Digitally Enabled Collective Action in the Areas of Limited Statehood
Implications of Information and Communication Technology for Collective Action on
Hazard Mitigation and Environmental Management in Mathare, Kenya

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Dedication

The author wishes to dedicate this thesis to the citizens of Mathare, his team members at Spatial Collective, and last but not least, to his mentor, Professor Steven Livingston, for their patience, trust, struggle, and their dedication towards making a world a better place.
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I am most grateful to the members of my committee, Steven Livingston, Catherine Snow Bailard, and David Rain for giving their time, encouragement, and insights throughout this project. I also want to give special thanks to the chairman of my committee, Steven Livingston, for his exquisite attention to detail, trust, and for his demand for excellence.
Abstract of Thesis

Digitally Enabled Collective Action in the Areas of Limited Statehood
Implications of Information and Communication Technology for Collective Action on Hazard Mitigation and Environmental Management in Mathare, Kenya

This thesis considers the role of technology in community mobilization in collective action initiatives in an urban slum. We are specifically interested in how new information and communication technology (ICT), specifically mobile phones and the Internet, changes the way groups organize for the purpose of providing public goods in the areas of limited statehood. The focus of the thesis is on waste management activities in Mathare, Kenya’s second largest slum. We look at a household survey to determine that Mathare is as information rich environment as the rest of the country in terms of mobile and Internet coverage and use. Further, we identify 33 youth groups that provide public service of waste management in Mathare. These groups constitute an “alternative governance modality” in the absence of the state in the informal settlement. The data collected on these groups’ shows that they use available technologies, mainly mobile phones and the Internet, to coordinate activities between members, communicate to their customers and the city council, and to promote their activities online. We conclude that ICTs are being used as an alternative governance modality in the informal settlements.
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Chapter 1: Introduction and Rationale

This thesis considers technology in community mobilization in collective action initiatives in an urban slum. Put more precisely, we are interested in exploring the role of technology in collective actions that are undertaken in efforts to address the under-provisioning of collective goods, such as security and sanitation in slums. Collective action refers to actions taken by two or more people toward a common goal or goals. In this respect, it is an analogue to governance. Given the central role of communication costs in collective action, the growing abundance of cheap, broadly distributed and sophisticated information and communication technologies has affected the nature of collaboration in community-based development initiatives. New technologies help marginalized communities communicate, conduct business, receive nearly real-time feedback from crisis areas, alert populations about health risks, fight corruption, climate change, and alleviate poverty.

We are specifically interested in how new information and communication technology (ICT) changes the way groups organize for the purpose of providing public goods in the areas of limited statehood. The term, areas of limited statehood, represents “geographical entities, policy fields, social groups, or temporal events for which states either cannot maintain a monopoly of force or experience significant problems with regard to rule-making, implementation and enforcement” (Livingston and Walter-Drop 2012, 5).

It is common to conflate governance and the state, assuming, as we often do, that the state is the only governance modality. For analytical purposes, though, the research
literature in this field regards them separately. From a historical point of view, the modern nation-state is more of an exception than the rule (Risse 2011). Most developing as well as developed states experience areas of limited statehood in today’s conflict zones (Eastern DRC or parts of Syria, Iraq, Central African Republic, South Sudan, etc), informal settlements (approximately one billion people in the world live in slums (Davis 2006)), or after natural disasters (typhoon Haiyan in Philippines or tsunami in Japan). When the state’s capacity to implement rules and enforce decisions is undermined, different governance modalities emerge. The state is but one of several possible governance modalities. Besides states, clans, community-based organizations (CBO), non-governmental (NGO) and international non-governmental organizations (INGO), and public-private partnerships (PPP) pursue the provision of public goods and create and enforce binding rules or more informal agreements. In our thesis we specifically focus on non-state actors that participate in service delivery as well as rule making and implementation in informal settlements in Nairobi, Kenya.

Nairobi’s informal settlements, or slums, constitute areas of limited statehood. Some estimation put the number of slums, individual nucleated settlements,¹ in Nairobi as high as two hundred (UN-Habitat 2006). Of the four types of limited statehood, Nairobi’s slums probably fit the spatial dimension of limited statehood most closely. By this we mean that it is a geographical area, though smaller in size than the sovereign borders of Kenya, relatively devoid of statehood. The area lacks state provisioning of public goods and the use of legitimate violence for the enforcement of binding rules. Its enduring quality means that it is not merely a temporal break in what would otherwise be

¹ Nucleated settlement refers to settlement that is concentrated at a particular point due to a variety of reasons, including security or utilities. See: http://www.slideshare.net/xksinz/settlement-patterns
an area enjoying the benefits of consolidated statehood. At the same time, their generally heterogeneous ethnic populations do not carry the signature of social exclusion, as is the case with some dimensions of limited statehood. Instead, the slums occupy a spatial break in the governance capacity of an otherwise consolidated state. The lack of basic services and state institutions create a governance vacuum that is filled by the informal sector. Where the state’s rule implementation and enforcement, service provision, and monopoly over force are challenged or even missing, civil society, businesses, non-governmental organizations, and, as it’s more often in Nairobi’s slums, informal sector fills some of the gaps. According to some estimates, Nairobi’s informal sector employs two thirds of the urban population (UN-Habitat 2006, 14). Informal economy refers to “all economic activities by workers and economic units that are – in law or in practice – not covered or insufficiently covered by formal arrangements.”2 This is a complicated system through which many of the services are provided, oftentimes without the involvement of the government, and, to various degrees of quality.

Another manifestation of why Nairobi’s slums constitute areas of limited statehood is their relative “invisibility.” Slums are often missing from geographic and statistical representation of countries. Very little information is available on the quality and quantity of public institutions and amenities, public services, or on the population itself living in the slums. Household surveys and other enumerations are few and far between, and results are often considered problematic. One example of this phenomenon is the population estimates of Kibera, which is considered by many to be sub-Saharan Africa’s largest slum. Population estimates for Kibera vary between 170,000 and one

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million (Ekdale 2011). Not only statistical information but also geographic information is missing. Nairobi’s slums are not represented on official maps; in fact, Kibera is portrayed as a forest on most city maps. Lack of geospatial information about a certain area can mean that the area is inaccessible, lacks interest, sensitive or it may also mean that the state in the area is challenged, in that the “projection of its governance is hardly enforceable in that particular geographic area and period of time” (Livingston and Walter-Drop 2012).

The relative “invisibility” and complicated nature of the slums makes them, according to James C. Scott, illegible to the state. Scott sees legibility as a “central problem in statecraft” (Scott 1998, 2). Similarly to the pre-modern states that knew very little about their subjects, their wealth, landholdings, or even their identity, the modern state of Kenya knows little about its slums. It lacks “anything like a detailed ‘map’ of the terrain and its people” (Scott 1998, 2). For the most part it lacks crucial information, or metric, which would allow it to integrate these slums into its “standard grid of statehood” (Scott 1998, 2).

We believe that, a recent rise in availability and accessibility of information and communications technologies allow various non-state actors to fill in some of the information gaps left by the inability, incompetence, or lack of interest by the state. We are specifically interested in what role information and communications technologies play in collective action in the informal settlements in Nairobi. We are interested in understanding how digitally enabled collective action mitigates some of the deficiencies found in the provision of collective goods that arise from weak and missing state institutions. Our focus is specifically on hazard mitigation, waste management, and
sanitation activities in Mathare, Kenya second largest slum. In most instances, collective goods of this sort are referred to, generally, as sanitation or community wellbeing. We look at how community-based organizations tackle the issues of waste management by using some of the available information and communication technologies in their community. The final question is: can information and communication technologies provide an alternative governance modality in the areas of limited statehood?

To answer some of these questions, we need to, first, inspect whether the conditions for digitally-enabled collective actions exist in areas of limited statehood, and second, to what degree the informal governance initiatives – in our case youth groups dealing with waste management – are using technologies in their work. In order to answer these questions we use two data sets provided by a social enterprise firm working in the Mathare slum: a household survey and a stakeholder survey.³ We conclude that slums are as information-rich as the rest of Kenya. Mobile and Internet penetration rates are comparable with and in some cases even higher than the national average. We believe that this is because of the difference in mobile and Internet penetrations between the rural and urban areas. It would seem from these data that the conditions for digitally enabled collective action are indeed present in this particular area of limited statehood. Furthermore, we find that there are at least 33 groups that provide waste management services in Mathare. These groups constitute an alternative governance modality in the absence of the state. The data further shows that groups use available technologies, mainly mobile phones and the Internet, to coordinate activities between members,

³ The social enterprise is called Spatial Collective of which the author is the co-founder.
communicate to their customers, and to promote their activities online. We conclude that ICTs can facilitate alternative governance modality in the informal settlements.

In the first section of the thesis we touch on the notion of public goods and the standard response to providing them, which is usually thought to be through consolidated states and hierarchical top-down institutions, such as municipal government. We then explain the concept of areas of limited statehood and acknowledge that when the state’s institutions to implement and enforce decisions are missing, different governance modalities are possible and sometimes necessary. Because governance is analogous to collective action, the next section briefly reviews the traditional theory of collective action. The theory puts forth two central elements: free riding and the importance of formal organization. It states that in order for people to contribute to common interest, formal hierarchical organizations need to be put in place, such as the states, to provide incentives and disincentives so as to prevent people from free-riding. However, with the rapid diffusion of digital technology, new patterns of collective action emerge. New tools decrease information costs which in turn enable large scale coordination at low cost (Shirky 2008). The next few sections touch on the rapid spread of information and communication technologies in the world and on its effects on the theory of collective action. Because our interest lies specifically in understanding the role of ICTs in service provision in informal settlements in Nairobi, the next sections touch on the state of service delivery in Nairobi’s slums and on waste management initiatives in Mathare. The final few sections describe the methodology of data collection and results of the surveys. Finally, we conclude the thesis with discussions and some of the limitations that can be found in digitally enabled collective actions in areas of limited statehood.
Chapter 2: Public Goods and Standard Response to Providing Them

Before we start the inquiry into our conceptual framework let us look first at the notion of public goods and the traditional mechanisms employed to provide them. According to Samuelson (1954, 387), a good is called a pure public good if “each individual’s consumption of such a good leads to no subtraction from any other individual’s consumption.” In other words, a public good is a good that is both non-excludable and non-rivalrous; in that an individual cannot be excluded in consuming it and where use by one individual does not reduces availability to others (Hal 1992). Some of the examples of public goods include fresh air, infrastructure such as roads and bridges, in some cases access to health services, access to knowledge, lighthouses, and last but not least, access to clean water and adequate sanitation.

The traditional response to providing public goods is usually through consolidated states, in fact, the “governance discourse remains centered in the ideal type of modern statehood – with full internal and external sovereignty, a legitimate monopoly on the use of force, and checks and balances that constrain political rule and authority” (Risse 2011, 1). It is based on the assumption that functioning states have full domestic sovereignty (Krasner 1999) and are capable of implementing and enforcing decisions over their territories. The notion of the modern statehood presumes that states are either fully consolidated, failing, or at risk of failing (Risse 2011). This view reveals a “normative orientation toward the highly developed and democratic statehood, and, thus, towards the Western model of statehood” (Risse 2011, 3). According to this view, the failed states
have “failed because their governments lose legitimacy and the very nature of the particular nation-state itself becomes illegitimate in the eyes and the hearts of a growing plurality of its citizens” (Rotberg 2003, 1). According to this definition, Somalia and the Democratic Republic of Congo can be considered as failed states. On the other side of the spectrum are fully consolidated states, which, as we have said, are capable of enforcing rules and implement decisions over their territories, such as, Scandinavian states. Other states lie presumably somewhere on the continuum between fully consolidated and failing states.

If we look at the notion of governance, similar concepts emerge. Governance is traditionally associated with the state. Fukuyama (2013, 3) defines governance as “a government’s ability to make and enforce rules, and to deliver services, regardless of whether the government is democratic or not.” (Fn emphasis added) The issue of states capacity is often at the center of the governance narrative. Matthews defines state’s capacity as the capacity to create and maintain order over a sovereign territory; to uphold its democratic authority and legitimacy; and to effectively achieve its policy outcomes (Matthews 2012, 281). Other authors have noted that governance simply applies to “the general exercise of authority, where authority refers to institutions, public or private or both, for maintaining control and enforcing accountability” (Lynn 2012, 50).

Within this normative narrative of the nation-states as the driving force behind governance initiatives, state building remains the main mechanism for establishing and restoring political and social order (Risse 2011, 2). A lot of effort in development and post-conflict reconstruction has been given on building capacities of the states. It is believed that through the process of state building the core functions of the states will be
“restored” including “the capacity to maintain security and rule of law; to provide basic services, such as emergency relief, schools, and health care; to formulate and administer budget plans; and to collect taxation revenues” (Norris 2012, 4). According to Norris, institutions of both “liberal democracy and state capacity need to be strengthened in parallel for the most effective progress deepening human security” (Norris 2012, 4).

However, state building is costly and is considered very demanding and time consuming. If we look at the two large state building processes of recent times, the reconstruction of Afghanistan and Iraq, the United States alone spent more on reconstructing the two countries than it did on reconstructing Germany after the Second World War. The reconstruction costs are approaching 200 billion dollars and the effects of the reconstruction process are still highly debatable. The total costs to the U.S. of the Iraq and Afghanistan conflicts already exceed 1.4 trillion dollars.4

These large top-down state-building initiatives are based on a premise that all of the problems can be solved by massive investments into infrastructure, agriculture, health, education and institutions on a state’s level (Sachs 2005). This school of thought argues that massive investments will eventually lead to progress and sustainability of countries. A prominent economist, Jeffrey Sachs, proposed an experiment to show that massive investments into states and communities create large returns on the short run. He proposed an experiment called Millennium Development Villages Project, where a group of carefully selected villages in various countries received massive investments in public services, agriculture, and new technologies. The project was initially widely praised; it was in a sense state-building on a micro scale. Today, many see the project as a failure.

The argument goes that the academics were unable to anticipate all the social and environmental complexities at work, even in the smallest of villages (Munk 2013). The weakness or unwillingness to understand or take into account local realities is best described by James C. Scott in his seminal work *Seeing Like a State*. He writes that the main culprits responsible for failure of many development and state-building processes are, first, the “administrative ordering of nature and society” which are always based on simplifications and extractions; second, a “high-modernist ideology which is best conceived as a strong, one might even say muscle-bound, version of the self-confidence about scientific and technical progress;” third, the coercive power of the authoritarian state; and fourth, a “prostate civil society” that fails to resist these plans (Scott 1998).

A contrary school of thought argues that piecemeal or incremental problem solving has the best chance of success. Academics and practitioners clustered around an economist William Easterly, contrasts the traditional "Planner" approach put forth by Sachs with the "Searcher" approach that treat problem-solving as an incremental discovery process, relying on competition and feedback to figure out what works (Easterly 2006). According to this school of thought, local detail matters. This view is further acknowledged by some development economists who believe that “it is possible to make very significant progress against the biggest problems in the world through the accumulation of a small set of steps, each well thought out, carefully tested, and judiciously implemented” (Duflo 2011).
Chapter 3: Governance in Areas of Limited Statehood

Looking at governance through this new prism of acknowledging local realities, some scholars began to “disassociate governance from government in favor of forms of governing” (Lynn 2012, 51). To simply quote the *Oxford English Dictionary*, “governance is the action or manner of governing”, that is, controlling, directing or regulating influence. All societies need to find ways to governing themselves and to providing collective direction, and governance asks questions about how this is done (Peters 2012, 23). In its most basic form governance is defined as “the attempt to steer society and the economy through the collective actions and forms of regulation that link values and objectives to outputs and outcomes” (Torfing 2012, 101).

According to Risse, the neo-realists view of the modern nation state, as the center of the governance activities, is a “historical anomaly and more of an exception than the rule” (Risse 2010, 8). Risse explains that the governance capacities of the states are best understood as a continuous variable, with fully failed states at one end and consolidated states at the other. He claims that every state is located somewhere on a scale ranging from the failed state on one side, such as Somalia, and fully consolidated states on the other, such as Scandinavian states.

He further explains that all of the countries on the scale, including fully consolidated OECD states, are faced with *areas of limited statehood*. In other words, *areas of limited statehood* concern those parts of the country in which central authorities (governments) lack the ability to implement and enforce rules and decisions and/or in which the legitimate monopoly over the means of violence is lacking, at least temporarily.

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(Risse 2010, 5). While such a state’s international sovereignty is recognition by the international community, they lack “domestic sovereignty” (Risse 2010, 2).

Areas of limited statehood can be: (1) “territorial, that is, parts of a country’s territorial spaces;” (2) “sectoral, that is, with regards to specific policy areas;” (3) “social, that is, with regards to specific parts of the population;” (4) “temporal,” that is, temporal breaks in statehood (Risse 2011, 5). Informal settlements around the world represent both territorial and policy breaks in statehood where governments fail to connect parts of their populations to basic public services or to certain policy implementations. Failure to implement environmental laws can constitute sectoral or policy breaks in statehood. Deliberate exclusion of a social group, such as lesbian, gay, bisexual and transgender (LGBT) can constitute social break in statehood. And last but not least, a natural disaster, such as the recent typhoon Haiyan in the Philippines, can constitute the temporal break in statehood. For weeks, the government of Philippines was unable to provide services to its population in the affected areas.6

If the areas of limited statehood represent locations where government cannot enforce decisions and has no capacity to implement force, the question arises, who then governs these areas? We have already mentioned that the neo-realist view, which is deeply rooted in the Western concept of governance, presumes that the state forms the core of governmental activities. In their view, the state is the main mechanism for applying basic goods, such as security or stability (Waltz 2000, 39).

This view changes under conditions of areas of limited statehood. Governance in areas of limited statehood requires providing rules and governance services in the

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absence of fully functioning states. Risse points out, “unless we want to give up a
normative proposition that human beings have a right to a decent authority structure,
security, and other collective goods, we have to look for functional equivalents to modern
statehood” (Risse 2011, 10). Within the areas of limited statehood other governance
modalities are possible, and sometimes necessary, that are different from that of the state.
He further notes that governance consists of both “structural (‘institutionalized’) and
process dimensions (‘modes of social coordination’)” (Risse 2011, 9). These other modes
of governance include “governance by government,” “governance with government,” and
“governance without government.” Governing by the government directly applies the
centrality of the state or state-centered governance which “combines a recognition of the
shift and transformation in the organization of the state, the limitations of its policy and
the importance of private actors, with the suggestion that the state is still the most
important and central actor in politics and policy” (Levi-Faur 2012, 11). Governing with
the government can be thought of as “action of government plus its interaction with its
non-governmental partners in the process of governing” (Boyer 1990). Governance
without the government refers to a “particular model of governing that coexists with
government but functions largely and wholly beyond its influence, that is, with a
significant degree of autonomy from the state;” “the emphasis is placed on the changing
boundary between the state and civil society” (Lynn 2012, 51).

These “other” modes of governance usually include different actors, ranging from
state and non-state organizations, as well as different modes of steering – a non-
hierarchical and more horizontal mode of social coordination. These other modes of
governance “do not complement hierarchical steering by a well functioning state but have
to provide functional equivalents to developed statehood” (Risse 2011, 3). In short, governance in the areas of limited statehood sometimes requires providing rules, regulations, and public services in the absence of fully functioning state whose domestic sovereignty is compromised either temporally, territorially, over a certain social group, or in some policy area (Risse 2012, 12).

Nairobi’s slums constitute areas of limited statehood. They fit the spatial dimension of limited statehood the closest, meaning that certain areas of the capital are devoid of statehood. The slums lack state provisioning of public goods and the use of legitimate violence for the enforcement of binding rules. Missing public services, such as access to clean water and sanitation, security of tenure, access to education and health services, and even waste management, provide opportunities for alternative governance modalities. These alternative governance modalities rely on collaboration and coordination of various actors for the purpose of providing missing services. Before we start our inquiry into Nairobi’s slums, let us first look at collective action theory.

Chapter 4: Collective Action Theory

We have argued that different modes of governance can be applied in order to provide basic public goods, and they rely heavily on coordination and collaboration of various actors that are involved in providing them. Local realities often determine the nature of governance. In areas of limited statehood, providing public goods depends heavily on collective action undertaken by various actors, who are often different from that of the state. In the next section, we will take a closer look at collective action and
new collective action theories. We are particularly interested whether new collective action, which emerged due to the changing nature of the information environment, can provide an alternative governance modality in the areas of limited statehood.

Collective action theory has undergone considerable revision in the last couple of decades. Collective action can be defined as those “actions taken by two or more people in pursuit of the same collective good; they are typically framed as resulting in some shared outcome or ‘public good’” (Marwell and Oliver 1993, 4). In the last decades, collective action perspectives have been applied to a variety of phenomena, and in recent years, a lot of emphasis has been put on the changing nature of collective action due to the changing nature of information and communication technologies. The main premise of the new focus is that, new communication tools fit our social-human networks well, and by lowering the communication and information costs they are changing the way we share information, collaborate, and collectively act (Shirky, 2008).

Mancur Olson is often credited for solidifying the modern idea of collective action and the notion of collective public goods. In his seminal work, The Logic of Collective Action (1965), Olson challenges the assertion put forth by the proponents of the group theory that individuals with common interest would voluntarily act in order to further the interests of its members. In his critique of the traditional group theory, Olson puts forth two central elements of the traditional collective action theory: freeriding and the importance of formal organizations. He writes, “unless the number of individuals in a group is quite small or unless there is coercion or some other special device to make
individuals act in their common interest, *rational, self-interested individuals will not act to achieve their common or group interests*” (Olson 1965, 2).

Olson’s argument rests on Samuelson’s premise that public goods are non-exclusive, meaning, once the public good is provided to the community it cannot be deprived to some member of the community, regardless of the member’s contribution to overall attainment of that public good (Olson 1965). And since one cannot be excluded from attaining the benefits of the public good, once the good is produced, the individual will have little incentive to contribute to the provision of that public good voluntarily; instead the individual will free-ride.

Olson believes that the only way to overcome the phenomenon of freeriding is formal organizing through hierarchical top-down organizations. He implies that coercion and selective incentives, the two mechanisms aimed at countering the problem of free-riding, can only be implied applied through formal organization with “a substantial capacity to monitor, administer, and distribute such measures” (Bennett and Segerberg 2012, 4). To Olson, large hierarchical organizations, such as nation states, are essential for provision of public goods when groups are large and the possibility of freeriding is likely. In this sense, he notes that group size affects the likelihood of collective action.

However, this type of formal, top-down organizing and incentivizing is costly. Communication and collaboration costs are often understood as central to formal, hierarchical organizations. Olson puts costs central to communicating and organizing. He notes that the larger the group is, the more agreement and organization it will take and the greater communication costs will be: “The larger the number of members in the group the
greater the organization costs, and thus the higher the hurdle that must be jumped before any of the collective good at all can be obtained” (Olson 1965, 48).

In summary, Olson says that the size of the group affects collective action. He notes that if groups are large and the goods are non-exclusive, once the public goods are provided, the individuals will have little interest in providing to that public good, hence they will free-ride. According to Olson, the only way to counter the free-riding problem is through formal organizing and top-down institutions. These institutions use coercion and selective incentives to counter the problem of freeriding. However, this type of organizing comes with high cost associated to it. Only entities that are capable to cover the large costs are formal organizations such as nation states.

Other scholars have elaborated on the topics of organizing and costs associated with it. Resource mobilization theory builds on Olsen’s concept of freeriding and costs of formal organizing. McCarthy and Zald (1977) write that organization’s ability to mobilize resources is critical and central to the success of its social movement. They argue that advocacy organizations depend heavily on resource mobilization. Clifford Bob (2005) also notes that the global civil society is structured by insatiable demand for support, expressed by local movements in the global south on one hand, and by the scarce supply of available resources by northern nongovernmental organizations on the other. This means that only movements with visible international standing and contacts, knowledge and material resources, organizational resources and charismatic leadership can hope for success. High cost of organizing and information are again critical in this interaction; only formal institutions can afford to pursue them.
Sidney Tarrow (2011, 124) also builds on Olson’s fundamental understanding of group formation and the importance of formal organizing when he points out that without some formal organizing and hierarchy “movements frequently fade away or dissipate their energies,” reinforcing the importance of formal, hierarchical organizations. He does, however, put forth the importance of the changing information environment and its role in organizing. He points out that individuals engage in collective action - or ‘contentious politics’ - when changes in the political environment create opportunities and constraints for organizations to mobilize individuals to act collectively. He explains that changes to information and communication environment spurred by the rise in new and available technologies affect the way communities deal with contentious politics: “People now take advantage of incentives created by shifting opportunities and constraints and the Internet and other forms of electronic communication are creating new opportunities, thus changing the nature of mobilization” (Tarrow 2011, 32). Despite these new modes of communicating, Tarrow still believes that formal organizing is crucial to the success of social movements.

Traditional collective action theory was developed in a time when key communication possibilities now common in public life were non-existent. Traditionally, in an information-scarce environment, high information costs and limited resources required central control (usually by the states or other private entities), management, and specialization in the form of a professional class. Olson, McCarthy, Zald, Clifford Bob and Tarrow all indicate that for the success of collective action in providing public goods or resources, formal organization is necessary and the costs of maintaining such an organization remain high.
With the rapid diffusion of digital technology, new patterns of collective action emerge. New tools decrease information costs which in turn enable large-scale coordination at low cost, leading to a situation where a loosely affiliated group can sometimes accomplish something more effectively than an established institution (Shirky 2008). Before turning to a review of new collective action theory we will take a moment to describe the remarkable growth in several key information and communication technologies. Again, the point of this review is to set up the consideration of new collective action (what we sometimes will call digitally enabled collective action) as an alternative governance modality in areas of limited statehood. Eventually, we will examine the specific application of digitally enabled collected action in sanitation and hazards mitigation initiatives.

Chapter 5: Growth of Information and Communication Technologies

The question whether information and communication technologies can support collective action and provide an alternative governance modality is based on a premise that the new information environment – mainly accessibility and availability of Internet and mobile phones, remote-sensing satellite imagery, and geographic information systems – is prevalent even among the most marginalized communities in the world. Furthermore, we contend that these “various contemporary technologies are in many different ways creating a more information-rich and communication intensive society and polity” (Bimber 2003, 28). Collective action is, according to Livingston and Walter-Drop, “affected by the constraints and opportunities created by the relative abundance of
information and the ability to communicate it.” (Livingston and Walter-Drop 2012, 12). The recent technological advancements around the globe seem to have set the stage for the emergence of the so-called new collective action, even in the areas of limited statehood.

In 2013, the International Telecommunication Union issued a report on the state of information and communication technologies in the world. The report notes that in the mid-2013, there were almost as many mobile-cellular subscriptions as people in the world. The report notes further that there will be some 6.8 billion users by the end of 2013. At the same time, over 2.7 billion people are using the Internet worldwide, which corresponds to almost 40 percent of the world’s population (ITU 2013). In the Global South, including Kenya, the object of the case study presented here, the breakthrough technology is mobile telephony.

This growing communication ecosystem and the availability and accessibility of information and communication technologies was further enhanced by the rise of open and freely available geographic information systems (GIS) and remote sensing satellite imagery; free and open-source software; growth of social media users and of online social capital; data driven policy decisions; and growth in communication infrastructure.

In the late 20th century high-resolution satellite imagery became widely available when the software together with the access to the satellite database became available for the wider public. Satellite images have a variety of applications ranging from meteorology, agriculture, urban and rural planning, security, education, intelligence, warfare. Public availability of satellite imagery has empowered non-state actors with capabilities previously held only by the states (Livingston and Walter-Drop 2012). Since
then the satellite imagery have been used not only by the governments but also non-governmental organizations to detect human rights violations;\textsuperscript{7} determine population densities of the urban slums;\textsuperscript{8} for emergency response;\textsuperscript{9} assess the human security situation;\textsuperscript{10} detect war crimes;\textsuperscript{11} or to map the previously unknown terrain. Satellite imagery, together with other open source software creates new technical capabilities and can depict a previously unseen picture of the world (Livingston and Walter-Drop 2012).

At the same time, widely available and open source mapping platforms and geographic information systems, such as Open Street Map or Quantum GIS to name just the two, have become a major resource in the hands of various tech-savvy non-governmental organizations. These tools have been used to address the issues of missing services in the slums or perhaps more importantly the lack of any feasible and open information about the slums;\textsuperscript{12} to address the issues of misplaced funding and corruption;\textsuperscript{13} for crisis or event mapping.

One example that reflects all of these capabilities is Ushahidi, and open-source GIS software that accommodates mobile phone-based crowd-sourced reports.\textsuperscript{14} As a response to the post-election violence of 2007/2008, Kenyan bloggers and technology experts put together the crowd-sourcing platform called Ushahidi. The platform allowed

\begin{footnotesize}
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  \item[9] See: iRevolution, Available at http://irevolution.net/category/satellite-imagery/ (accessed 14 March 2014)
  \item[12] See: Map Kibera, Available at http://irevolution.net/category/satellite-imagery/ (accessed 14 March 2014)
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citizens to provide information about violence and other activities through an online mapping platform, with SMS, social-media, e-mail, and web-form integration almost in real time. The information was then used to allocate resources and most importantly share awareness to inform population about potential risks. Ushahidi has since been deployed tens of thousands of times for variety of reasons ranging from election monitoring to bird watching.

Due to these new technologies, even the so-called Global South now has sufficient relative capacity to accomplish goals with digitally enabled collective action. We are interested how this growing reach of information and communication technologies affects collective action in the areas of limited statehood. Our focus is on informal settlements in Nairobi, Kenya, and for this purpose we will now take a closer look at the changing information environment in Africa, and in Kenya specifically.

Africa has seen a major increase in mobile phone subscriptions, growing from 2 percent of the population in 2000 to 63 percent by the end of 2012 (ITU 2013). In early 2013, Africa had the second fastest mobile telephony growth rate in the world with 775 million cellular connections across the continent (Livingston 2013). In the developing world, 31 percent of the population is online, compared with 77 percent in the developed world. In Africa, 16 percent of people are using the Internet. While much of the growth in mobile telephony in Africa involves simple handsets, more recent growth includes Internet-enabled smart-phones. Africa is the region with the highest growth rates of mobile-broadband penetration. In the last three years mobile-broadband penetration increased from 2 percent in 2010 to 11 percent in 2013 (ITU 2013).
Africa has in recent years seen the rise in information and communication technologies and their application in the methodologies for collective action. Information and communication technology tools are widely used in development, with more focus on the poor and the marginalized as the producers and innovators with ICTs. There is widespread availability and accessibility of mobile phones, Internet and social media in the informal settlements.15

Kenya is becoming a major technology hub of Africa. The “availability of mobile technology, access to Internet, and provision of government services (referred as e-government) and open data initiative all contribute to a growing information ecosystem in the country” (Kovačič and Lundine 2014). According to Communications Commission of Kenya, the country had a mobile penetration rate of 76.9 percent in September 2013, translating into approximately 31.3 million mobile phone subscriptions.16 As a comparison, eleven years earlier, in 2002 the penetration rate was 3.61 percent, translating into approximately one million users.17

Internet penetration and usage have also been on the increase in Kenya. In 2009, Kenya received an underwater broadband Internet cable that spurred government and private investments in the countries communication infrastructure. This has increased the availability of the Internet and Internet related services. In September 2013, the

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17 See: Mobile Technology in East Africa, iHub Blog, Available at http://www.ihub.co.ke/blog/2012/05/mobile-technology-in-east-africa/ (accessed 15 March 2014)
population that had access to Internet services reached 43.5 percent or approximately 19.2 million users.  

In the last couple of years, Nairobi has become a city in the thrall of the information age. The changing information environment encouraged the rise of innovation centers in ICT in Kenya and across Africa. Leading-edge innovation centers can be found in various African cities. Perhaps the most well known component of Nairobi’s emerging strength as the technology superpower, or Silicon Savannah as many call it, is iHub, a technology innovation center in Nairobi. This boost in the technological infrastructure spurred the emergence of dozens of technology companies and organizations promoting the use of ICT in development in Kenya. ICT tools are now widely used in development and education with more focus on the poor as the innovators with ICTs. There is widespread availability and accessibility of mobile phones, Internet and social media even in the informal settlements. Mobile Internet is the most common mode through which Kenyans access the web with 26.3 percent of the population having mobile data/internet subscriptions. People in Nairobi and in its informal settlements no longer have to visit the few Internet cafés to check their email, communicate through chat and instant messaging services or get updates on their Facebook and Twitter accounts (Kovačič and Lundine 2014).

As we will see in the following sections, this new technology environment creates opportunities for non-state actors in the areas of limited statehood to fill in some of the

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information gaps left by the inability, incompetence, or lack of interest by the state. The stage is set for new collective action in the areas of limited statehood.

Chapter 6: New Collective Action Theory

With the rapid diffusion of digital technology, new patterns of collective action emerge. New tools decrease information costs which in turn enable large scale coordination at low cost, leading to a situation where a loosely affiliated group can sometimes accomplish something more effectively than an established institution (Shirky 2008).

Bruce Bimber (2003) touches on the notions of the shifting nature of information technologies and collaboration costs. He identifies four information regimes, each of which is characterized by the dominant way in which information is shared. According to Bimber, we currently live in the fourth information regime associated with “information abundance” (Bimber 2003, 23). This information rich environment enables virtually anyone to create, distribute, and use information relatively cheaply or for free (Bimber 2003, 23). Bimber contends that, thanks to information and communications technologies, the characteristics of bureaucratic politics and the top-down hierarchical organization are being supplemented by less-centralized organizational structures. He further notes that new collective action no longer requires the formal organization and that other organizational structures are now possible.

We start to see the importance that the new information environment has on incentives for collective action. The traditional collective action theory notes that once
the non-exclusive public goods are delivered, some individuals will freeride. Hence, formal, top-down institutions are necessary to provide selective incentives to keep people from freeriding. The cost of organizing and coordinating such a formal organization remain high. New information environment lowers the cost of information sharing and consequently the cost of organizing. New and more horizontal organizational structures are possible as the cost of organization decreases. As more and more people have access to information, in an environment where anyone can create, distribute and use information, the possibility of freeriding undetected also decreases. This more transparent and information rich environment changes the nature of collective action.

In recent years we have seen a drastic change in how people use the Internet and online tools. New information and communication technologies allow users to interact and collaborate with each other either through the online-offline engagement or simply online in virtual communities. Communication can be done through dialogue online, via social media, or through the creation of a user-generated content. The term “user-generated” is important because it highlights the fact that anyone with access to the Internet can now use it to communicate, collaborate, and create content. Sometimes there is no expectation of face-to-face confrontation hence the collaboration costs are extremely lowered (Karpf 2012).

W. Lance Bennett and Alexandra Segerberg (2012) propose a new model to the logic of collective action called the “logic of connective action.” At the core of their model is the logic that recognizes digital media as organizing agents. They write: “the model behind the logic of connective action applies increasingly to life in modern societies in which institutions are losing their grip on authority and group ties are being
replaced by large-scale, fluid social networks” (Bennett and Segerberg, 742) These
“networks can operate through the organizational process of social media, and their logic
does not require strong organizational control or the symbolic construction of a united
‘we’” (Bennett and Segerberg 2012, 748). They argue that the new information
environment of increased information abundance, together with the ability to personalize
a message and the individual incentive to share, has created a situation where groups can
self-organize and where the self-interest, as opposed to free-riding, is less of a hurdle to
achieving collective goods.

Shirky (2008) adds that the emergence of new information and communication
tools has collapsed the barriers to group action. Because new communication tools,
Internet and mobile phones, fit our social-human networks well, they are changing the
way we share information, collaborate, and collectively act.

As we can see, communication that is central to collective action is no longer as
costly, difficult, time consuming, or limited by the cognitive constraints of individuals as
it once was (Bimber, Flanagin and Stohl 2005). By treating information, communication
and collaboration costs as variable, new organizational forms and new collective actions
are possible (Bimber, Flanagin and Stohl 2005). New technological advances and
ubiquitous nature of information and communications technologies lower the cost of
gathering, creating, storing, and distributing information. This in turn enables groups to
communicate at a much lower cost that would have been possible in an earlier age. New
technologies facilitate coordination at a much lower cost. Technologies that reduce the
cost of receiving and sending information can reduce organizational costs, increase
noticeability, and make ineffective communicative networks effective (Lupia and Sin
In this way, “technology changes longstanding expectations about what people can learn about each other (Lupia and Sin 2003, 316).” Society no longer relies only on the state or other hierarchical types of organizations to provide information or in some cases coordinate delivery of public goods. Each person can now gather, analyze and share data with the cost of doing so set as a variable. Users can become contributors and vice versa. We could argue that through the availability of ICTs, accompanying social media, and other technological advances, people around the world have access to more information more quickly and at lower cost which in turn changes the nature of collective action.

We are specifically interested in how new information and communication technologies change the nature of collective action in informal settlements in Nairobi. We are interested in how groups organize for the purpose of service provision when the government fails to provide basic services, specifically looking at the environmental management and hazard mitigation in Mathare, Kenya’s second largest slum. In that sense, we are looking at the potential governance capacity found in digitally enabled collective action. The next section will touch on the provision of public goods in Nairobi’s informal settlements.

Chapter 7: Service Provision in Nairobi’s Informal Settlements

Nairobi, Kenya’s capital city is the largest city and metropolitan area in East Africa (see figure 1). Nicknamed, the ‘Green City in the Sun,’ it is a political and administrative capital of Kenya and “an international, regional and national hub for
commerce, transport, tourism, education, technology, communication, and regional and international center for cooperation and economic development” (UN-Habitat 2006, 4). The city of Nairobi has in the last decades experienced rapid population growth. According to the UN-Habitat, Nairobi has the highest per annum urban growth rate in East Africa (UN-Habitat 2006). Nairobi’s population grew between 1980 and 2009 from 862,000 to about 3,100,000.\(^\text{22}\) According to the report 75% of the urban population growth was absorbed by informal settlements (UN-Habitat 2006).

![Map of Kenya and Africa and Location of Nairobi](image)

Figure 1: Map of Kenya and Africa and Location of Nairobi

Africa’s informal settlements are probably one of the most poignant examples of urban poverty in the world. Millions of people in African live in slums and the growing cities are having a difficult time coping with the influx of people arriving every day. Informal settlements are growing and governments are struggling to provide even the

most fundamental services to their urban populations. According to some estimates, half of Nairobi’s population lives in two hundred of the city’s informal settlements (UN-Habitat 2006). The population estimates of these areas vary and are highly debatable. For example, estimates of the population of Kibera, considered sub-Saharan largest slum, vary between 170,000 and 1 million. Whatever the exact number, one thing is clear: many of Nairobi’s citizen live in informal settlements (Kovačič and Lundine 2014).

UN-Habitat defines a slum household as a household that lacks access to improved water and sanitation, sufficient living area, durability of housing, and security of tenure. Most of Nairobi’s informal settlements lack basic public services such as access to clean water and sanitation; sustainable waste management and hazard mitigation; sufficient living space, security of tenure and durable housing; access to adequate education and health services, and security. In these settlements, the state often fails to provide even the most basic of public goods and is experiencing “significant problems with regard to rule-making, implementation and enforcement,” classifying many informal settlements as areas of limited statehood (Livingston and Walter-Drop 2012, 38).

Where the state's control over the means of legitimate force, rule implementation, and service provision are missing, the informal sector fills-in the gap (Kovačič and Lundine 2014). According to one estimate, informal sector employs two-thirds of Nairobi’s labor force (UN-Habitat 2006) as businessmen and merchants, sellers and buyers, security guards, manual laborers, teachers, health workers, waste pickers, waste sorters, and cleaners. Informal employment sector is a complicated system though which

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many of the services usually associated by the state are provided to varying degrees of quality (Kovačič and Lundine 2014).

Many projects have in recent years tried to address the problem of lacking public services in Nairobi’s informal settlements through the use of available technologies. In 2008, the Map Kibera Project used a combination of on-the-ground surveys and satellite imagery analysis to estimate the population figure of Kibera, sub-Saharan largest slum. For many years, the numbers around Kibera’s population were unknown and highly inflated. Some estimates put the number of residents as high as one million people. The project concluded that the number of people in the slum stands between 235,000 and 270,000. These numbers were far more in line with the recent survey conducted by the Kenya Population and Housing Census in 2009 that reports the population of Kibera at 170,000.

A different project, though with a similar name, Map Kibera, aimed at producing the first open and free map of Kibera. A group of volunteers from Kibera documented all of the educational and health facilities in the slum, as well as water and sanitation facilities and security risks. The map revealed that the majority of schools in Kibera – more than 200 – are informal schools, including nurseries, kindergartens, primary and secondary schools. Most of these schools were attached to religious institutions and other non-governmental and community-based organizations, and many of the teachers in these schools are untrained. The same project documented all of the health facilities in Kibera. The map showed over 100 chemists and pharmacies and over 60 clinics offering a variety

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26 Map Kibera, Available at http://irevolution.net/category/satellite-imagery/ (accessed 14 March 2014)
of services operating in Kibera. The data further revealed that only one clinic was owned by the government, while the rest were owned by non-governmental, religious institutions, or individuals. The map also displayed numerous health programs operating within Kibera, ranging from HIV/AIDS treatment and voluntary counseling and testing, to mental health and psychotherapy counseling, dental clinics, rehabilitation centers, and herbalists. Many of these programs were run by non-governmental organizations.

The two examples of mapping Kibera point to the growing capabilities of non-governmental organizations in acquiring useful and relevant information about informal settlements; a capacity that was previously associated only with the state. Moreover, the two examples show that the majority public services in Kibera, which are usually associated with the state, are provided by non-governmental organizations and other private entities. Similar conclusions to can be drawn for many other services ranging from access to clean water and sanitation, hazard mitigation activities, environmental and waste management, and providing security.

Nairobi’s slums constitute areas of limited statehood. Our main assumption in this thesis is based on the premise that new and available technologies enable these non-state actors to fill in some of the gaps left by the absence of the state. New technologies change the way non-state actors organize for the purpose of providing public goods. In order to test our assumption, we will take a closer look at how waste management and hazard mitigation services are provided in Mathare, Kenya’s second largest informal settlement.
Chapter 8: Use Case: Community-Led Waste Management and Hazard Mitigation Activities in Mathare and ICTs

To fully understand the importance of informal waste management initiatives in Nairobi’s Mathare slum and to put it into a broader context of environmental management, public health concerns, and sustainable urban development, let us first look at some of the general underlying problems of waste in the cities.

Garbage or waste is largely an urban problem which carries with it global consequences. It is a “by-product of consumer-based lifestyles that drive much of the world’s economy” (The World Bank 2012, 3). Because waste needs much more time to dissolve than it takes for it to be produced, it is also one of the most important environmental and sustainability issues of our times (Benton-Short 2013).

Generation of waste as well as successful management of waste involves an interaction of social, economic, governance, environmental, cultural, and technological processes. Managing solid waste well is one of the major challenges of the cities and governments. It is widely accepted that removal and management of waste together with human excreta are two of the most vital services provided by the city (UN-Habitat 2010).

Failing to manage waste properly has direct impact on public health, length of life, and the environment (UN-Habitat 2010). Uncollected waste litters the streets, clogs drains, causes flooding and spread of water born diseases. Solid waste is a complex

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mixture of various substances, some of which are hazardous to health. For example, gasses emitted from landfills and waste incinerations consist of toxic elements hazardous to public health.\textsuperscript{28} Illegal discarding of waste and accumulating landfills can leak various chemicals into groundwater. The United States Environmental Protection Agency has identified 22 human diseases linked to improper waste management (Benton-Short 2013). Research shows that “diarrhea and acute respiratory infections are significantly higher with children living in households where solid waste is dumped, or burned in the yard, compared to households in the same cities that receive a regular waste collection services” (UN-Habitat 2010, xx). In low- and middle-income countries, waste is often dumped in land next to slums (The World Bank 2012). Environmental threats can include contamination of ground and surface water and air pollution from burning of waste (The World Bank 2012). Additionally, waste is estimated to account for almost 5% of total global green house gas (GHG) emissions (UN-Habitat 2010).

Waste is closely tied to income. It is generally known that as the income of people increases so does the amount of waste that is generated. At the same time, the distribution of waste is not equal in all parts of the world. There are significant geographical disparities in production, composition and waste management in the world and even within cities (The World Bank 2012). Informal settlements all over the world lack proper waste management systems leaving people to literally live on waste. Waste is often dumped in the informal communities where it accumulates through time, representing a major health hazard to the citizens. Many of the open spaces in these areas are used as dumping sites for trash. All sorts of wastes are dumped together. Trash accumulates in

\textsuperscript{28} See: The International POPs Elimination Project : A Study on Waste Incineration Activities in Nairobi that Release Dioxin and Furan into the Environment
the streets and attracts, as well as contains, “germs, insects, rats, and other disease vectors” (UN-Habitat 2010, 14). Uncollected trash clogs drains and is responsible for flooding during rains. Stagnant water can develop into the breeding ground for mosquitoes and it can contaminate water sources (UN-Habitat 2010). On top of that, various animals are attracted to waste bringing them into close proximity to humans and causing additional danger of bacterial, viral and other diseases. Waste is often burned which in turn causes the emission of various toxic substances to the air (UN-Habitat 2010). Children are especially at risk because of their “behavior and psychological characteristics” (UN-Habitat 2010, 15). Children play on dumpsites due to the lack of playgrounds and other available public spaces which exposes them to dangerous materials that can be found in waste (UN-Habitat 2010).

Waste management is “almost always the responsibility of local governments” and often represents one of the largest budget items of the cities and governments, particularly in developing countries (The World Bank 2012, 2). Waste management can be one of the biggest sources of employment in developing countries. Formal and informal solid waste management can represent between 1 and 5% of the city’s employment (The World Bank 2012).

According to the study conducted by the UN-Habitat: “the main driver for solid waste management in Nairobi is public health” (UN-Habitat 2010, 72). Waste collection in Nairobi is conducted mostly by the private sector, which consists of companies, small enterprises, and community based organizations (UN-Habitat 2010). Despite that, the city is struggling to resolve its waste disposal problems (see figure 2). The city council of Nairobi still depends on Dandora dumping site located some 10 km from the city center.
in a deserted rock quarry. Dandora, East Africa’s largest open landfill, is surrounded by low-income communities. It has been over its capacity for many years (UN-Habitat 2010). The health and environmental consequences to the people and the environment surrounding the dumpsite are nothing but disastrous. According to the survey conducted by Spatial Collective in 2013, 98% of the people in Mathare believe that garbage lying around in their community is harmful to their lives.\(^\text{29}\) Hundreds of waste pickers on the Dandora dumpsite shift through waste trying to find valuable recyclable material such as paper, textiles, metal, and plastic. Informal recycling represents means of employment for hundreds if not thousands of other informal recyclers around the city, mainly in the slums. Some research shows that up to 20% of household waste was recovered by informal pickers and city council workers (UN-Habitat 2010). At the same time, Spatial Collective’s survey showed that more than 93% of the people surveyed in Mathare believe that waste management should improve.

\(^{29}\) Spatial Collective conducted a survey of 1000 randomly collected households in Mathare in October, 2013
Access to clean water and adequate sanitation, as well as removal of solid waste and other public health services are considered to be public goods that are usually provided by the state. When the state fails to provide these basic services, different governance modalities may emerge to fill in the gap. In this thesis, we are specifically interested in how various self-organized groups in Mathare, Kenya’s second largest slum, provide waste management and other hazard mitigation services that can have a significant impact on the health, length of life, environment, and general well-being of the population in the absence of the state, and further, what is the role of information and communication technologies in these activities.
Mathare is Kenya’s second largest informal settlement situated approximately 5 kilometers from Nairobi’s city center (see figure 4). It is notorious for drugs, gangs, lack of basic services and employment opportunities, security issues, and poor hygiene and sanitation conditions. It is an impoverished area, situated in an abandoned rock quarry, on private and state-owned land, and located at the heart of one of the most densely populated areas of Nairobi called the Eastlands. According to the Kenya National Bureau of Statistics, 193,416 people live in Mathare constituency. The constituency is further divided into six wards: Hospital (20,463), Mabatini (28,260), Huruma (36,247), Ngei (36,248), Mlango Kubwa (38,374), and Kiamaiko (33,824).\textsuperscript{30} Majority of people in Mathare live either in shacks made out of tin and wood or in high-rise buildings (fig. 3).

Figure 3: Infrastructure in Mathare (Photo by: Primož Kovačič)

\textsuperscript{30} Bracketed numbers represent population figures in the associating Wards. Source: Kenya Bureau of Statistics.
Figure 4: Map of Mathare and its Villages

Service provision in these areas varies in degrees of quality and quantity, for example, most of the high-rise buildings have water, sewerage and electricity connections, yet the provision of these services is often infrequent. At the same time, most of the tin-shacks and mud-huts in the area do not have access to these services. In addition to a handful of government facilities that provide scarce public services, there are numerous community-led initiatives ranging from youth groups, self-help groups, religious institutions, NGOs that provide various public services.

In 2011, a similar project to that of mapping Kibera was established in Mathare by Map Kibera Trust. The project aimed to map public toilets, water points and open defecation in the area. Information gathered exposed that private individuals and non-

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governmental organizations owned most of the public toilets. Information concerning water points revealed that individuals or interest groups owned 60% of public water points in the area, and that the rest were owned by various non-governmental organizations. The project also concluded that poverty, lack of access to adequate sanitation facilities, and security were the main reasons behind open defecation in Mathare. Due to security concerns most people do not leave the relative safety of their houses during the night. Because they cannot access the public toilets during the night, they use paper bags to relieve themselves. The bags are then discarded throughout the community in the morning. The phenomenon is known as “flying toilets,” one of the main reasons for the rampant open defecation in the area. In addition to the lack of access to clean water and adequate sanitation, poor waste management represents an additional hazard to the community. The problem of inadequate waste management is no less an environmental and humanitarian disaster. Food waste, paper, broken bottles, batteries, metal, plastic, electrical material, building material, raw sewerage, paint and other chemicals - even human feces - litter walking paths, open spaces, roads, and even people’s houses. Then there are the very dangerous toxins created by open-pit burning and the overflowing waste from the open-drainage. The health implications for the people living in these conditions are disastrous. Human excreta together with mountains of solid waste represent a major health hazard to the citizens of Mathare.

When the state fails to protect its population, the informal sector takes control. Informal waste management such as sorting and recycling are diverse and generally consist of street-pickers, dump-pickers, truck-pickers, waste buyers (middlemen) and junk shops. Waste management in Mathare is handled by the numerous youth groups or
community-based organizations. In some areas the groups have built in relationships with small enterprises, mostly individuals who own garbage trucks. Although some of the youth groups and individuals, as well as some of the small enterprises, are registered with the City Council; most of them are not. According to the UN-Habitat’s research, the informal recycling has a significant economic footprint in the cities. Although the numbers for Mathare and other informal settlements are not known, the informal sector may be removing and recovering as much as 20% of the waste at no cost to the local authority (UN-Habitat 2012). Informal recycling “saves the city money and improves the environment” in the process (UN-Habitat 2012, 131). The local government can enjoy these privileges because of the economic interests of informal recyclers – this is often their only means of income. Indeed, waste represents an important source of income for many groups and individuals either through waste collection or through controlling public toilets and water points. According to the citizens who were interviewed by Spatial Collective, many youths took on waste management as an opportunity to earn much needed cash. Recycling plastics, which they sell back to the industries or to the middlemen, earns a bit of money for cash-strapped youth.

Waste and environmental management in Mathare tends to become political as well. Tatiana Thieme states that groups dealing with garbage collection and waste management become “productive entry points of youth ‘mobilization,’ ‘livelihood creation’ and a ‘mode of resistance’ and hence a political platform for low-income urban youth to reclaim their rights to the city” (Thieme 2010, 350)

Spatial Collective’s survey identified 33 groups dealing with waste management activities in the area of interest. These groups had 802 members, of which 434 were directly involved in waste management. *These informal groups represent an alternative governance modality in the area of limited statehood. Our main interest in this thesis is to see whether information and communication technologies play an active role in collective action initiatives of these groups.* In order to answer this question, we will look at two datasets collected by Spatial Collective in the fall of 2013 and spring of 2014. The datasets touch on accessibility, availability and use of ICTs in Mathare and people’s perceptions of waste management activities, as well as the organizational capacities of groups dealing with waste management and their use of information and communication technologies in their work. Our main goal is to show that digitally enabled collective action is indeed possible in the areas of limited statehood and to what degree it already occurs. In the next section we will take a closer look at the methodologies applied and the data collected for the purpose of this thesis.

Chapter 9: Data and Methodology

In this thesis we want to answer the following questions: What roles can information and communications technologies play in collective action? We are specifically interested in initiatives aimed at addressing the lack of what Scott (1998) called legibility and the lack of information and awareness of informal settlements and its populations. We are also interested in whether ICTs can fill in some of the governance void found in areas of limited statehood; how might digitally enabled collective action
mitigate some of the deficiencies found in the provision of collective goods that arise from weak and “missing” state institutions? Our focus is specifically on hazard mitigation, environmental and waste management, and sanitation activities in Mathare. We will look at how youth groups, self-help groups, and individuals - with the help of a private enterprise, Spatial Collective - tackle the issues of missing data, as well as missing environmental and other hazard mitigation initiatives, which are usually associated with the state. The final overreaching question is whether information and communication technology can provide an alternative governance modality in the areas of limited statehood?

The question of whether digitally enabled collective action is possible in areas of limited statehood rests on a series of assumptions: first, it assumes that ICTs are prevalent, even among the most marginalized communities in Nairobi; second, it assumes that they are being used for the purpose of collective action and provision of public services; and third, it assumes that ICTs can fill in some of the governance void found by the absence of the state, providing an alternative governance modality in the areas of limited statehood.

We look at two datasets acquired by Spatial Collective, a technology consulting social enterprise based in Nairobi, Kenya. The organization’s aim is to explore how trends change through space, place and time. Its expertise lies in developing innovative technology tools and on-the-ground approaches to collective action initiatives. They are specifically interested in exploring ways in which groups organize themselves for the purpose of providing public goods and to support them with customized technology.
solutions and collective action approaches in order to mitigate some of the deficiencies found in service provision.

In order to document and understand the extent of the community led governance initiatives, Spatial Collective used a variety of tools to gather information quickly and reliably. Some of the tools used are: global positioning system (GPS) and analysis of satellite imagery in order to document the spatial extent and relations between various entities; usage of android phones to gather insights and opinions of the citizens through surveys; and qualitative grassroots community meetings with all the major stakeholders who are directly involved in providing this particular public good. The aim was to better understand how governance happens in the areas of limited statehood.

The first dataset that Spatial Collective gathered was the household survey of 980 randomly selected households in Mathare (aim was 1000 households). Professor Steven Livingston of the School of Media and Public Affairs at the George Washington University offered advice on the initial survey design and on setting up the initial strategies. The focus of the survey was, apart from basic demographic information, on availability, accessibility, and usage of mobile telephony and the Internet; and on people’s perceptions and behavior on waste and waste management activities in the slum. The second dataset targeted 33 groups and individuals identified as dealing with environmental and waste management activities in Mathare. These groups’ activities range from household garbage collection, sorting, recycling and reusing of waste, to community cleanups and other hazard mitigation activities. The survey focuses on the capacity of these groups, their modes of operation and their use of various ICTs in their work. The survey takes a closer look at how groups use ICTs for the purpose of
coordination of activities and collaboration between group members and in some instance city council representatives, and payments made between groups and customers. The data also provides a qualitative assessment of the group’s experiences with the city council and other government officials who are responsible for environmental and waste management in Nairobi and their opinions on how to better deal with the problem of waste in slums. The first dataset was collected in November, 2013, and the second dataset in March and April of 2014.

Household survey was conducted in November 2013. Through careful considerations of local realities provided by the field team and through interviews with community members and activists, Spatial Collective designed a public opinion survey targeting 1000 households in Mathare and completing 980 interviews. The first section of the survey focused on the demographic information of the interviewees. Questions in this section included information on age, gender, location of residence within the slum, years spent in Mathare, education, marital status, employment, and number of people in the household. The second section of the survey consisted of ICT-related questions including information about ownership, access and use of mobile phones, computers, and the Internet. The third and final section of the survey included questions targeting people’s perceptions and habits concerning waste management. The survey was conducted in four out of the six wards in Mathare: Hospital, Mabatini, Ngei, and Mlango Kubwa. These four wards host approximately 123,345 people and were selected because of their representativeness of the broader Mathare constituency in the greater Eastlands area of Nairobi.
To conduct a random selection of the households, a grid layer or a fishnet was superimposed on top of the satellite imagery of Mathare in GIS software. The dimensions of the grid cell of the fishnet were 3x3 m which is consistent with an average room in both the high-rise buildings and in the tin-shack or a mud-house: majority of the families in Mathare live in one room apartments/spaces which are on average 9 square meters large. Once the grid was superimposed over the satellite imagery a random selection function was used in the Quantum GIS software in order to randomly assigning 1000 grid cell locations. Selected grid cell locations were then transformed into GPS location points with latitude and longitude coordinates. The points were then uploaded into eight GPS units that were assigned to the field workers, each of whom had a pre-assigned section of Mathare where he or she would conduct the survey. The field team navigated with the help of the GPS units to the randomly selected households on the ground where they then engaged the resident and conducted the interviews. If the person at a particular location did not want to participate in the survey or if the location of a randomly selected GPS point fell on anything else but the house, the team moved to the nearest household in order to conduct the interview. Any person older than 18 years of age was eligible for the interview.

Once the individual accepted to participate in the survey, the field team used android phones to record the answers using Open Data Kit software. Open Data Kit (ODK) is a free and open-source set of tools that helps gather and manage data collected on the field. Finally, location of each completed interview was recorded with the GPS unit and survey, together with the GPS location, was immediately sent into the database.

33 See: Open Data Kit, Available at http://opendatakit.org/ (accessed 2 March 2014)
through the Internet and mobile-Internet connections (see figure 5). The final toll was a database of 980 interviews.

Figure 5: Locations of the Survey Interviews in Mathare

In March and April of 2014, Spatial Collective continued their research into informal environmental and waste management and other community-led hazard mitigation practices in Mathare. In order to better understanding the informal governance initiatives, they conducted interviews with various groups and individuals dealing with environmental and waste management initiatives in four targeted wards in Mathare. These groups were identified through months of fieldwork and community meetings. The groups interviewed included youth groups, self-help groups, and individual garbage pickers, sorters and recyclers. The survey intended to show who the actors were, what were their modes of operation (did they use ICT in their work), and what some of the connections between them were. Similarly to the household survey, the answers to the
survey were recorded using android phones and GPS units. Locations of each of the groups, as well as locations of illegal dump sites, recycling and sorting locations, and any other points of interest were collected. The survey data and GPS points were sent to the designated database.

Chapter 10: Results: ICTs as an Alternative Governance Modality in Mathare

The main questions that we want to look at in our thesis are: What roles can information and communications technologies play in collective action in the areas of limited statehood? Can ICTs fill in some of the governance void found in areas of limited statehood and how might digitally enabled collective action mitigate some of the deficiencies found in the provision of collective goods that arise from weak and “missing” state institutions? And the third, final and overreaching question is whether information and communication technology can provide an alternative governance modality in the areas of limited statehood?

We have identified slums in Nairobi as areas of limited statehood. Our research rests on a premise that ICTs are prevalent even among the most marginalized communities in the world, Nairobi’s slums. Many still find it puzzling how people who live on less than two dollars per day can afford to buy or have access to mobile phones and the Internet. In order to confirm that this is indeed the case we will first show that the information environment in Mathare is as rich as any. Secondly, we assume that if the technologies are prevalent in Mathare, they can be used for the purpose of collective action and provision of public goods. We will look how groups dealing with waste
management in Mathare use technologies in order to coordinate their activities. And finally, we assume that since the ICTs are used to coordinate provision of some of the basic goods they can be considered as, at least, an integral part of alternative governance modalities.

To answer whether ICTs are at all prevalent in Mathare we will look at the household survey, but first, let us look at some basic demographic information about the population in the sample. The sample is divided approximately 49.7% male and 50.3% female. Approximately 41% of the people in the sample are aged between 18 and 25 and 38% between the age of 25 and 35, meaning, that the majority of the people in the sample (79%) are younger than 35 years old (see figure 6). This information is in-line with what is known as an African Youth Bulge, a common phenomenon in many developing countries. The youth bulge exists because the country reduced infant mortality rates but still has high fertility rate, which results in the fact that a large share of the population is comprised of children and young adults.34

![Figure 6: Age of the Population in the Sample](image)

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More than half of the people interviewed (54%) have lived in Mathare 10 years or less, which points to the transient nature of the informal settlements. Some scholars argued that it is this transient nature of many tenants in the slums that may lead tenants not to voice demands for improved services (Isunju et al 2011).

Majority of the people (71%) in the survey only have either primary or secondary education. Only 4 people out of the whole sample of 980 have advanced post-undergraduate degrees (see figure 7). This is very likely due to the poor economic situation of residents in the slums. According to some research conducted in Nairobi’s slums, education costs amount to 10% of the total household expenditures. Child education expenditure can amount almost as high as that of food or rent and because people can’t afford to send children to school many children living in slums do not benefit from free primary education in Kenya (Amendah, Buigut and Mohamed 2014). The fact that almost three-quarters of the people only have primary or secondary education does not bode well for their employment options as we will see in the next paragraph.

Figure 7: Education of the Population in the Sample
Almost half (45%) of the people interviewed were reportedly self-employed and one-third (32%) of them were unemployed (see figure 8). We have already noted that according to some studies, the informal sector in Nairobi employs up to two-thirds of the labor force and because of this we can assume that many of the self-employed and unemployed workers – who constantly look for work and occasionally do find temporary work in the city – work mostly in the informal sector.

![Figure 8: Employment of the Population in the Sample](image)

It is well known that many of the people in the slums in Kenya live in houses made out of tin and wood and mud. According to UN-Habitat, Nairobi’s slums have some of the most deprived conditions (UN-Habitat 2006). In our survey two-thirds (64%) of the people interviewed lived in these sort of conditions and additional third (36%) lived in semi-permanent, permanent or high-rise buildings. These buildings differ from tin-shacks in that they are usually units with multiple apartments but the apartment sizes inside are similar to that of tin-shacks (approximately 9 square meters). High-rise buildings also have access to more services, such as electricity, water, sewerage, yet the provision of these services is very infrequent. Concerning access to services, our data shows that
majority of the people in the high-rise and (semi-) permanent buildings pay for waste removal (81%) while majority of the people in tin-shack and mud-huts do not (73%). We believe that this is due to the higher income of the people in the high-rise and permanent or semi-permanent buildings. The map below (figure 9) shows the types of households divided into more permanent structures (high-rise, semi-permanent and permanent) and more temporary structures (mud huts and iron sheet buildings). Despite these differences, ownership of these high-rise buildings, land property and tenure issues are very unclear, making them a part of informal settlements.

![Map of House Type in Mathare](image)

**Figure 9: Types of Houses in Mathare**

This basic information tells us that according to other studies conducted in the similar areas, we can conclude that our sample is representative. Let us now look at the availability, accessibility and use of mobile telephony and the Internet in Mathare. We
want to answer the question whether ICTs are prevalent even among the most marginalized, which we have said is a pre-condition for digitally-enabled collective action.

According to the survey of 980 households, almost 93% of the residents own a mobile phone (see figure 10). This number is significantly larger than the national average of 76.9% (in September 2013). We believe that the difference is due to the different penetration and coverage rates between rural and urban areas.

![Figure 10: Mobile Phone Ownership in Mathare and Kenya](image)

Out of the 73 people in the survey who don’t own a phone, 48 of them have access to a mobile phone - either through a friend or a neighbor or a family member, making accessibility of mobile phones in Mathare a staggering 98%. Twenty-five out of 980 people interviewed did not have access to the mobile phone. The main reason they stated for not having access was that they can’t afford to buy airtime (16 out of 25 said that).

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Additionally, almost 38% of the people surveyed in Mathare have a smart-phone with which they can use to connect to the Internet. This is another relatively high number if we compare it to the national average that stands at approximately 10%.\textsuperscript{36} Even though we don’t have access to this information, we believe the difference can again be assigned to the differences between the rural and urban areas. The difference could also be age-driven because younger people are more tech-savvy.

Some of the ways people make use of mobile phones are: making calls (97%); send messages (90%); to conduct mobile payments though M-Pesa (90%). Fewer people use their mobile phones to access the Internet (26%) or social media (27%). Another interesting observation is that more than half of the mobile phone owners (58%) use their mobile phones to listen to the radio (see figure 11). This observation confirms the usefulness of ICTs such as mobile phones in providing relevant and timely information to the citizens of informal settlements.

![Figure 11: Mobile Phone Usage in Mathare](image)

A slightly different story emerges when we look at data about computers and the Internet. According to our survey, only about 8% of the people own a computer with additional quarter (26%) having alternative access to computers. Majority of the people access computers through various cyber cafés in the city (94%). Altogether, 34% of the people surveyed have access to the computer. People who have access to computers use them mainly to (see figure 12) access social media (77%); write emails (68%); to download content from the Internet (58%); and for entertainment (41%).

![Figure 12: Computer Use in Mathare](image)

Slightly more than a third (38%) of the people surveyed have access to the Internet, a number that is in-line with the rest of the developing world, where, according to ITU data, 31% of the population is online (ITU 2013). The number is close to the national average, were in September 2013, 43.5% of the population had access to the Internet services (see figure 13).³⁷ People access the Internet mostly through cyber cafes (70%) and mobile phones (69%). As we’ve already noted, mobile Internet is the most

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common mode through which Kenyans access the web with 26.3% of the population having mobile data/Internet subscriptions.\textsuperscript{38}

![Internet Access in Mahtare and Kenya](image)

Figure 13: Internet Access in Mahtare and Kenya

We can conclude that access to mobile phones and the Internet in Nairobi’s informal settlements is at least as high, in some cases even higher than that of the national average. Considering this information rich environment, we can conclude the conditions for digitally enabled collective are present even in the areas of limited statehood.

The next section will look at groups providing public services in Mathare, specifically groups dealing with waste management and other environmental and hazard mitigation services. We are interested in exploring the role of technology in collective actions that are undertaken in efforts to address the under-provisioning of collective goods, such as waste management and sanitation. As we have noted earlier, ICTs lower the cost of communication and collaboration, which can lead to loosely affiliated groups to provide services previously associated with the state. We are not arguing that ICTs are responsible for collective action or service provision, rather, that they play an integral

role in collective action and service provision activities by the non-state actors in the areas of limited statehood.

A lot of ink has been spilled about the role of ICTs in organizing protest movements (Howard and Hussain 2014); in empowering governments (Asmolov 2014) or improving their governance capabilities (Singh 2014); or in holding them accountable to their populations (Siegle 2014). While many of these authors look at either contemporary events, such as Arab Spring, or at the role of ICTs in the relationship between the government and its citizens, we look at how informal sector uses ICTs in order to provide services in the absence of the state. For this purpose Spatial Collective conducted a series of stakeholder meetings and focus group discussions with relevant entities involved in informal governance activities – waste management and hazard mitigation.

Looking back at the household survey, majority of the population interviewed agreed or strongly agreed that garbage lying on the ground is a major problem (93%) and harmful for their health (99%). People dispose of garbage from their households every day or almost every day (79%). We have already noted that due to the higher income of the people in the high-rise and permanent or semi-permanent buildings the majority of the citizens in these dwellings pay for waste removal (81%) and that less than a third (27%) of the citizens in tin-shack and mud-huts paid for the service. Spatial Collective then asked who in Mathare collects waste. More than three-quarters of the people said that it is the youth groups (77%) who provide the service. Since the youth’s are the main actor in waste management in Mathare, Spatial Collective turned their attention to identifying these youth groups, their capacities and their modes of operation.
Through a series of field visits and person-to-person interviews, Spatial Collective identified 33 groups that had 802 members. More than a half of these members (54%) were directly involved in waste management. Twenty-eight out of 33 groups were so called self-help groups, the remaining five were registered as community-based organizations.

The groups collect garbage either once or twice a week. The workers are very poorly prepared for this type of work. Less than half of the groups have gloves (15/33) and only 2 out of 33 groups have mouth-masks. Some groups have access to handcarts (21/33), spades (14/33), and rakes (12/33). It is well known that workers involved in waste management are constantly exposed to risks; their injury rate is, according to some estimates, higher than in industrial work. Several studies have shown that the relative risk of infections and parasites is three to six times higher for solid waste workers than for the control baseline populations, while acute diarrhea is ten times more often (UN-Habitat 2010, 15).

Some of these groups served more than 500 customers majority had between 50 and 500 (25/33). The group members charged between 100 and 200 schillings per month for garbage collection to each customer (between 1.5 and 2.30 dollars per customer per month). Most members would earn between 500 to 2000 schillings (around 6 to 23 dollars) per month doing garbage collection.

Our main interest in these groups is their capacity to use ICTs to coordinate their activities. All but two of the groups interviewed use mobile phones in their work and 28 out of 33 groups had smartphones available to them. All of them use mobile phones to coordinate collection activities or to alert the city council about the accumulated waste.
Coordinating activities usually involve arranging for the arrival of the truck, and coordinating the activities of the group members. Additional half of the groups use mobile phones to communicate with their customers.

We are additionally interested whether groups use the Internet in order to promote their activities. We found that 29 out of 33 groups use the Internet, mainly to promote themselves on Facebook (all 29 groups); access email services (Google: 19/29, Yahoo: 13/29); or use Twitter (13/29) and WhatsApp (16/29) services to connect to members and other publics (see figure 14). Throughout discussions youths have claimed that the Internet is a great tool for promoting their work.

![Internet Use by Groups Dealing With Waste Management in Mathare](image)

Figure 14: Internet Use by Groups Dealing With Waste Management in Mathare

We argue that digitally enabled collective action is possible only in the information rich environment. Looking at our data, we see that people in the slums have access to both mobile phones and the Internet; in some cases the number of people with access is even higher than the national average. We are also able to show that majority of the services concerning removal of hazardous waste from communities is provided by groups not affiliated with the state. These groups in Mathare represent a governance
modality that is different from that of the state. The data also shows us that the groups use mobile phones and the Internet to a certain degree in order to coordinate activities between members, communicate to their customers and the city council, and promote their activities online. Concluding, we can consider Mathare to be an information rich environment as any other.

Chapter 1: Conclusions and Discussions

In our thesis we aimed to answer the following questions: Is digitally enabled collective action possible in areas of limited statehood? We were further interested in what role can information and communications technology play in collective action, specifically looking at initiatives aimed at the lack of legibility and the lack of information and awareness of informal settlements. Whether ICTs can fill in some of the governance void found in areas of limited statehood and how might digitally enabled collective action mitigate some of the deficiencies found in the provision of collective goods that arise from weak and “missing” state institutions? Our focus was on hazard mitigation, environmental, waste management, and sanitation activities in Mathare, Kenya second largest slum. We looked at how groups of youths, self-help groups and individuals with the help of a private enterprise, Spatial Collective, organize themselves in order to tackle the issues of missing data and missing environmental and other hazard mitigation initiatives that are usually associated with the state.

We have concluded that Nairobi’s informal settlements, including Mathare, constitute areas of limited statehood best described as territorial breaks in otherwise more
or less consolidated states. We found that Mathare, second largest slum in Kenya, is as information rich environment as the rest of the country in terms of mobile and Internet coverage and use. Mobile and Internet penetrations are comparable with and in some cases even higher than the national average, concluding, that the conditions for digitally enabled collective action are indeed present in the areas of limited statehood. We have further identified 33 groups that provide public service of waste management in Mathare. These groups constitute an alternative governance modality in the absence of the state in the informal settlement. The data showed that groups use available technologies, mainly mobile phones and the Internet, to coordinate activities between members, communicate to their customers and the city council, and to promote their activities online. We conclude that ICTs are being used as an alternative governance modality in the informal settlements.

Finally, we proposed that ICTs can indeed facilitate collective action initiatives in the areas of limited statehood. They enable citizens to fill in some of the governance the gaps left by the absence of the state. The tools are being used to facilitate coordination of activities and to gather information about major issues within communities. The citizens, through the use of ICTs, can fill in the governance void that is found due to the lack of data. Technology can also help in identifying the gaps in provision of public goods. Hypothetically, we can say that ICTs can indeed provide an alternative governance modality in the areas of limited statehood.

At the end, it is important that we address some of the limitations of ICT-enabled collaboration. As Livingston and Walter-Drop note, the first major limitation of ICT-enabled collaboration is found in the nature of public good itself (Livingston and Walter-
Drop 2014, 2). Some public goods, such as providing accurate and relevant information or knowledge are more susceptible to ICT-driven governance than other, more physical goods, such as building roads, wells, schools, hospitals, or bridges. In this sense, “ICTs are best suited to provide public goods which are strongly affected by information” (Livingston and Walter-Drop 2014).

Another major limitation touches on the capacity of citizens and their ability to fill in the government void in service provision. In Mathare, despite the best efforts of the youth groups to provide people with a clean and livable environment, a lot of the waste still ends up dumped in the community. These groups simply don’t have the capacity to deal with such a vast problem on their own. At the same time, having the right capacity can also mean the ability to understand what constitutes a problem in the first place. An amateur citizen-cartographer, equipped with a GPS unit, aimed with the best of intentions to provide accurate information, can still face basic physical constrains or misperceptions of what the real nature of the problem is. For example, an individual interested in mapping dumpsites cannot detect the difference in toxicity between two different piles of trash. When a small, and, in the eye of an individual, insignificant pile of very toxic trash can be far more dangerous than a huge pile of paper and plastic, how much can we rely on the citizens to provide good information about the hazards within their communities?40

Sustainability is another issue that has remained in the forefront of discussions about digitally enabled collective actions in informal settlements. Some technology

initiatives mentioned in this thesis, such as mapping of public amenities, surveys and enumerations of populations, crime mapping, or monitoring service delivery, rely heavily on resource mobilization and on the support of the professional staff. While these initiatives provide services in the form of information for better decision-making, what happens when the funds run out? How scalable are these projects beyond the donor-client relationship?

Perhaps the most important question to consider in the end is: who is responsible and accountable for providing services in areas of limited statehood in the first place? According to Norris, institutions of both “liberal democracy and state capacity need to be strengthened in parallel for the most effective progress deepening human security” (Norris 2012, 4) Acemoglu and Robinson’s conclusions are similar, that political institutions are core determinants of economic development as long as they are inclusive (Acemoglu and Robinson 2012). However, when state’s fail to take care of the needs of some of its people, informal governance institutions, often emerge in the areas of limited statehood “providing social and political order as well as collective goods preventing the country or the region from completely collapsing into anarchy” (Risse 2011, 14).

According to Risse, limited statehood “consists of weak political institutions lacking the capacity to constrain power-maximizing actors.” The simple question we need to ask ourselves is who holds these informal institutions accountable for their actions in the absence of the state? In the areas of limited statehood it “remains unclear who are the addressees of governance, who is entitled to which governance services, and who actually receives them in practice” (Risse 2011, 16). Because of this uncertainty and the lack of accountability structures, collective goods can quickly become “club goods,” in a sense
that only certain aspects of the populations, such as certain ethnic, religious, or gender groups, can receive them. The border between the governance and racketeering can quickly become rather fluid (Risse 2011, 17). For example, the government of Kenya often brands youths who are providing various services as gangs despite the fact that they represent the only governance modality in areas where the state itself is missing. Spatial Collective’s survey indicates that 15 out of 33 groups interviewed have members who were arrested in the past by the government for providing waste management services.

Last but not least we need to ask ourselves, who is empowered and who is disempowered by ICT-enabled collective action initiatives in informal settlements? Are these technologies liberating and empowering citizens or empowering governments? ICT-enabled collective action initiatives aimed at providing information about the informal settlements can act as a double-edged sword. One the one hand they can empower people with greater access to advocacy tools that they can use to hold their governments accountable for the missing public services. On the other hand they can empower governments to crack down on the citizens in informal settlements. ICTs can make “invisible visible” and in that sense legible to the state. If states previously lacked anything like a detailed map of the terrain and the people, they can now gradually get a better handle on its subjects and the environment, and re-affirm their authority in the process (Scott 1998, 2).

These are not easy questions and we will not find the answer within this thesis but they are very important when we consider ICT-enabled governance in the areas of limited statehood.
Nairobi’s informal settlements are areas of limited statehood where the state lacks legitimacy and control over the means of force. They constitute areas of limited statehood in the center of the power of the state and remain among the most deprived in the world. They lack basic services such as access to clean water and sanitation. Continuous neglect has seen the rise of the informal sector which employs its own rules and regulations often different from that of the state (Kovačič and Lundine, 2014).

Yet, despite these deficiencies, the ICT revolution has reached the slums as we have documented. The ICT boom in Kenya has made some of the technologies ubiquitous even in the areas of limited statehood. Residents of informal settlements have not been excluded from many of the technological advancements of the 21st century. They are consumers of mobile phones and Internet services and they use web-based networking sites. They are also producers and users of data (Kovačič and Lundine, 2014). The growing technological ecosystem encourages growth and innovation in the ICT sector. ICTs are becoming ubiquitous in our daily lives, and even in the areas of limited statehood. With the rapid diffusion of digital technology, new patterns of collective action emerge. New tools decrease information costs which in turn enable large scale coordination at low cost. These new tools support governance modalities that are different from that of the state to address some of the basic issues in the areas of limited statehood. Small-scale ICTs can have a significant role in governance and can be extremely powerful in addressing some of the most fundamental needs of the populations, and, as we have seen in our use case, they can be very effective if they address some of the ongoing governance initiative.
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