# Open mapping from the ground up: learning from Map Kibera

Erica Hagen

MAP KIBERA

GroundTruth INITIATIVE

## About the author

**Erica Hagen** is a specialist in the use of technology for international development. She is co-founder of Map Kibera Trust, which created the first free and open map of the Kibera slum in Nairobi in 2009. She is also director of GroundTruth Initiative, LLC, in Washington DC, which works with partners around the world to use digital technologies and mapping for greater citizen voice and impact. Erica holds a Master's of International Affairs from Columbia University in Economic and Political Development.

## Acknowledgements

## Reference and copyright

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# Summary

In Nairobi in 2009, 13 young residents of the informal settlement of Kibera mapped their community using OpenStreetMap, an online mapping platform. This was the start of Map Kibera, and eight years of ongoing work to date on digital mapping, citizen media and open data.

In this paper, Erica Hagen – one of the initiators of Map Kibera – reflects on the trajectory of this work. Through research interviews with Map Kibera staff, participants and clients, and users of the data and maps the project has produced, she digs into what it means for citizens to map their communities, and examines the impact of open local information on members of the community.

The paper begins by situating the research and Map Kibera in selected literature on transparency, accountability and mapping. It then presents three case studies of mapping in Kibera – in the education, security and water sectors – discussing evidence about the effects not only on project participants, but also on governmental and non-governmental actors in each of the three sectors.

It concludes that open, community-based data collection can lead to greater trust, which is sorely lacking in marginalised places. In large-scale data gathering, it is often unclear to those involved why the data is needed or what will be done with it. But the experience of Map Kibera shows that by starting from the ground up and sharing open data widely, it is possible to achieve strong sector-wide ramifications beyond the scope of the initial project, including increased resources and targeting by government and NGOs.

While debates continue over the best way to truly engage citizens in the 'data revolution' and tracking the Sustainable Development Goals, the research here shows that engaging people fully in the information value chain can be the missing link between data as a measurement tool, and information having an impact on social development.

## Key themes in this paper

- Open mapping and open data
- Trust-building and communication as enabling factors for change
- Information and effectively targeted service delivery
- Marginalised communities, infomediaries and responsive governance

# 1 Introduction

In 2009, 13 young people mapped their informal settlement[1] of Kibera, in Nairobi, using an online mapping platform called OpenStreetMap (OSM).[2] My partner Mikel Maron and I initiated this project, which we called Map Kibera, with a small grant, never imagining it would still be ongoing some eight years later. Now, in 2017, Map Kibera Trust is a small but vibrant organisation in Kenya working on digital open mapping, citizen media and open data. It has been researched and replicated around the world, while remaining dedicated to one small part of the globe: Kibera, a slum of around 250,000[3] residents in Nairobi, Kenya. Although Map Kibera is now linked to many projects outside this community, and with my related US-based company GroundTruth Initiative has worked in a variety of locations, our Kibera-based work has been in process the longest, and has dug the deepest into what it means for citizens to map their own communities. I wanted to examine the trajectory of this work and evaluate the impact of open local information on the community itself. A Practitioner Research and Learning Grant from Making All Voices Count made this examination possible. This report is the result.

Since 2009, technology has transformed every area of development, from agriculture to education to health, as well as transparency and accountability. But the impacts of this shift are still not fully clear. While information and communications technologies for development (ICT4D) projects proliferate, many have not fulfilled their promise. In terms of mapping, transparency and tech-enabled 'citizen voice', we know even less about the longer-term dynamics of projects aiming to make people's voices heard and help them achieve social impacts.

In the world of mapping, a concurrent shift has taken place. Digital mapping has become more accessible to more people than ever before, thanks to mobile phone improvements, better satellite imagery and the emergence of accessible tools like OSM. But less is known about how participatory mapping, community mapping and the fast-growing use of OSM as a development and humanitarian tool have impacted change. Organisations including the World Bank, local governments and start-up companies now use OSM. But how useful has open data been to local communities in achieving their own goals? All this technology was supposed to level the playing field. Has it done so?

In this report, I give several answers to these questions. A look back at Map Kibera, as one of the longer-running and earliest digital technology and development projects, will shed light on the interplay between tech, local communities, transparency and social accountability. Some research was done on Map Kibera in its early days by external researchers. However, much of this focused on the first year or two; the project has evolved since then, in response to changes in demand and context. So it was worth assessing where we are now, to see if any outcomes might have been overlooked since that early research. This report traces the evolution of Map Kibera, and reviews what has been achieved. It is based on interviews and discussions with clients, data and map users, and participants.

The research process began in late 2016 with some of these initial questions:

1. Have Kibera citizens been able to influence local change using maps and other digital tools? If so, how?

2. What were the inflection points (triggers) that succeeded in directing attention to issues raised by Map Kibera over the past seven or eight years, and how has government responded?

3. Has information gathered and shared by Map Kibera brought about: 1) new awareness or understanding of issues; and 2) actions taken based on this knowledge?

4. What were the barriers, if any, to understanding and action?

5. Have there been changes over time to the original theory of change for Map Kibera?

## 1.1 Historical overview

My partner and I began with a simple question: is it possible to work directly with residents of one of Africa's largest slums to map their community in OpenStreetMap, the online, editable, open map of the

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1 An informal settlement or slum (which I use here interchangeably) is typically characterised by a lack of formal land tenure, lack of most government services or infrastructure, and substandard housing and building quality.

2 An open, editable online map of the world.

3 Population in Kibera (and other slums) is notoriously difficult to calculate. See www.mapkibera.org/blog/2010/09/05/kiberas-census-population-politics-precision/ (accessed 29 August 2017)

world? To find out, we went to Nairobi, Kenya armed with several global positioning system (GPS) devices and a couple of laptops, anticipating a few months' stay.

OSM was then still relatively unknown, and Google Maps was just getting on its feet in Kenya and was not nearly as widely used as it is today. OSM is often called the 'Wikipedia of maps': anyone can edit, access and use its data. Edits are monitored by thousands of other mappers to ensure quality. It in fact predates Google Maps, having begun in 2004 in response to the lack of quality online, freely available digital map data.

We trained 13 young people (mainly in their early 20s) from the slum to survey their neighbourhoods, collecting waypoints (a single point of latitude and longitude) and road tracks with the GPS devices, and then editing the map online in a computer lab.[4] Partners in this endeavour included a local organisation, Carolina for Kibera (CFK), and others both inside and outside the slum.[5] The information that came back painted a unique picture: the young mappers had identified what *they* thought was important to make visible about their community. We taught them *how* to map, but not *what* to map. This was an opportunity to create a picture of slum life from the ground, as seen by residents themselves. Basic, but vital features emerged as a

variety of health, education, sanitation, commercial, entertainment and other establishments appeared on the map.

Excited by this progress and wanting to make this map as relevant as possible, the mappers[6] created thematic maps charting health, education, sanitation and security. Community meetings were held to discuss and verify these maps.

Meanwhile, I introduced other visual media to the youth of Kibera, aiming to enable them to give 'voice' to their experiences of life and to slum dwellers' overall desires for development. This, together with the maps, would provide a completely different view from those of NGOs and government planners, who tried, often unsuccessfully, to solve local problems without involving locals. I trained groups in video journalism, blogging and use of the Nairobi-based Ushahidi software to create community media. Many ideas came together, and Kibera News Network (a YouTube-based video news site) and Voice of Kibera were born.

Throughout this period (2009–2010), we focused on experimentation and learning, prioritising the leadership and goals of the young participants. The concept was to reorient information to the local level, using the open nature of the world wide web and new tools in social media, journalism and mapping

**Figure 1 Kibera in OpenStreetMap**



OPENSTREETMAP CONTRIBUTORS

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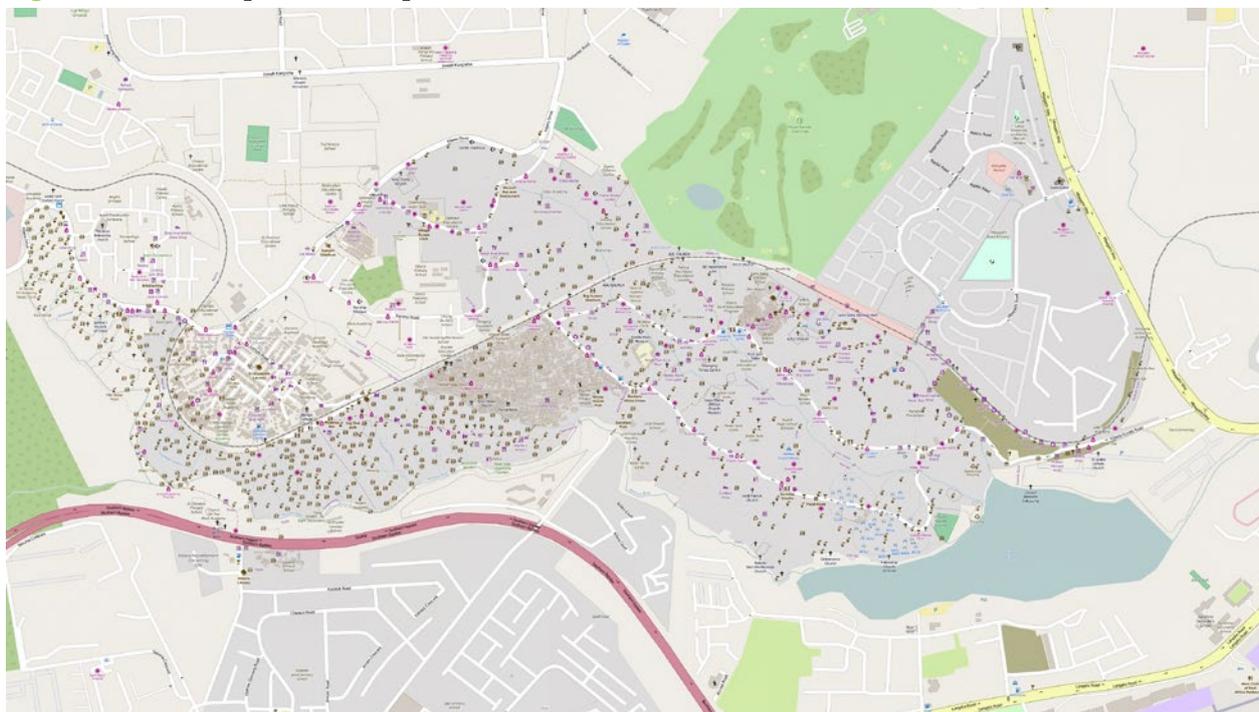
4 Discussed in Hagen (2011).

5 Including Ushahidi, Kibera Community Development Association (KCODA), Jumpstart International (which funded this initial exercise) and Sodnet.

6 With a grant from Unicef.

to empower residents. Information asymmetry, we thought, was at least partly responsible for the stark inequality of cities like Nairobi. At the time, the technology boom in Nairobi was starting to make waves. We wanted to harness this energy to create opportunities for young people in Kibera. My background in international development and journalism, and Mikel's background as a software developer and OSM enthusiast influenced our orientation to and leadership of the project as it evolved. We designed a participatory project, with a consensus-based, flat organisational structure to encourage local ownership and leadership.

We did not set out to create an accountability project per se, but hoped that transparency and visibility might generate positive impacts for slum dwellers in terms of self-determination in local development. Above all, we were determined to learn and 'lead' from behind.

We posed several questions:

- Could open mapping by slum dwellers help bring diverse kinds of stakeholders onto the same page, and even lend an advantage to the mappers as citizens equipped with data?

- Shouldn't slum dwellers have a right to know and share the facts about the place they lived?

- Could this information empower people to play a greater role in decisions that affect them?

We did not present a full theory of change to initial trainees and partners; we simply asked these questions, hoping that they would lead both trainees and partners to new avenues of joint enquiry.

We speculated that open information would take on a life of its own, as people accessed, used and repurposed it for all sorts of things. We left the "what next?" question open. This was in turn informed by this creative and experimental period in the evolution of the Internet. It was before the days of massive companies like Google and Facebook driving the Internet for commercial reward, when free Web 2.0 tools like WordPress, Flickr, Craigslist and Wikipedia were nascent and exciting.

It soon became clear that many groups (NGOs, religious charities, governmental agencies) were gathering facts about Kibera, but sharing them only outside the slum or within their own organisations. For us, equalising this information asymmetry became a strong motivation. We distributed paper maps and screened videos. We held community forums to get input from residents, who wrote and drew directly on the paper maps. We also tried to build capacity

among young people to lead the local organisation themselves. Still new to Nairobi, and aware of our cultural limitations, we incorporated Map Kibera Trust only at the behest of these young people. We deferred to them as much as possible.

Throughout this period, people constantly asked: "What is a map good for in a place like Kibera?" We could see that Kibera people knew quite well how to navigate, so we were often pressed (both locally and by outside groups) to be more explicit about the power of this type of information. Media, if accessed widely enough, could motivate people to act (for instance, a video segment on lack of latrines in one slum led to a local donor building new toilets for schoolchildren). Moreover, media as a concept was quite familiar to people. Maps and data presented more of a challenge. We noted, after presenting our maps and data at community forums, that improved information did not automatically lead to action, and we developed a theory of change:

## Box 1: Map Kibera's Impact and Advocacy Engagement model

Step One: Initial mobilisation.

Step Two: Using own tools, collect and develop materials; data analysis.

Step Three: Report back to the community and develop action plans.

Step Four: Lobbying and advocacy.

Step Five: Negotiation between consortium of community members and government representatives.[7]

We did not envision performing steps four and five ourselves, hoping that leadership would emerge from strong stakeholder interest in the issues raised. Indeed, we thought that the issues for investigation would only arise from the data-gathering process, and that the community would identify those which felt most urgent to them. We envisioned our role as providing a type of open data clearing house; we even thought of opening a tech hub or IT-enabled library in Kibera. We speculated that local groups, community-based organisations (CBOs) and NGOs would take action on the data (and share it).

This social accountability trajectory was outlined during a strategic planning process in late 2010, but subsequent projects pulled us to varying degrees

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7 Map Kibera (2014) and http://mapkibera.org/work/methods/ (accessed 29 August 2017)

*Information and mapping processes themselves can build networks of trust between citizens and governments in low-trust environments*

away from this theory. Most of the time we were busy working on initial mapping and media training in Kibera and elsewhere (Mathare, another Nairobi slum, for instance), developing maps for clients or working on grant-funded projects (election reporting and peacebuilding). Therefore, our community-driven advocacy model did not get directly tested, though not for want of trying (the election reporting project came closer than most). The grants we secured had different goals: to gather data for a specific project, or continued piloting of our innovation in short timeframes. It became clear that pure, open-ended, community-driven participatory development and social accountability, whether supported by new digital information ecosystems or not, was simply not going to be well-funded – if at all. By then, we also knew that pure volunteerism could not long be sustained in slum-based information work (members eventually needed to be paid; free time was at a premium).

We still believed that information could lead to action and change, especially for slum dwellers. However, it became increasingly clear that we needed to let the young people determine priorities and lead the way, as they developed leadership skills. Thus, a constant 'give-and-take' between me and other leaders (board members, partners), Kenyan youth leaders and other project participants, as well as funders and clients, each with their own vision, shaped the direction of the organisation over time. I can't imagine that it could have worked any other way. Yet the mission statement the team had created together during our first year – *to increase influence and representation of marginalised communities through the creative use of digital tools for action* – was shared by all.

We had also determined our role in the new field of ICT4D. We were not a software company or technology developer or website builder, like many. We would not sell a product. Instead, we would train and support local people, enabling them to do mapping, collect data and use media at the grass-roots level.

## 1.2 Aims of this report

What I have now been able to do, thanks to this research grant, is to track some of the informational pathways in Map Kibera's work that we had not

known about before. Open data and information has a way of going places without a trace, so I wanted to find out who had used our maps and for what purpose. I felt I could then better structure our future work around what had actually happened, and what had worked. Now it would be possible to draw on stronger, more recent evidence, and update earlier reports that I and others had written in the past. This would also be my first opportunity to engage with the relevant academic literature and conduct formal research.

After examining three sector-based cases of Map Kibera's work in gathering and sharing open information (on education, security and water), I found surprising outcomes that had not been explored previously.

One of the most striking is that information and mapping processes themselves can build networks of trust between citizens and governments in low-trust environments. The evidence for this was particularly strong in the case of Map Kibera's mapping of small informal schools, which could now strengthen their ties to formal systems, given an infomediary like Map Kibera (see p.9 for a definition of 'infomediary'). The fact that the mappers came from Kibera and became trusted in the community over the years has been important to this outcome.

Essentially, building capacity and growing a strong local reputation through data and mapping, supplemented by community media, has meant that many different kinds of stakeholders can now rely on Map Kibera. By playing a bridging role, rather than becoming either a confrontational advocate or working directly on government priorities, the organisation created a context for greater social accountability.

In this report, I will first situate the research in relation to selected literature on transparency, accountability and mapping. I will then present three case studies based on my field research, and discuss the evidence regarding the effects of Map Kibera on project participants. Finally, I will return to the literature and my original research questions, analyse the case studies with these in mind, assess the implications of this research and set out the way forward.

# 2. Situating the research in relation to key issues

## 2.1 Transparency and accountability

The best way to assess Map Kibera's impact was not immediately clear. Using a strict transparency and accountability framework did not feel appropriate, because the project did not intend to solve a specific accountability gap, but rather to shift the locus of information and follow the desires and needs of the community. Nonetheless, some ideas from this field proved useful in assessing Map Kibera.

In a review of studies of the impact of transparency and accountability projects, Fox (2014; 2015) distinguishes 'tactical' from 'strategic' approaches to accountability. A tactical project provides a citizen voice only in aggregate, and assumes that "information provision alone will (a) inspire collective action with (b) sufficient power to influence public sector performance" (2014: slide 3). Similarly, Joshi and Houtzager (2012) think of technology tools for accountability as a kind of 'widget' which, when applied, will have the desired result. They review several categories of such 'widgets', including scorecards and crowdsourcing, but caution against assigning success to the tool itself:

> Assuming that the 'widget' is what leads to success ignores the range of contextual and process factors that support the widget (and the processes that comprise the widget) in the successful cases and enables it to work. In particular, political processes within which widgets are embedded receive less attention. (2012: 152)

Meanwhile, a strategic project under Fox's definition works on many levels, fostering an enabling environment while "coordinat[ing] citizen voice initiatives with governmental reforms that bolster public sector responsiveness" (2014: slide 3). He proposes a "sandwich approach" – essentially, finding and working with people in government who wish to combat corruption, at the same time as working with civil society to bring the two sides together for best results. But other factors are also key. Information must be user-centred: "This *user-centred* emphasis on actionable *information* contrasts sharply with widespread optimism that larger quantities of public data will inherently promote good governance" (2014: slide 7). An intermediary or 'interlocutor' is needed to bring this information to the right people. (This is sometimes called an 'infomediary'; Map Kibera could be identified as one.) Institutions then need to develop the capacity to respond to these demands.

In many ways, Map Kibera has followed a trajectory from a tactical to a strategic project. We initially hoped that collective action would result because Kibera citizens would recognise the need for it, having seen the facts reflected on a map. But there was a disconnect between citizens knowing the details of a problem and knowing an effective way to use that information to advocate directly with government; there was also little faith that officials would actually respond. Map Kibera either needed an intermediary (a civil society organisation) to publicise the data and to advocate, or it needed to become such an intermediary.

However, the laser-like focus on 'actionable' information which Fox endorses is not exactly the path we followed. In any case, different kinds of open information will be actionable to different kinds of people and groups. While information alone may not bring change, it might beneficially follow unpredicted pathways; the ability to connect with multiple stakeholders might be as effective as presenting a specific, actionable piece of data. It is also relevant that OSM is a 'commons', where everyone can contribute to and use the data, rather than a portal or static system presenting information from one source. In other words, engaging people in a data process can be more effective than presenting them with final results.

Joshi and Houtzager summarise trust vs. mistrust-based accountability processes. Trust-based processes assume goodwill on the part of government, with participants working together as much as possible, local communities even relying on government to initiate projects. Mistrust-based processes tend to more of a 'stick' than 'carrot' approach in working with government, with the threat of whistleblowing to ensure goals are reached, for instance (2012: 153). In Kibera, however, where mistrust is the

*The complexities of accountability in settlements like Kibera require a highly nuanced understanding of land ownership and occupancy, social networks and systems of trust*

norm, it is uncommon to approach government in an adversarial or 'stick' fashion, due to the particular powerlessness associated with dwelling on illegal or at least non-tenured land. The complexities of accountability in settlements like Kibera require a highly nuanced understanding of land ownership and occupancy, social networks and systems of trust. Even in formal areas, adversarial strategies for accountability are not typical, whether for cultural reasons or due to concerns over repercussions. This is one reason why finding strong advocacy partners was not straightforward.

However, working hand in hand with government reformers is also challenging: if one is starting from the grass roots in a neglected community, the government may pay no attention for quite some time. On the other hand, starting from within government, a solid local buy-in may be lacking. Starting with both sides of Fox's sandwich equally is problematic.

Resources for such double-sided community building are also in short supply. The trouble with Fox's conclusions is that the long-term resources for complex projects in general are not typically forthcoming. Instead, many groups must work on accountability at once, with varying levels of coordination, success and funding. One major gap we found was a lack of existing civil society groups in Kibera with the capacity to lobby government for changes, and which had the relationships with government reformers that might give 'teeth' to community demands. Supposedly participatory projects were often not actually citizen-driven, but were at varying stages and experiencing varying levels of success in gaining local trust and ownership. To date, at least, Fox's model requires a seemingly unattainable confluence of resources, government will and citizen action.

Several key points from this section will arise throughout the report: strategic vs. tactical accountability, trust vs. mistrust-based accountability, and information-targeting.

## 2.2 Community-based mapping and OpenStreetMap

Other key issues arise from the application of geographic frameworks, particularly community mapping, participatory geographic information systems (PGIS), 'neo-geography',[8] and related concepts.

For many years, visual mapping has been used in participatory rural appraisal and evaluation methods. Haklay (2013) references a detailed literature on PGIS – an originally non-digital process in which facilitators work with communities to develop visual representations of their surroundings. This foregrounds issues like underlying power structures, while protecting traditional or local spatial understandings. PGIS is often focused explicitly on reversing power imbalances in land tenure and related issues. It is a strong precursor to and influence on Map Kibera's work, which takes many of these principles into the digital age.

Haklay writes, "Unlike early critical GIS and the literature on participatory GIS, the analysis of neo-geography adopted an instrumentalist interpretation of the technology and its applications" (2013: 55).

A study by Shkabatur (2014) compares "interactive community mapping" (ICM) projects, discussing the contrast or tension between process-oriented community-driven mapping, (she cites Map Kibera as an example), and goal-oriented professional mapping for targeted results within communities:

> The process of creating an interactive community map can be inherently valuable for local communities … The ICM process is also an empowering experience, providing local residents from marginalised and poor communities with the opportunity to determine how their communities are portrayed to the outside world. (2014: 81)

Shkabatur suggests a continuum between this type of community orientation, and mapping done by 'professionals' from outside the community

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8 New forms of open, local and citizen mapping, often by non-experts, including OpenStreetMap.

Lucy Fondo of Map Kibera shares Open Schools Kenya website with school staff in Kibera.

(however, often they are simply more well-educated volunteers or students), which is much more common. Professional ICM is often geared towards a specific result, rather than general mapping of an area.

Ultimately, she finds that

> The ICM process entails a range of trade-offs and challenges. One of the most difficult trade-offs is the need to choose between community empowerment and capacity-building, on the one hand, and effective delivery and use of the map, on the other hand. (2014:103)

Rather than focusing on accountability between citizens and government per se, she asks if mapping empowers residents and whether the data gets used for concrete development objectives (disaster risk mitigation or service delivery, for example). This is aligned with the language of her publisher, the World Bank, which is sometimes known to emphasise a less political, more service delivery-oriented vision of development.

Another way to frame this issue is to ask whether it is best to prioritise the 'instrumental' impacts of mapping – the map as an instrument for achieving a specific end – over the intrinsic value of mapping both as a process and a resulting artefact. It may seem odd to consider a map intrinsically valuable on levels other than the purely practical, but consider the historical role of maps in representing systems of power and hegemony. In some regions of the world, including Africa, colonial powers gathered (often in Europe) around a map and drew arbitrary borders, with devastating consequences that are still very much playing out today; thus, a map can have symbolic as well as very real meaning. When created by people living in an informal (i.e. illegal) settlement like Kibera, which had been, before our mapping project, literally a blank spot on the map, the act of map creation and distribution can have a positive impact on the individuals involved and represented.

Haklay (2013) takes up many of these issues, challenging rhetoric about the democratising potential of OSM, arguing that it is still mainly used for instrumental purposes, or at least, is 'edited' by elites. He argues that technology itself has been seen romantically as a way for marginalised global citizens

to achieve a level playing field.[9] Instead, frequently "there is a separation between technological elites and a wider group of uninformed, labouring participants who are not empowered through the use of the technology" (2013: 2). In other words, simply increasing the map's coverage isn't enough; skills must be transferred to those represented by the map. Haklay looks for "deep democratisation" in which marginalised citizens can either manipulate the actual software through coding, or otherwise repurpose technology tools for their own ends.

Haklay finds that with Map Kibera, "the act of creating the map is a political intervention in making the place visible and therefore the act of creating it goes beyond the practical humanitarian benefits of having a map" (2013:15). Externally determined instrumental uses are less important to him than whether technology has been used to challenge political hierarchies, even symbolically. The framing of mapping by Haklay and Shkabatur offers different ways of understanding Map Kibera's work which could more fully illuminate the research questions. Following this discussion, we will revisit the concept of a continuum between community process or empowerment, and instrumentally specific mapping, and assess its usefulness for this research.

## 2.3 Research on Map Kibera

Key issues relevant to this study are also raised by the larger body of literature referencing Map Kibera. As part of my research, I reviewed 16 papers in academic journals published since 2010 which referenced Map Kibera directly.[10] I found three key weaknesses in some of these analyses:

1. Research on ICT projects like Map Kibera tends to have trouble capturing the complex and iterative approach taken, given the constant updates to technology and process.

2. Research is often based on a short-term snapshot which is not updated later. Often, by the time the research is published, it is quite old. This is particularly troubling when a fast-moving technology project is being discussed.

3. Some frameworks can be reductive. For instance, a participatory development perspective might characterise all action in terms of whether it substantiates that theory of change.

For example, in one paper[11] which references Map Kibera's work indirectly, research was done largely in 2011 in Mathare, another settlement in Nairobi where Map Kibera was working at the time. However, results were not published until 2016. The author discusses how the participants in the project became entangled in conflicting desires for more visibility and power, as well as for legitimisation in Nairobi's tech sector, which always seemed one step ahead of them. Gaining certificates of achievement was one of their main objectives. The outsiders who initiated the project are representatives of the bridge to 'Silicon Savannah'[12] and a kind of tech-utopianism, that she links to a view of development which is purely technical (rather than political) in nature.

Her characterisation of the desires and challenges of young people living in the slum is familiar. It is difficult for Map Kibera participants to achieve a degree of professionalism and status while remaining true to the community and its perceived needs. However, in her analysis, a moment frozen in time, and now outdated, is deconstructed not as fluid but as decisive and final. Also, young participants in the project are depicted without agency. This fails to capture the nuance and complexity of the lives of residents and their engagement with technology and data.

Similarly, Berdou's 2017 paper used research from 2011 to draw conclusions about Map Kibera. She references critiques of the project from the perspective of a strict participatory development framework, which may not be the most relevant or effective lens with which to analyse it. Based on this early research, she mentions "the project's tight timeframe, which left little time for meaningful community engagement in all stages of participation" (2017:26). However, since 2011, the approach has evolved in exactly this direction.

This all emphasised the need for a fresh look at how Map Kibera has evolved o*ver time*, to see which new approaches and frameworks for understanding and evaluating the project might be of value.

### Discussion

The studies reviewed here raise issues for Map Kibera that can be located along a continuum, from those most concerned with instrumental results in terms of political, humanitarian or development

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9   For instance, see https://www.eff.org/cyberspace-independence (accessed 29 August 2017).
10  Arora (2016); Balestrini, Bird, Marshall, Zaro and Rogers (2014); Beale (2012); De Carli (2012); Desta, Fitzgibbon and Byrne (2014); Donovan (2012); Ekdale (2014); Ekdale (2011); Jaksch and Nieves (2014); Kruk (2015); Lundine, Kovačič and Poggiali (2012); Nelson (2011); Shkabatur (2014); Tully (2015); Wyche (2015); and one anonymised paper (see Footnote 10).
11  Because that paper anonymised subjects and location, presumably for the privacy reasons, I will not reference the article title or the author's name here.
12  A play on Silicon Valley and Kenya's savannahs, referring to the country's notable digital technology and start-up ecosystem.

goals achieved, to those focusing on process, for example, degrees of participation and the nature of community integration and engagement. This is not to say the authors are explicitly judging whether or not work has been successful under these criteria, but that their publications indicate certain fundamental approaches which give rise to different evaluative frameworks.

I would place the approaches identified by the authors I have reviewed on the following spectrum:

(instrumental) Fox – Joshi / Houtzager – Shkabatur – Haklay – Berdou (process / participation)

Looking at it this way allows us to be more explicit about how we are evaluating the project and the impact of the mapping. Here are some of the implicit 'success' criteria within the literature, listed in order from instrumental to process-based:

- *Improvement in service delivery:* government taking action after being held accountable by community members, through information gathered by them.

- *Citizens taking action on information*, through advocacy (with government) or any other means, which they would not otherwise have done.

- *Empowerment through process:* including mapping itself, information-gathering, learning new technology.

- *Economic empowerment:* learning skills leading to employment and other opportunities.

- *Empowerment through crossing social boundaries:* a gain in social mobility.

- *'Deep democratisation':* expanding the reach of tech tools beyond elites to achieve the original democratic ideals of the Internet / tech / participatory GIS.

- *Political artefact:* mapping a slum area is a political statement in and of itself when undertaken by residents.

## 2.4 The state of the field: digital collaborative mapping

In the above list of success criteria most of the items are process-oriented. However, in practice, these are rarely prioritised. At this point, some context around the current status of community-

based[13] mapping is in order. There has been an explosion of mapping in OSM in recent years. This is partly due to improvements in satellite imagery quality, which has made remote sensing (mapping by tracing features on satellite imagery) more accessible to more people. Groups such as Missing Maps and Humanitarian OpenStreetMap Team stage 'mapathon' events, using tools like the tasking manager to distribute tasks to volunteers who may live halfway around the world. Imagery has been released from its prior private control, through projects like the US State Department's Imagery to the Crowd, and commercial providers like Digital Globe are now opening their data. This has led to a major increase in remote digital humanitarian mapping globally.

Remote mapping, of course, cannot add important details like place and road names, so many agencies using these methods find that at least some ground-level mapping is also required. However, for many reasons these projects have tended to strongly favour 'professional' mappers[14] or those with somewhat more education and training who do not come from the area being mapped. Thus, the benefits of process and participation that Shkabatur highlights have not frequently resulted; nor have the 'strategic' dimensions of accountability initiatives identified by Fox. Many projects mapping in informal settlements have prioritised quantity and speed over engagement with local residents as mappers, even when they have been involved as guides and participants. Local leadership and ownership is then less likely to result, due to lower levels of involvement in the entire information 'value chain'. This is not to say only one type of mapping is useful, or that remote sensing should not be used in conjunction with community-based mapping. Certain kinds of goals for map data can be met without intensive local participation. But if local empowerment and strategic engagement with partners were more frequent goals of mapping projects, the kinds of outcomes discussed in this report are more likely to be achieved. This research shows what that might look like, and the investment involved.

In practice, Map Kibera has actually worked from both ends of the spectrum, mixing up all the categories outlined above. From professional to volunteer mappers, from instrumental to empowering participatory mapping, from government-oriented to 'voice'-oriented mapping, from tactical to strategic

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13 By 'community' it is important to clarify I am referring to geographic neighbourhoods, rather than, for example, the 'community' of digital mappers working globally in OSM, for example.

14 As defined in Shkabatur's paper, these are the opposite of community mappers and "only visit the relevant community for mapping purposes and do not possess additional ties to it" (2014: 88).

types of projects, we have used elements of all these approaches, even within the same project. 'General mapping', which Shkabatur places at one edge of her continuum, has hardly been done since the very first Kibera mapping, even in other locations where we have worked. Regrettably, early 'snapshot' literature on Map Kibera misses the evolution of the project along these continuums.

Further, some success criteria might be missing from the previous list. For example:

- greater political awareness among participants involved in creating media or maps (generating, for example, a growing sense of civic responsibility, or even of indignation at political problems)

- becoming visible as a result of being mapped for the first time (i.e. schools having greater pride and a sense of their right to exist and be properly resourced)

- resources being directed to specific places due to maps or media stories (i.e. schools, individuals); not service provision so much as bringing charitable connections and networks

- building trusted networks and increasing social capital of participants and data users.

This research addresses gaps in the literature on the impact of participation in data and mapping processes on both individuals and communities. It investigates the relevance of the key concepts outlined above: process-oriented mapping, instrumental mapping, and strategic and tactical approaches to accountability.

Finally, I'll look at how digital mapping globally could benefit from these findings, especially in terms of engaging community members. I'll touch on practical questions of resources, and the emergence of data – in particular 'big data' – as a commodity.

# 3. Research process

Part of the aim of this paper is to assess whether Map Kibera has indeed met indicators of a successful 'process' while also gauging whether instrumental and accountability results have been achieved, within the framework of the research questions. A long timeframe allows for reflection on the entire life of the project to date, to understand changes over time.

In order to research a topic in which I am actively working and invested, I focused on demonstrable results and tangible outcomes, despite knowing that these would not be enough to capture the full range of implications arising from this work. I therefore addressed matters of bias as much as possible. Aware of the nature of inherent bias, I make my approach explicit in this report by using first-person language at times, avoiding a tone of omniscience and referring back to evidence.

To begin, I focused on the maps themselves and related data in OSM. This allowed a "where are the maps?" approach, where I could interview people who have come into contact with Map Kibera maps over the years. It did not, however, allow me to investigate thoroughly the impact of our media work, or evaluate projects like Voice of Kibera or Kibera News Network. I refer to these projects whenever possible, particularly when the picture seemed otherwise incomplete. I look forward to conducting further research on the value of citizen reporting, especially when combined with mapping.

The primary research involved 14 semi-structured interviews with stakeholders, three focus group discussions with participants in Map Kibera's work and employees, and three follow-up interviews. Nine interviews were conducted by research assistants Joshua Ogure (also Coordinator at Map Kibera Trust) and Adele Manassero, a master's student at the University of Torino. I conducted the remainder, accompanied by Joshua Ogure. All interviews were conducted in English; while this was not the primary language of some respondents, Mr Ogure advised that people preferred to speak English in this context.

Interviewees were selected from a list of known map users; they were targeted because they had been in contact with Map Kibera regarding its maps and data.

**Table 1 Type and number of research respondents**

| Interviewee | Individuals interviewed | Follow-ups (second interviews) |
|---|---|---|
| Member of government | 3 | 1 |
| Head teacher | 3 | |
| Local leader | 3 | 2 |
| Kibera-based NGO head | 4 | |
| Others | 2 | |
| Total: | 15 | 3 |

Joshua Ogure of Map Kibera shares the security map with Administrative Police Commandant Enos Maloba and Inspector Dorine Munyao in advance of the 2017 elections.

To ensure validity of these results, given my proximity to the subject, I asked follow-up questions and conducted follow-up interviews. I wanted to get to the bottom of how exactly data had been used and what outcomes had resulted; and what could be directly attributed to Map Kibera's work. This often meant asking the same question a few different ways, or asking another person to verify what someone else had said. Sometimes it meant pinning down the exact details of an incident. This can be very difficult because of a tendency in Kenya to speak in possibilities or intentions rather than details, and to say yes rather than no. Being used to this, I was able to be more specific in identifying what was known or not known, or suggested but not confirmed, than a researcher with no connection to the project would have been. This reduced the risk of subjects trying to make Map Kibera look good or gain something by responding in a certain way. In this type of qualitative social research, such challenges must arise no matter who is conducting the research. Wide social impacts and policy impacts are particularly hard to attribute.

Additionally, to investigate personal empowerment and process impacts, two focus group discussions were held with long-term members of Map Kibera, including two from the first group of mappers trained in 2009; participants also included two mappers and three citizen media team members. In one discussion, a 'Road of Life' activity was conducted, in which participants (one woman and four men[15]) drew their life paths on paper in the format of a road, adding in Map Kibera-related life events, twists and turns.

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15  We have had some difficulty over the years retaining young women; we are not alone in experiencing this.

# 4. Case studies

## 4.1 Education (Open Schools Kenya)

Open Schools Kenya (OSK) began in 2014 with a Grand Challenges grant by the Gates Foundation.[16] The purpose was to map every school in Kibera (and eventually every school in Kenya; the project is continuing), including detailed self-reported data on each school. Given the proliferation of small private schools in Kenya, this was a huge data collection effort. The data was entered into OSM directly, meaning it could be openly accessed and edited later. The data was also linked to the government's latest (openly available) figures for each school to highlight data gaps and changes. Pre-project interviews with parents, teachers and other education stakeholders helped determine which data would be gathered.

The resulting database is online at www. openschoolskenya.org. Print maps were distributed and the online portal was demonstrated to every school, and further publicity included street outreach to parents and a formal launch event with government and NGOs. Tracking this case was easier than in other mapping projects we have done because of this extensive outreach; we could easily visit those who had either been given a paper map or attended an event.

One surprising discovery made by OSK was the sheer number of schools, and therefore schoolchildren, attending informal schools in Kibera. The District Education Officer (DEO) had expected to find around 100 such schools, but there were actually more than 330. Even the school network heads seemed surprised by this figure. We found that 75% of an estimated 53,000 students in Kibera were attending schools not administered by the Ministry of Education (some were run by CBOs, some by churches, by private citizens and so on).

Interviews were conducted with several head teachers, the DEO, the Member of Parliament for Kibera (Kibra constituency), the heads of the two informal schools[17] networks (who are also head teachers), one NGO leader, and one former high-level government official. The purpose of the interviews was to track their use of the maps or data, and any further spread or influence of the information. There were several clear results.

Legitimacy: Respondents said the map helped to legitimise them in the eyes of government and the 'outside world'. This had different meanings and impacts. One school head mentioned that "it helps our government to acknowledge our presence, these small, small schools ... Because we also expect services from our government. The children in these schools are not non-formal children."[18]

Funding and resources: Outsiders (usually foreign donors or NGOs) were able to locate the schools, contact them and bring in resources or funds. One potential donor became convinced a school was legitimate and stable because of the map and online website.

Security and stability: There was a sense that OSK might help prevent demolition of school buildings by government. Being identified, quantified, counted and located provided a tangible security benefit and bolstered stability.

Recognition and visibility: The "importance of being recognised" was mentioned, regardless of further tangible results. "It gives people an opportunity to be proud that they have been recognised as an area, to be captured on a map," said the leader of one informal schools network. He continued:

> Secondly, the outside world will be able to appreciate there are people who want to highlight … this is where Kibera is, [and] how they are working. This is something that is very important, for any community to be identified and recognised and put on some record that would show they exist.[19]

Another school head described searching for Kibera on maps from the Ministry of Education and receiving one where Kibera was still labelled a forest;[20] how discouraging for someone who had worked so hard to develop a school in the settlement.

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16  OSK grew out of a consortium of members of Feedback Labs. The grant holder was Development Gateway, which worked on development of the OSK data site.

17  For the purpose of this paper, I refer merely to 'informal schools' to indicate small non-governmental and unregistered schools in the slum. However, in Kenya these schools are now formally known as APBET schools, or 'alternative provision of basic education'. All are privately run, some are affiliated to churches, some to CBOs and others merely to their owners. For more on this see OSK.

18  Respondent 1

19  Respondent 2

20  Indeed, the word *Kibra* means forest in Nubian. Originally it was forest land but has been inhabited for many decades. Kibra is now also the official name of the district.

Government data use was tracked from lower through to higher levels. The DEO responsible for Kibera – one of those who initially believed that there were only around 100 schools in the settlement – reported that she had used the OSK map to contact schools she hadn't known existed before these maps came out. Subsequently, she worked with these schools to try to increase latrine provision, invited unqualified teachers to train to become qualified, and hired extra teachers in crowded schools. We had collected data on all these points and listed them on the OSK site. The DEO also said she had used the OSK information to develop and present a paper on the state of education in Kibera to a national governmental education conference. In a follow-up interview, however, she said she relied on the paper map, which included only a portion of the detailed data, because of her lack of facility with computers (though subordinates had accessed online data). Therefore, it wasn't clear the exact interplay between the online and offline data and her initiatives. But it was clear that the names of most of the schools and their physical locations were not known to her previously, and that this information definitely resulted in increased outreach to schools.

Another point she raised was that the relationship between these informal schools and the local government had not been very trusting to begin with. Her office was new (following devolution and reorganisation of government), and schools weren't keen to be connected with it, in case she shut them down. She thought our role in talking to schools helped build trust and reassure them that her office did not intend to shut them down, but to help them register with the government so they could benefit from further resources.

The DEO also mentioned in both interviews and on a video made by the Map Kibera media team that she had distributed the map to organisations looking to do charitable work with Kibera schools, including making photocopies of the map and referring organisations to Map Kibera for further guidance. Resources may have been channelled to schools this way, or the data may have been otherwise beneficially used by these agencies (we were unable to follow up during this research period).

It became clear that that no schools had yet been registered under a new policy, pushed for by the informal schools networks over many years, which



Zacharia Muindi of Map Kibera demonstrates Open Schools Kenya at St Stephen Children's Centre.

allowed alternative schools to register and be eligible for government support. There seemed to be a blockage at some level of government. One of the school network heads wondered if Map Kibera could play a role here, perhaps hosting a meeting of relevant officials to set up the necessary processes. The network head alone hadn't been able to capture their attention, and did not have the resources to sponsor a major event (an elaborate breakfast, for example).[21] This showed that advocacy by local groups can sometimes fall short, due not to lack of data or effort, but to a lack of lobbying resources. Also, perhaps the lack of a strategic alliance with a partner who could play a role like this was a factor.

At a higher level of government, the Kibera constituency MP, Kenneth Okoth, said in an interview that he had made extensive use of Map Kibera's schools map and online data. After seeing the map, he said he saw the need for more secondary schools to serve Kibera; OSK showed that while Kibera had 144 primary schools, there were only 31 secondary schools.

> I even used it at the education committee to hold the Ministry [of Education] accountable … We have succeeded in getting 37 million [Kenyan shillings; about $370,000] for high schools in Kibra. Because I had the data and the arguments, the government therefore had to move money for this. The average constituency is getting 12 million.

He also used the information to justify this expenditure to the public:

> I've used the data from Map Kibera even when making arguments in the media, as to why CDF [Community Development Fund] is investing in education first … the empirical data we had from Map Kibera helped us to back up the policy decision to invest as most effective and impactful in education.

Having apparently decided to prioritise education, the data helped him make his case.

After learning about the non-governmental schools, he contacted many of them to create a WhatsApp group he uses to communicate with educators, sharing important local information on topics like cholera prevention and voter registration. He successfully argued for the inclusion of 50 non-governmental school heads from Kibera at a

teachers' retreat, using data showing the number of school attendees from the informal sector. This teachers' retreat was previously for teachers from government schools only. He also helped schools to set up a mock exam for a national test, reporting that initially they were wary of being critiqued on their results, but later said it had been extremely valuable.

The MP had also repeatedly referred external researchers, journalists and others to Map Kibera's website when they requested data on Kibera, and displayed copies of the map in his offices.

He was able to advocate using specific data such as the number of Kibera children whose parents pay 'double' for school (through both taxes and 'private' school fees). He therefore found the information highly actionable. It also helped him reach out to and build trust with the schools.

Others also used our mapping and data to get results. A former Minister of ICT, currently a professor of business and newspaper columnist, took a printed schools map to the Minister of Education (also Cabinet Secretary, or CS), to illustrate the need to support the 39,000 students in Kibera who were not getting government resources for their education due to attending non-governmental schools. While the CS was apparently surprised by the data, he did not take action. But the former minister tried again with the new CS. This time he showed him the printed map and mentioned the policy which barred private school primary level graduates from receiving government financial support to attend well-regarded public high schools; the assumption was clearly that any private school pupil must be well off. Using our data, he showed that, in fact, most slum children attend 'private' schools. According to the former minister, the CS then changed this policy.

## Discussion

Some school leaders asked us to help them with advocacy, using the maps and data to lobby government or showing them how to share information online with potential donors. These gaps had not been filled by Map Kibera because of a lack of follow-on funding for the project, plus our feeling that we were not ourselves an advocacy group, or education experts. Although helping others with lobbying or advocacy would have fallen within our mandate, we had not been able to do this by the time the initial project funding had ended.

The request to assist with specific schools lobbying was challenging. The implication that we could get

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21 This might seem unnecessary or even corrupt, but it is common in Kenya to expect a nice meal if not outright pay for attention to an issue by a government representative.

*Without open data, none of the uses and benefits reported above would have happened. Distribution of paper maps as well as OSK online data was fundamental to these and other outcomes*

officials to progress school registrations by hosting an attractive event might place the organisation in a tricky position. Was this really a role for Map Kibera? Were there other kinds of alliances that might have assisted in navigating these local political dynamics?

I asked Map Kibera's general manager about this, and he said that some NGOs did do direct organising at times, including legal support in the courts.[22] Map Kibera members did not seem to want to do this kind of organising; they had good relations with all sides of the schools issue and did not want to compromise their neutrality. Some advocates, such as the MP, promoted public schools for all and tried to improve government schools; others (head teachers and schools network leaders) promoted their own small private schools. In discussions with parents during a pre-project study, Map Kibera found that parents preferred private schools, thinking they were generally of higher quality than crowded government schools.

We were not the only ones to carry out schools mapping in Kibera. During the course of mapping anywhere, it was not unusual to be told "xyz organisation has already done this". In Kibera we did encounter another group doing a form of schools mapping. However, as was typically the case, we were not allowed access to that data. It was often produced for one specific purpose and not shared widely. This highlights Map Kibera's achievements: without open data, none of the uses and benefits reported above would have happened. Distribution of paper maps as well as OSK online data was fundamental to these and other outcomes as discussed below.

In the schools sector work, we did a huge amount of outreach with stakeholders, especially the schools themselves. We explained what we do clearly from the start, later providing information directly to them in the form of paper maps. This created a level of trust with the schools which could be considered a valuable kind of social capital. Maintaining that relationship while creating similar levels of trust with

government officials, some of whom clearly prefer to have children attend government public schools rather than these small schools, was paramount to the team. An adversarial approach to getting sector improvements could have backfired. As with most Map Kibera work, there was an emphasis on bringing a variety of stakeholders into a network based on shared information. (This is not to say that no group should be adversarial, but that it is more important for a group generating data to be seen as neutral, albeit one with allegiance to the community as a whole. Indeed, this is how the journalistic ethos and the tie-in with community media programming makes sense.)

What happened next was, for the most part, up to stakeholders. Prior to this research, we did not know what actions had been taken, especially by government representatives. Formal contact with the DEO and MP about OSK was limited to a few encounters, including a launch event where copies of the map were distributed. It is therefore all the more remarkable to find that the DEO was distributing photocopies of the map and the MP was quoting OSK figures in Parliament. In other words, the map was being used by better-placed advocates to get specific policy change and direct more resources to Kibera schools based on greater understanding of the number of students in informal schooling in Kibera, without any further guidance by Map Kibera staff or volunteers. Map Kibera was, however, known to local officials – they recognised members and saw them at events in the community. Map Kibera was generally trusted, and this likely lent credibility to OSK and its data.

We also knew little about any action subsequently taken by parents. In the original theory of change, parents were one of the initial target demographics for this data set. When surveyed, parents had shown an interest in school features like feeding programmes, distance from home and student-teacher ratios. We gathered this information and hoped to include their feedback on their child's school, so that school quality could be assessed. However, increasing parent access to and use of

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22  It also can be challenging to form alliances with such organisations, especially on topics which are not part of their funded programming.

the data would have required a more intensive, targeted outreach. Kiosks were tested in Kibera to show the online resources as well as the paper maps to parents.[23]

The initial OSK project was meant to show differences and gaps between official open data (a data set released on Kenya Open Data Initiative's website, gathered by the MoE in 2007) and citizen-generated data in OSM. This comparison showed that governmental open data was not nearly as complete regarding Kibera schools as the OSM data. We also looked at the formal reporting mechanism for non-governmental schools through a system called the Education Management Information System (EMIS). The DEO for the area sent this paper form to all the Kibera schools on her list, but these numbered 149, far short of the 330+ on our database. The paper EMIS forms were entered into a computer system for aggregation, but the data was not openly shared as far as we could determine.

There are two distinct factors in terms of data credibility:

1. Data reliability: it must be 'good enough' in terms of accuracy, at least better than other sources, and thereby useful for analysis and planning.

2. The reliability of the data process: it must be neutral, well-informed, intended for open sharing, and otherwise created in good faith rather than for any self-serving purposes of the entities being mapped (schools, in this case), or for self-serving purposes of government (always under suspicion of corruption). Reliability could provide the basis for a level of trust between these entities.

Had the mapping been commissioned by the government directly, it is likely that it would not have achieved credibility. Does this mean all data collection in contested locations needs to be done by private organisations like Map Kibera? Not necessarily; citizen-collected data could be government-sponsored, if data credibility as described above were always central to the arrangement.

Schools data typically travels from the school to the DEO, and from there to higher levels of the education ministry. Therefore, there is typically an information gap for those outside this system. Creating and distributing this open data set reduced this asymmetry. The information itself did not seem

to alter the power dynamic, but introduced further relationships into the network: those between the DEO and the individual school heads, and with Map Kibera itself.

Perhaps most fundamentally, open data helped create trust in and of itself, when brokered by a trustworthy and neutral intermediary.

## 4.2 Security

In 2010, Map Kibera created a map focusing on girls' safety and security, with funding from Unicef. Unicef wanted to understand where girls were either safe or at risk from threats which might increase their vulnerability to dangers like HIV infection. The resulting map was based on focus groups with girls aged 8 to 16. As well as mapping of features like crime hotspots, it included positive security features like street lamps and police stations. It turned out to reveal general patterns of safety and insecurity in Kibera, a topic which girls were especially familiar with.

During the 2013 national elections, security issues were on everyone's minds. In 2007, during the prior election cycle, disputed results had led to inter-tribal and police violence, ultimately claiming some 1,300 lives. Kibera was one of the main hotspots in Nairobi. For the 2013 election, Map Kibera printed and distributed the security map developed with the girls' groups to security officials as part of our larger commitment to supporting peaceful elections, and painted it on a large wall at the main road entrance to Kibera. For this research, we attempted to determine whether it had been used for advocacy or policy-making, planning for the elections, or anything else beyond its original intention.

The main source for this information was the Secretary for the Sub-County Peace Committee, who is closely involved in conflict mediation in Kibera, and is well known in the community. His position is technically non-governmental, but his office, a small metal container, is located within the District Commissioner grounds among other local government offices.

During the 2013 elections, the Secretary was given several copies of the security map indicating hotspots – locations known to be unsafe. He distributed them in turn to other offices in the compound and to various NGO leaders. He "gave them out like hotcakes," he said, as most of these

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23  Much of the work on this case was cut short by the end of project funding, which was through a Gates Grand Challenges grant for data interoperability (in this case, data from the government was matched to our OSM data for each school). The Challenge category itself was aborted by the foundation midway through the challenge and was never restored.

Security Map mural painted on a wall on Kibera Drive prior to the 2017 elections.

people weren't familiar with Kibera. During the elections, there were many such officials (including foreigners) working on security in Kibera.

We tried to trace these distributed maps, but the individuals filling the key posts had changed. We do know that the company Adopt-a-Light received the map, and it is possible they installed new streetlights based on the mapping of unlit hotspots. However, we were not able to confirm this.

Citizens themselves were not targeted by the printed security map, although two maps were painted on prominent local walls. These wall paintings were mentioned by individuals as one way they learned about Map Kibera, and for other purposes, although not as a way to prevent insecurity. They were attractive more as a general map of the area. It seemed unlikely that these maps would have prompted citizens to undertake any advocacy on their own.

However, the distribution of the map to local security offices is likely to have familiarised these

officers with Kibera as a whole, and key hotspots in particular. This may have led to the creation of satellite police posts to maintain order during the election period, something which was referenced by the Secretary.[24] While Map Kibera did not extensively lobby officials to do more to improve security in Kibera, Map Kibera's director did hand the printed map over to the national Inspector General directly during his visit to Kibera to prepare for the elections, sending a clear message about the need for improvements in security.

The Secretary also mentioned distributing the maps to visitors from outside Kibera, especially representatives of foreign organisations, for use in navigating the area. As a centrally positioned individual, both physically and socially, he regularly met those interested in working in Kibera.

Aside from security mapping for the 2013 election, Map Kibera did a great deal of election-related reporting, interviewing candidates and screening issue-based interviews in the community, hosting a candidate debate forum, reporting via YouTube

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24  The source we spoke to also emphasised that the administrative police in his compound were mainly tasked with non-escalation of violence, maintaining peace and mediation, not catching criminals and placing them in the justice system like the 'regular' police. Thus they are not generally responsible for complaints of excessive use of force or corruption. However, this can be a fine line. The Langata Sub-County Peace Committee head was trusted by our local staff to fully contribute to maintaining peace and as such able to conduct outreach using maps to enhance security, not exacerbate tension.

videos on election day, and conducting follow-up reporting after concern emerged about whether the election results would be accepted (a period when most media had already left the area). Map Kibera also mapped polling stations and boundaries, posting these online. On election day, Map Kibera used Voice of Kibera to gather SMS reports by our reporters at polling stations, in case of any disruptions.

While this study did not provide an opportunity to investigate the direct impact of this reportage, it was clear that when looking at security in Kibera as a whole, connections established by Map Kibera with individuals like the Secretary did enable verification of reports of election-related wrongdoing or violence. Map Kibera members were able to track rumours coming in through Ushahidi's Uchaguzi reporting site and Voice of Kibera, and to alert security personnel as needed.

This research took place prior to the 2017 elections in Kenya, but Map Kibera took part in a similar exercise during that election cycle, including updating the security map in conjunction with local peace groups and reporting via SMS and video. Preliminary findings indicate that similar outcomes in terms of verification of rumours appeared to have resulted.

### Discussion

Again, the distribution of paper maps increased understanding of the issues in Kibera both among government officials and non-governmental actors.

Offline versions of online data were also vital to resource allocation (of police posts, for example) and navigation by government officials (and possibly by non-governmental charitable organisations as well). Online data was hardly used directly in this particular case. Nevertheless, SMS-based communications regarding rising tensions were important.

We observed instances of rumour verification and follow-up. In one case, the team on the ground was able to quell a rumour of election-related violence by pushing a message through the SMS system. In another, the Director of Map Kibera was able to alert security officials of tensions on the ground, again conveyed by SMS from a trusted reporter; this led to a prompt response.[25] Coordination via local networks seems key when addressing security concerns.

Overall, then, having information / data available and channelling it through a trusted network was key to improving security. Distributing neutral data (the maps) strengthened collaborative networks and built social capital – both for Map Kibera members and the head of the Peace Network, who became an additional distributor of this data.

In Kibera, so many NGOs and foreigners come and go, all with their own ideas for what will improve the slum but often not staying long enough to understand the context or get results. Local CBOs can be equally problematic in that residents are often suspicious as to what they are doing with grant money. Generally, there is little trust in aid organisations. In addition, government programmes come and go, while many people question the motives of officials. The post-election violence of 2007–2008 brought tensions to a head, and inter-tribal trust is also still at a low.[26] At the time of publication, this mistrust is once again on display as new national election results have been nullified by the Supreme Court over irregularities in the vote tallying process.

Creating trust is extremely valuable in an environment like Kibera – indeed, in any informal settlement – where scarce resources coupled with an infusion of aid funding can create opportunities for corruption, and suspicion of the same. Map Kibera's printed security and education maps garnered a positive response along the lines of, "Oh, you've actually done something I can see. And that is important to me." This seemed to have value apart from any navigational uses of the map.

## 4.3 Water and sanitation

The water and sanitation map of Kibera was first created in 2010, and has been updated a few times since for various projects.

One update involved the NGO Carolina for Kibera (CFK), an organisation linked to the University of North Carolina, and one of our original partners in Kibera. In late 2013, the director of CFK wanted to implement a project to improve water and sanitation. They first needed to map all the water, sanitation and hygiene (WASH) facilities in the villages of Kibera where they planned to work. CFK hired Map Kibera to create this map (actually, to update existing data on OSM and then provide a custom-printed map). The features they wanted mapped included dumpsites, latrines, water points and pharmacies.

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25  Kepha Ngito, blog post and personal conversation, 2014.
26  Map Kibera worked with The Sentinel Project in 2016 to survey residents of Kibera and found that 90% of respondents trusted information from other ethnic groups only moderately or not at all.

Following this mapping, CFK re-targeted its programming. In an interview, the director said he was quite surprised at the findings, including uneven distribution of latrines (which are usually open to the public at a fee but provided by various non-governmental or private groups). Based on the mapping information, they were able to target the community that most lacked such facilities. They also increased outreach by health volunteers to provide training and information on WASH to residents in those areas. The impact in terms of health outcomes is not known in detail, but it is likely to have increased access to latrines. The director noted that previously, they based their work on 'common knowledge' or assumptions about where needs were greatest; the actual mapping painted a very different picture that was contrary to these assumptions. The maps were distributed to the Ministry of Health and an international NGO funding partner, FHI 360.

There was some misunderstanding about the nature of the open data produced by Map Kibera. The director felt that CFK owned the WASH map; in fact he stated that he was reluctant to share it with another NGO for this reason – although he had given it to his donors and the Ministry of Health, and acknowledged that they may in turn have shared it. The value of open data conflicted with a sense of ownership, since CFK had paid for this map.

At the same time, the director asked Map Kibera to coordinate organisations working on this issue and share findings in a workshop. Such NGO coordination was missing, he felt, as was accurate knowledge of programming gaps. Thus, CFK's idea of ownership of data (and indeed of anything which had been paid for using scarce funding) conflicted with the premise of OSM and open data; but even so, CFK's director still considered it important to share findings with others in the sector for coordination purposes.

The Human Needs Project (HNP) is also a foreign-founded (and funded) but locally based NGO in Kibera. During conversations with one of the project's founders, a successful technology entrepreneur from Silicon Valley, he indicated that Map Kibera's maps, particularly the water maps found online, had been key to situating the project's complex water filtration system, including deep-drilled wells and water treatment tanks. The local director interviewed for this research had also surveyed the community and found that location was the most important criterion influencing where residents decided to go for water (above, say, price). She then found Map Kibera's water maps online. She saw that they indicated a lack of water points in an area called Karanja; this surprised her, since it is more developed than other parts of Kibera. Having verified this observation herself, she

then used the maps to convince her board of directors that this was the best place to start their clean water distribution project. She also noted that both foreign and Kenyan visitors to Kibera relied heavily on our maps posted at HNP's Kibera Town Centre (a gathering spot). She found that the maps generated interest and helped people get around. So accurate targeting of services and navigational guidance for outsiders were two useful outcomes in this case.

## Discussion

These two uses of the water and sanitation map differed in that one was commissioned, while the other used a download of a free and open version of the map without directly contacting Map Kibera. In neither case was advocacy involved as a priority, although in one case the map was shared with the relevant ministry. But in both cases, services were ultimately better targeted and improved thanks to the mapping data.

This illustrates the multiple, practical benefits of a client-driven, issue-specific map; because it is open, freely available data, it can also become useful to other groups looking to direct services to an area. There may even be other examples of use we are as yet unaware of. The value of even passive open data is demonstrated. Simply making information available is often critiqued as insufficient. But this case shows that sometimes just sharing information can help in extremely useful and surprising ways.

Key to this is location: this was not a general database, but a community-level source of information. Map Kibera, as a go-to information source, lent legitimacy to the data. The siting of user organisations right in Kibera also underlines the importance of location. HNP did not come to Map Kibera itself to verify the mapped information, but was able to do so in person and on foot. Also, they didn't find out about the data by perusing OSM's site (which also contains all the map data) but directly via Map Kibera's website.

It would be interesting to compare these use cases with patterns of use of the Kenya Open Data Initiative (KODI), a national initiative which posts official data on the web (we used it to source government education data in the OSK case). As a local source, was Map Kibera's data considered more accurate and relevant, or would some users have preferred a government data source because of its official nature? Notably, however, on KODI it is difficult to find data at the level of granularity that Map Kibera has gathered, so such a comparison may not be possible. In OSK for instance on each school page the OSM data is listed alongside the KODI data, showing that many are missing in KODI.

*Creating linkages inside a community requires individuals from the community having or gaining the ability to fill the infomediary role. Issues of empowerment and democratisation are inherent in this process*

# 5. Participants' experiences / empowerment

What was the personal impact on participants from Kibera in Map Kibera activities? In my review of key literature, the concepts of empowerment and deep democratisation emerged. While these were not explicitly part of my primary research questions, it is clear that creating linkages inside a community requires individuals from the community having or gaining the ability to fill the infomediary role. Issues of empowerment and democratisation are inherent in this process. Therefore, I decided to investigate the extent to which the 'process' indicators of empowerment were achieved. This would also allow me to situate some of the ideas in the literature in the context of Map Kibera membership.

During two focus group discussions with long-term Map Kibera employees and volunteers, participants shared major turning points related to Map Kibera. These included training others in mapping; attending GIS training workshops and conferences in Kenya and abroad, winning an international media award, travelling to New York with other young leaders from around the world, and winning a contest for a blog post. These achievements reflect enhanced social, occupational (and indeed, geographic) mobility, and a level of technical facility indicating deep democratisation. In the words of one participant, "Sometimes when I go to the same place where other journalists are, I feel at this moment I can even work for KTN, Nation or Citizen, because I feel it's the same thing that we do."[27]

Another reported:

> Almost everything I've done from 2010 till now, I owe to Map Kibera. Even things I've done outside of Map Kibera. From here I got interested in a lot of technology stuff. Videos, installing software, graphics. Just through trial and error I learned them. Because I didn't even know how to use a computer.[28]

Members felt that had they not joined Map Kibera, they'd still be doing what they had been doing before: running a barbershop, or fixing small electronics in a market stall, for example. Many turning points and highlights were framed in terms of an increase in confidence. Winning awards or being recognised in some way, or being able to teach others, became life-changing experiences with broader implications, even if direct employment or volunteer work with Map Kibera had been sporadic.

We also asked whether members felt they could participate in technology activities and events throughout Nairobi with greater ease and confidence. When we specifically asked about Nairobi's i-Hub, a co-working and tech hub space founded by Ushahidi, they described feeling comfortable there.

Members also reported feeling responsible to the community in a way they had not before. People would come to them and expect them to know about what was happening. There was also a sense of greater civic responsibility and political awareness in terms of finding out the truth. One commented, "I used to like politics so much. Since I joined the reporting side, documenting issues, I decided to not like the politicians. Journalists hold people accountable and politicians are not telling the truth."[29]

## Discussion

The ability to cross social boundaries from the slums of Kibera over the road, literally, into the i-Hub, a

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27 Respondent 3
28 Respondent 4
29 Respondent 3

*Map Kibera members reported the realisation that they were better at some tasks than the university-educated tech entrepreneurs. This realisation challenged ingrained social norms and demonstrated the spread of deep democracy and the roots of empowerment in the work with Map Kibera*

well-appointed building filled with tech start-ups, constitutes major social mobility in Kenya. While this is not the place for a detailed discussion of social class in Nairobi, it is clear that a major barrier to mobility is education. Most of the young tech entrepreneurs who fill the i-Hub and who are the drivers of 'Silicon Savannah' come from middle class backgrounds and have university degrees. A common perception among Kibera residents is that they wouldn't feel able to hold their own in such company. However, Map Kibera members reported the realisation that they were better at some tasks than the university-educated tech entrepreneurs. This realisation

challenged ingrained social norms and demonstrated the spread of deep democracy and the roots of empowerment in the work with Map Kibera.

Participants also gained detailed knowledge of local politics, networks and leaders. Meanwhile, they became recognised as go-to sources for both media and map information locally. As information mediators, the group attained a reputation for trustworthiness which is difficult to gain in the slum, especially among young people. Process-related empowerment on a personal level was a clear result of involvement with Map Kibera.

# 6. Discussion and analysis

## 6.1 Responding to the research questions

In this section, I address the initial research questions. I will first look at my initial three questions – all of which ask about outcomes – together. I examine these results by looking at key changes that took place in governance, trust-building, communication, resources and targeting. In the literature, I found that process-oriented outcomes, such as visibility, legitimacy and voice were important to focus on as well, so these are also discussed in this section.

These first three research questions were:

- Have Kibera citizens been able to influence local change using maps and other digital tools? If so, how?

- What have been the inflection points (triggers) for directing attention to issues raised by Map Kibera over the past seven years, and how has government responded?

- Has information gathered and shared by Map Kibera brought: 1) new awareness or

understanding of the issues; and 2) actions taken based on this knowledge?

Overall, information sharing has clearly fostered action and understanding, and brought about local changes, but not necessarily as we had expected. The first research question might imply that citizens had spontaneously banded together or individually called for changes, which did not happen. Even the informal schools networks appear not to have used the information to advocate directly with government; instead, they saw this as something Map Kibera could do, or help with.

### Governance impacts

There have clearly been local changes related to governance in the three sectors researched. In the education sector, highlights included the use of the maps for advocacy by the local MP and high-level influencers outside government; this led to policy changes and more resources for education. Change resulted primarily from redirection of resources by government, internal government advocacy, or advocacy by high-level influencers. Citizens did not directly lobby government. But if Map Kibera's young

*For action to be taken, three factors were key: an ability to make direct use of the data, a high level of interest in the sector and responsibility for the Kibera constituency, either personally or professionally*

participants can be considered the Kibera 'citizens' demanding accountability, then we can answer 'yes' to my first research question. These citizen mappers did use the information they had collected to influence local change by engaging with sector stakeholders.

In the water sector, local organisations with strong ties to external NGOs redirected and improved services; it is unknown whether government was influenced. In the security sector there is some evidence that government was able to respond and improve security based on the outreach efforts of a quasi-governmental actor.

For action to be taken, three factors were key: an ability to make direct use of the data, a high level of interest in the sector and responsibility for the Kibera constituency, either personally or professionally. Whether governmental or non-governmental, targeting the right individuals and groups was important.

### Trust-building and communication

Another key impact of the data-gathering and distribution was trust-building and improving communication between the informal sector and government as well as non-governmental organisations. This shift created an enabling environment for changes like those discussed above, and indeed others which may arise in future.

Both governmental and non-governmental outreach increased substantially following the mapping of schools and establishment of communication with them. A feedback channel was opened via WhatsApp, encouraging communication between the MP and schools; other channels included a link between schools and the DEO. Similarly, citizen–government trust was improved on security issues, and between Map Kibera itself and security officials. Vital information was then channelled through these networks.

Overall, an open community data process helped develop trust networks, which in turn created the context that enabled specific outcomes. Providing an open data artefact helped the infomediary, Map Kibera, to become a trusted, neutral, productive actor in the community. The long-term commitment of Map Kibera within the community was key to building this trust.

### Resource increase and service targeting

Our findings indicate that both financial and in-kind contributions by private donors occurred when information was made widely available. This often happened simply because Map Kibera made the information available freely online. Some organisations then used the information to convince their leaders to increase resources or otherwise validate the work they were doing in Kibera.

Government actors were also able to increase and channel resources based on the new, mapped information; for instance, providing teacher training access and school building funds (teacher training was NGO-funded; buildings were funded by government). The trigger was outreach by Map Kibera, but the quality and reliability of its information was essential. Outreach to informal schools could only follow awareness of their existence, which Map Kibera made possible. If Map Kibera's documentation had not been trusted, this would not have occurred. Overall, there was also an increase in connections with outside supporters and visitors to Kibera.

The cases also demonstrate the importance of paper map outreach. In two of the three cases reported here, distributing paper maps widely helped to open new communication channels. In the case of water mapping, no paper maps were distributed, and there was less of an impact in terms of trust and communication. However, this is not to say paper maps exist in isolation from the digital process of data collection; a paper map simply reflects the information gathered in the field and stored digitally in OSM at a particular point in time. For example, the printed schools map included key data from the OSK database, such as numbers of students and schools in the sector. And online open data had previously unknown impacts, particularly when it was accessed by an NGO. Figure 2 below shows results of Map Kibera's work in terms of whether they occurred as part of online or offline research or outreach efforts – or both. Most results depended on a combination of online and offline activities. 'Offline' generally means distributing the printed maps for direct use in specific contexts (schools, security), or having personal conversations.

The fourth research question asked:

- What were the barriers, if any, to this understanding and action?

Barriers to action included resource limitations preventing Map Kibera from wider outreach as an infomediary or as a direct advocate; a lack of strong advocacy partners on the ground; and a preference for quick results among partners, clients and donors which precluded longer term community outreach and engagement.

Essentially, the more legwork and outreach done by Map Kibera, the greater the outcome in terms of government action and policy. However, even with minimal outreach offline, NGO actors were able to take action. But the systemic shifts in policy or overall sectoral functioning were primarily associated with wider coordination.
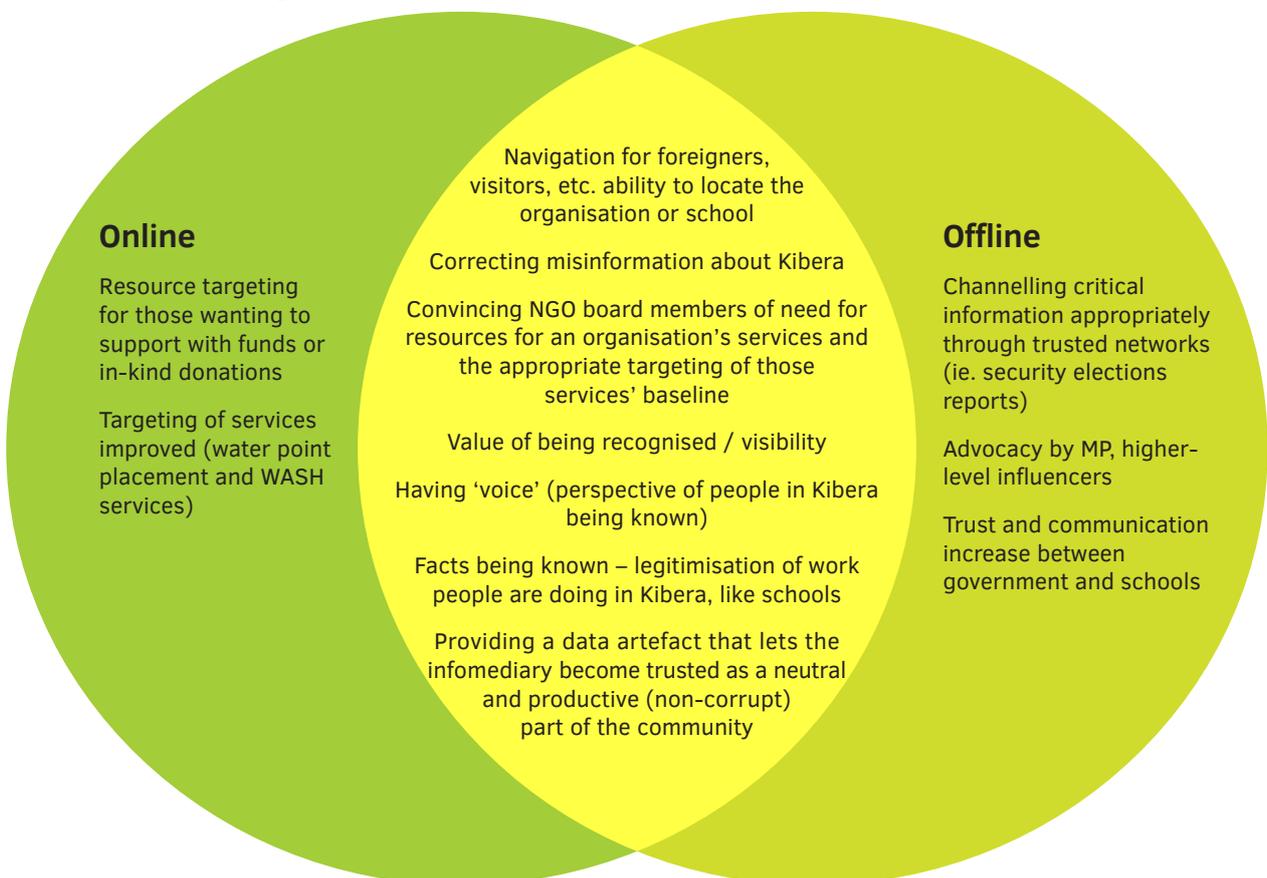
Greater coordination among more actors might therefore have led to even greater impacts. The evidence points to a need for Map Kibera to engage with a wider network of accountability actors. This would entail a more strategic approach involving direct engagement with other local NGOs – not only sector-specific partners (like schools) but others which may not be immediately obvious. This way, horizontal linkages among NGOs, CBOs and others could support the primarily vertically integrated work in education, in which Map Kibera engaged with government and schools but less with other organisations.

This is not to say that advocacy organisations would necessarily have to be those partners; after all, such organisations are not common, especially at the grass-roots level. It is also possible that partnerships with advocates that took an adversarial stance might compromise the neutrality of Map Kibera. But in the three case studies here, no such partners were actually discovered. What does exist is a highly developed civil society sector which might come together for great impact. Data and maps relevant to their work could potentially provide incentive for such groups, typically fragmented, to coordinate more closely.

However, stronger strategic work would require further resources. A major hindrance to larger impact overall was a lack of funding for work that was part of either strategic or process-based initiatives (for instance, support to civil society organisation outreach, or community

**Figure 2** Results of Map Kibera related to online and offline activities



**Online**

Resource targeting for those wanting to support with funds or in-kind donations

Targeting of services improved (water point placement and WASH services)

Navigation for foreigners, visitors, etc. ability to locate the organisation or school

Correcting misinformation about Kibera

Convincing NGO board members of need for resources for an organisation's services and the appropriate targeting of those services' baseline

Value of being recognised / visibility

Having 'voice' (perspective of people in Kibera being known)

Facts being known – legitimisation of work people are doing in Kibera, like schools

Providing a data artefact that lets the infomediary become trusted as a neutral and productive (non-corrupt) part of the community

**Offline**

Channelling critical information appropriately through trusted networks (ie. security elections reports)

Advocacy by MP, higher-level influencers

Trust and communication increase between government and schools

*The process of improving a marginalised community like Kibera might be better supported by creating linkages and trust among divergent stakeholders than by direct demands for accountability*

engagement in data gathering and analysis), and was perceived to be less directly tied to a specific outcome / objective. Data gathering and mapping are often funded only as components of larger projects, with little attention paid to whether the resulting data is open or shared. Even printing maps or training community members is challenging to resource. Although funders like to have data gathered on their projects, mainly for evaluative purposes, they are rarely concerned with the *processes* of data gathering, the potential for data to be used within a community, or whether the data is made open or not. Organisations tend to then collect just what is needed for either planning or reporting. There is a particularly large gap in funding for longer-term work in community-centred technology and innovative data, yet this is precisely what is required in order to generate systemic change.

The major problem here seems to be a disconnect between perceptions of what data is for and what it can accomplish. If the *process* of data collection was seen to have specific impacts in and of itself which could create larger systemic change and achieve the goal of open data impact, then perhaps such processes would be better resourced.

Project-oriented data needs drove some of Map Kibera's client work, such as the water and health data commissioned by Carolina for Kibera (CFK). While these projects had a certain impact, more could potentially have been achieved with broader funding of outreach (publicising and distributing the data) and coordination, perhaps supported either by the client's own donor or another external source. Funding mechanisms that rely less on donors – for example, increasing client services to the business community in order to fund larger civic outreach, or using a social entrepreneurship model – might also help.

As for online information, there is a need for greater outreach. For instance, it is possible the data in the schools project could have had more impact if Map Kibera had been able to train more stakeholders to use the website (perhaps using a mobile site, which had been in the initial plans).

The fifth and final question asked:

- Have there been changes over time to the original theory of change for Map Kibera?

The original idea of simple, open information leading to change in Kibera gradually became a more extensive effort involving media, outreach, printed maps, trust-building and direct work with clients on targeted results.

This research, as well as my years of experience with Map Kibera, indicates that ideas about transparency and accountability (as it tends to be practised) may be simplistic – particularly regarding the relationship between information, action and power. Information may not directly enable citizens to extract new commitments or resources from governments. Even with an infomediary such as Map Kibera Trust, the process of improving a marginalised community like Kibera might be better supported by creating linkages and trust among divergent stakeholders than by direct demands for accountability.

We had thought that information would lead to shifts in power as citizens used Map Kibera maps to lobby officials, and amplified their demands through citizen media. This reflected our early theory of change (see Section 1.1).

However, in the end, we left most details of the advocacy stage of activity to the citizens of Kibera, while focusing on expanding geographic coverage and detail for mapping, serving a variety of client requests, building the media programme, and making the case for open data and OSM as a means to create shared data resources.

The skills imparted by Map Kibera centred on technical skills related to mapping and media. It did not make sense to force a process of adversarial change. Instead, following the members' lead, we focused on getting the facts correct and staying politically neutral, serving as an information source, and building networks, reputation and trust. Our neutrality helped to ensure that in a charged atmosphere, Map Kibera would not become a target of hostility. Mapping an informal settlement could have antagonised the national government if not done in a certain way. We as co-founders could also see that it was important to allow Map Kibera's members to take the lead on sensitive issues.

Millicent Achieng of Map Kibera collects waypoints with a GPS device in Kibera.

However, Map Kibera's role in organising and highlighting important facts within sectors, whether for direct client use or for broad outreach, did lead to significant changes. By trying at all times to understand the needs and viewpoints of each side of the education sector (public, private, government, parents and teachers), the information gathered could be trusted by all. Schools which had previously been hesitant to be identified became comfortable to do so. Members of Map Kibera, acting as information stewards, cultivated local relationships based on their insider status and ensured that community members received information back via paper maps. The trust this created allowed for bridges to local government to be built. It also allowed the NGO sector to become more targeted and efficient. The maps produced hard evidence of local residents' efforts in providing their own services in the absence of any government provision. Ultimately, in this subtle manner, the needs of local schools and schoolchildren were able to emerge clearly and be prioritised.

Based on the current research, we can say that while the most powerful actors working in social data may be those with the greatest means, power or resources, their actions are influenced by the trust network created by an open community process. Even an awareness of a data set 'owned' by and visible to the community may help keep these more powerful actors accountable. Becoming a go-to local news channel in Kibera, KNN helped cement Map Kibera's reputation for trustworthiness and for speaking for the community. This likely helped enhance the effects found here.

This shift in the nature of Map Kibera's theory of change and agenda may not have been fully explicit, but has come through in this research.

## Empowerment, legitimacy, voice and capacity

During the initial section on key issues, we refocused attention on process-oriented outcomes, or impacts on community members and individual participants which they found empowering.

*Capability was gained in navigating political and social systems effectively, and ultimately in generating change in the community itself. These elements of 'deep democratisation' tie in to the empowerment process, but also form the basis of every other achievement discussed here*

This was distinct from instrumental or strictly results-oriented outcomes like those discussed above. The literature referenced various types of empowerment: empowerment generated by the mapping process itself (including information gathering, learning technology); economic empowerment (learning skills leading to employment and improved opportunities); and empowerment through crossing social boundaries (gains in social mobility). Strong evidence for each type of empowerment was found within the long-term Map Kibera group.

Another key result of the work of Map Kibera is the significance of 'voice' in and of itself. A sense of legitimacy has resulted from being mapped for the first time, and by one's own people. Feelings of pride came through in interviews and in my own observations throughout eight years of work there.

This kind of legitimacy has intrinsic benefits for a community which has traditionally been stigmatised. The sense of empowerment extended even beyond Map Kibera activists to the wider community. There was a clear value for community members in being recognised as a provider of services such as schools, and in the visibility of one's work on a map and online. The legitimisation of the kinds of activities that residents engaged in to help their community was seen as extremely valuable, as was the general sense that Kibera had become known; its people had gained a real 'voice'.

Such empowerment is not separate from other impacts. For instance, participating in the process of becoming visible on one's own terms helps generate the type of trust which can lead to connections within the larger network of actors. This in turn can result in increased resources and improvements in marginalised communities.

Finally, capacity-building among participants shows a clear process of skill transfer. Capability was gained in navigating political and social systems effectively, and ultimately in generating change in the community itself. These elements of 'deep democratisation' tie in to the empowerment process, but also form the basis of every other achievement discussed here.

# 7. Conclusion

Even with the current global emphasis on the new Sustainable Development Goals (SDGs) and being 'counted' by data of all kinds, rarely are people part of the data process. And yet there are huge benefits when they are. In the case of Map Kibera, becoming visible on a map brought both practical effects (more resources, more security of de-facto tenure) and personal ones (pride, confidence). The same could be said of the members of Map Kibera themselves. They were able to do more partly thanks to new technical skills, and partly because those skills and visibility made them more likely to seek out other skills, cross social barriers and approach those in power with less timidity. These 'process' outcomes need to be more valued and supported, especially in the age of the data revolution and big data.

Building on discussions of community mapping in the literature, this study adds some nuance to the idea of results-oriented mapping being in tension with general purpose or process-oriented mapping. The three cases analysed here illustrate the growth of both personal and community empowerment, yet also lead to quite tangible results and targets aside from amplified voice. While building a comprehensive approach that includes both process and instrumental goals is not easy, it ultimately yields greater dividends. Many new mappers are coming online in marginal communities globally. They all face similar challenges. The case of Kibera shows that by tapping into both empowerment and community needs alongside the specific data needs identified by larger agencies, such communities could achieve deeper and longer lasting change.

## Recommendations

What is the future for this kind of initiative? Are the effects described here transferrable, scalable and replicable, and if so, how? Box 2 is a summary of the elements that were key to bringing about change in Kibera in the context of the mapping project.

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### Box 2: Bringing about change through community mapping

- Involving community residents in data gathering, distribution, discussion, outreach and ideally in difficult technical processes such as editing.

- Engaging broadly with service providers or stakeholders before, during and after the data gathering. Creating an open channel of communication with them, providing answers to their questions, and learning what they need most from the data. This does not mean just officials or NGOs, but also community members of various kinds.

- Sharing offline. Paper maps are effective, hence essential. Digital data is necessary for wider access and to keep updated, but printing is extremely powerful.

- Government should be an aware, supportive data recipient, but should not lead the process directly. Key officials will emerge who are most interested in the information. Coordination would ensure government uses the data and doesn't duplicate it, but this may not be possible from the outset. There needs to be a balance between maintaining local ownership and serving as a government data source. Ideally, citizen and official systems can ultimately be integrated (for instance, governments using OSM data).

- Wide outreach to the NGO sector, including bringing together all actors to discuss and receive the data, would also have a huge impact. Trust between NGOs is quite low, with little incentive for them to share or communicate within their sectors. Donor-driven sectoral coordination groups typically exist but not at the community level. A role can be played by an infomediary here.

- The extent to which advocacy needs to be done or supported directly by an organisation like Map Kibera remains an open question. The context and availability of strong partner organisations should guide this decision. Where strong advocates do exist, it is possible to join forces to amplify the priorities of the community members. Alternately, the infomediary can play a larger role in guiding the process if well-resourced.

*In-depth and lasting strategic results can best be achieved with strong community integration. In particularly challenging settings, not only is accurate data hard for external parties to gather, but one of the key missing pieces is a lack of trustworthy data sources that can be accessed and verified by all stakeholders*

Based on these lessons, recommendations for donors and those working on large-scale data efforts (such as SDGs) would include the following:

Donors should consider whether infomediary organisations are worthy of long-term funding. Map Kibera may be a rare organisation of its type, but could and should be much more common.

Data should not only be a goal (let's get whatever data we need, in whatever way possible); the means to that end also matters (how the data is captured is important).

Open, community-based data collection can lead to greater trust, which is sorely lacking in marginalised places. In large-scale data gathering, it is often unclear to those involved why the data is needed or what will be done with it. It also happens that some data, once collected, is never actually used. By starting from the ground up, however, it's possible to work with local dynamics and processes and achieve stronger sector-wide ramifications and social development impacts.

I began this research in the hope that it would yield practical advice for Map Kibera. In fact, several lessons have emerged which could strengthen the work Map Kibera does, and there are fresh, new directions to explore.

Looking ahead, an earlier focus on key sector-based officials would facilitate a relationship with them and ensure the data could be as useful as possible. When mapping a sector, outreach to all proprietors of related businesses should be carried out. In the case of water, for instance, each water vendor could be engaged during mapping and later given a map. Although each sector is unique (water is possibly more challenging due to a black market system), this relationship might create positive results later. Sectors like security might benefit from engagement with all relevant peace and safety groups, something which Map Kibera has

been pursuing recently in the context of the 2017 national elections.

Map Kibera should also distribute paper maps much more widely (and create more wall painted maps as well). At the same time, it could do more to expand use of online resources like OSM and OSK. Many respondents indicated a lack of familiarity with these sites and how to use them. Developing easily accessed, full service mobile sites or apps should be a priority.

I believe that Map Kibera should provide more advocacy support and organising than it currently does. The Trust should maintain its neutral information broker status, but should support informal sector leaders to use information more effectively. Map Kibera should also host workshops for NGOs in each sector to share findings and maps, and help them to coordinate and plan better.

This research shows why expanding beyond Kibera has been difficult for the organisation. Creating and maintaining local credibility and relationships is a long-term process. Yet lessons learned here should enhance Map Kibera's ability to work with and even initiate local data groups in other communities. A few ways to do this come to mind, such as creating a network of data and mapping groups and building a strong set of tools and guides to support other organisations. Above all, the full gamut of the work should be supported, rather than just piecemeal pilot efforts.

Recalling the discussion of the increase in digital mapping worldwide, this research also suggests that in-depth and lasting strategic results can best be achieved with strong community integration. In particularly challenging settings, not only is accurate data hard for external parties to gather, but one of the key missing pieces is a lack of trustworthy data sources that can be accessed and verified by all stakeholders. Efforts to increase geographic data for the benefit of government and INGO use on a large

scale currently fall short of the ultimate goal of the SDGs' "Leave No One Behind" objective. Coordination with and support for grass-roots mappers and civil society-driven data initiatives could be much more extensive. While certain objectives could be met exclusively by remote or field mapping by non-locals, the research here indicates that locally owned and developed information, with the leadership of local infomediary groups, can create a stable, integrated resource for a range of issues. Such groups should be cultivated; one day soon, they may constitute a new kind of information sector.

# Appendix: Stakeholders and roles

From the cases examined here, several types of roles can be determined among the various stakeholders. Understanding these roles and how they come together may be useful for planning or analysing other community mapping initiatives geared towards government accountability.

- Project founder / leader: project starter, manager, fundraiser.

- Local participants: data gatherers, mappers, map editors, local residents, journalists.

- Local project leaders: coordination of projects, accountability to donors, board or founder. Tracking progress. Networking in the community, building trust with residents.

- Sector informants: those who run health centres, schools; health workers, teachers. Members of the public in the case of security hotspot identification. Some sectors, like sanitation, have no informants other than mapping participants who can identify locations.

- Local civic leaders on specific issues: local peace initiative leader, heads of informal schools networks, others known locally to be influencers.

- Local NGOs (foreign or locally founded or led): NGOs with offices in Kibera; those using MK data for their work.

- Local government: local officials who are known in the community and responsible for what happens there. Varying degrees of trust and goodwill with community members. Varying degrees of desire and ability to improve Kibera. Often they are in post only temporarily.

- County / national government: accessible usually only by equally high-level people or by large INGOs.

- High-level influencers: well-connected individuals outside government. To the extent they can be accessed, they have the ear of upper level government / general public via media, international community, etc.

- Media: local and national. Some media is our own (KNN).

- Large national and international NGOs and the World Bank.

- Donors: international foundations, bilateral donor agencies, UN. Some are major players in Kenya in specific sectors. Others fund from afar and stay out of the local context.

These various roles may come together in the following way:

1. The project gathers information via local participants and project leaders, sometimes in conjunction with sector informants.

2. Information is presented to local leaders for distribution and discussion, as well as to general public; knowledge and understanding increases.

3. It is also presented to high-level influencers, local government, INGOs.

4. Sectoral improvement in terms of policy requires action by local, county or national government. They may use the information provided to understand the sector and reach out to sector representatives (head teachers, health workers, clinic heads, etc.).

5. Local leaders pressure local government, who in turn must change / activate policy to help schools improve and allocate resources. This may require additional pressure on higher levels of government by HL influencers.

6. The role played by the infomediary organisation may end with information gathering and distribution. Or they may further advocate or use convening power, take on role as broker, remaining a neutral, informed group.

7. The NGO sphere can take action on the data, often more quickly than government. However, competition among organisations may limit effectiveness.

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## About Making All Voices Count

Making All Voices Count is a programme working towards a world in which open, effective and participatory governance is the norm and not the exception. It focuses global attention on creative and cutting-edge solutions to transform the relationship between citizens and their governments. The programme is inspired by and supports the goals of the Open Government Partnership.

Making All Voices Count is supported by the UK Department for International Development (DFID), the US Agency for International Development (USAID), the Swedish International Development Cooperation Agency (SIDA) and the Omidyar Network, and is implemented by a consortium consisting of Hivos, IDS and Ushahidi.

## Research, Evidence and Learning component

The programme's Research, Evidence and Learning component, managed by IDS, contributes to improving performance and practice, and builds an evidence base in the field of citizen voice, government responsiveness, transparency and accountability (T&A) and technology for T&A (Tech4T&A).

## About GroundTruth Initiative and Map Kibera Trust

Map Kibera Trust's mission is to increase influence and representation of marginalised communities through the creative use of digital tools for action. Since 2009, when Map Kibera launched its work by empowering youth residents of the Kibera community in Nairobi to create the first free and open digital map of their community, Map Kibera Trust has continued efforts to transform a marginalised settlement which was previously a blank spot on the map. Now a citizen information and media organisation, Map Kibera uses tools like mapping, SMS, blogging and video to create social change.

GroundTruth Initiative, LLC, was started in early 2010 by Erica Hagen and Mikel Maron to build on the work of Map Kibera and bring the tools to a wider audience by offering consulting services, training events and strategic advising internationally. GroundTruth helps communities use digital media, mapping and open data tools for greater influence and representation in development and democracy.

Web     www.makingallvoicescount.org
Email   info@makingallvoicescount.org
Twitter @allvoicescount

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