

Malleable grassroots infrastructures for the interstices: The case of the Kenyan community currencies

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Paper to be presented at the WINIR Conference in the Special Themed Session “Multiple currency systems: Blessing and curse”, September 19-22, 2019. To be in Lund University, Sweden.

Abstract

The article is an answer to the call in urban studies to research the active engagement with the city of the urban interstices. It does so by studying a particular infrastructure of the interstices: Community currencies. The article builds the argument in three steps. First, it presents the notion of money as an infrastructure. The corollary of such a perspective is to conceive of community currencies as grassroots infrastructures for the interstices. Second, the article follows the development of the Kenyan community currencies from backed paper-based to blockchain-based, and identifies malleability as a key trait of interstitial grassroots infrastructures. The article concludes by emphasizing some of the implications of interstitial monetary infrastructures for theories of grassroots urban politics.

Keywords: community currencies, urban infrastructures, grassroots innovations, urban interstices, malleability, grassroots infrastructures

Think of “infrastructure” and images of large, complex and financially demanding projects come to mind: Water provision and sewage systems, IT and optical grids or electricity and power structures. Networks of lines, pipes, tunnels, conducts and viaducts criss-crossing the city. These images exude a uniform, centralized and modernist ideal of urban infrastructure (Graham & Marvin 2001) that informs much of urban planning beyond its birthplace – colonial Europe – and into post-colonial times (Nilsson, 2006, 2016). Not surprisingly, large and composite urban infrastructures have received increased scholarly attention from the social sciences for the way they enable, shape and reproduce life in the city (for a recent examples, see Hönke & Cuesta-Fernandez, 2017).

“The infrastructure turn” in urban studies (Graham, 2010; MacFarlane and Rutherford, 2008; Dodson, 2017) has not only brought much needed attention to the way large urban infrastructures shape the economic (Torrance 2008), social (Graham 2000a), and cultural (Kaika & Swyngedouw 2000) fabric of our cities; it has also recognized the heterogenous nature of urban infrastructures (Lawhon et al., 2018). Often building on concepts from Science and Technology Studies, urban infrastructures are increasingly conceived as socio-technical networks (Furlong 2010), assemblages of material objects, social practices and cultural meanings (McFarlane, 2011), in which people’s activities in the city are co-constitutive of infrastructural conjunctions (Simone, 2004). This approach has come with a close empirical attention to residents’ activities, social relations, and everyday understandings as they relate to their city and its physical infrastructures, and has resulted in an emergent realization that infrastructures not only connect territories, people, and resources, but are also complicit in disconnecting spaces, communities, and capitals. Infrastructures, that is, connect and disconnect, and are hence inextricably involved in processes of urban fragmentation. In this way, theorization and analysis of urban infrastructures have become genuinely political.

To be sure, with notions such as “splintering urbanism” (Graham & Marvin 2001), urban scholars capture the way infrastructure fragments the city, linking certain urban spaces across international geographies while separating other urban spaces from its immediate geographical environment (Graham 2000b). While “premium networked spaces” (Graham & Marvin 2001) and “fragments” (McFarlane 2018) point to different human sides of urban fragmentation processes, these distinct urban spaces are all the expression of the relationship between urban infrastructure, uneven urban development, and life possibilities in the city (Suárez et al. 2015). Thirsty for notions that can help understand the political dimension of infrastructural processes of connection and disconnection, a plethora of perspectives has been recently suggested: From questioning the formal-informal binary as a way to elicit the multiple knowledges, peoples, practices and spaces that make up the city and its infrastructure (McFarlane, 2019; Herrschel and Newman, 2000; Pratt, 2019; Narayanan and Véron, 2018; Varley 2013) to concepts such as “heterogeneous infrastructure configurations” (Lawhon et al., 2018), “assemblage” (McFarlane, 2011; Richmond 2018), “subaltern urbanism” (Roy 2011), or “urban interstices” (Phelps and Silva, 2018). In common, these notions put relationality and hybridity at the core of analysis of the urban in general and urban infrastructuring processes in particular.

Welcome as the politization of large scale urban infrastructures is, studies have largely ignored projects that are smaller, simpler, cheaper and grassroots-driven but that nonetheless shape the economic relations, social possibilities and cultural foundations of city-dwellers. Or, as McFarlane (2018) puts it, “our conception of the politics of fragments is less well established” (p.1008). Except for a few notable exceptions (see Gutberlet et al. 2016), urban studies have thus far fallen short of looking into how vulnerable communities are themselves adapting existing infrastructures (Kain et al., 2017; Chelcea and Pulay, 2015) or developing their own grassroots interstitial infrastructures, sometimes from scratch. Ignored by private and public actors that are increasingly constrained by the demands of financialized global networks (O’Neill 2018), residents in splintered city areas (Kooy & Bakker 2008) are finding new ways of organizing critical infrastructures for their communities. A recent line of research refers to these grassroots-driven small-scale projects as “grassroots innovations” (Smith et al. 2017). It is where scholarship on urban infrastructure ends that studies of grassroots innovations start; that is, with small – instead of big –, simple – instead of complex –, financially humble – instead of financially

demanding –, and grassroots-driven – instead of driven by large public and private actors. Bringing grassroots innovation studies to urban studies offers yet another standpoint from which to study the “urban interstices” (Phelps and Silva, 2016) and understand “politics at the margins of the city” (McFarlane, 2018).

More specifically, grassroots innovation studies focus on the ways networks of community groups, activists, and researchers develop and implement grassroots solutions in efforts to bring about more just, inclusive and sustainable cities (Smith et al. 2017). While this research field borrows the vocabulary of innovation and entrepreneurship, it also builds on the literature on social movements. The result is a conceptualisation of the piecemeal, everyday, relentless tinkering of grassroots groups with small scale solutions as the political practices of the grassroots (Barinaga, 2017). In this doing, grassroots innovation studies highlight that the entrepreneurial and political agency of the grassroots is not merely against dominant institutional arrangements. Rather, through their everyday tinkering, these grassroots innovation initiatives are suggesting new ways to re-organize society and the economy (Fressoli et al. 2014). In the quest to understand grassroots efforts to re-organize society through small and humble tinkering practices, the grassroots innovation literature challenges scholars to look into how grassroots initiatives navigate the tension between attending to local specificities whilst simultaneously seeking wide-scale diffusion (Smith et al. 2014). Or, in other words, the challenge is to understand the various ways through which those at the margins of the city do politics (McFarlane 2018).

That is, while the infrastructural turn in urban studies has brought much needed attention to the political dimension of infrastructures and infrastructural processes, bridging grassroots innovations studies with urban studies has the potential to elicit the practical politics of grassroots interstitial infrastructures. Building on empirical research on community currencies in Kenya, the paper argues that these monetary grassroots innovations are not only suggesting a new way to do sustainable development work (Bendell et al. 2015). They are, above all, infrastructural developments through which “the interstices” are re-imagining and re-organizing a critical urban infrastructure; namely, the monetary infrastructure that enables other critical infrastructures. Bringing together monetary studies, urban studies and grassroots innovation studies, the paper builds its argument in three steps. First, it argues that money can be seen as an urban infrastructure, and community currencies as small, relatively simple and affordable grassroots economic infrastructures for the interstices. It then presents the case of the Kenyan community currencies and explores the malleable character of these grassroots monetary infrastructures: 1. simultaneously material and immaterial; 2. based on moral principles of mutual communism and reciprocal exchange; and 3. localized geographically in order to facilitate greater regional mobility; and 4. governing the economy while structuring feeling. The paper ends considering the role grassroots initiatives play in the development of critical urban infrastructures as well as the political dimension of this form of engagement with the city.

Money as a socio-material infrastructure...

Money, as such, is seldom, if ever, considered as an object of study within urban studies. When considered, it is to elicit the role global financial networks play in shaping large urban infrastructures and, through these, life in the city (see O'Brien et al. 2019; Pryke and Allen 2017). Important as it is to understand how capital flows shape infrastructures and govern urban social relations from afar (Torrance 2008, 2009), such studies fall short of understanding money, itself, as an infrastructure, as “the living mediation of what organizes life” (to use Berlant's take on infrastructures), as a complex conjunction of things, geographies, humans and practices (Simone, 2004), as a socio-technical arrangement that mediates flows, movement, and exchange (Graham and Marvin 2001).

And yet, as many an economist (Ricks 2018), sociologist of money (Ingham 2004), and economic anthropologist (Graeber, 2011) contend, money is “arguably one of the most important developments in humanity's organizational or infrastructural powers” (Ingham, 2001:312). Conceptualized as representing a debt-relation, a “promise to pay” (Innes, 1913), an “obligation, which exists between

human beings and cannot be identified independently of its institutional usage” (Bell, 2001), analysts agree on approaching money as a socio-material infrastructure for record-keeping through which monetary societies achieve the allocation of resources (Bell, 2001; Forsberg 2015). As a two-sided balance-sheet phenomenon (Keynes, 1930; Minsky, 1986; Wray, 1998), at once an asset (credit) and a liability (debt), money enables resources to flow between people, various forms of capital moving through networks of humans and institutions.

Three traits of this characterization of money are particularly relevant for an urban studies approach to it. One, contrary to popular misconceptions, analysts argue, money is not merely the material stuff it is made of or it is assumed to be a representation of. Rather, for money to be able to connect economic activities and organize movement and exchange, a money-of-account needs to be in place. In Geoffrey Ingham’s own terms, “these *promises* [to pay] are constituted by *the means of accounting for value (money of account)* and the *various means or forms of the representation of abstract value* (abstract purchasing power that is accepted as means of payment/settlement of debt)” (Ingham, 2001:307, emphasis in the original). Money, that is, has an ideational/social component (abstract means to measure economic value that needs to be agreed upon) and a material component (the money-stuff - commodity, paper, or digital). Two, money is relational since a promise to pay requires a buyer that promises and a seller that accepts that promise. In the terms of these analysts, money “expresses a social relation” (Foley, 1987; Ingham, 1996). And three, it hinges on the general acceptability of those promises to pay (Kiyotaki and Wright, 1987), a general recognition of the value of the promise. Only then can the “promises to pay” (coins, paper bills, or digital bits) be transferable and circulate across (connect) economic actors. Indeed, it has been argued that this form of transferable credit-money is a social technology specific to capitalism (Ingham, 1999). In other words, money can be conceived as a socio-material arrangement connecting economic actors and organizing economic flows in our societies.

Taking an infrastructural approach to money allows us to see money as a social technology (Ingham, 1996) that shapes and is shaped by socio-economic conventions, and that hinges on socio-material networks of exchange (acceptability). It allows us to see the extent to which money connects (and disconnects) people, places, objects and spaces across the city and beyond, thus weaving together (or apart) the social and economic fabric of economies, societies, and the environment. Money becomes the invisible tissue, the social organ of cities, nations and global networks, connecting (and disconnecting) not only geographies through its financial flows, but also other critical infrastructures and environments.

... and community currencies as grassroots economic infrastructures for the interstices

Conceiving money as a critical infrastructure, necessarily entails looking at local, community-based monies as grassroots infrastructures. While community currencies resemble more the unassuming projects studied by the grassroots innovation literature than the grand projects studied by infrastructure studies, we argue that these grassroots innovations are re-imagining, re-organizing and re-claiming the monetary infrastructure for the community. Further, we argue that grassroots initiatives are particularly suited to organizing the local monetary infrastructure thanks to their capacity to adapt locally while remaining connected to global flows of knowledges and practices.

We build our argument from the case of the Kenyan community currencies in the urban informal settlements of Mombasa and Nairobi. While conventional money – shillings in Kenya – reaches informal settlements scarcely through those few residents that earn an income outside the community, as soon as it is spent, it quickly leaves the informal settlement for goods produced and exchanged outside of it. Called “leakage” (Ward & Lewis 2002), this dynamic leaves the community without a medium of exchange with which to trade the local goods and services that residents readily offer. This, in turn, further exacerbates unemployment and poverty in the area. “Leakage” is the monetary expression of splintering urbanism (Graham & Marvin 2001), the monetary infrastructure thus

contributing to further fragment the economy, discriminate social interactions, and provide for distinct experiences of the city.

For those areas forgotten by established financial actors and splintered from global, national and regional flows of money, their position at the interstices of the monetary infrastructure is doubly harmful. One, because scarcity of money excludes residents from the established economy. Two, because a position at the margins of the monetary and financial infrastructures is constitutive of the lack (and cracks) of other critical infrastructures. Indeed, although spontaneous settlements are “anything but homogeneous” (Gilbert, 2007: 69), their residents frequently live overcrowded in poor or informal houseing, with food insecurity, inadequate access to safe water and sanitation, and deficient access to the power grid (Arimah, 2012).

To tackle the monetary leakage at the root of other infrastructural cracks, that is, to help money remain in the “disjunct fragments” of cities (Keil, 2018), grassroots initiatives are designing and introducing community currencies as local infrastructures to facilitate exchange, organize the movement of critical goods and services, and assemble flows of people and resources into geographically delimited markets. Instead of the normative ideal of a uniform money, these grassroots organizations are contributing to enact monetary infrastructures that are intentionally situated, develop through continuous experimentation and adjustment (Castán-Broto and Bulkeley, 2014) and build on people’s everyday relational work (Simone, 2004 & 2014). In the case of the Kenyan community currencies that are at the centre of this paper, these grassroots infrastructures are designed to support financially the build up of other critical infrastructures (waste collection and food security infrastructures). In this doing, they draw from knowledges and experiences in other cities and from other times, continuously tinker with the monetary designs as they learn through continuous experimentation, and are adapted to the particular challenges and resources of the urban interstices where the currencies are to be used. In re-organizing and re-claiming money for the urban marginalized, we conclude, these grassroots organizations are not only developing novel interstitial infrastructures, they are also suggesting a form of “politics of urban fragments” (McFarlane, 2018).

Eco-pesa:

The first Kenyan community currency infrastructural design

Eco-pesa is the forerunner of today’s community currencies in Kenya. Although no longer in place, a history of the Kenyan community currencies necessarily begins with Eco-pesa for the experience of setting and running it taught the ‘activist entrepreneur’ (Davis, 2017) coordinating it (co-author of this paper)—, lessons that would shape later currencies in the country (Ruddick et al. 2015). (This and the next sections are based on Ruddick 2011 and Ruddick et al. 2015).

Given its setting in Kongowea – an urban informal settlement in Mombasa where local trade is low, unemployment high (up to 80%), the population live under the poverty line, have no access to bank-loans, and lack critical infrastructures such as waste management –, the purpose with the introduction of Eco-pesa was twofold: (1) to help facilitate and promote environmentally targeted (2) social service work and economic development activities in Kenyan informal settlements. “Eco” stood for the promoters’ ecological ambition. “Pesa” is the Kiswahili word for money.

Modelled by the activist entrepreneur and implemented together with the Kenyan chapter of Eco-Ethics International Union – an international environmental NGO –, ecology and employment stood as central guidelines for the design of the Eco-pesa monetary system. Inspiration for the monetary design came from the Berkshares, a prominent local currency in Massachusetts, which is issued in exchange for dollars. The dollars are then used to back the currency, while currency users buy and sell in Berkshares. This localizes production, boosting the local economy (North, 2014).

Relying on the same principle, the Eco-pesa was designed as a local currency backed by the national currency. To encourage adoption, local businesses and youth were given a 20% discount upon

purchasing Eco-pesa for Kenyan shillings. Because only local businesses accepted Eco-pesas, the possibility of spending the currency was geographically limited, thus preventing it from leaking out of the informal settlement. To further prevent leakage, the program charged a 20% fee upon redeeming the Eco-pesa for shillings. That is, Eco-pesas were convertible to Kenyan shillings at a significant fee.

After one month, once the community had gained familiarity with the new money and seen its effects in increased local trade, both the discount and the fee were removed. Yet the activist entrepreneur wanted to further generate jobs in the settlement while taking care of the lived environment. For this, he managed to get a US\$ 4,000 donation from the Kenyan chapter of Eco-Ethics International Union, which were used to back the issuance of new Eco-pesas. These donation-backed Eco-Pesas were used to pay residents for the waste collected during community-wide waste collection events. Connecting waste collection to the distribution of community currency was a feature in the grassroots monetary infrastructure that was inspired by the community currency in Curitiba, Brazil. Residents could then spend their Eco-pesas in goods and services from local businesses, which in turn could spend the community money in other local businesses, pay local youth for additional services, or redeem them for shillings at the local exchange shop.

Connecting

The economic connections strengthened through the community currency were soon visible in the surge of local trade and youth employment. After one month, 8 of 31 businesses (26%) monitored noticed positive increases in the number of customers and monthly income. This figure went up to 32 of the 41 businesses (80%) interviewed 2 months later, with an average of 22% increase in monthly income. This was partly a result of increased awareness among local residents/businesses which soon realized that thanks to a higher number of transactions the Eco-pesas they used returned swiftly. Or, as they put it, "I am happy because the Eco-pesa I spend comes back to me."

This was mirrored in improved local employment, as businesses started to spend their Eco-pesas in waste collection and other infrastructural services for which they hired youths. Indeed, in surveys, the local youth reported getting more work and expressed enhanced morale due to the Eco-pesa. Apart from increased local trade and employment, residents avowed a new-found capacity to save. As one resident put it, "I use Eco-pesa and save my shillings. I have never saved before now."

The connecting capacity of the new grassroots monetary infrastructure was also visible in how it extended the waste collection infrastructure it was designed to support. Four tons of waste were gathered during the first waste collection event; 16 on the second one month later. This waste was then hauled away to a local landfill. Such events helped raise awareness on the functioning of the new money. They also further generated jobs for the local youth as local businesses increasingly used their Eco-pesas to pay for assorted environmental services, from waste collection to tree planting.

Disconnecting

The donated Kenyan shillings, as well as those residents exchanged for their Eco-pesas, were kept at the Eco-Ethics office. These served as backing for the grassroots currency and local businesses could redeem their accumulated Eco-pesas for shillings. Although the possibility to redeem Eco-pesas guaranteed trust in the new currency, it also clogged up the grassroots monetary infrastructure. Foremost, some businesses were purposefully hoarding Eco-pesas in order to redeem them for shillings. This took the local currency out of circulation in the community, disconnecting users and thus weakening the capacity of the new currency to strengthen local trade and foster local employment.

A second challenge was the dependence on donors. With a donation of US\$ 4,000, the community currency had reached over 75 businesses and 20,000 residents. Yet, despite its effectiveness in improving health, as well as environmental and economic indicators, the program was necessarily limited in time. Once all backing of the Eco-pesa had been redeemed, there were no funds left to underwrite the community currency, the connections the monetary infrastructure supported ceasing to be in place.

Finally, because the national currency was too valuable to exchange for a more restricted local currency, many local businesses were reluctant to purchase the Eco-pesa for Kenyan shillings. This resulted in a relatively low number of businesses getting connected to the grassroots economic infrastructure, which in turn limited the variety and number of goods and services moving through the community economy.

That is, a main trait of the new local monetary infrastructure, that the community currency was backed by and redeemable for the national currency, resulted in a number of challenges that limited the capacity of the infrastructure to connect economic actors and organize economic life in the informal settlement. This is why the nature of the backing as well as the possibility to redeem, as we will see, were to be changed in the community currencies that followed.

Bangla-pesa: Second Kenyan community currency infrastructural design

Launched by Grassroots Economics (GE) – a non-profit organization the activist entrepreneur behind the Eco-pesa founded in 2013 –, the Bangla-pesa circulates in the Bangladesh informal settlement, Mombasa. Two features are key to understand the grassroots initiative's tinkering with the design of the new community currency: 1. independence from external donors, and 2. no possibility to redeem the currency into the national currency.

Independence was designed into the grassroots monetary infrastructure by substituting the donation and fee-based backing of the community currency in conventional money (as in the Eco-pesa) for a cooperative credit system. Inspired by the WIR credit clearing network in Switzerland – a community currency that has existed since 1934 (Stodder, 2009; Studer, 1998) –, GE assisted in the formation of the Bangladesh Business Network (BBN), a cooperative, or economic circle,, organizing about 200 micro-enterprises in the settlement that would accept and trade in the community currency. The productive capacity of the cooperative undergirded the backing of the collective credit. That is, the economic activities the members conducted stood for the value of the new community currency. 400 Bangla-pesas (at a parity of one with the Kenyan shilling) were issued per registered member, 200 of which (equal the average budget for a family's daily needs) were distributed directly to each member and the other 200 put into a Community Fund. Through assembly democracy, the Community Fund decided what community services to spend their funds on, in this way distributing Bangla-pesas to residents outside the BBN. Typically, such services included waste collection and tree planting by the local youth, thus strengthening the people dimension of the waste infrastructure.

To avoid the risk of members spending all their credit without accepting Bangla-pesas for purchases in their shops, a requirement was set of 4 businesses backing each business in the network. Guarantors promised to both spend and receive pesas from the new business, as well as accept them from customers if the new business refused. Similarly, to avoid businesses hoarding the pesas, thus taking them out of circulation and limiting economic flow, community liaisons were selected. These went from business to business, discussed the challenges they may be having, educated them on the implications of hoarding and encouraged them to spend the local currency on a daily basis. The system of guarantors as well as that of community liaisons developed the people dimension of the local monetary infrastructure, contributing to embed market exchange in extant communal relations. This made the grassroots economic infrastructure more decidedly local; its embeddedness in community structures aimed at assuring more rapid and wider connectivity (and thus increased circulation of the currency).

Further, to accelerate the flow of Bangla-pesas in the community, and learning from the experiences in Wörgl – an Austrian city which mayor introduced a stamp scrip currency in 1932 –, an expiration date was printed on the paper bills (Von Muralt, 1934; Fisher, 1933). On that date, and after one year of circulation, members of the cooperative met and each participant returned the 200 Bangla-pesas granted to her/him. The collected bills were then stamped and redistributed among those members

that had paid back their initial 200Bp credit. Without the stamp, the bills were no longer accepted. That is, Bangla-pesas lost 100% of their value yearly.

In sum, in stark contrast to its predecessor, Bangla-pesa was designed as a cooperative credit-based currency (and thus not convertible to conventional shillings) that depreciated over time. The new monetary infrastructural design was inspired by two historical community currencies, the WIR and Wörgl's stamp scrip. Through experimentation and continuous tinkering, the features of these two currencies were adapted to build on the assets (communal relations) and address the challenges (slow moving money) particular to the Kenyan informal settlements.

Connecting

Within one week of launching, local micro-businesses were reporting 22% of daily trade was carried in Bangla-pesa and the currency was circulating two to three times faster than the official Kenyan shilling. Women in particular benefitted as many of them set up their businesses in front of their homes. Indeed, 75% of the businesses in the economic circle were women's and their revenues grew by 37%. This resulted in a reported increase of 77% in families' access to food.

Surveys among associated businesses as well as other residents revealed other impacts. A 23% increase in school attendance and a 25% reduction in crime occurred, in addition to a 57% increase in environmental activities in the settlement. Businesses and residents were spending their pesas on the idle youth, taking them out of criminality and putting them into working for the environment of the area. This meant 17% more jobs created in the informal settlement. Gift-giving among residents increased a whopping 347% and 77% more neighbors declared to trust each other.

On top of the social and economic connections developed, Bangla-pesa also bore significant political consequences. Health and environmental hazards from the absence of urban infrastructures are endemic to informal settlements. And yet, while Mombasa's city officials and county politicians had long been aware of it, they had thus far largely ignored dwellers' cries for paving their main road. With the visibility gained through the community currency and a newfound sense of empowerment, in the run-up to the 2017 election, dwellers in the Bangladesh informal settlement made their collective demand for pavement heard and threatened to withhold their votes. Before election date, Bangladesh had its main thoroughfare paved.

Disconnecting

However, everyday governance of the Bangla-pesa was onerous. People often forgot the paper bills at home, which introduced a degree of disconnection into the monetary infrastructure thus slowing down circulation of the currency. Field-officers from GE, the grassroots innovation organization supporting the process, had to spend a good deal of time simply going from one business to the next, finding out where the currency accumulated, explaining the importance of spending, connecting businesses that hoarded with those that couldn't get Bangla-pesas, or suggesting new ways to develop possibilities to spend and earn the local money. The task was made all the more time-consuming because the paper-based nature of the currency made it difficult to trace its circulation paths.

Governance of the cooperative was also taxing. Either for lack of time, because of personal conflicts, or for low levels of trust among community members (Dissaux and Ruddick, 2017), BBN meetings were poorly attended and decision-making was slow. This was to the detriment of quick adaptation of governance rules of the community currency. For business networks where the seasonality of the products sold affects the economic wellbeing of the community, the inability to continuously and promptly adapt a currency's governance rules to the challenges of the community resulted in the web of debts throughout the community not being balanced, disconnection of economic actors, and thus poor circulation of the currency.

These challenges notwithstanding, neighboring communities were showing interest in introducing a currency of their own. By late 2017, and with support from GE, similar currencies had been

introduced in two other informal settlements in Mombasa as well as in three settlements in the capital, Nairobi. Within each of these communities, their local currency was extensively used. Schools accepted it for school fees, churches for the Sunday alms, and a larger number and variety of businesses traded in it. Yet, the geographical delimitation of the currencies inhibited the expansion of trade across community boundaries, something that could further strengthen the economy of the urban informal settlements. As we will see, all these challenges prompted yet another round of re-designing the grassroots monetary infrastructure.

Sarafu-Credit: Crypto-ing the Kenyan community currency infrastructures

Making the community currencies digital provided one answer to some of the disconnections the Kenyan currencies were experiencing. 98% of Kenyans use M-pesa – a mobile currency driven by Kenya's biggest telecom operator (Donovan, 2012). With no need to have a bank account, Kenyans pay and transfer money from one's pre-paid phone-card to someone else's pre-paid phone-card. In fact, diffusion of M-pesa has gone so fast from its introduction in 2007 that the telecom and banking sectors in other developing countries are looking at Kenya for lessons (Mas & Radcliffe 2011). Kenyans, that is, were already used to digital money, and digitalizing the community currencies would allow GE to track their circulation, set currency governance rules into the code, and facilitate trade across communities.

Blockchain technology – the digital technology behind most recent monetary innovations, from Bitcoin to EOS – seemed to offer possibilities to address the challenges and disconnections the Kenyan community currencies were facing. Teaming up with Bancor – the blockchain startup celebrated for its record-breaking ICO (Initial Currency Offering) in 2017 – GE went on to re-design the local monetary infrastructure. Bancor had developed a protocol that facilitated connecting monetary units – or tokens, as they are often referred to in the crypto world –, thus enabling transactions across blockchain-based currencies. The big crypto-currencies were already using the protocol to exchange among them. GE took the technology as the basis from which to re-design local currencies for social and economic development. This led to the Sarafu Model, a network of community currencies allowing users to exchange monetary units directly through the wallets in their phones. As in the previous monetary design, issuance of each community currency resided in GE. Tokens are then distributed broadly to those residents that agree to trade in the local currency. After transactions are carried out, a SMS is sent to the user's phone showing the money sent/received and the balance remaining in one's wallet. A mobile currency increases connectivity because, as one resident put it, "you forget the paper bills but you never forget your phone at home."

Gatina, an area of Kibera (Nairobi) informal settlement, and Miyani, a rural and coastal community north of Mombasa, became two of the first testing grounds. Both communities had used the paper-version of the currency for two years and understood the benefits of local money. In mid-December 2018, Gatina-pesa and Miyani-pesa, two blockchain community currencies building on the Bancor Protocol were rolled out. Field officers walked around the communities and registered residents into the system, a process that took no more than five minutes, and thus quickly connected economic actors within each community. Immediately upon registration, users received 200 pesas – worth 200 Kenyan shillings – straight into their phones, which they could start spending directly.

By January 2019, five communities in Mombasa and Nairobi were going blockchain. The Sarafu model opened up the possibility of easily trading across all five currencies, extending the monetary system's geographical reach. **As per the writing of this paper, however, connecting the currencies remains the next roll-out phase.** Further, by keeping transaction records in the blockchain, the circulation of the currency and the speed and paths of circulation can easily be traced. Being able to see where the infrastructure gets clogged facilitates field officers' work as they now walk to those users who seem to have troubles spending and help them find businesses that accept the currency or educate them in

the use, benefits, and challenges of local monies.

Incipient connecting

While the first Kenyan community crypto-currencies had been in place for a mere four weeks, by mid-January 2019, their capacity to connect across economic actors was already discernible. In the first month alone, transactions in all five communities totalled US\$ 10,900. For communities living with a perpetual lack of conventional money, having a new medium of exchange translated into paid school fees, two meals a day, and support for a daughter that lived in another city. Word of mouth spread quickly and about 100 businesses were enrolling weekly.

————— Insert graph Total Trade Volume as of January 2019 —————

————— Insert graph Community Currency Usage —————

The possibilities brought by the new technology were also starting to become evident in terms of governance rules of the currencies. The transparency of blockchain technology gave GE access to live data and could thus continuously oversee the stream of data, identify circulation challenges on the spot, design a rule to tackle such challenges, and rapidly code the rule into smart-contracts. To illustrate, on January 20, 2019 seeing that some businesses were accumulating a disproportionate amount of pesas, GE coded a time-based fee into the smart-contract. A SMS was then sent twice a week to all currency users: "If you don't spend, your community doesn't benefit. If you don't spend by the end of the week, 1% of your balance will be withdrawn from your account." That is, GE directly implemented a time-based fee, like that in Wörgl's stamp scrip. Eventually, the idea is to redistribute the funds thus collected as Universal Basic Income to all currency users. Based on up to date data on the circulation of the currency, GE could tinker with the governance rules of the community currency and quickly implement them. This opened up the possibility to swiftly adapt the governance rules of the monetary infrastructure to the idiosyncrasies of each community.

Incipient disconnecting

While businesses were rapidly registering to the currency system and immediately using their newly-acquired money, the digital nature of the new currency makes connection of non-registered residents more difficult. In paper currencies, residents and businesses outside the economic circle could still be paid with Bangla-pesa notes and then use them for their own purchases. This was a natural and intuitive way of showing reluctant dwellers the benefits of a community currency as well as an easy way for residents to enlist other residents. Payment to non-registered users is however not possible in the digital currencies, thus inhibiting the connection of residents with no phone. To cope with this potential disconnection, the transition from a paper to blockchain based currency is being done gradually, both technologies currently co-existing. That is, both blockchain and paper forms of the local money are currently in circulation.

Less obvious but of no less importance is the educational dimension of paper currencies. Indeed, currency users were quick to admit that use of paper notes had given them a deeper understanding of the importance to consume locally. "My spending is your income; your spending is my income" as they put it. While speeding up circulation and enabling quick adaptation of governance rules, it is feared that with the lack of materiality of the new currency also an important educational component necessary for the empowerment of the community will go missing. However, preliminary observations in Miyani (Mombasa) – where over 90% of the population were using the blockchain-based community currency by April 2019 – suggest the educational component resides not in the degree of materiality of the currency but in the extent of the social networks the currency is embedded in.

A malleable grassroots monetary infrastructure

The Kenyan community currencies are not a phenomenon isolated in time and space. As we have seen, they are instances of monetary knowledges and grassroots practices that circulate at a global scale. To name, the Eco-pesa was inspired by the experiences in Berkshire (US) and Curitiba (Brazil); the Bangla-pesa built on the lessons from the Eco-pesa while bringing in those from the WIR (Switzerland) and Wörgl (Austria). It is this capacity to learn from global networks while adapting to local conditions that make grassroots innovations for community infrastructure particularly potent. They remain embedded into the peculiarities of local relations and cultures, yet build on a myriad of other local experiences that are shared globally. This, the tension between attending to local specificities whilst simultaneously seeking wide-scale diffusion, has been identified as one of the key challenges for grassroots innovations (Smith et al. 2017). How do monetary grassroots infrastructures manage this tension? What traits allow them to move back and forth between global networks and situated localities? How do they manage the contradictory simultaneity of standardizing global knowledges on monetary infrastructure and particularizing practices to the needs and assets of the interstices? Or, how do the fragments of the city practice everyday urban politics?

Malleability. That is the argument we want to put forward in this section. It is the malleable nature of grassroots innovations that allows them to adapt global knowledges and practices into local small-scale and financially humble community infrastructures. It is in the continuous, incessant adaptation of grassroots innovations as economic fragments that characterizes “politics at the margins of the city” (McFarlane 2018). In the case of grassroots monetary infrastructures such as community currencies, malleability manifests in four dimensions.

One, community currencies are simultaneously material and immaterial; a thing and invented; a commodity and an accounting tool. Two main positions exist within monetary theory concerning the nature of money. Metalists argue that money developed from barter, currencies becoming the thing all agreed to barter with. In this view, currencies have value per se, the gold and silver of the first coins standing for that inherent, material, value of money. Chartalists, on the other hand, argue that money is based on mutual credit, its origins found on a neighborly economy of favors. This position views units of currency as units of measurement, tokens neighbors used to measure mutual debts. IOUs. For Metalists, that is, money is a commodity; for the Chartalists, it is an accounting tool (Graeber 2011; Ingham, 2004; Wray 1998).

We see aspects of both views in the development of the Kenyan community currencies. Backed by donor funds, the Eco-pesas were the physical representation of the Kenyan shillings held as reserves at the Eco-Ethics office. This aligns to the Metalist view, the community currency being the local translation of a thing (Kenyan bills) that is given value per se. But, because shillings are given value per se, local businesses were reticent to purchase the local currency with the more valuable national currency. Further, material things are finite and so as Eco-pesas were redeemed into shillings, the donor funds that backed the local currency ended. As the first Kenyan community currency met the challenges of finitude proper of material things, and inspired by other local experiences shared in global flows of knowledge, the promoters of Kenya’s pesa-programs were able to re-imagine the grassroots monetary infrastructure from a commodity with inherent value (that is, directly redeemable into Kenyan shillings) into a voucher registering a member’s debt to the community (the Bangla-pesa model) and again into a token with value given by its acceptability in the local community (the Sarafu-credit model). Malleability of money, that is, allowed GE to experiment and tinker with the monetary design of the local currency.

The second malleable aspect of community currencies refers to the dual set of moral principles that ground the economic relationships they are set to organize. On the one hand, a moral principle of communism based, as Graeber (2011) describes it, not on the notion of property but on that of human sociality. Communism defined as “any human relationship that operates on the principles of ‘from each according to their abilities, to each according to their needs’”, a definition that

acknowledges the inequality that pervades human relations. This turns money into an infrastructure based on solidarity and mutual aid. On the other hand, the moral principle proper of exchange, one that assumes equality of relations, that builds on a notion of equivalence, and that therefore demands reciprocal tic-for-tac, independent of individual abilities and needs.

That community currencies are simultaneously based on a principle of communal solidarity that assumes inequality of relations **and** on a principle of reciprocity of exchange that assumes equal relations is best seen in the confusion that seems to pervade among scholars of community currencies. Some describe community currencies as driven by an ethos of reciprocity (Werner 2015), others as enabling economies of solidarity (Collom & Lasker, 2012; Powell 2002). Our argument is that they are both, simultaneously assuming equal and unequal relationships, asking for reciprocity while nonetheless demanding different efforts from different members. To illustrate: Some local businesses bought Eco-pesa with their hard-won Kenyan shillings, others paid their Eco-pesa with time in waste collection events. And while not all businesses in the Bangladesh Business Network were equally strong – some being a mere mat by the road with only a couple of products, others having a proper shop offering a wide range of goods –, each and every member was handed 200 Bangla-pesas in initial credit. Similar in the Sarafu currencies, members receive the same amount of tokens independently of their productive capacity. And yet, once the local currency is issued and distributed, all members are expected to trade with each other equally, buying and offering services in it, paying in it and accepting it in return.

Three, community currencies have to be immobilized geographically in order to facilitate greater movement in that space. As they are fixed to the informal settlement yet its movement accelerated through the promotion of local networks of exchange, these forms of monetary grassroots infrastructures are gradually embedded within the fabric of the settlement. It is the very crippling of the currency to strict geographical boundaries that is the necessary condition for the vitality of the economic relations the infrastructure is to support. In the process, existing relations of exchange are strengthened, and new ones are formed (ex. waste collecting youth groups, new customers), thus articulating different types of social relations and producing new territorial configurations. The economy, that is, is progressively embedded in the local community. In a sense, it can be said that grassroots economic infrastructures not merely adapt global knowledges to local needs. By rearranging local social and economic relations, monetary grassroots infrastructures contribute to create communities and geographies anew.

Four and last, although community currencies may be introduced as tools to govern the local economy, their tight connection to the territory and its social networks result in new structures of feeling (Williams, 1977; Larkin, 2013). Because geographical immobilization of the currency prevents its leakage outside the community, because it demands from each according to their capacity yet expects that all equally reciprocate in its use, and because the community becomes aware of a new-found ability to create their own money, community currencies shape how residents experience their settlement and, by extension, the city. Indeed, repeatedly, the aspect that residents valued the most about Bangla-pesa was an increased sense of collective identity and pride in their settlement. New structures of feeling are the seeds of new formations of thought and action. From an increase in gift-giving practices to the BBN's newfound capacity to mobilize residents to demand pavement of the settlement's main road, community currencies seem to catalyse the re-structuring of feelings towards the community, opening up novel political possibilities in the informal settlement and its relation to the city.

The malleable nature of these grassroots monetary innovations – as both commodity and accounting tools, based on moral principles of both equality and inequality, both immobilized and accelerated, and structuring relations of both trade and affect –, enables their adaptability to the objects, spaces, persons and practices particular to each place. The grassroots initiative innovating on local monetary infrastructure, could experiment with various infrastructural designs, adapt the currency to the circumstances and assets of the local community, and tinker with various “combinations of objects,

spaces, persons and practices” (Simone 2004) to make up an urban infrastructure specific for the interstices.

Discussion

The notion of splintering urbanism emphasizes the connection between urban infrastructure, urban development and life possibilities in cities (Graham & Marvin 2001). As an analytical framework, splintering processes and splintered places (Kooy & Bakker 2008) help unveil the way infrastructures further fragment cities along socio-economic and ethnic lines. Yet, while analytically productive, splintering urbanism is immersed in a dichotomist language of have’s and have-not’s, of “premium networked spaces” (Graham & Marvin 2001) and “urban interstices” (Phelps and Silva, 2018). Such a disjunctive narrative, as other commentators have pointed out (see for instance Gibson-Graham 1996), makes the analyst blind to agency processes in the interstices, thus ignoring local practices of re-appropriation, of creation of innovative alternatives, of re-claiming and re-organizing the in-betweens. Against this background, recent calls have been made to study “fragment urbanism” (McFarlane 2018), to go beyond the formal-informal dichotomy (McFarlane 2019) and look at the ways through which residents of the interstices and activists deal with the lacks of the city, actively developing their own infrastructures, and politicizing the city.

The article is a response to such calls. It does so by bringing grassroots innovation studies into the discussion of interstitial urban infrastructures. The literature on grassroots innovations focuses on small, simple, and financially humble innovations driven by grassroots actors. While local in nature, grassroots innovations do however build on the experiences of grassroots innovations from other places and times that circulate through global networks of knowledges and practices (Smith et al. 2017). The article shows the way in which the interplay between local grassroots innovations and global knowledges and practices opens up the possibility for residents and activists to actively engage in developing urban infrastructures for the interstices.

The article then identifies the malleability of grassroots innovations as key to the possibility of this sort of active “fragment urbanism”. In the case at hand – Kenyan community currencies – we identified four malleable dimensions: 1. the ontology of the infrastructure (thing and invented), 2. the moral principle grounding the infrastructure (communism of access and reciprocal equivalence), 3. the degree of fixedness of the infrastructure (immobilized yet accelerated), and 4. its relational reach (economic and affective). While the first two dimensions of malleability are specifically connected to the monetary nature of the grassroots infrastructure analysed, the last two could be generalized to other grassroots infrastructures. Indeed, both the degree of mobility and the affective and material dimensions of infrastructures have been pointed out as relevant for how infrastructures shape life in the city (see, for instance, Graham & McFarlane, 2014; Larkin 2013).

But malleable grassroots innovations are per se not enough. The case showed the extent to which the malleability of grassroots innovations, if it is to be productively used locally, necessarily comes with practices of continuous tinkering by the grassroots innovators (Barinaga 2017). Translating global knowledges to local idiosyncrasies, adapting localized practices to constantly changing circumstances, and continuously adjusting combinations of objects, spaces, persons and practices is possible thanks to both grassroots’ immersive presence in the communities for which they innovate and their tireless re-organizing of the infrastructures they suggest. In this way, interstitial grassroots infrastructures are far from the uniform modernist ideal informing grand urban infrastructures. Herein, in the relentless, ongoing, piecemeal adaptation of global knowledges and practices to local circumstances and needs lies an active form of fragment politics, one that attends to the agency of the interstices and their capacity not only to react and resist but to enact and create. In this sense, the Kenyan community currencies are suggesting one way to sketch “new urban imaginaries capable of inspiring more democratic urban politics” (Graham and Marvin 2001).

At this moment in the research project, we can but speculate on the long-term implications of such grassroots economic infrastructures. One argument could be that, as they develop differentiated infrastructures in the city, they are able to adapt to the needs of diverse population groups, thus facilitating the integration of the city. There is also the possibility to argue in the opposite direction. Because monetary grassroots infrastructures create separate economic, social and affective spaces, they risk contributing to further splintering the city. To answer this question, research that takes a long-term perspective is needed. At any rate, the guiding question should be what socio-financial relationships develop in the city as those in the interstices re-claim and re-organize the monetary infrastructure?

Answering such urban development questions calls for interdisciplinary research that builds on urban and grassroots innovation studies for the study of infrastructures at large. Depending on the nature of the infrastructure investigated, it also calls for bringing more specialised fields of research; in our case, that of monetary studies.

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