Cities of the Future Need to Be Both Smart and Just: How We Think Open Mapping Can Help

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Abstract

Along with increasing urban growth rates, especially in the global south, cities are becoming more fragile because of rapid climate change, insecurity, and increasing urban landscape challenges. With the limited budget sums, coupled with outdated and limited spatial and aspatial data, city planners, governors, and governments are left short of the optimal and efficient approaches to deploy and reckon just, smart, and sustainable cities across all populaces. This demands agile tools and applications for effective decision-making to maintain and sustainably improve quality of life with an assurance that no one is left behind. We demonstrate the potential utilization of OpenStreetMap datasets by urban planners and governing councils to enhance evidence-based planning and policy initiatives. Several projects have been pioneered and executed by youth to demonstrate their crucial role in the organization and collection of crowdsourced geospatial data as a manifestation of the broader theoretical underpinnings of urban governance encapsulated in SDG 16 – Peace, Justice, and Strong Institutions and SDG 11 – Sustainable Cities and Communities. We argue youth are communicating through the collection of the data. We demonstrate practical approaches to the inclusion of OSM and the participation of local YouthMappers chapters towards objectively positive, just urban governance.

Keywords

Governance · Drones · Flooding · Smart cities · Justice · Uganda · Ghana

1 The Scope of the Challenge

In the current era of globalization and rapid urbanization, governance of cities remains a significant challenge of the 21st century and central to the achievement of sustainable development. As the share of the global population living in urban areas has surpassed 50%, cities have become a new historical phenomenon and have increasingly attracted attention as sites of the

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main threats to global sustainable development, but also as sites of the solutions (New Urban Agenda 2017). According to the UN Habitat (2010), rapid urbanization has taken place in Asia and Africa since 2007, with Sub-Saharan Africa estimated to be over 48% of the entire population by 2030. This inexorable urban transformation in Africa presents a pressing challenge to the landscape of urban governance concerning ideas of 'just', 'smart', and 'sustainable' cities (Gupta et al. 2015).

As a process by which local, regional, and national governments and stakeholders collectively decide how to plan, finance, and manage urban areas, urban governance influences whether the public benefits from economic growth, and also determines how they bring their influence to bear and whether political and institutional systems, processes, and mechanisms facilitate inclusive and pro-poor decisions and outcomes (William 2016). It involves a continuous process of negotiation and contestation over the allocation of social and material resources and political power.

With good urban governance, cities act as engines of growth and provide inhabitants with better opportunities and safe and innovative spaces, thus improving their global development pathways (Turok 2014). With distinctive targets and well-spelt-out responsibilities across all levels of governance, cities take a more central role in building national growth through increased revenue generation and political stability, as well as enabling shared and common lingual spaces for the global community. Without good governance, cities besieged by poor planning struggle to adapt to pressing political, social, and spatial challenges as a result of increased inequality, conflict, and environmental degradation (William 2016). Encapsulated in the 48% population growth predictions for sub-Saharan Africa, a burgeoning youth bulge currently estimated at a 20% for the youth demographic, between the ages of 15–24 (Eloundou-Enyegue 2021), will face insurmountable challenges with a very limited range of policy learning to mitigate the rapidly developing risk-taking behaviors that can be a catalyst of all forms of violence. These cities also generally have fewer resources and less governmental capacity to singlehandedly center and adopt policies to achieve sustainable development goals.

In this chapter, we reproduce OpenStreetMap (OSM) as a data platform that each country within the sub-Saharan region can capitalize as a data platform allowing cities to inform unique and fitting infrastructure and other service investment strategies in the efforts to build just and smart cities. By building and capitalizing on the data capabilities of web 2.0, we envisage data platforms at city scale in each country as concrete action that must be developed to allow for a well-informed, locally and nationally integrated targeted action that can be monitored and evaluated to ensure effective policy implementation (Smit and Pieterse 2014). The main proposition is that there have not been comprehensive, deliberate efforts by local and national governments, development agents, and urban systems to engage the value of data embedded within the volunteered database of OSM. Students are skilled, motivated, and strategically positioned to support this effort through data collection and data interpretation.

2 OSM for Urban Governance

Regarded as a web 2.0 development, OSM, a collaborative mapping project aimed at creating a database or digital map of the world (Quinn 2017), renders comprehensive coverage of spaces, places, and locations with free explicit geospatial data and information. Built as a crowdsourced campaign, OSM proves an incorruptible space promoting visibility of every individual or community and propagate peaceful and harmonious exchange amongst city planners, policymakers, and the public, at a very commendable temporal resolution and in a smart manner. Its growth has proven a powerful antidote in the reproduction of community through various mapping engagements that aggregate a mix of profiles, editing habits, and robust styles across locations. It capitalizes 'citizens as sensors' thereby launching a domain that propagates

unencumbered youth participation in building knowledge on emerging environmental, political, and socio-economic issues. Here, young people have the space to reconstruct and build pride within their cities through improving data and map quality. Accessibility to this newly collected data that is open and readily available, can pave the way for quick alternative policy interventions and at the same time drive policy attention to the most critical and unique aspects of their own cities' urban revolution.

3 Role of Youth Towards Achieving Positive Urban Governance

Youth participation provides young people the opportunity to share their knowledge and acquired skills. To ensure peace in developing countries it is important that young people are engaged, and their capacities improved to enable them to partake in the decision-making process. Through the use of OpenStreetMap, young people have been engaged in community mapping projects while engaging community leaders to tackle real-world challenges in their communities. YouthMappers have also created a space for young people to build their skills, techniques, and capacity in the geospatial through peer training programs. The YouthMappers model through the OSM platform has proved to be an effective tool in ensuring youth participation and capacity building.

Encapsulated in a cluster of case studies in Uganda and Ghana, is OSM data generated to support the process of effective decision-making regarding cross-sectional challenges constraining the achievement of just and smart cities. Overall, our stories and reflection intend to provide a contemporary knowledge tenet, towards scientific policy learning and positive thinking among policymakers. As YouthMappers, we have set ourselves on the course of reviving practical policies and OSM as a geospatial dataset to change the participation in governance and at the same time prompt agile realization of SDGs 16 and 11 targets.

4 YouthMappers Smart, Just Activities in Uganda

Ggaba is one of the rapidly growing informal settlements within the administrative bounds of Kampala. Unlike others, it is located within the Murchison Bay area of the world's largest freshwater lake, Lake Victoria, intercepted by Uganda, Kenya, and Tanzania. Coupled with the increasingly unpredictable rainy seasons, drastic water upsurge in the lake is making the livelihoods of the residents of Ggaba unpredictable, leaving the community beyond a breaking point. Encumbered by the 3.7% population growth rate, the severe encroachment on this bay is defined by the long-term failure of governments to plan, monitor, and collectively enforce development controls, resulting in rapid wetland ecosystem destruction, increased livelihood vulnerability, and high risks of ill health and poverty (Isunju et al. 2016). It is also defined as a landing site, lucrative for the fishing community and many recreational spaces for activities that instigate a significant amount of change in land use.

4.1 Flood-Risk Mapping in Ggaba

The Uganda Opening mapping program modeled flood resilience mapping mechanisms that Kampala and other urbanizing areas can reproduce in order to improve decision-making. The goal of the program was to develop methodology that integrates local capacity and available technology to improve access to baseline data through spatial data crowdsourcing. Baseline geospatial data can be used for disaster risk-reducing policy, designing interventions, for efficient disaster response, and to quicken decision-making (Fig. 27.1).

Uganda Bureau of Statistics (UBOS), Kampala Capital City Authority (KCCA), Office of Prime Minister (OPM), GeoGecko, community members, and YouthMappers, under the guidance of Map Uganda as the controlling organization, developed, discussed, executed, and overall participated in the successful implementation of the mapping activities in

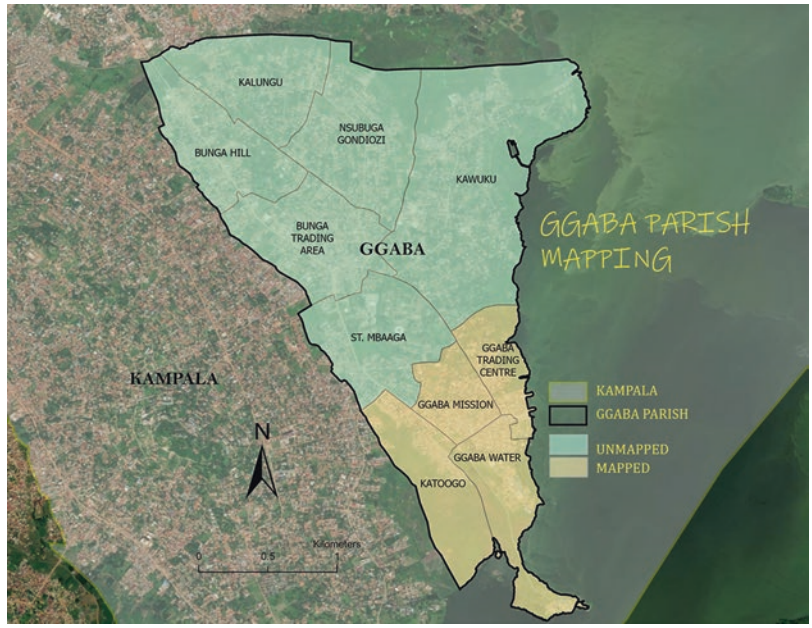

Fig. 27.1 The study area of Ggaba is outlined, where mapped as well as unmapped regions are identified

Ggaba. Chapter members of *GoodMappers*, *Geo YouthMappers*, and *Mappers For Life*, YouthMappers chapters in Uganda, were among those responsible for ensuring quality and field data collection based on the project model and general OSM quality standards. Overall, the project involved approximately 60% of youths to ensure robust rigorous and rapid data collection maximizing both time and cost. This was possible because of their signature advantages in terms of numbers but also their expertise in handling modern smartphone technology which consists of GPS hardware that can be exploited to derive spatial representation of their communities and other under-mapped societal issues (Figs. 27.2 and 27.3).

4.2 Project Model

A cost-effective methodical practice was developed by applying OSM to conduct flood-risk assessments and a disaster preparedness system with low administrative costs that provided geo data planning and data collection. The model was organized into three categories (1) remote and field mapping in OSM, (2) drone mapping, and (3) validation of collected remotely mapped fea-

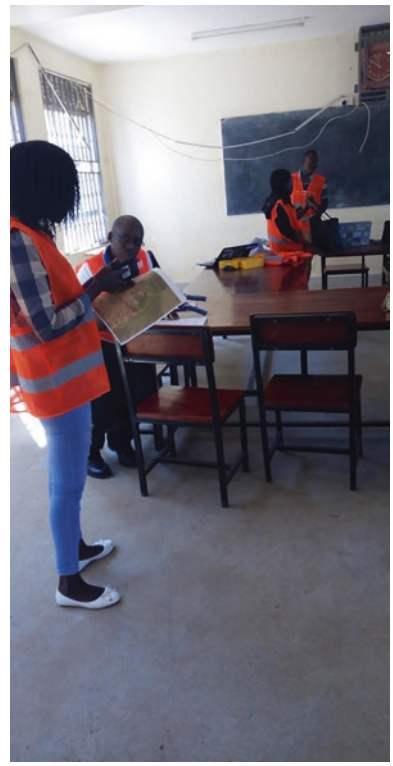

Fig. 27.2 A data cleaning session unites team members from Uganda Bureau of Statistics, Map Uganda and YouthMappers

Fig. 27.3 The YouthMappers team coordinate remote mapping tasks using open tools

tures to reproduce a real-time spatial outlook of the livelihoods of the four villages that compose Ggaba. These would later be used to estimate the flood-risk maps and atlas for both community and authority engagements on the best decisions forwards towards a sustainable mitigation and management plan.

4.3 Remote Mapping

Open-source tools including the Humanitarian OpenStreetMap Team (HOT) Tasking Manager, Java OpenStreetMap (JOSM), and iD Editor were used to create mapping project tasks to support mass mapping process in OpenStreetMap. Buildings and roads data were generated by many people working on the same overall area of approximately 1.3 km^2 that included Ggaba Water, Katoogo, and Ggaba Trading Centre within Ggaba Parish. A total of 5657 buildings and 14 km of road data were created on OSM and made publicly available Visit https://tasks.hotosm.org/ and https://tasks.teachosm.org to learn about remote mapping.

4.4 Data Collection

A field mapping exercise was executed to create GPS spatial and aspatial properties and attributes of the mapped roads and buildings to derive the significant qualities of Ggaba infrastructure and flood-risk components. This was executed with open-source mobile applicationsOpenDataKit (ODK), OpenMappingKit (OMK), and OSMAnd for field performance monitoring and were downloaded onto individual smartphones. GPS tracks included the drainage footprint of the area and aspatial data included drains, roads, and buildings (Table 27.1).

These were integrated into a data model profiling detailed information on the unique features within the area that make a composition of the similar features that exist within other parts of Kampala and possibly other urbanizing areas of Uganda. This model was discussed and agreed upon by the community together with the governing authorities in the city under their participating capacity and henceforth handed over for mass extension in other flood-prone areas of the city.

Table 27.1 Categories of data features and attributes mapped

Drains/ditches	Buildings	Roads
Profiles Connection Width Length	Purpose (Residential/commercial/social) Levels Building material Roofing material	Type of road a. Surface b. Smoothness c. Width d. One-way d. Road Name/street Name

4.5 Drone Imagery and Validation

Drone imagery was collected for the 1.3 km^2 and was used within JOSM for the validation of the previously remotely mapped buildings and roads. This was necessary because it provided a desirable temporal and spatial resolution to clearly identify the actual number of buildings regarding the informal nature of the building styles within the area, especially in Ggaba Water. The drone mapping also complimented the derivation of topographic data that was later combined with the field-collected flood Z points to complete the derivation of a flood heatmap.

4.6 Results and Achievements

The development of a model to scale through other areas including a documented workflow combining OpenStreetMap online and offline open-mapping tools like the JOSM editor, iD Editor, the tasking manager, and field mapping (ODK and OMK) was a significant achievement designed during the planning phase of this activity. We succeeded in demonstrating that OSM is a low cost and integrative technology that can be used to map keys accurately and rapidly. Three villages were fully mapped, which created baseline data for the area establishing ingenuine methods for future accountability and performance monitoring and evaluation of the developments in the area. By October 2018, a total of 8945 buildings and 17 km of roads had been mapped, and through OSM, this data was made available for government and communal use.

Overall, all stakeholders from UBOS, KCCA, OPM, and communities became fully aware of the benefits and workflow processes necessary to create geospatial data. The greatest achievement is that all engaged authorities were exposed to tools and frameworks embedding unprecedented mechanism of democratic engagement of the communities, youths, and marginalized groups in critical issues regarding their communities hence, promoting inclusive and accountable citizens simultaneously propagating just and smart future cities.

This project annexed OSM for planning and policy realization including (a) National Free and Open-Source Software Policy (draft May 2016), (b) National Open Data Policy (draft May 2017), and (c) Uganda Spatial Data Infrastructure Policy (draft Feb 2018), towards inclusion, resource efficiency, mitigation, and adaptation to climate change.

5 YouthMappers Smart, Just Activities in Ghana

The city of Accra is estimated to have a population of about three million people with an annual population growth rate of about 4% between 2000 and 2010 (Ghana Statistical Service 2012). The size of the metropolis is approximately 300 km^2 (Amoako and Frimpong Boamah 2015; Møller-Jensen et al. 2005) and the city's vulnerability to floods has been an issue of great concern to the populace. Being one of the growing cities in Africa, the city is also faced with an uncontrolled increase in informal settlements in

low-lying areas that are susceptible to floods. Residents living in informal settlements live in deprived conditions both physically and socio-economically. Most often these areas are situated along river catchments.

Because these settlements are informal, residents lack certain basic amenities and infrastructure such as proper waste disposal, sanitation, toilet facilities, drainage systems, etc. Over the last decade, incidents of flooding have reached an alarming level rendering some inhabitants homeless while leading to the loss of lives of others. According to the National Disaster Management Organization (2009), a total of six million dollars of assets are at risk each year. The causes of flooding range from the overflow of the Odaw River out of its catchments, insufficient channels for solid waste disposal, poor drainage, and uncontrolled growth.

5.1 Accra City Mapping (Open Cities Project)

The Accra City Mapping is an initiative of the Open Cities Project which is a collaborative effort by the Global Facility for Disaster Reduction and Recovery's (GFDDR) Open Data for Resilience Initiative (OpenDRI) and the World Bank Africa Urban, Resilience and Land unit with funding from the European Union's Africa Disaster Risk Financing (ADRF) program. This project was carried out in four low-income communities in Accra. These communities over the years have been affected by floods during the rainy season and have serious issues with solid waste management. The communities included Alajo, Nima, Agbogbloshie, and Akweteyman within the catchment area of the Odaw river basin. The purpose of the project was to provide assistance and support to the Greater Accra Resilience Integrated Development (GARID) project in the management of solid waste and floods. Dealing with the problem, therefore, required an evidence-based approach to ensure decision-making at the national, regional, and local levels of governments is supported by data.

5.2 OSM Approach

The OpenStreetMap (OSM) Approach provides a digital approach to solving challenges spatially. The project brought together OpenStreetMap communities in Ghana including the Humanitarian OpenStreetMap Team (HOT), OSM Ghana, members of YouthMappers Chapters in Ghana, and Mobile Web Ghana. The team created geospatial data to support future decision-making by providing updated data on affected communities. The use of OSM allows for effective participation of all stakeholders from several ministries such as the Ministry of Inner Cities and Zongo's as well as the Ghana Statistical Services and Metropolitan and Municipal District Assemblies (MMDAs).

This approach enables young people to bring their skills in mapping and digital tools to the forefront of the decision-making process. Over fifty community mappers were trained for the mapping activity. Attention was given to representation to ensure gender balance among mappers. Series of engagements were done to ensure participation of leaders even at mapping events as they also tried to understand how the geospatial data is being gathered.

5.3 Results and Achievements

Over 7279 buildings were mapped, 315 km of highway and 418 km of waterways were digitized. These maps are hosted online and are made available to stakeholders and the general public for use. The team from Ghana Web Ghana and HOT created a web application which will allow stakeholders make data-driven decisions on solid flood and solid waste management (Fig. 27.4).

The project is one of a kind that ensured a high level of participation among different stakeholders, youth, and gender balance. The high turnout of young people to volunteer in the mapping activities showed that they are ready and willing to come to the decision table if they are called upon. The project also allowed YouthMappers chapter members to showcase their skills in the use of digital tools as well as providing training

Fig. 27.4 YouthMappers in Ghana support data in the four communities (Alajo, Nima, Agbogbloshie and Akweteyman) for Open Cities Accra. Credit: Open Cities

for other young people to acquire very essential skills that could get them employed. The inclusion of girls in the mapping project proved as a step in the right direction to encourage girls in the use of digital tools.

6 Smart and Just Cities of the Future

The inclusion of young people makes us feel and know that our voices are being heard and that our contributions matter to the development of our communities. It gives us direct access to plan our communities in a way that addresses their needs, especially because we make up the majority of the population in developing countries. Youth participation is highly recommended in the planning of human settlements that are safe, inclusive, resilient, and sustainable for all. The projects described provided a platform for young people to design and provide solutions to the challenges in their communities.

Young people are not spared by the problems-facing developing countries. In most cases we are the most affected, therefore there is the need to ensure inclusion and participation at all levels of decision-making. The greatest benefits are that

OSM, open-source tools, and frameworks prevail as an unprecedented mechanism of democratic engagement of local communities, youths, and marginalized groups. The use of geospatial technologies not only advances global targets like SDG 16 – Peace, Justice, and Strong Institutions and SDG 11 – Sustainable Cities and Communities. But our direct involvement also allows for our participation in the search for solutions to critical issues regarding our own communities and overall, promoting inclusive and accountable citizens and institutions while propagating just and smart future cities. What a way to reproduce sustainable urban governance! Implicitly, our projects demonstrated the capacity of the young population as active responders to the governance priorities of their communities.

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