Mapping as Empowerment – Lessons from a Year of Participatory Community Mapping



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Abstract

Participatory mapping is often presented as an approach that empowers people to create their own maps. Unfortunately, too often complex tools and inappropriate recommendations have led to ineffective or unsustainable mapping programs that either do not achieve the targeted empowerment outcomes or even disempower the communities they intended to support. This is particularly concerning for efforts aimed at strengthening land rights and governance process for indigenous and customary communities. The nexus between participatory mapping and empowerment – especially legal empowerment as it relates to formal recognition of land rights – warrants further attention and is central to the work of Namati, Cadasta, and our partner organizations. This paper synthesizes lessons from seven participatory mapping exercises undertaken by Namati's Community Land Protection Program and Cadasta Foundation with national and grassroots organizations in Kenya, Uganda, Zambia, Nepal, and Myanmar over the past two years. These exercises informed the development of a suite of tools, methods, and training supports that can be tailored to the particular goals and context of an organization and community involved in future mapping activites. This paper analyzes lessons that emerged from the pilots and shares practical suggestions for how organizations can leverage mapping as a tool for empowerment – for communities, civil society, and governments. Participatory community mapping is not only a means to an end. It is an empowering process of documenting local knowledge, building technical skills, and using tools that were previously only available to the State or powerful elites.

Introduction

Unlocking the full potential for new mapping technologies to revolutionize the documentation and recognition of communities' customary and indigenous land rights requires more than merely training organizations and communities to use data collection tools. Organizations and communities must also be empowered with the skills and tools to design and implement fair, rigorous, and complete mapping processes without depending on external support. And their mapping efforts should be designed to achieve formal legal recognition and be integrated into existing land administrations systems. To achieve this, organizations that provide training and mapping technical support should think intentionally and creatively about how we train and support organizations and communities undertaking participatory mapping efforts. We need to build tools and practices that empower communities in the design of their own mapping processes and in the ownership of their spatial data. And we need to actively engage with government at local and national levels to build acceptance for community-led mapping as an approach to land documentation and registration that furthers government's goals for improving land tenure security.

The emergence of low-cost mapping tools has made map-making more accessible than ever before, and a wide range of applications of participatory and community-based mapping methods are gaining legitimacy among communities, civil society, and land professionals (Enemark et. al, 2014). However, for organizations that have never made maps before the diversity of data collection tools, systems for managing information, and technical approaches can be overwhelming. This is often compounded by a lack of impartial guidance and localized support for small organizations and communities who have an interest in mapping. This is particularly the case for groups mapping land and resource rights, which can be significantly more complex than mapping fixed assets like wells or schools. Even mapping projects with a similar theme, such as mapping communities' customary territories, will vary significantly based on local circumstances. Collecting sensitive land tenure information is never as simple as picking points from a GPS or satellite imagery. Rather, it requires an understanding of governance processes and systems and of how land and resource rights are perceived within the community.

Intimidated by the "technical" work of mapping and the lack of clear guidance, many organizations find their mapping efforts shaped by the tools they select, as opposed to selecting tools based upon the objectives of the mapping exercise. The risks associated with weak project design and inappropriate technologies can quickly lead to costly mistakes and limited sustainability, replicability, or scalability of mapping efforts. This is to say nothing of the risk of conflict when mapping exercises lack understanding of the various individuals and communities impacted by the process and their particular perceptions of rights and boundaries, or the potential for data collected to be used by outside groups for unintended

purposes. An excessive focus on the technical steps of community mapping can even make mapping a disempowering experience for communities. To avoid these pitfalls, participatory mapping needs careful goal-driven design; skillful and extensive training; early, sustained, and deep engagement with local and neighboring communities; proactive and intentional handling of data ownership and management questions; and a recognition that approaches and tools will vary based on program needs.

Legal Empowerment and Community Mapping

Legal empowerment strives to build the capacity of citizens to exercise their rights and participate in processes of governing – to know the law, use the law, and shape the law (Golub, 2005; Domingo and O'Neil, 2014). Legal empowerment approaches span activities from public interest litigation, to provision of paralegal support, to legal literary training, depending on the nature of the justice challenge (Cotula and Mathieu, 2008; Hatcher et al., 2010; Cotula, 2010)**.** The legal recognition and protection of indigenous and customary land rights is one justice challenge that is receiving growing international attention (Oxfam, International Land Coalition, and Rights and Resource Initiative, 2016). Legal empowerment organizations in Africa, Asia, Latin America, and the Pacific **are supporting individuals and communities in efforts to exercise, claim, and defend their tenure rights; mediate land conflicts; negotiate fair land and resource contracts with governments or the private sector; and enforce environmental regulations (Maru, 2014).** Other organizations focused on poverty reduction and environmental conservation are also turning to legal tools and procedures — such as formal land registration and titling — to advance the goals of sustainable development by increasing tenure security for communities and families. However, these efforts often struggle to produce the intended benefits for a number of reasons. One major obstacle is that many existing land administration systems favor elites by requiring land registration procedures that are "complex, costly, time consuming and with high demands for accuracy of boundary surveys and often unnecessary legal interventions by notaries, lawyers and the court" (Enemark et. al, 2014, 23). As well, in many countries the process for community land registration goes unimplemented because of a lack of political will, resources, or practicality.

Grassroots mapping efforts by communities and civil society seek to bypass some of these bureaucratic barriers by empowering communities themselves to create maps of their territories. While not strictly in the realm of 'legal empowerment', community mapping directly supports goals of legal empowerment in several ways. Community mapping creates powerful evidence that can be used in applications for registration, in negotiations with government or private interests, or in court if needed. By providing communities with spatial information, community mapping also supports efforts to strengthen local land governance and localize

land management, which are also often part of land-focused legal empowerment efforts. And finally, for many rural and indigenous populations, community-led mapping is directly about reclaiming power – it represents a way to counter-balance or challenge State defined boundaries, or, in cases where communities are not officially recognized on maps, for communities to assert their tenure rights and identify themselves proactively (Bryan and Wood, 2015, xvi). Participatory community mapping is not only a means to an end. It is an empowering process of documenting local knowledge, building technical skills, and using tools that were previously only available to the State or powerful elites.

Namati and Cadasta Community Mapping Pilots

Namati is an international organization dedicated to strengthening people's capacity to exercise and defend their rights in practical ways. In a world where billions of people live outside the protection of the law, Namati is building a global movement of grassroots legal advocates who work with communities to advance justice. Their community-based approach is practical, flexible, responsive to socio-legal context, and inclusive of both state law and customary systems[1] (Maru 2010, 83). These advocates help people learn how to protect their rights and demand accountable and responsive governance from public institutions.

Namati's Community Land Protection Program works with local NGOs and CSOs in Africa and Asia[2] to support communities' efforts to protect their customary land claims in accordance with national land laws. Namati's integrated community land protection approach combines the legal and technical work of mapping and documentation with the governance work of establishing mechanisms for accountable, equitable and participatory local management of land and natural resources. Namati's community land protection process supports communities to:

- **Improve local governance by holding leaders accountable and increasing community involvement in land and natural resource management;**
- **Strengthen protections for women and minority groups' land rights;**
- **Resolve long-standing land disputes and reduce future land conflict;**
- **Improve conservation and sustainable use and management of natural resources;**
- **Align community norms and practices with national and international law; and**
- **Plan for community-defined local development.**

In most contexts, Namati focuses on protecting the 'tenurial shell' or 'meta-unit' of a community's lands, according to customary boundaries, to strengthen the tenure of a large numbers of families' lands at once as well as protect forests, water bodies, and grazing areas

that rural communities depend on and which are often the first to be allocated to investors, claimed by elites, or appropriated by government.

In the initial years of the Community Land Protection program, Namati and its local partners supported communities to make hand-drawn sketch maps, leaving the stages of GPS data collection or survey to be completed by the government during registration. However, a lack of government resources – or political will – usually meant very long wait times or high fees for this mapping. Frequently once the GPS data collection did begin, boundary disputes thought to have been resolved would re-emerge. Namati became interested in the potential of the growing range of low-cost and accessible mapping technologies to strengthen the community-led mapping activities so that communities could create more detailed maps of their own until such a time as the government formally added their lands to the national registry.

In 2016, Namati partnered with the Cadasta Foundation, a non-profit focused on supporting communities and citizens to directly capture and record evidence of their land and resource rights, through the Cadasta Platform – an open source, cost effective land information platform supported by associated tools. Namati, Cadasta, and four local partners agreed to pilot various new mapping technologies in Kenya, Zambia, and Myanmar. Namati also investigated mapping techniques with other partners in Uganda, Kenya, and Nepal.

Empowering Civil Society Organizations in Mapping

For Namati, one of the central objectives of the mapping pilots was to develop a training strategy that would effectively equip partner organizations to lead their own community mapping efforts. At first we expected that this would involve first testing various tools and associated methodologies to identify a recommended standard and then training partners on how to use the tools. While Namati and Cadasta did identify a suite of recommended tools, we quickly realized that empowering partner organizations to implement complete community mapping processes required far more than just technical skills training.

Learning From a Challenging Pilot

The first pilot was with Kenya Land Alliance in Turkana and Tana River counties. Namati engaged the Nairobi-based mapping firm Spatial Collective to lead a three-day training workshop followed by several days of supported field work to apply the training. Spatial Collective provided a very engaging, practical training and Kenya Land Alliance staff were able to apply the skills learned to collect the necessary GPS data with communities. However, the design of the mapping process – including tool selection, the types and format of data to be collected, the timing of field work, the procedures for engaging community members – was almost entirely decided by Spatial Collective and Namati. It was apparent that Kenya Land

Alliance staff did not feel ownership over the mapping efforts: staff described the mapping efforts as ‘Namati’s’, did not voice concerns over the appropriateness of some design decisions, expected Namati and Spatial Collective staff to arrange logistics during field days, and when asked questions about the mapping process would defer to Namati or Spatial Collective staff. Following the training and supported field work, Kenya Land Alliance staff expressed that they did not feel confident to replicate the mapping process independently (insisting that it was necessary for Namati to join them in further field work) and that they did not fully understand the reasons behind various procedures in GPS data collection or how the GPS data was going to be used. When challenges and uncertainties arose during data collection, map making, and map validation, Kenya Land Alliance staff expected Namati to decide the way forward. These challenges meant that Namati staff were far more involved in implementation than expected, that it was not a sustainable or scalable approach, and that the training failed to achieve its goal of empowering Kenya Land Alliance to independently conduct community mapping efforts.

A Reorientation of Approach

In response to these lessons and feedback from Kenya Land Alliance, Namati and Cadasta radically redesigned our approach to the next mapping pilot with the Ogiek People’s Development Program in the Mau Forest complex in Kenya, Kivulini Trust in Isiolo county in Kenya, and Petauke District Land Alliance in Zambia. We realized that we could not think of mapping as a discrete technical step that could be completed almost separately from the rest of the community land protection process. Instead, we realized that there are many critical and interrelated considerations when designing a mapping process, and the design of mapping activities has important implications for many other steps in the community land protection process and should be considered during the initial design of the overall program. While attempting to devise a single recommended approach to mapping for partner organizations, we realized that mapping efforts can take many forms and should reflect the objectives and appropriate approaches unique to each community.

Part of the reason for our oversight was that many of the existing manuals and guidance resources about participatory mapping — upon which we based our original training approach — do not explain the importance of design considerations nor do they highlight the learning process that led to the selection or creation of the methodologies and tools that they describe. This leaves organizations to, at best, repeat a trial-and-error process of learning about their preferred mapping approach. It can also lead organizations to invest precious time and resources in ill-fitting pre-made mapping tools and methods.

In our redesign, we drew inspiration from principles of legal empowerment, which emphasize understanding, agency, and confidence to use tools independently and creatively, not just the

technical knowledge of how to implement use of the tools with a dependency on guidance from experts. We realized that the primary goal of our mapping trainings with partner organizations was not technical proficiency, but fostering confidence and ownership over the mapping process. Only then would partners be prepared to combine their expertise about communities with their new understanding of mapping tools in order to design the most appropriate mapping process for their particular context and the particular target outcomes.

We approached the subsequent mapping trainings as a co-design process. Drawing from a range of existing guides, and Namati's own experience in navigating the numerous options of mapping tools and methods available, we developed a set of tools to support partners to design their own mapping processes, including a series of Design Questions (See Box 1) and an eight-part mapping process framework that illustrates the full arc of a mapping process, the rationale for each component, and suggested tools and roles (See Table 1), both of which we continue to improve with input from partners.

Namati tested the new approach, hosting workshops with partners for three to five days that were based on collaboratively working through each component of the mapping process framework (Table 1) and the Guiding Questions (Box 1). The workshops started with a conversation about mapping goals and the needs of partners and communities (representatives of the communities were included when possible) and various constraints, such as timing, budgets, and government requirements for mapping processes.[3] Namati and Cadasta provided information about principles of participatory mapping that have emerged from other organizations' experiences, a selection of different tools and methods available to choose from, and the advantages and disadvantages of various options. The discussions were interspersed with hands-on testing and practicing with different tools and methods. After a partner decided on the design of their mapping process, Namati and Cadasta worked with them to identify additional training needs and scheduled further sessions or remote support calls.

The co-design approach resulted in variations between partner's mapping exercises. The Ogiek People's Development Program (OPDP) decided that their primary goal of the community mapping was to create detailed evidence of the Ogiek's traditional use, occupancy, and management of their traditional territories to aid with their ongoing negotiations with the Kenyan government about returning forest land to the Ogiek or establishing co-management arrangements. With this goal, it was important that OPDP's mapping process captured community features and land use in addition to boundaries, with detailed records about place names, use and management of resources, and photographs. Instead of hand-held GPS units like what Kenya Land Alliance had used, they chose to use mobile phones equipped with GeoODK because this allowed them to bundle together coordinates, notes, photographs, and audio/video recordings about a location in one easy-to-

use survey form. OPDP designed two data collection survey forms on GeoODK, one relatively simple form for recording boundary information and another form tailored to collecting community feature and land use sites, and trained community mobilizers on how to use the form. In contrast, the primary mapping goal of the Petauke District Land Alliance in Zambia was clear, detailed boundary information to aid communities' applications for recognition of their customary lands. PDLA used a single survey form, to be collected on tablets, and hired experienced data collectors to travel with teams of community members around the community boundaries with fewer stops to record community features.

The new training approach proved an effective way to engender a sense of ownership of the mapping process by partners, even when partners were worked with technical experts for additional ongoing support. Being involved with the design of the mapping efforts moved partners from feeling like simply an implementer of one part of a mapping process designed and funded by another organization to feeling like they could understand, adapt, implement, and replicate an entire community mapping process themselves. Partners exhibited a sense of ownership over the mapping and did not expect Namati and Cadasta staff to answer questions for them beyond providing suggestions and guidance to consider.

Empowering Communities in Mapping

The commitment to empowerment as a principle of community mapping should extend to work at the community level as well. As Namati observed during our 2016 pilots, mapping can be an empowering or disempowering experience for communities based on how organizations approach it.

Because mapping can involve new, expensive, and unfamiliar technologies and activities, communities may find it intimidating or consider it something that is to be done by technical professionals. If organizations arrive with plans already made and merely consult with communities for approval, it is more likely that community members will feel less ownership over the process and expect the organization to conduct the mapping activities, potentially even expecting payment for participating, which runs counter to the legal empowerment approach. Therefore, Namati and Cadasta's approach to training organizations includes coaching on how to collaboratively plan out the mapping process with a community from the start and techniques for having the community lead implementation of the mapping process as much as possible.

Governments and Participatory Community Mapping

Mapping of rights to land and resources is much more than a technical process of geospatial data collection. The definition of territories is inherently political and raises challenging

questions about how to appropriately engage government in community mapping efforts. On the one hand, many community mapping efforts are a form of ‘counter-mapping’ whereby communities assert their claims over territory or challenge official boundaries, in which case communities may not want government involvement or may face opposition from government. On the other hand, if communities plan to use their community maps to support applications for recognition of their land rights or management authority, they need to interface with the government’s processes and land information systems. A failure to engage with government may result in maps that do not meet official specifications for registration, maps that do not meet process requirements for how boundaries are adjudicated, or maps that are opposed by local governments because they were not involved in their creation, all of which would cost additional time and resources to redo the maps.

Across Namati and Cadasta’s community mapping pilots partners took different approaches to engagement with government. Kenya Land Alliance proactively discussed the goals and process of community mapping with the county governments of Turkana and Tana River, building support among the local government for the initiative and benefiting from guidance by county surveyors. When certain local officials of the national government threatened to obstruct the mapping efforts, the support of the county government was critical in allowing Kenya Land Alliance and the communities to proceed. In Zambia, the Petuake District Land Alliance also directly engaged with forestry officials in order to gain their support for the mapping and benefit from their familiarity with the landscape and existing official data. This engagement was successful in large part because PDLA was able to demonstrate to the officials how community mapping would support the government’s goals for forest management, reducing land conflicts, and enhancing geospatial information. The efforts of the Ogiek People’s Development Program and Kivulini Trust to engage with local officials and county government about mapping have been less successful to date and there is greater community concern about whether and how government should be involved in the mapping.

Drawing upon the experiences of Namati, Cadasta, and partners, three areas where governments could provide greater support to community mapping efforts are: creating supportive legal and technical frameworks; issuing clear guidelines and requirements; and providing technical support, information, and/or resources.

- **Technical and legal frameworks that support community mapping:** For large, rural, nomadic, or forest-dwelling communities in many countries official surveys are often impractical or inaccessible. Recent endorsement of 'fit-for-purpose' land administration by the International Federation of Surveyors (FIG), World Bank, and others point to a growing recognition that achieving land tenure security gains at scale will require many governments to take a more flexible and pragmatic approach to land documentation than cadastral surveying (Enemark et. al, 2014). However, this gradual shift in mindset has yet to result in changes to the technical and legal requirements for land registration in many countries. The establishment of official mechanisms to incorporate and validate land data collected by communities and civil society efforts will greatly support these efforts.
- **Clear guidelines and requirements:** In many countries the official technical or procedural requirements relating to spatial data in community land registration applications are unclear, such as: the minimum required accuracy of coordinates, the process by which coordinates are collected and validated, the tools used, the design and symbols used in map making, data formats, and whether 'general boundaries' are acceptable. The lack of clear technical requirements and process guidelines creates uncertainty about whether and how government will recognize or use communities' maps or GPS data. If national standards are unclear, local governments may still be able to provide support by offering recommendations from their land departments or surveyors.
- **Technical support, information sharing, and resources:** Participatory GPS mapping often requires a very significant investment of resources by civil society organizations and communities, both in time required to develop the necessary technical skills and funds for equipment and logistics, which creates dependency on donor funding and specialized professionals. The 'fit-for-purpose' approach to spatial data and land administration includes recommendations that governments provide technical guidance and capacity-building support to community-based and voluntary organizations that are well positioned to generate crowd-sourced and community-created land data (Enemark et. al, 2014). At a minimum, governments could increase the accessibility of base maps and existing data for use by civil society and communities.

Designing for Empowerment

While many of the lessons from Namati and Cadasta's pilots relate to capacity building and process design, there is also the need for appropriate tools not only for data collection but also for storing, maintaining and updating community maps. Too often community mapping exercises are conducted as a one-off exercise, presenting a snapshot in time of community spatial information, as opposed to a living repository of information maintained by the community on an ongoing basis. Existing software applications have often proven too expensive and/or complex to be accessible only to a few highly-trained community members,

if at all. It is precisely this challenge that led to the development of the Cadasta platform, which has been designed to be a repository of land tenure information that can be accessed online, shared as needed, and utilized not just by mapping and GIS specialists, but anyone with basic computer skills, ensuring that data collected can be accessed and maintained well into the future.

Recognizing that the type of information collected, and of course the data collection processes themselves, can vary by community, the platform had to be flexible enough to allow users to define what information is documented – however much, or little, is deemed necessary. In the spirit of empowerment, the information needed to stay under the control of the user. Furthermore, partners expressed the desire to be able to add information in various formats in order to compile evidence of community tenure – including traditional paper-based surveys and maps, GPS coordinates, footage from drones, digital maps, video or interviews and recordings, photographs, or paper attestations.

While initiating plans for the community mapping process with the various partners, a key first step was a detailed needs assessment and requirements specification phase. During this process, Namati and Cadasta interviewed and observed partners in order to identify staff capacity, mapping experience, data needs, expected outcomes of the mapping process and proposed long term goals of the data use. This process helped to define approaches and tools for the co-design process, technical skills training, and eventual field activities. The initial needs assessment proved to be very valuable and helped us to think through assumptions, and in many cases, to revise initial thinking in regards to potential methodologies. As well, the Cadasta platform benefited greatly from the needs assessment, resulting in numerous specific platform feature requests that have been integrated into the Cadasta platform – and others which will be in future releases. Experiences co-designing and co-learning with partners has deeply shaped the training materials and platform documentation of Cadasta, including a detailed user guide and video guides for various common tasks completed via the platform.

Ongoing Challenges

Despite encouraging outcomes of Namati and Cadasta's 2016 mapping pilots with partner organizations, there remain several significant challenges, uncertainties, and limitations concerning participatory mapping for the documentation and recognition of communities' customary and indigenous land rights. Moving from simple participatory mapping techniques, such as sketch-mapping, to using GPS data collection and more advanced cartographic tools presents a number of logistical, financial, technical, and political challenges to navigate — for communities, the civil society organizations that work with them, and organizations that train and support civil society. Four challenges with particular relevance to Namati and Cadasta's work are:

- **Mapping increases the potential for land conflicts to escalate and therefore requires proactive and extensive land conflict mediation support:** Mapping boundaries must be intertwined with extensive and proactive conflict resolution. Due to the sensitive nature of recording physical locations and making formal maps, Namati advises that mapping activities should only be undertaken after communities have met with their neighbors to discuss and agree upon the location of boundaries. This may require several rounds of meetings and conflict resolution, especially in cases of active land conflicts or where boundaries have been contested for generations. Even after extensive boundary negotiation and recording of agreements, conflicts may flare during mapping, requiring organizations and communities to have clear plans to manage conflict and ensure safety. In many situations, ignoring the question of boundary harmonization and agreements with neighbors in order to map a community quickly is irresponsible, as it leaves critical adjudication decisions undecided only to flare into conflict during later registration stages, it may result in intentional or inadvertent land grabbing by the communities privileged with being the first to map and register their boundaries, and it may escalate boundary conflicts if neighbors learn of the mapping efforts only after they begin or are completed.
- **Significant investment is required for organizations to complete map production independently, without it they continue to rely on specialized professionals**: Significant time and effort is required to convert raw data from participatory GPS mapping into formatted maps. Organizations must think carefully about how they will do the data processing and map creation and who and what will be required to complete it. While the steps required to create boundaries and community features from GPS points and digitize simple landscape features from satellite imagery are not overly complex, many of the tools and skills do require more extensive training and experience. During the pilots, staff had to invest many hours of learning and practice, even after having prior exposure to GIS software. If an organization plans to use GIS software to independently create or edit maps this will require a significant investment in training, time, and potentially equipment. If this is not feasible for organizations, they will continue to require support from mapping professionals, at least until more accessible cartography tools are available.[5]

- **Practical challenges continue to restrict communities' direct control over the management of their spatial data:** While new mapping tools and participatory methodologies have the potential to make data management accessible to communities, achieving this in practice remains challenging. Equipping communities to responsibly and securely manage their own spatial data requires more extensive training than GPS data collection, additional time to establish community structures and roles for data management, and increased equipment costs. There are also difficult questions about how to support and incentivize communities to maintain their spatial data over the long-term. Even with empowerment as a guiding principle of Namati and Cadasta's pilots, to date the management of the data created remains in the hands of civil society organizations, not the communities directly. While the organizations have agreements with the communities about how they can access their data in the future, it remains to be seen if this is sustainable and if it provides sufficient access. As well, Namati and partner organizations have so far found it challenging to establish meaningful and detailed data sharing agreements with communities due to the technical complexity and abstract nature of some aspects of data use, data sharing, and data management. Namati and partners are continuing to test methods to improve data sharing agreements.
- **Many questions remain about the cost-effective distribution of roles between communities, civil society organizations, larger organizations or mapping professionals, and government:** Decentralizing the mapping of community boundaries raises questions about who is most appropriately placed to undertake mapping efforts and trade-offs between costs, efficiency, quality, and empowerment. From an empowerment perspective the ideal may be that community members themselves complete their own community mapping process, but this likely is not practical due to the costs and technical skills required and may not be ideal for efficiency or quality. This makes it difficult for organizations to determine how much to invest in training and equipping community members to complete mapping tasks, versus training and equipping a team of field staff who can work with multiple communities. Likewise, when providing training or technical support to civil society organizations, Namati and Cadasta grapple with whether it is more efficient and cost-effective to train an inexperienced organization to be able to trouble-shoot their own challenges or if it is more appropriate to simple provide the technical support to fix a problem quickly. In the design of a mapping process, organizations should be prompted to consider whether it would be more efficient for them to work with consultants, specialists, or government staff (if available) for certain tasks. For some organizations, this may apply to almost all steps of the mapping process.

In light of these challenges or other constraints, if extensive participatory mapping or GPS data collection is not feasible or appropriate for an organization or community to undertake, other emerging mapping tools can be used to enhance community mapping efforts. Tools that

Namati, Cadasta, and partner organizations have found to be useful include: free satellite imagery for non-profit organizations (such as that available through the Cadasta Platform), the Field Papers website (www.fieldpapers.org), and Quantum GIS software and the open-source spatial data available within it (such as Open Street Map). Supporting partners to think through the design of each part of a mapping process can help to identify where these low-cost improvements and opportunities are the most applicable. Even without GPS data collection, the process of participatory community mapping remains a highly motivating and effective activity for communities to document their local knowledge about their use of land and natural resources, discuss boundaries, and engage with the spatial aspects of land management.

Conclusion

Community-based, participatory mapping is a powerful way for communities to independently document their customary or indigenous rights to lands and natural resources, which is a vital component of legal empowerment efforts that focus on improving land tenure security. Namati and Cadasta's two years of pilots with partner organizations found GPS mapping to be highly motivating for communities and organizations, especially when communities, local organizations, and technical partners were all empowered to co-design the mapping process. Co-designing the process gives communities and implementing organizations a sense of agency and control over how the maps are made, which is critical for the successful implementation of a mapping process and the legitimacy of the final maps.

Based on these experiences, Namati and Cadasta have developed training tools and techniques based on a co-design approach, rather than presenting a fixed technical process. The experiences during the pilots and feedback from partner organizations and communities are directly informing the refinement of Cadasta's online platform and other integrated tools. Namati is also strengthening other aspects of our community land protection efforts based on learning from the mapping pilots, including how to: use mapping activities to ensure that agreed boundary with neighbors are documented clearly and precisely, increase involvement by community leaders and local government, and improve transparency between communities and organizations concerning the use of community data.

Creating better, more accessible mapping technology and software is only one piece of what is necessary to revolutionize the documentation and recognition of communities' customary land rights. Mapping organizations like Cadasta and capacity-building organizations like Namati also need to improve how we support organizations and communities to design and implement their own fair, rigorous, and complete mapping processes without requiring external support. And we need to engage leaders and government at all levels to create space and support for community-led mapping efforts within official legal and technical

frameworks. The rise of crowd-sourced geospatial data, including community mapping, represents a dynamic democratization of data that requires more than a single, standard approach to design, training, or procedure. Instead we need flexibility, dialogue, and creativity to find ways to foster and harmonize the diversity of voices that are starting to add their stories to our collective human map.

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Footnotes