cinderby 2011). The information that emerges may be contrary to what was expected, and lend towards

improved understanding and planning (Chan 2014). However, these unintended outcomes and impacts are not always positive, and it takes courage to recognize, share and learn from challenges of this nature. When mapping is viewed as a technical process, devoid of ethical considerations, it may provide anonymous authority and legitimacy to colonial, racist and marginalizing maps (Harley 1990). Community-based and participatory mapping projects are not free from this and can result and reinforce injustice. One example from Tanzania indicates how "clarifying" the boundaries "disrupted traditional reciprocal relationships" (Sieber 2006, 495).

Evaluation

> Even with the assistance of new tools and techniques, measurable
> improvements in outcomes can be elusive. (Tulloch 2007)

The evaluation of in-process activities within community-based and participatory mapping is uncommon. As with the in-process phase, research has focused upon accounting of implementation (Elwood 2000), rather than evaluating the outcome and impact of it. Some forms of evaluation that did take place within this phase include checks and balances upon the processes themselves and the accuracy of the data (Ghose 2001; Yearley 2003). In these cases, however, the effectiveness and effect of these particular feedback mechanisms are not explored in detail.

To provide one example of what is considered a lack of evaluation, yet also asserting impact comes from one mapping project experienced a revitalization of their sense of place, enabled them to negotiate with powerful external bodies and improved their understanding of resources and vulnerabilities, amongst other stated changes. The way in which this was known was "according to most of the participants" and

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statements of the author, however no details of how that information was collected or assessed was provided (Warren 2005, 38).

Impact

Although it was not thoroughly evaluated, a great deal of impact was suggested to have resulted from in-process activities. The ways in which this impact was communicated, the forms that it took and the method(s) utilized in understanding how the activities resulted in impact will be explored in this section. The impact of in-process activities can be both significant and diverse, such as improved resource management, resolution of conflicts, knowledge sharing and capacity building, empowerment, increased political voice and decision making power. Part of the process of map-making may facilitate new understandings and representations, both for those involved in the process and those that interact with them.

One of the initial challenges in having an impact is how knowledge is approached. For some, the community-based and participatory outcomes are made valid and trustable when verified by 'scientific' processes, which might include the use of aerial photography (Mapedza 2003). This, however, seems to be embedded in an assumption that community-based and participatory information requires validation, and similarly must match the epistemological expectations of traditional cartography. Assessing impact is fundamentally connected with what impact means. In this study, impact is considered within the terms of how it was asserted, described and justified and critically analyzed. Being critical, as done here, is not an investigation of each project and verifying the impact, rather it is a process of contextualizing the claims of impact within the wider literature and the way in which that impact can be understood within the theory of community-based and participatory mapping work.

In-process activities, which is largely the map-making stage, can change the social relations, connectivity, spatial relationships and network of a community. Assumptions and perceptions may be challenged and changed on the individual, group or community level (Corbett 2003). Prominent among the impacts of this phase is **empowerment**. Empowerment is poorly theorized (MikeKesby 2005, 2051) and often not defined (Corbett 2005), yet is widely asserted to be an impact. As such, how empowerment occurs, for how long it lasts, its impact on the power of others, and, importantly, how it results in the ability to make change is not well understood.

Examples of how people have been empowered by community-based and participatory mapping include recognition and acceptance, which facilitates for improved positioning in negotiations and decision making (Peluso 1995). Others suggest that "losing fear, gaining confidence, self-esteem, and direction", which emerged from participatory investigation and decision making are empowering processes (Macaulay 1999, 775). The representation of community knowledge and perspectives as well as gaining access to information is advocated as being empowering (Harris 2003).

Empowerment, as mentioned in an earlier section, is not a good that is given or a good that increases for one person and does not affect others. A manifestation of empowerment, such as recognition, might coincide with marginalization (Edmunds 2002). At the same time, disempowerment has also been identified as an impact of community-based and participatory mapping, such as the creation of "a new technical elite" (Harris 2003). It has been suggested that some approaches and technologies used within community-based and participatory mapping are disempowering (Rundstrom 1995)

In some cases empowerment is asserted as an impact, while the processes being described do not indicate shifts in power for anyone – some may understand empowerment in a way that is inclusive of practices that are largely information collection activities. Gaining information, as a stand alone activity, does not necessitate empowerment, lest the term become synonymous with teaching or training. A wealth of data and information may be of little use (Wood 2005), and importantly not result in and shifts of power, rather an entrenching of existing power relationships. The interchangeable nature of the words data, information and knowledge within participatory mapping, when in fact they need to be differentiated (Sieber 2006). One review of more than fifteen participatory projects suggests that, despite it being the primary objective, the projects did not increase public impact on decision making (Brown 2012a).

Empowerment is not only about changing power relationships, however some have defined it that way (Corbett 2003). Empowerment may be transformation of the self, or the selves, that engages with map making. Users that interact with participatory process may feel empowered by participating, "the perception of the participatory experience rather than the outcome" (Tulloch 2007).

> While this might not always be satisfying to Internet application developers anticipating dramatic and instantaneous changes, for countless individuals experiencing mapping at a new level these experiences will be exceptional. And, as an increased number of local citizens use these tools to look at patterns of growth, crime, commercial development and open space, the data and applications will result in a new form of democratization. (Tulloch 2007)

The definition of empowerment will determine if these changes are empowering, or if they ought to be defined otherwise, such as teaching, training or improving democratic process. Indeed, a "changed social role is not necessarily one of

empowerment" (Corbett 2003, 167). Increased skills and knowledge, for example, can also result in disempowerment and marginalization (Corbett 2003).

A more concrete measure of impact that is common to mapping projects, particularly those of the online sort, is **usage**. Common approaches to assessing impact with regard to usage related to the number of participants, volume of data contributed, frequency and duration of visits. In many cases engagement requires training (Ghose 2001a), even convincing (RamirezGomez 2013; Wood 2005). Enabling usage with training can be an empowering process, however map-making may still rely upon technical experts. As such, participation may take the form of information sharing and provision of feedback, rather than map-making. Positive feedback can sometimes conflict with usage. In one instance positive community evaluation of a mapping interface was given, yet was used infrequently by community members (Corbett 2006a). When individuals do use the skills, knowledge and tools gained through the process, they may be entirely unrelated to map making or the objective of the project (Corbett 2003). It appears that impact related to usage requires much more consideration and critical reflection to understand how usage correlates into impact.

A **contribution to knowledge** may be one of the outcomes with some community-based and participatory mapping projects. A contribution to knowledge may lend toward impact in other realms, it often has little impact in and of itself. An example of an impact that emerges out of improved understanding is improving service provision (Dongus 2007) or changing policy (Thompson 2012). These, however, ought to not be considered impacts of knowledge contributions in and of themselves, because these changes often require communication, integration, negotiation and collaboration with decision makers and decision making bodies. The information itself, may not have any

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impact at all without those processes and it is commonly better understood as an outcome. That being said, community-based and participatory mapping may facilitate a new understanding of an issue, contributions to knowledge of this nature, may only be achieved with these processes (Cinderby 2008).

Community-based and participatory mapping may have an impact on **decision making and policy**. In some instances mappers have a significant influence on public policy, with concrete examples of how their engagement has done so (Thompson 2012). In others the participatory maps are used to support decision making, as they are originally designed and funded by decision making bodies. In these cases, decision making is influenced by public participation, although it is not clear to what extent (Brown 2013), or if the approach is being misused (Chapin 2005), such used to justify decisions that have already been made. At the outset, many uses of community-based and participatory mapping projects operate with the theoretical potential of influencing decision making and policy (Welch 2003), however few explore the way in which those impacts will be brought about beyond that theoretical potential.

Post-process

The post-process of community-based and participatory mapping is hard to define. Some projects run indefinitely, while some exist indefinitely but have lost all forms of engagement. Post-process as it is used here refers to a period of time when one or more outcomes have been reached. This section seeks to understand what those outcomes are, how those activities were evaluated and what impact they had. Whereas the literature on pre-process stage explored the methods, processes and activities with little assertion of impact, the literature on the post-process is the opposite; few examples of methods, processes and activities while the assertions of impact was extensive. Of all impacts, most would fall in the post-process phase. Although this may not be surprising to some, it ought to be cause for reflection with regard to those that suggest the process of map-making is the phase that results in the most significant impacts.

Despite the fact that outcomes are produced, such as air quality maps, it is unclear "how good" they are, and can be difficult to assess (Yearley 2003, 257). Accuracy is sometimes sought through external validation, although this is not always an available option, or an appropriate one. Outcomes might be considered positive when agreement emerges, yet this too may be indicative of power more so than shared understanding. A successful project might be one when the knowledge that is presented is communicated and widely interacted with (Peluso 1995), however that may not result in change.

While some outcomes are unclear, in and of themselves and as resulting in positive social change, others are clear. One community used maps to confront illegal loggers, using information collected in a community-based and participatory mapping project to interact with the authorities and support their position. When

the illegal loggers came the first time, the authorities ordered the timber to be returned to the community and the illegal loggers were threatened with severe fines (Corbett 2003, 177). In another instance in the same area, community-based and participatory mapping information, skills and tools were used again to resolve another logging dispute (Corbett 2003). In another case, the skills and tools, which are indirectly related to the mapping project as it was not included in the map, were used to increase power in a negotiation for a logging contract (Corbett 2003, 178).

Another example is the advancement of legal recognition of land rights with the use of community-based and participatory mapping. Claims based on these processes and outcomes have challenged legal standards and supported the recognition of indigenous peoples' rights, such as customary use and occupancy (Wainwright 2009). However, these changes are almost always dependent upon governments, which may have been the same body marginalizing the community in question, precedent-setting legal victories have been won. Victory, however, is sometimes bittersweet. The changes may also necessitate changes to traditional land ownership, for example. "The legal and cartographic strategy thus confronts a racist and exclusionary colonial past, yet reinforces differences and inequalities in the colonial present" (Wainwright 2009, 154). Furthermore,

> … delineating territories based strictly on land use and occupancy does not take into account broader relationships between people and place. Property, language, residence and identity are categories also appropriate to Coast Salish territorial boundaries, while ideas and practices of kin, travel, descent and sharing make boundaries permeable. (Thom 2009, 179)

The challenge of impacts such as these is that many cannot be turned back. It is extremely different to make public and communal what has been privatized. Legal victories that result in shifts such as these need to be critically assessed

throughout the process because mapping according to legal and governmental bodies commonly exist in one format, within which indigenous and other ways interacting with landscapes must fit.

> Many of the documented problems in counter mapping emerge, then, when counter mappers take the spatial form of indigenous territory, delineate it into legible two-dimensional zones of use, management and tenure - and attempt to use such a spatial conception to claim an accurate representation of local land use and management. Such a practice can neglect less visible land uses, land uses that don't fit into abstract space, land uses of marginalized members of the community or of neighboring communities, and can neglect past and potential land uses that stem from dynamic systems of management. (Roth 2009, 208)

The potential for participatory mapping is also influenced by the context within which it operates. It is suggested that in some places, such as Tibet, mapping does not have the same potential as elsewhere due to the legal and political structures within which it operates (Bauer 2009). Recognizing those limitations, however, does not mean that community-based and participatory mapping has no potential to affect change, as it can, albeit in different ways (Bauer 2009).

Contributing factors for success

The contributing factors for success in the post-process phase were not numerous, or explored in detail. The three that stand out are common factors for success in all three phases analyzed, namely: participation, empowerment and ownership. While other elements may have played a role, the focus of the content with regard to the post-process was impact, which is explored in detail below.

The role of **participation** in the post-process phase contributed to success as it encouraged on-going public awareness raising, which translates into continued use and development of the map (Ganapati 2011). Specifically with regard to online maps, which may experience enthusiastic participation while in-process, the post-process period may see interaction decline, or stop entirely. Some projects have a timeframe or are designed for a specific purpose and period; for those that are on-going, participation is a critical factor for success. Enabling continued engagement may require creativity, such as using social media and having contests, while ensuring that participants see that their interaction is contributing to an objective. The latter point ties into communicating impact, which is explored below.

Linked with a feeling of contribution, or of personal benefit, the ability for a project to empower those that engage with it will contribute to its post-process success. **Empowerment** in this form may be building capacity so that maps and map-making can become a feature of the community, whereby maps are control, revised and reinvented with time (Fox 2008). The complexity both of projects and empowerment, however, make this task a challenging one.

> Community empowerment is complex. Projects have different goals: cycling mapping is not the same as green mapping, community artistic maps, or open-source collaborative cartography. Participants in the process will not buy into all these goals either. The same project may carry different meanings for different members, who are likely to engage in different ways with the mapping. (Perkins 2008, 154)

The Green Map is an example of a concept that has, from an initial local map, expanded into a global movement. The success it has experienced in the post-process stage is unprecedented, with hundreds of maps in more than sixty-five

countries. Some of that success is related to the empowering structure of the Green Map, whereby anyone can start a map, new logos can be created, adaptable tools, and anyone can contributed to the maps. The Green Map movement is driven by a desire for a more sustainable world, however this vision as well as the term 'sustainable' are sufficiently vague so as to accept a broad array of participants and diverse themes for the maps.

Ownership of the information and map can affect the post-process success of it. In some cases the ownership can restrict accessibility and availability of the information and map, which is an outcome that can be purposeful or unintentional. Communities, in some cases, may not have access to information and maps due to ownership by consultants, researchers or non-governmental organizations (Mccall 2005). On the other hand, arrangement about ownership that are public, easily accessible, readily available and that offering on-going engagement opportunities or updates can support a larger audience in the post-process period. Regardless of the arrangement and reasons for it, ownership will affect the post-process phase.

Evaluation

Although most community-based and participatory mapping projects stated that some impacts that resulted, few provided details about how that impact can be known. This challenge has been noted as an area of weakness within the mapping community (Brown 2014). In some cases there was no discussion of the outcomes or achievement of objectives at all (King 2002). While participatory mapping is advocated as an effective tool (Brown 2013), participatory evaluation, which has been shown to have many positive impacts on learning, capacity building and participation (Smits 2008) has not received much attention by mappers.

Evaluation is not entirely absent in the literature, but not common. There are examples of participant evaluation, which were published and assessed (Beyer 2010). In other cases the general agreement between official maps and participatory produced maps (neither the same nor too different) was seen as "a prima facie indicators of their reasonableness" (Yearley 2003). Yet other mapping projects utilized community feedback mechanisms as a means of refinement and evaluation (Nackoney 2013).

In the case of the Green Map, assessment of impact via survey evaluation was built into the mapping process. However, due to low usage rates it was later removed (Personal communication, Wendy Brawer). This highlights an important component of evaluation, and that is that the theory of evaluation must be matched with approaches that fosters and encourages involvement in participation. On one level this requires a perception shift, as evaluation may appear as a technical term that turns those concerned with community engagement away. Instead, mappers need to see how evaluation can primarily be a tool for the benefit of their work and be a means to improve the work being done. Similarly, some feel evaluation is done only for the sake of donors, while the 'real' work is in the community. What needs to be introduced into these conversations is that the work is enhanced by evaluation, as it helps to identity areas of strength and weakness, so each can be respectively scaled or shifted accordingly.

Impact

It is striking that these case studies are largely silent on whether these representations are adopted by national agencies, which makes it difficult to conclude that GIS is a useful addition to planning processes (King 2002, 49)

One self-described "successful use of participatory mapping" explored health impacts from past exposure using hazard mapping and body mapping and resulted in increased advocacy for services and compensation (Keith 2004). This particular example was unique as it mapped structures based on memory, as the buildings no longer existed, while the body maps helped to create a "collective health profile" (Keith 2004, 152). Another project that was "extremely useful" brought together data that was previously difficult and time consuming to obtain, and made it accessible and available, resulting in an effective way of expressing important concerns (Ghose 2001a, 153).

When claims to land and resources are disputed, community-based and participatory mapping can legitimize those claims, and may even be considered more accurate than other traditional forms of mapping (Cooke 2003, 281). Some countries have encouraged this approach, formally, in recognizing land claims of aboriginal people (Fox 1998), and in other countries as legally supporting land tenure rights and protection at the community level (DiGessaStefano 2008, 41).

> Maps are the most effective, legitimate, and convincing means available to villagers for demonstrating to outsiders that they manage their natural resources and hence for proving claims to their customary lands. (Fox 1998, 2)

However, community-based maps are not always considered valid or a means to securing rights (Peluso 1995).

Mapping can positive support the establishment and protection of indigenous rights, examples of this include: gaining recognition of land rights, demarcation of traditional territories, protection of land, collecting and preserving traditional

knowledge, improvement land and resource management and conflict resolution (Hodgson 2002, 80; Poole 1995a). Recognition has also supported process that successfully sought compensation for land loss and formation of indigenous government (Fox 2003). Maps have been used in diverse ways, beyond what is typically thought to be a map, by including audio, photos, and video, which has been particularly valuable in gathering and guarding traditional knowledge (Poole 1995a, 6).

Influencing **decision making and policy** is an objective of many mapping project, but it is challenging to assess how much influence activities had. One of the indications of positive impact is the utilization and usefulness of maps in advocacy work over the long term. In one case, although the need for maps and map-making have changed over time, the products and the process have been important for three decades supporting negotiations, gathering the community and strengthening the collective voice (Candler 2006).

When activists have been able to use maps and map-making in decision making and policy setting meetings, the intended messages have changed those processes and outcomes (Robinson 2007). A detailed example from Denver demonstrates how the maps resulted in embarrassment and put the "development community on the defense" (Robinson 2007, 33). The issues that were brought to light with the maps clearly identifies the social issues at hand that were previously invisible, or at least unspoken of. This also proved the potential power that maps and map-making can have, which is strengthened when it speaks the cartographic 'language' that decision makers are used to seeing. Some of the results that came out of the work in Denver included agreements for developments to include social benefits, a new requirement, and barred certain forms of development from taking place (Robinson 2007). The project also feels there is long-term potential for "changing economic development policy on a host of projects to include more sensitivity to low-income

resident concerns" (Robinson 2007, 33). Testimonials from a City Councilor described the project as a turning point for the policy debate (Robinson 2007).

In other political contexts, however, community-based and participatory mapping post-process impacts may be limited. While enabling land and resource claims to be secured, higher levels of political decision making and policy are largely uninfluenced (Pramono 2006). The limitation of scale, at least in Indonesia, is considered to be a "major weakness" of maps and map-making (Pramono 2006, 11). The political context and receptivity of maps and map making is crucial in this regard, as projects in other countries have experienced governmental support for expansion (Yearley 2003). As such, community-based and participatory mapping projects "must be accompanied by a well conceived legal and political strategies if they are to achieve their full potential" (Hodgson 2002, 96).

Maps and map-making have built **relationships** and enhanced **connectivity**. These newly formed networks have linked together members of a community that previously would not interact, and their interaction resulted in mutually beneficial exchanges of knowledge and experience (Ghose 2001a). These relationships are not only built between participations, but also with local and national government, as well as other stakeholders in the community (DiGessaStefano 2008). Such interaction enhances the function of democratic process as the community becomes more engaged, both as mappers work with government as well as government learning from the advocacy and activities of mappers.

Post-process impact can include a significant shift in relationships, including **conflict resolution**. How this can manifest itself, and be know, is stability in a previously unstable environment, and an agreed upon process for conflict resolution. The process of map-making may facilitate the creation of a shared vision, communication approach and even help overcome linguistic barriers through visual

engagement (DiGessaStefano 2008). The durability of these impacts is questionable, however.

Many mappers consider **empowerment** to be an on-going impact of community-based and participatory mapping projects, extending beyond the in-process phase. Changes of this nature include new and strengthened capacity (Mccall 2005), which can continue to empower with time. Improved capacity of individuals, groups and organizations supports the sustainability of action (Ghose 2001a). The resulting impact of that built capacity can be improved access to resources in the long-term due to gained technical and analytic skills (Fox 2008). An example of this is strengthened positions and capacities when engaging with government (Smith 2008). Improved capacity of this nature can also enable communities to be better able to respond to new challenges.

The enthusiasm for community-based and participatory mapping may lend to assumptions that the transformation that results can have long-lasting impacts and create permanent shifts in power relationships. In some cases, these "expected positive gains" do not materialize at all (Mccall 2005, 353).

> At the outset of the research the author speculated that the informants whose information was recorded in the PGIMS project would experience some change in political power or social influence as a result of having their views heard. However, no-one seemed to gain status through sharing information; those informants who were already powerful figures in the community only had their power reinforced and those informants who were less powerful stayed less powerful. (Corbett 2003, 164)

As with in-process activities, it ought to be noted that the long-term changes that result are not always empowering, or are they empowering for all involved. The impact can be exacerbated conflict (Sieber 2006, 495) or the creation of new conflict (Anau 2003). Changes in tenure rights, which are based upon individualism, may have permanent and disempowering impacts for communities (Pramono 2006). It may also strengthen government regulation and control, of lands that were previously managed by the community (Fox 2008). Privatization may increase tension within communities, while individuals may gain the community may lose (Benjaminsen 2008). Mapping may result in the long-term empowerment of a new elite, or further empowerment of an existing elite, while disempowering and disenfranchising others (Parker 2006).

One of the reasons that empowerment did not occur while in-process, and does not occur post-process is because the political context was not understood and matched with the strategic objectives of the project.

> The majority of the case studies reviewed have a stated goal of addressing national policy, either for the purposes of protecting local ownership of geographic territory, to engage in land reform planning, or to create sustainable livelihood systems. These laudable goals are undermined by limited attention as to whether national agencies consider these representations in planning processes (King 2002, 49)

Empowerment is thus undermined by a lack of contextualization, which was highlighted as a key factor for success in the pre-process phase. Participatory methods that seek to change policy, for example, must be understand how the agencies that set policies operate so that the impact can be integrated and understood. Without doing so, and therefore having a limited impact, can be disempowering for those involved, as they may view their time and effort as

fruitless. That is possible even if participants were empowered in the process of expressing their views and concerns in the projects (Craig 2002). Maps and map-making may be assessed as helpful, yet still go unused, even by the participants who were involved (Corbett 2003, 149).

Ownership can be a long-term post-process impact of mapping. This can be ownership of maps themselves, a map-making process, of tools and of newfound abilities to respond to challenges and of ownership of a project when other stakeholders depart. For example, it was "indicated that taking ownership of the maps was especially important for transferring to future generations their geographic knowledge about management" (Nackoney 2013, 168). Ownership of information, maps and map-making tools enables communities to adjust existing maps and create new maps, which is an impact that can be long-lasting and one that can be re-visited when required as a result of ownership.

A **contribution to knowledge**, such as an effort to better understand game extraction by indigenous peoples, may advance what is known about the interaction people have with their environment (Smith 2003). However, knowledge of hunts and hunting as well as the type and number of game extracted by indigenous people may have negative impacts. For example, conservation efforts may advocate that based on this information certain animal types be protected or areas blocked from use. It also makes private knowledge, in the above case the sites of successful hunts, known publicly. In other cases, such as GIS maps for land claims of indigenous territory in Bolivia, the process and information resulted in rapid logging and extractive activities (Stocks 2003). The negative impact was not only due to new information, but changing contexts as a result of the community-mapping project.

One effect of creating territorial maps and the supportive process that has assisted indigenous "civil societies" to come into the framework of law as

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territorial managers, is that history is somewhat frozen both by the maps and by the embodiment of territorial organization. (Stocks 2003, 353)

Other contributions to knowledge utilize mapping as a tool, but ought to not be considered community-based, as the community does not drive the process, or participatory, as the collection of information is akin to having volunteer research assistants. In one case mapping was used as "low-cost and relatively easy-to-use techniques for counting a hard-to-reach population, such as female street-based SWs [sex workers]" (Kruse 2003, 669). In such cases the post-process impact for those involved is likely negligible, however that contribution to knowledge may influence service provision.

Reflection

When reviewing the literature in producing this report, the author read the material in a chronological fashion, based upon date of publication. This process facilitated a greater understanding of the trends of community-based and participatory mapping over time. One of those trends is that the critical literature, from which community-based and participatory mapping practices emerged, has declined in frequency. At the same time, a large number of disciplines have started using 'community-based and participatory' mapping approaches, methods and processes in their work. A significant number of these projects would not be recognized as either community-based or participatory by many community-based and participatory mappers.

These manifestations are, for example, uses of community-based and participatory approaches as a means to extract data in an effective and low cost manner. Research efforts and contributions to knowledge are not suggested as being incorrect, however it might be incorrect to label such approaches as participatory, when in fact they are often interviews, focus groups and surveys. One research team sought to identify assets and barriers to health and safety and benefited from the contribution of youth in the 'participatory' process (Dennis 2009). Information from participants may 'add value' to the research and facilitate discussions (Beyer 2010; Hessel 2009), but remain low on the ladder of participation.

That being said, many of these projects recognize and acknowledge the level of participation and the objectives. It is not the case that participation is being described as high level when in fact it is not, rather it is the use of participatory terminology, when the methods do not differ significantly from non-participatory data collection techniques, such as focus groups. In other cases, the low level of participation is a part of the stated objective, such as having the public contribute

information to support decision making. In taking part as a participant, however, it is made clear that the role of participation is contributing information, as opposed to actually participating in decision making.

While "participatory mapping has great potential to increase our understanding" (Beyer 2010, 643), the use of the literature in justifying this claim is becoming increasingly diverse, and as such more difficult to assess where evidence is being correctly used. A participatory project that is started, driven and owned by a community, for example, does not speak much to participatory projects that are started, driven and owned by researchers. The challenge posed to the mapping community, therefore, is wading through the myriad of 'participatory' projects in order to understand how their particular approach fits within the literature as a practice, beyond the methodology or terminology.

Mapping is also being used as teaching tool, whereby the action is undertaken for the benefit of an individual learner, as opposed to the community mapping issue at hand. That is not to suggest that such efforts do not contribute to understanding important community issues, it does imply that the reasons why community mapping occurs, and the respective objectives, are becoming increasingly varied. One example of this is public health students using mapping as a tool to help students gain experience in building relationships with community and to learn about cultural practices and social networking (Kathirvel 2012).

The diverse use of 'community-based' and 'participatory' is not limited to fields outside of geography. Participatory practices within the field are suggested as being "efficient methodology to gain basic and important information on how human populations are living and using natural resources" (Bernard 2001, 568). While public participation methodologies, published in a wide range of journals and conducted by geographers, contain low levels of participation and offer little

community-based process (Brown 2003; Brown 2006; Brown 2009; Brown 2011a).

In summary, researchers and practitioners from diverse fields in recent years have used the terms, and some of the methods, of community-based and participatory mapping. Despite utilizing the language from which the practice originally developed, the processes often take the form of effective and low-cost methods of information extraction and are not participatory or community-based. This trend suggests that a renewed critical reflection of mapping is required, particularly one that address the adoption of terminology and methods that do not match the objectives and reason for existence of the practice.

Discussion

> As participatory mapping practitioners in the workshop concluded, the more we map, the more likely it is that we will have no choice but to map. (Fox 2008, 215)

Reviewing the literature on community-based and participatory mapping and map-making with regard to its impact has resulted in collection of important examples, success factors and examples of impact. In doing so, it has become clear that monitoring and evaluation, means through which impact can be better understood, are currently lacking and require much more emphasis in the field. This study contributes to that objective. However, a number of concerns, challenges and questions also arose from the literature. These will be explored, albeit in brief, in this section. The points raised here are not conclusions of the study, rather they are points for consideration, conversation and discussion.

Mapping is a social and political process. Yet, it is often viewed as a scientific one. It ought to be considered, with regard to the technological nature of many mapping processes, including those of the participatory type, that one reinforces the "a tendency not only to look down on the maps of the past (with a dismissive scientific chauvinism) but also to regard the maps of other non-Western or early cultures (where the rules of mapmaking were different) as inferior to European maps" (Harley 1989, 4)? That is not to suggest that the same process Harley speaks to are occurring, but that the contemporary manifestation of mapping itself speaks to the way in which maps 'ought to be' or the 'best way' to represent geographical information. Technology brings new benefits, precision and potential for greater participation being only two of them, but it may also require its own deconstruction in order to understand the other messages that are sent in making this shift.

For example, what does it say when a community uses paper or ground maps to develop their ideas, and the final product is an online platform? Is this, as Harley pointed out, an expression of superiority of mapping processes? Are there times that community mapping ought to remain expressed in the form designed by the community? Specifically with regard to participatory mapping, if one of the primary objectives of the process is transformation of the participants involved, to what extend are gathered data input into online products essential? This last question is particularly useful in light of the commonly experienced rapid decline of online usage of participatory-made maps. It appears, either directly or indirectly, much of the emphasis is the creation process itself. Thus begs the question is if the utilization of online and other technological platforms are merely conforming to a standard of what is considered successful?

As participatory mapping becomes less radical and more mainstream, such as being integrated into government processes, it ought to be asked what incorporation means and for what purpose incorporation is done. If governments view participatory mapping as a means to attain greater approval and prevent opposition (Yearley 2003) incorporation may be political process used as validation of pre-determined objectives.

The assumption that community-based and participatory mapping is essentially a process for positive social change required greater critical analysis. "It could be easily argued that many communities are worse off for the mapping" (Stocks 2003, 347), or gained very little from the process (RamirezGomez 2013). It could also be argued that success or failure is largely dependent upon previous or on-going processes (ReyesGarcía 2012). Many examples of this were alluded to throughout this study. Two and a half decades ago Harley raised important questions, which are just as relevant for mappers today:

Are the mechanics of the new technology so preoccupying that cartographers have lost interest in the meaning of what they represent? And in its social consequences? And in the evidence that maps them- selves can be said to embody a social structure? (Harley 1990, 7)

Recently, researchers have voiced similar concerns, whereby researchers engaged with mapping projects focus on methods and models, while neglecting to explore the achievement of objectives and impact (Brown 2014, 132). A critical approach to mapping, which is what helped revolutionize mapping in the 1980s and 1990s, is required again, so that mapping can be revolutionized in the 2010s and 2020s. Asking difficult questions and reflecting upon embedded assumptions will support that process.

One of main problems is its preoccupation on technical matters in mapping. It leads to the situation where map is an end not a means for social transformation. Because of this, the movement, that also applies to Indonesia in general and in West Kalimantan in particular, is still unable to have their voices heard. (Pramono 2006, 12)

Might is be the case that, as the "bureaucratization of cartography has led to homogenization of the map" (Harley 1990, 5) that the Google-ization of participatory mapping has also resulted in homogenization?

In questioning the community-based and participatory mapping enterprise as a whole, it is crucial to reflect upon how maps are viewed as tools for social change. In doing so, often the complex environment within with maps operate are simplified (Stocks 2003). Expectations may be unrealistic (KyemP 2004). However, the "kind

of social dynamics in which it operates will determine whether it will empower or further marginalize poor communities; like the double-sided coin of accessibility and exclusion" (Mccall 2012, 93). As McCall notes, it may not be possible to incorporate the entire complex picture, and technological advances will not aid this shortcoming, because part of the problem is view mapping as a technical solution, even if that mapping is community-based and participatory. Technological advancements have not resulted in a "people's cartography" as hoped (Boulton 2010, 1).

> Instead of assuming we have eliminated or temporarily neutralized political differences within negotiations, practitioners need to acknowledge power relations in negotiations and work actively to increase the decision-making power of disadvantaged groups. Since negotiations are an iterative process rather than a single event, practitioners need to think about how power relations also change, how to keep track of these changes and to use a diversity of approaches that best meet disadvantaged groups evolving needs. (Edmunds 2002, 2).

Mappers also need to come to terms with, and be open, with the nuances of participation and inclusion. Projects will be fully inclusive or entirely participatory (Smith 2008), although they are often claimed to be. Nor will projects be able to represent the collective voice, as opinions within communities vary significantly (Brown 2014a). The exploitative nature of some stakeholder engagement, including researchers and advocates, must be explored and recognized (Craig 2002). Often, it appears, that the assumption of neutrality that existed in cartography of an earlier time, has re-expressed itself in participatory mapping. In other words, since someone has participated in the creation of the map, it is therefore free from bias.

There may be other reasons to engage, or disengage, with participatory mapping. Harley (Harley 1989) provides an example of purposeful map falsification for political purposes. At the community level, there may be reason to disengage and/or leave out information in certain cases – mapping locations of environmental beauty may be seen as potentially harming that same location by increasing traffic to it; mapping resources or sacred places may be seen as information that ought to not be mapped at all. In cases of this nature, mapping of any sort, be it participatory or not, may be fraught with difficulties. In other cases, there may be incentive to map such information, if it is a means for protection or recognition; these outcomes, however, can rarely be guaranteed when collecting data.

Lastly, with advancements in technology and diverse manifestations of mapping, the nature of projects must be considered, particularly with reference to duration. The pre-process stage is often infused with ideas of on-going social change, however many projects are not sustained or sustainable. This can result in repetition of community-based mapping projects (Shih 2004).

Future Research Questions

The pre-process, in-process and post-process phases respectively outlined factors that contributed to success in projects. However, very little is understood to what degree each of these factors is more or less important than others. Furthermore, little is known about how these factors interact and feedback into one another. Much more research is required in order to understand how these factors operate, how influential they actually are, and how they interact with one another.

A brief introduction to a critical analysis of participation and participatory methodologies was outlined in this study, however a much more rigorous study is required for a more thorough analysis of participation within community-based and participatory mapping. A study of this nature might take into account how different affiliations influence the degree to which participation takes place, such as the different of degree in participation between those mapping projects self-described as counter mapping versus those of PPGIS. A similar analysis may consider the difference between participation from different disciplinary backgrounds, for example comparing the works from public health, geography and sociology.

Empowerment is often referred to in the literature, and assertions of empowered people and communities made, however very little research explored the other side of those power relationships, the marginalizing and disempowering components. Greater understand of these processes will not only help community-based and participatory mappers know how these changes can manifest themselves, but also explore the mechanisms that lead to changes of this nature.

This study suggests that very little evaluation occurs in community-based and participatory mapping projects, an idea that is supported by a number of

researchers. An important area in need of research is why this is the case, and what can be done so that mappers view evaluation as an important and useful tool.

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Appendix 1: Framework

Principle-based and inquiry-driven to avoid standardization; remaining flexible, useful and practice for the diverse nature of participatory and community-based mapping projects.

Principles of Community-based and Participatory Mapping

1. Embodies a truly participatory process

2. Is inclusive

3. Is appropriate for needs, interests and goals

4. Accountability, transparency and recognition of ownership

5. Understands the socio-cultural, political and economic context

6. Synergistically collaborates with others

7. Responsible, ethical and sensitive

8. Based upon understanding of CM processes, potential and limitations
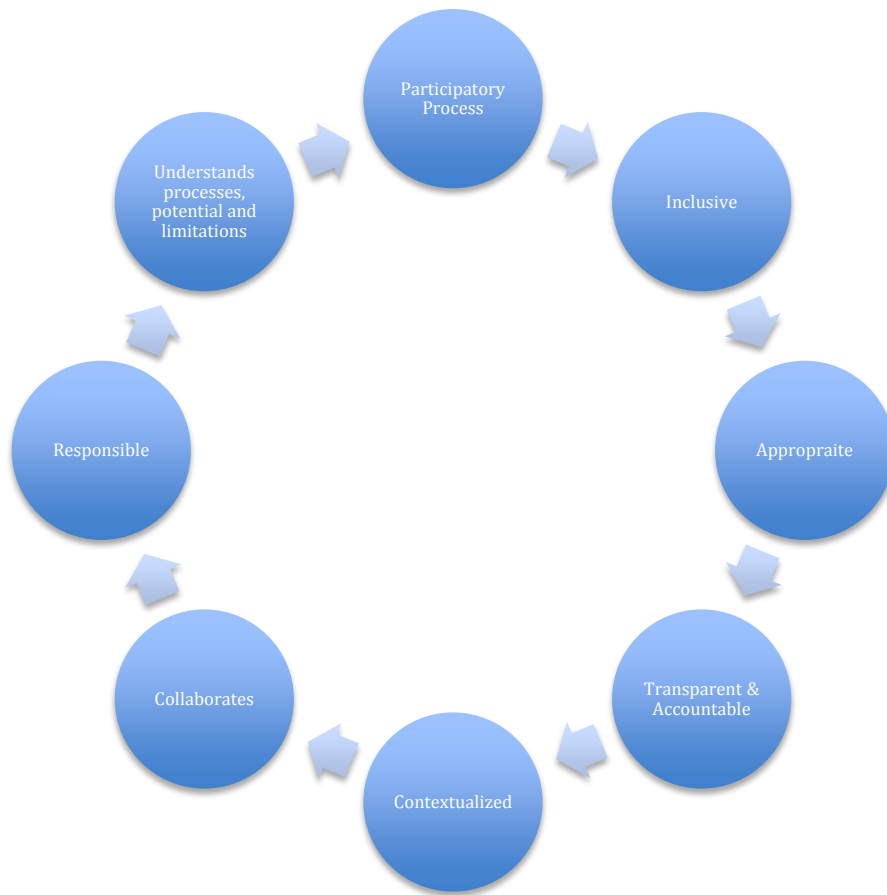
The following are a series of questions to ask (not in this particular order). If the project has a space or room that it works in these questions might be posted on the walls around the room, in an unordered fashion, so that the questions continue to be revisited as the project evolves with time.

What is the objective?	Who owns the map?
How will we know?	Who gave permission?
Who owns the information?	Who sets the direction?
Who makes decisions?	Where does it take place?

What platform should be used?	What time(s) are we mapping?
How are conflicts managed?	Who is present?
Is it transparent?	Who is not present?
What are the power dynamics?	Is it accountable?
To whom is it accountable?	What will is cost?
Where will funding come from?	Is it easy to participate in?
Will it be easy to communicate?	Who are we communicating with?
Who are the stakeholders?	What do we need?
What are the stakeholder roles?	What are the political structures?
What are the economic structures?	What are the socio-cultural structures?
What is the challenge?	Are there barriers?
Is it inclusive?	Is it participatory?
What is expected?	What is the agenda?
Who might benefit?	Who might be harmed?
Could it create tension or conflict?	Who has access?
What is the format?	What is to be included?
What is not to be included?	How will information be collected?
What will be done with the map?	What is the history?
Is this process required?	Is it effective?

Is it feasible?	Is it user-friendly?
Are there issues of confidentiality?	Are the right questions being asked?
What training is needed?	What capacity needs to be built?
What skills and knowledge do we have?	What skills and knowledge do we need?
Is it relevant?	Does it support the objective?
Is it accurate?	Does it need to be accurate?

The chart below is completed by everyone participating, so that a large number of questions are raised in order to refine and reflect on the project.

Principle	What to Ask	How do you know	How will others know
Participatory Process	1. 2. 3. 4. 5.	1. 2. 3.	1. 2. 3.
Inclusivity	1. 2. 3. 4. 5.	1. 2. 3.	1. 2. 3.

Appropriate	1. 2. 3. 4. 5.	1. 2. 3.	1. 2. 3.
Transparent & Accountable	1. 2. 3. 4. 5.	1. 2. 3.	1. 2. 3.
Contextualized	1. 2. 3. 4. 5.	1. 2. 3.	1. 2. 3.
Collaborative	1. 2. 3. 4. 5.	1. 2. 3.	1. 2. 3.
Responsible	1. 2.	1. 2.	1. 2.

	3. 4. 5.	3.	3.
Understands processes, potential and limitations	1. 2. 3. 4. 5.	1. 2. 3.	1. 2. 3.

Appendix 2: Reviewed Material

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