Moving proximity from critical issue to addressable challenge: Possible approaches and tools

Main Report

Steve Peachey and Mbinya Mutiso

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Introduction

Lack of proximity has long been identified as an obstacle to sustained take-up and – even more so – sustained use of formal financial services. Through this decade, funding and specialist skillsets have been deployed to more fully scope the problem. Public bodies have also kept proximity on their agenda, urging banks to open branches in rural districts, adapting regulatory provisions for second- and third-tier rural finance providers and, more recently, creating space for innovative digital finance solutions.

Likewise, financial services providers (FSPs) seem to recognise the commercial opportunity and benefits to their businesses of expanding services to lower-income segments and into rural areas. Linking to informal savings mechanisms (ISMs) is a part of this but most successful efforts have been confined to urban and peri-urban areas and some connected rural areas with reasonable road and telecoms access. This is partly because FSPs are discouraged from extending linkage efforts into less densely populated rural areas by an apparent lack of information about the distribution and characteristics of potential rural customers.

Early in the Savings at the Frontier (SatF) programme, it became clear that failing to address the proximity gap was a major factor behind widespread failures of past efforts to link ISMs to savings and loan products from FSPs. It was equally clear that a large part of this was due to a shortage of useful, timely, practical insights about the scale and nature of the gap to be bridged at specific locations targeted for linkage.

Why proximity matters to the SatF linkage agenda

Linkage of ISMs to formal finance works by helping small savers combine funds that are too small to justify depositing directly into individual accounts and combining them sufficiently so the same money-handling infrastructure that mobile money uses can move the larger amounts collectively into a safe store of value.

Tie-ups with mobile money are proving a key part of making SatF linkage initiatives work but securing the proximity gain that comes with mobile money is not easy to engineer:

- The reason mobile money gets used more in peri-urban and rural locations relative to

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A working definition of the 'proximity gap' for the purposes of this report…

… the distance people must travel to get periodic surpluses out of the pocket and into a formal store of value and later to access this value when it is needed for sending or spending.

Savings at the Frontier is a $17.6 million partnership between Oxford Policy Management and The Mastercard Foundation. Its aim is to expand the range of financial products and services available to people living in poverty in Ghana, Tanzania and Zambia by testing and implementing business models that sustainably deliver those products and services by establishing links with a broad range of informal savings mechanisms.

Informal savings mechanisms (ISMs) are a set of ways in which groups of people save money together. They have existed worldwide for generations. Some are facilitated by external individuals and organisations, but many others are self-organised. Some of the facilitation is international but there are many local variants and all of them support the formation of groups and provide preset rules/processes for them to operate by. In some ISMs, savings accumulate over a cycle to be shared-out at completion and this often repeats multiple times. Others roll up saved capital but periodically make distributions from investment returns while some models do this in a circular, not accumulating, manner. Affinity groups help people with common interests to save for shared rather than individual purposes. There are also deposit collection mechanisms that pool savings without any of the formal structures of a group. ISMs come with a huge variety of names and formats but all build on two key principles of small-balance saving, namely that larger sums of money work better than multiple small amounts deployed on their own and peer encouragement/nudge strengthens the discipline to save.

For more information, please visit *http://www.opml.co.uk/projects/savings-frontier*

formal financial services is a function of proximity but is often as much process-related as proximity driven, and integrating systems, and the sharing of workforces and work processes is hard. One particular challenge is that digitisation of ISM activities in rural locations requires ISM users to hold or load surplus cash into individual (mobile) wallets before it can be transferred to linked collective ISM accounts. The work of our FSP partners has shown that this only works if charges on user-to-ISM and ISM-to-user transfers are as close as possible to zero. At best, transactions are not just fee-free but also session-cost free. Without this, cash remains the default for most ISMs and ISM users. Cash-in, especially remote cash-in, is not costless and is only now offered free because mobile network operatorts (MNOs) charge elsewhere along the transaction chain. Negotiations about concessions on the pricing of transfers are complex and often fail to conclude.

- All this said, it is easy to overestimate how far mobile money has solved the rural proximity challenge. The closer the service is offered to the rural ISM user, the further an agent has to travel to float-balance:
  o Too many cash-out transactions (typical in the village) mean the agent has to travel frequently to town to swap accumulating surplus e-value for cash to take back to the village.
  o Large or frequent cash deposits in the village only have working value if the cash amount can be deposited in a float account (that too requires a trip to town).

These are all reasons why a good understanding of the proximity gap is key to building viable models of co-delivery with MNOs, but it is also crucial to working with the NGOs as a route to finding ISMs and ISM users with which to link. Many NGOs focus on linkage for very remote, rural ISMs to bring the power of formal finance to add longer term and larger savings and loan options to the group model where scarcity of capital is a real constraint on development. Real conflicts of expectations build up where NGOs underestimate the likely severity of the float-balancing challenge described above because they do not have good geodata on where their groups are located and FSPs overestimate how far the available cash-in/out infrastructure really reaches.

Objectives for this study

This report describes a mixed desk and field research approach that helps define the proximity challenge in ways that are designed to help SatF partner FSPs to practically address proximity and improve reach. The three original objectives of the study were:

- to test whether we can develop a practical tool that can be used by partner FSPs in Ghana to accurately characterise the urban, peri-urban and rural split of ISMs to be reached;
- to scope the prospects of using comparable approaches in the two other SatF focus countries, Tanzania and Zambia; and
- to test new approaches and tools of potential wider relevance.

The objective was <u>not</u> to characterise (yet again) nor resolve (in ways not managed to date) the proximity challenge in SatF countries. <u>Rather, it is</u> to test the appetite and potential pathways for partner FSPs to collaborate on developing solutions with a genuine potential for closing the gap.

This report therefore tries to answer three key questions:

1. What is the best way to characterise the proximity challenge in general terms and in country-specific contexts?

2. How can existing freely available national datasets be used to address specific local challenges related to locating potential customers?

3. How can provider data be used to address specific local challenges relating to the challenge of getting cash swapped for e-value and moved into a linked ISM account or wallet?

Existing research base

The value of Geographic Information System (GIS) mapping as a tool to define proximity is recognised by policymakers (see, for example, AFI).[i] Practitioners are also clearly interested if workshop attendance is any indicator (see i2i/FSDT workshop).[ii]

GIS mapping to date has, however, been fragmented, either conducted sporadically or over limited periods of time. It has therefore provided only snapshots of the challenge, rather than an evolving base of systematic evidence over time that can be continuously used to judge and shape progress. This makes it particularly hard to tell where the limits to digital reach really lie and where they can be further pushed but available studies suggest a range of interesting possibilities.

What constitutes proximity varies by product

Published work by WSBI[iii] used 2010 census data and 2012/13 access point mapping across Kenya, Tanzania and Uganda to suggest that digital reach depends on the need being met. A poor rural family accepts the costs of someone walking half a day to collect a monthly transfer from an agent 5–10km away because that transfer can be worth an entire week's household spending. By contrast, the same study found that depositing a spare dollar into a safe formal store of value is uneconomic if someone has to walk for more than an hour (2km there and back), even without any fees to pay.

Based on a 5km radius, WSBI found 60–75 per cent of peri-urban/rural Kenyans and Ugandans (20 per cent for Tanzania) could be said to have had proximate access to P2P transfers in 2013/14. Based on a 2km radius, this reduced to a mere 25 per cent for Ugandan peri-urban/rural savers, 50 per cent for Kenyan savers, and less than 10 per cent for Tanzanian savers.

Mobile money agents may not contribute substantially to proximate access

Access point mapping[iv] of the sort that underpinned the WSBI analysis shows mobile money as the closest touch point for the majority of adults in low/lower-middle-income developing countries. At the same time, it confirmed that mobile money agents cluster, often within metres of each other in urban contexts. Multiple agents also clustered in peri-urban/rural trading hotspots along the main roads but were hard to find in off-road villages. A large or growing number of agents does not therefore automatically imply much closer proximity to financial services. In countries with established agency banking or thriving local savings and credit co-operative (SACCO) provision, the clustering of mobile money agents means that they increase the physical reach of formal financial services by only a small fraction. For example:

- In Uganda and Kenya in 2013, when mobile money was already ubiquitous, WSBI found that it nevertheless only pushed up proximate access (on the 5km definition) by another five to ten percentage points on top of the 55–67 per cent achieved by more traditional formal finance (banks, microfinance institutions, co-ops, etc.).
- The 2017 geospatial mapping conducted by FSD Zambia[v] confirms this, with mobile money adding barely two percentage points to traditional reach (from just under 40 per cent to just over 40 per cent).

AFI – Alliance for Financial Inclusion – 13th meeting of the Financial Inclusion Data Working Group (FIDWG), July 2016

'Geo-spatial mapping provides a visual display of otherwise bland financial inclusion statistical data creating a potent and easy-to-understand overview of a country's financial inclusion landscape. The use of GIS mapping is being driven by the need to understand unreached groups and reveal unseen markets. The availability of comprehensive sub-national data makes geo-spatial mapping all the more possible. It is an intelligent investment that leads to smarter policies and better product development by the market. As we move forward, the cost of not investing in geo-spatial mapping is becoming too high – especially when the alternative is choosing to remain in the dark.'

Top six trends in financial inclusion data and measurement: No. 4 – Technology availability and cost will enable GIS mapping for financial inclusion to spread

Moreover, growth of proximate access runs at very different rates in different geographies:

- In Zambia, the share of people with proximate access on the 5km definition rose by no more than a percentage point in two years (from 39.7 per cent in 2015 to 40.4 per cent in 2017) despite a 57 per cent increase in the number of tracked and active mobile money agents, and the emergence of bank agents. This looks like a very deep-seated geo-demographic constraint – under half of Zambian adults live within 5km of any obvious interface with organised society, be it a school, a market, a primary health-care outlet or a religious centre.
- By contrast, the 2017 FinScope Tanzania shows a very considerable change in just four years; by 2017, some 78 per cent of rural adults were living within 5km of an outlet (traditional or mobile money), a substantial increase from a mere 16 per cent in 2013/14, despite Tanzania also having a notoriously low overall population density in rural areas.

People cluster differently in different geographies and different clustering creates different starting conditions for the spread of mobile money.

Problem definition

If existing geospatial work is not yet consistent and regular enough to contribute to shaping commercial solutions, this study aims to identify low-cost methods and tools to address local proximity challenges that do not require full GIS mapping skills and datasets. Our approach is based on standard office software (Microsoft Excel) populated with census data that is often publicly available on the websites of relevant government agencies.

Defining the problem: a proximity cliff-edge and different types of urban

In Ghana, there are detailed census reports for each district that provide maps locating the largest 20 settlements with data on the number of adults and households per settlement. These datapoints are ideal to illustrate what this study identifies as a 'proximity cliff-edge', the size of settlement at which agent outlets appear to stop being viable. The 'cliff-edge' rarely extends beyond district main towns and a few other rural trading clusters.

The SatF team chose a mixed but slightly rural-biased sample of 15 out of 27 census districts of the Ashanti Region outside Kumasi Metro (see Box 1) where less than 10 per cent of the recorded settlements have a population of more than 5,000, which equates to the threshold for 'urban' classification in official statistics. Observation suggests that this also equates to a market size of approximately 3,000 youth/adults and 1,000 households, which also seems to be the reach limit for effective mobile money. Through a mix of 'web-scraping' – where websites are searched for branch and agent locations – and field visits, it also became clear that three in ten Ashanti districts had no formal financial institution presence at all.

For application in the SatF programme, the Ghana census data can be visualised using standard scatter charting functions of Excel (see Box 1 for one example). Combining these with map images from the district level census reports as background, the listed individual settlements can be geolocated. With this simple visualisation it was possible to show urban and rural population clusters and discuss the specific local proximity challenges faced by three partner FSPs in Ghana. This approach is replicable across all 164 non-metro districts of Ghana to create a base of evidence that can be linked to our FSP partners' own location data to design data-driven outreach strategies for each partner. The format and detail of the Ghanaian dataset is well suited for the purposes of this study, but district-level and sub-district-level population figures, and population density data, are available for Tanzania and Zambia and can work as well as the Ghanaian approach (see Box 2 and Annex 1, which explain the sample deployment for one SatF partner FSP working in Chongwe District, Zambia).

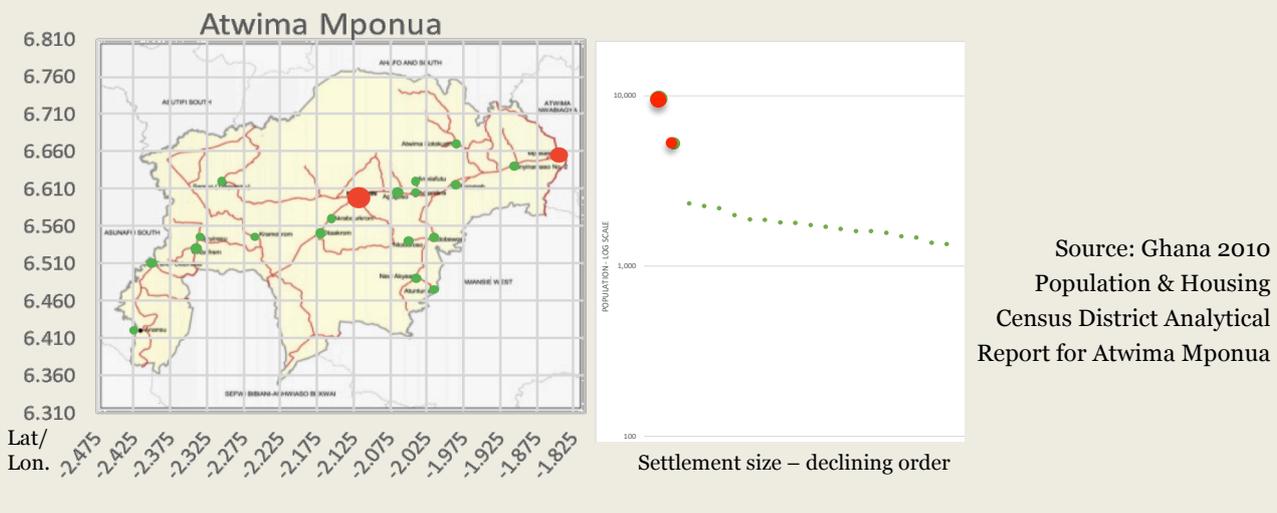## Box 1: Scoping the proximity challenge in Ghana

Ghana is a relatively urbanised country with the most recent census showing 51 per cent of the whole population and 54 per cent of all adults living in recognised urban areas. Just under half the urban adult population (44 per cent) live in six major metro areas, the largest of which is Greater Accra, with the rest split evenly between 37 districts classed as municipal (29 per cent of all urban adults) and 127 ordinary districts (27 per cent).

The SatF team chose Ashanti region as a reasonably representative sampling area for its initial country landscaping. It has one, very concentrated, major metro area – Kumasi – where 72 per cent of all Ashanti Region urban adults live. Ghana grades districts partly by their degree of urbanisation and in Ashanti there are four districts outside of metro-Kumasi that class as municipal and have relatively large towns at their centre. One of them, Obuasi, has one very large town in the centre (93,000 adults) with very small villages surrounding; the other three have much smaller towns (10,000–20,000 adults) but larger villages. There are other towns not classed as municipal in the mid-sized (10,000–20,000) range but a more typical size is closer to 5,000 adults. Non-municipal districts in Ashanti range from the purely rural to the relatively urban where over half of all adults are in towns, which is a higher proportion overall than in some municipal districts.

This illustrates how difficult it is for a single FSP interested in linkage to create any systematic grading of potential across the variety of circumstances present countrywide.

To test what might be possible, the SatF team extracted settlement-level detail from 15 out of the 21 Ashanti census districts, with a slight bias towards rural districts, and calculated the adult population for every identified location. Out of the 300 settlements profiled, 34 officially classed as urban but only five of these were in the 10,000+ bracket that typically supports a formal financial institution presence as opposed to just mobile money.

The SatF team developed the following visualisations for districts profiled this way. The first visualisation plots the size of settlements on a map taken from the relevant district report (urban centres in red and rural in green) with circle size representing settlement size; the second plots population by declining order of settlement size. The example shown here is for Atwima Mponua, a very rural district in Ashanti with only two urban clusters. Data organised in this way can transfer between tools (Microsoft Excel, Google Earth, etc.) and be shared remotely so that a programme like SatF and its partners can agree locations that might form a hub from which ISMs can be reached or around which a deposit collector might operate (all 20 given the size profile in this particular district but that would not be true for all the profiled districts). Judgements are possible on the proportion of adults reachable in various ways and although the rules for making these must be partner and ISM specific, the key point is that they can be applied to a consistent set of base data on settlement size, common across all partners/locations.

Source: Ghana 2010 Population & Housing Census District Analytical Report for Atwima Mponua

Settlement size – declining order

Box 2: Alternative approach for Tanzania and Zambia

For Tanzania and Zambia, an alternative approach was needed because there was no easy, systematic source for individual settlement name, location and size. The route chosen was to use a public good website that provides population, density and urbanisation data down to a level below district in each country (in both cases called wards). These sites use census data as their base so the approach should be replicable in any country where the census process works and the same approach is also possible by working locally with a national census or statistical authority. The site chosen was CityPopulation.de[vi] as this has data for both countries (but for Ghana it is less suitable because there is no available census data for administrative units below district level and settlement mapping is done instead).

Source: Thomas Brinkhoff, City Population (www.citypopulation.de)

The charts shown here are for a Zambian district called Chongwe, which is adjacent to the capital Lusaka, but what is shown here can be replicated in Tanzania. Chongwe is a largely rural district but its closeness to Lusaka means the main town (also Chongwe) has a large element of non-agricultural households. The starting point is the CityPopulation ward map showing population density (red equals dense urban through to dark green for very sparse rural). Lusaka/Chongwe are highlighted and the Chongwe ward is isolated using both the density and urbanisation mapping provided by CityPopulation.

The next stage was to replicate the ward boundary in Google Earth and isolate the area that might reasonably constitute Chongwe town. This is shown below in two stages and takes an hour or two to do for each urban/rural ward (of which there are 112 in Zambia but just over 400 in Tanzania). It is then possible to estimate the size of dense urban clusters (5.5sq km for Chongwe town) and how dense these are versus the numbers and density of any looser rural clusters there might be (three in Chongwe ward). Ultimately, the same metrics can be created as for the Ghanaian districts described in Box 1.

Source: Google Earth © 2018 Google

The peri-urban challenge

More problematic is the issue of what counts as peri-urban. There are areas of self-organised infill within organised urban areas that can have a financial institution outlet close by but be so far socially removed that the physical proximity becomes meaningless unless tailored pathways to the outlet are created. In addition, there is a mix of self-organised and developer-organised urban sprawl beyond the official limits of metro/municipal urban areas that have spread into what used to be villages in the rural hinterland to major towns. Lastly, there are small towns in predominantly rural districts that only just get an urban classification.[1] Examples of these challenges are shown in Box 3.

Specialist GIS mapping tools offer a way to address this challenge and there is public high-resolution demographic grid data to base the analysis on. For this study, free-to-use satellite imagery (Google Earth) and available census data or district/sub-district population density maps are used to show that workable solutions are possible (see Annex 1, which explains the sample deployment for one SatF partner FSP working in Lusaka, Zambia). While this is a low-cost approach, there is a significant skill threshold that has to be overcome if a programme like SatF is to make an active effort to apply the approach described systematically across projects. For the techniques developed by SatF to be useful for FSPs within the programme and, in due course, for FSPs in general, it will be necessary to develop a toolkit and to demonstrate its usefulness to FSPs in developing their markets.

Available systematic data on ISM and FSP outlet location

Location data for informal savings mechanisms, especially for self-organised groups, is not publicly available, and it will be up to FSPs to maintain location data as part of the customer information they keep on ISMs served by collective savings products. This is a non-trivial challenge in that CIFs (customer information files) do not usually include geolocation.

The stored data may include the district, but official characterisations of urban or rural require working at the administrative level below this. More common is to rely on the branch, office or sales-point where an account was either opened or is technically domiciled. That location may be nowhere near where the customer accesses the provider (i.e. an account may be domiciled at a branch, which will almost certainly be based in some sort of town and therefore class as an urban location; but an account held by a rural customer may be accessed via a mix of urban and rural agents depending on what they are doing at the time they use the account).

The same holds true for facilitated groups. In some cases, for example that of a rural bank working with a SatF partner FSP in Ghana, basic location data exists in a free-form location field that individual bank officers complete as they see fit, rather than select from a standardised list that links to recognisable administrative units. Nowhere have the researchers found GIS coordinates being recorded for informal groups such as VSLAs, SILCs, VICOBAs, etc. (see SatF 2018[vii] for more on the typology of facilitated groups). SatF experience suggests that facilitating organisations, such as NGOs, have no direct incentive to record where ISMs are physically located. There appears to be no incentive for local providers working with individual facilitated groups to record their location systematically; knowledge of where the groups operate is often in the heads of the individual field agents who help set up and support them, and this gets lost when NGO funding for it runs out.
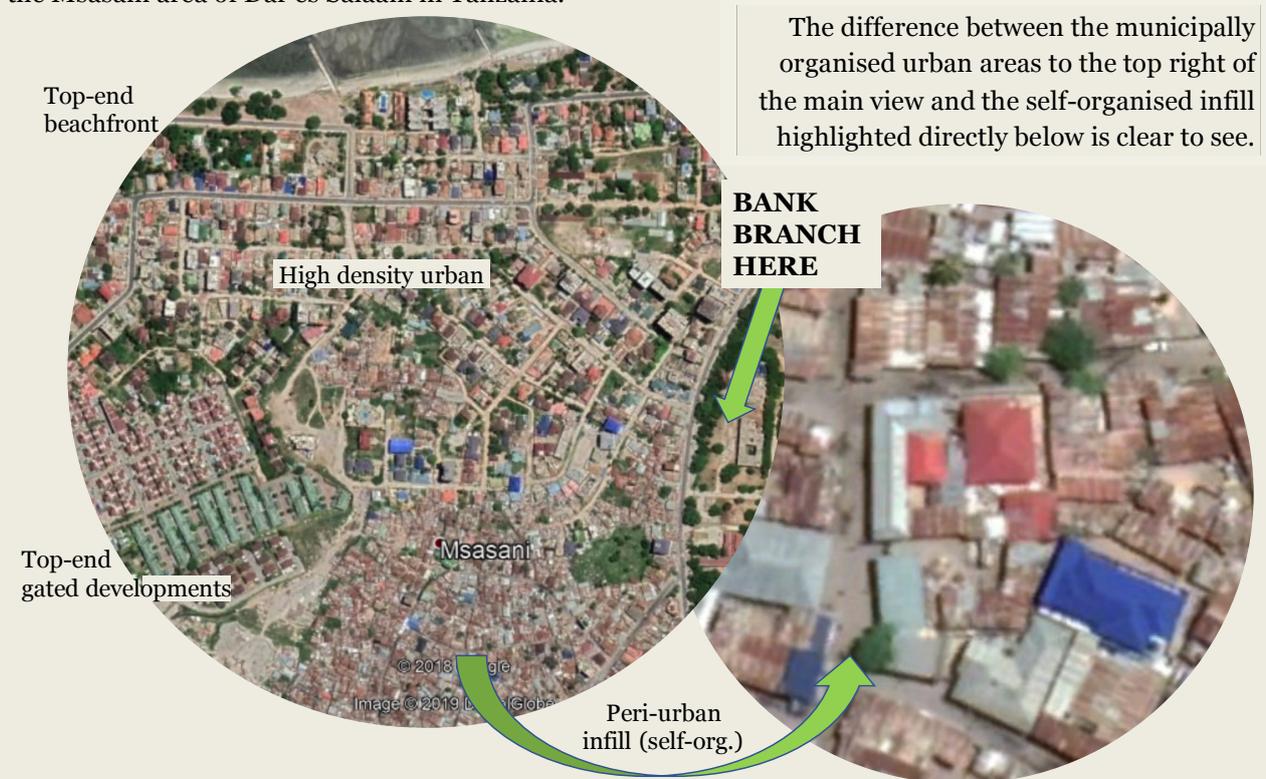
One example of systematically recorded geolocations of facilitated ISMs was put together by a market-enabling agency (FSD Zambia)[viii] and conducted in 2015. This was part of a wider exercise to geolocate access points for formal finance – including mobile money – that has been updated to

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[1] Places that might be walked end to end in 20 minutes that have barely 1,000–1,250 households and if a major bank is there it is because the 'town' is the nominated district centre of a very rural district and where, if there is any FSP outlet, it is quite possibly the only electrified and digitally connected outlet.

Box 3: Visualising the peri-urban challenge

The Zambian example in Box 2 has already started to address one aspect of the peri-urban challenge, which is urban sprawl into the rural hinterland surrounding a town outside of the major metro-urban centres of a country. In these circumstances, urbanisation is pushing settlement out into previously agricultural areas so that a patchwork is created of still farmed land with often quite organised and expensive-looking suburban development (large plot sizes but no obvious commercial cultivation).

It is feasible to use the techniques described in Boxes 1 and 2 for the challenge faced in the SatF countries outside the main metro centres but that does nothing to address the equally large and important challenge of people with originally rural roots who have been moving into town for decades now and occupy low-income, usually self-organised areas within the major metro areas. These are interspersed between higher-income organised areas and both count as urban. SatF has, however, classified the infill as peri-urban because it fails to meet the qualitative dimensions of what UN Habitat is targeting for sustainable urban living (high densities plus meaningful access to transport links and services). Again, Google Earth is very good for visualising the challenge and deciding the status of particular areas. The example shown is from the Msasani area of Dar es Salaam in Tanzania.

The difference between the municipally organised urban areas to the top right of the main view and the self-organised infill highlighted directly below is clear to see.

Top-end beachfront

High density urban

BANK BRANCH HERE

Top-end gated developments

Msasani

Peri-urban infill (self-org.)

To the west of these two areas lies the branch of a major mass-market retail bank, close physically to both zones, but the bank concerned is part of SatF because it sees linkage with ISMs as a way of making that proximity meaningful for people it has historically failed to reach. Giving scope and scale to this challenge is one reason why SatF has a mixed peri-urban as well as rural target.

It would be feasible, just, using local partners to replicate a workable zoning using this kind of visualisation for the six major metro areas in Ghana, three in Tanzania and four in Zambia, but SatF is exploring other sources and a more machine learning-based approach to do this more systematically and efficiently. Nevertheless, for more limited circumstances than a three country, ten-partner programme this is a workable solution for separating peri-urban from rural.

2017. Earlier systematic attempts at an inventory of national access points in both Ghana and Tanzania are accessible via MiX Finclusion Lab.[ix] Unfortunately, this data is now very outdated and in the case of Ghana does not sufficiently capture mobile money as it only differentiates at regional level. Barely a third of the available data records for each outlet include a unique and identifiable

location that can allow a provider to assess availability of potential partner service points to support linkage.

Market-enabling agencies such as the FSDs across Africa are beginning to use standardised access surveys to geolocate households and combine these with questions that allow a more accurate and expansive mapping of the sorts of places where different types of ISM users tend to live, but this does not extend to stored and publicly available data on where ISMs themselves are located. Separately, FinScope Tanzania 2017 has also geolocated access points within or near survey locations but the same caveats on usability of data apply. These are valuable additions to the research base for characterising and further refining the nature of the proximity challenge but they do not provide adequate (publicly available) datasets for FSPs to use in proximity planning and monitoring.

Practical approaches within the SatF programme

Lastly, there is the issue of what constitutes practical approaches and tools that can be used to characterise FSP capacity to deliver peri-urban and rural outreach as well as to locate the presence of competitors or partners across potential catchment areas.

Revisiting the problem statement

So far, the focus has been on locations and the assessment of their reachable potential for linkage. This is a useful planning capacity because many past linkage efforts have created a lot of group account dormancy where the linked groups had no meaningful proximate access to deposit or withdraw cash even in the larger amounts typical of collective – as opposed to individual – saving. But, beyond this there is the issue of applying any systematic location-grading as a measurement tool for achieved reach as well as a tool for planning better reach. For this to work there has to be some means of linking achieved FSP outreach to the graded locations.

In Ghana one partner FSP with an extensive branch network in lower-income areas already geolocates its outlets through data on administrative regions and districts, as well as storing geo-coordinates. The two other SatF partners in Ghana, however, offer B2B solutions to other FSPs that mobilise collective savings. As such, SatF partners do not have any automatic right to data on locations serving ISM users. They may be able to request data but they will only ever have limited ability to quality assure it.

In Tanzania and Zambia, multiple projects involve linking clusters of ISMs to specific agents who are trained to support them. Those agents or field officers can be geolocated at the sub-district level at which the grading systems described above are designed to work. This then leaves the challenge of establishing a link between the ISMs served and the agents or field officers who serve them. If this can be done, then the ISMs can be classified accordingly (i.e. if an agent is rural then the ISMs they support are by definition rural too).

The imputed locations of ISMs are, however, not linked in any of the SatF projects to a location indicator for individual ISM users who open and maintain accounts so that they can transact with an ISM account. Finding a sustainable workaround that establishes a dynamic link between an ISM user's individual account and (located) accounts of the ISMs they use is work in progress for SatF.

Rule-based rural classification

Publicly available district and sub-district data allow accurate decisions on what constitutes a rural location. For SatF, the rural category will necessarily include all ISMs located in sub-district locations that count as rural for administrative purposes. On the basis of this study, it is now proposed that ISMs located in small-town urban locations where dense clustering is contained within a one-kilometre radius are also treated as rural. In these locations, ISM linkage may hub off what is officially an urban location but it is likely to reach a larger number of ISMs in the surrounding rural hinterland rather than in the small-town locations themselves.

The three SatF focus countries have a total of 7,500 sub-district administrative units. Maintaining the master tables to allow FSPs to self-grade locations as rural is a feasible programme-level overhead for supporting a rules-based approach to classifying ISMs. Within this total, fewer than 500 urban wards in Tanzania and Zambia will need checking against satellite-based imagery to see if they class as rural trading centres or full towns in the sense of being much more than a kilometre in radius (Chongwe, the town in Box 2 on Tanzanian/Zambia replication of the methodology, would class as fully urban on this basis as 5.5sq km of dense urban clustering was identified).

This then leaves the key challenge for FSPs interested in linkage of capturing accurate and standardised geolocator datapoints in the CIFs maintained for ISM accounts as described above.

Rule-based urban and peri-urban classifications

A more complex task is to accurately draw the line between urban and peri-urban in the major metro centres and large regional towns. This is essential to SatF as the peri-urban market seems highly relevant to finding the business case for linkage. There is evidence from Zambia that poorly served households in low-income urban areas are bigger handlers of spendable (and therefore saveable) cash than small-scale rural farming households.[2] It is also well documented that they are active users of informal savings mechanisms for business (microenterprise) as well household purposes.

A grading based on a case-by-case analysis using the techniques described in this study is possible for planning purposes but does not allow for systematic reporting. Free-to-use satellite imagery allows such centres to be graded remotely (based on an intuitive approach with spot-checks or using machine learning approaches) and a demonstration example for Zambia is provided in the Annex. In addition, there are predefined rules – for example, from UN Habitat – for the classification of locations across countries. Whether this is done at programme level or individual project level is a question of the amount of effort required, approach, resources and capacity.

Finally, so-called 'web-scraping' can identify some competitor or partner formal financial institution (FFI) outlets. Some of this has become open source data and can also be imported into mapping software but this requires specialist data skills. These can then be located and pinned using imagery software like Google Earth. This does not, however, hold true for mobile money agency networks, as their outlets are often housed in informal structures. With the numbers involved, the cost of doing this systematically would be prohibitive. In any case, real customers use their own informal knowledge and networks – not websites – to identify which agents work best for them and there is plenty of evidence from regulatory efforts to organise information that the operators do have, that it is rarely of very good quality.

Locating mobile money access points as a part of any ISM savings offer must, therefore, generally be a distributed effort by local sales staff of any FSP pursuing a linkage strategy. Fortunately, there are easy-to-use free phone apps to make this possible but as it involves working effort as part of a sales process, the outputs are unlikely to be publicly shareable (although some level of data might be shareable between partners within a programme like SatF).

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[2] The Zambia 2015 Living Conditions Monitoring Survey separates rural households into small/medium/large-scale farming and then separately non-farming households; for urban households, it splits them into in low/medium/high-cost areas. Small-scale farming households account for half of all households but less than 20 per cent of free-cash flow (money they spend on cash purchases of food and non-food excluding housing). Even this may be overstated because of barter. Low-cost area urban households are also significant in terms of numbers – a third of the total – but even more so in cash terms (over 40 per cent of all free spend).

Conclusions

Many FSPs recognise the benefits to their businesses and to their customers of linking with ISMs. Most of the successful efforts in this area have, however, so far been confined to urban and peri-urban areas. This is partly because FSPs have been discouraged from extending linkage efforts into less densely populated rural areas by an apparent lack of information about the distribution and characteristics of potential customers in those areas. As described in this report, it is possible to find and collate the relevant information, using standard office software and existing census and other publicly available data, combined with an application of free-to-use geospatial mapping tools.

 The key technical findings of the study are:

- Data exists that sufficiently describes and characterises the scale of the proximity challenge to getting small, dispersed individual savings to move in pooled, collective amounts that are large enough to be handled as credit or debit transactions in the formal financial system.

- Detailed local knowledge of where access points for cash-in/out are located is required. This has to be part of the customer value proposition for linkage, and the access point database requires continuous updates. The need to maintain the database renders this a private – not public – good and as such not obviously widely shareable.

- Similarly, recorded information of where individual ISMs are located is fragmented, even for facilitated savings group programmes. This requires FSPs to take the lead in recording ISM locations. These data are valuable and also not obviously shareable.

- By contrast, data on location and scale of unmet needs or underserved customers is already available in the public domain, and often for free. Such data can be analysed using spreadsheets and publicly available geospatial mapping tools. Efficiency and consistency gains exist at programme level, but the work can be done in ways that are easy to share with partner FSPs.

- Specialist geospatial mapping is the most accurate approach to identifying and illustrating the nature of the proximity challenge. In the absence of resources and capacity within FSPs to use this directly, alternative approaches can still support FSPs with rural outreach planning. These can help locate settlements in particular administrative areas and identify whether and how they are served so that they can be ranked according to access/exclusion.

- A sample deployment using alternative approaches is attached as Annex 1. It demonstrates that useful insights for rural outreach planning can be gained in a manner that requires no specialist skills and realistic levels of effort and time. SatF deems this realistic at individual FSP level, especially for those FSPs supported within a partnership framework such as Savings at the Frontier.

- Obtaining a more granular understanding of urban landscapes and zoning low-income areas in regional main towns and major metro-conurbations (in contrast to fully organised urban areas) can be done using satellite imagery and rule-based systems. This approach also allows the 'fuzzy edge' where urban ends and rural starts to be identified. For small, single-country/single-FSP applications, publicly available software such as Google Earth suffices, whereas for a wider application for multi-country/multi-FSP programmes, like SatF, machine learning methods using multiple datasets are more appropriate.

- Finally, we point to a need for a better balance to be struck between the large-scale geospatial studies that currently frame the proximity challenge and the practical approach laid out in this report (and Annex 1), involving elements of the following:

  o Satellite imagery and machine learning applications to accurately define which areas fall within classification of structured urban, self-organised urban, peri-urban infill, edge of town peri-urban and rural; and

  o A link of these mapped classifications to imported population data, overlaying the graded satellite imagery.

These two elements require specialist skills but the results, once made available as a plug-in to commonly available office software (e.g. Microsoft Excel) could be easily used by the FSP teams. For this,

o   FSPs need to build skills in the areas of geolocating actual and potential access points and recording and maintaining customer locations so that they can create catchment areas for agent outlets informed by customer, not just supplier, data;

o   FSPs should also invest in basic satellite image-reading skills (e.g. Google Earth) to review and assess different sets of rules for doing catchment area planning, which need to vary by terrain and local social arrangements; and

o   SatF and specialists need to develop a business case for developing the working tool as well as the frequent reruns of the application, to maintain an accurate understanding of classification of urban and peri-urban landscapes.

SatF is now working with an industrial PhD candidate and a team of consultants to advance satellite imagery and machine learning applications for development programmes to evolve a proof of concept for exactly this approach.

Annex 1 – Application of proposed methodology to Zambia: Chongwe and Peri-Urban Lusaka

Context

The aim of SatF is to bring the power of formal finance to people who display potentially attractive financial behaviours through their use of cash-based informal savings mechanisms (ISMs). In Zambia, both ends of this challenge are reasonably well set – there are a number of banks and mobile money operators competing for business,[3] mobile money has given rural Zambians a base level of access,[4] and vibrant indigenous savings mechanisms are increasingly augmented by a growth in NGO-facilitated village savings and loan groups (VSLA, SILC, etc.).

Zambian ISM users mix their cash-based informal transactions with new forms of largely digital formal finance, such as mobile money. By 2017, the number of ISM users who also access some sort of formal finance was 4.5 times as big as those relying only on a mix of ISM use and cash at home. Combined, this mixing of formal with informal usage grew 10-fold between 2011 and 2017 and 2.5-fold between 2014 and 2017.[5] There is, however, no obvious evidence of users linking their formal transactional activity with their informal savings activity. Working out practical and sustainable models for doing so is the focus of SatF's two projects in Zambia. Two key proximity challenges arise from this and are addressed by this report:

- Does the mobile money network, which has grown rapidly and deepened since the middle of the decade,[6] extend far enough for village savings groups to use the network for cash-in/out?

- Are there agent models that can allow the formalisation of urban *chilimba* savings activity to be linked to formal solidarity group lending?

Supporting secondary research

Findings from a short country-landscaping done for SatF using 2014 Findex data suggested there must have been about 2 ¼ million users of ISMs at that time, of which 1.5 million were not actively using any formal financial institution account. At that stage mobile money was making little difference to account/wallet ownership levels. Since then, the number of ISM users without any formal access has fallen sharply because of the spread of mobile money: by 2017, over 80 per cent of ISM users had at least some sort of formal access.

Local proximity research conducted in 2015 and 2017 by Financial Sector Deepening Zambia (FSDZ)[7] showed that the expansion of mobile money brought 40 per cent of adults within 5km of formal access points. However, the share of total population within 5km of any access point including mobile money (40 per cent) was only one percentage point higher than the share of total population within 5km of a bank/ microfinance institution (MFI)/ Savings and Credit Cooperative Organisation (SACCO) outlet. Access points thus remained in close proximity to the urban share of total population, suggesting little expansion of meaningful rural access.

Mobile money as a platform for advancing rural financial inclusion cannot therefore be asserted without detailed evidence as to why it would be better than alternatives such as own agent

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[3] SatF's analysis of the Global Findex 2017 data shows 61 per cent of Zambian adults at least touching the formal financial system in some way (mostly digital) and the segments of the population benefiting particularly from the new options for access are those traditionally seen as particularly excluded (youth, farmers, the poor, etc.).

[4] The same Global Findex data show 41 per cent of rural adults with some sort of account/wallet, compared to 46 per cent of all adults, and implicitly the rate of rural access is three quarters of the urban rate of access – not a huge divide.

[5] Global Findex 2017 compared with 2014 and 2011.

[6] The main model of mobile money was an over-the-counter service called Zoona but mobile wallets from three MNOs (MTN, Airtel and Zamtel) have recently gained share rapidly.

[7] Grundling, Irma (2016) Geospatial Mapping of Service Access Points in Zambia, FSD Zambia, www.fsdzambia.org, 6 July.

networks or deposit collection models. How far mobile money is and could become a realistic cash-in/out model for rural savers is a major focus of this test deployment; in essence, it is an exercise in whether frequent reiteration of desk-based analysis could be linked to field research to improve the prospects for better commercial outcomes.

Analyses of secondary public domain datasets focused on population data by administrative unit. Zambia operates a multi-tier administrative structure beneath national government comprising provinces, districts, constituencies and wards. Data was sought down to second and fourth levels. Three main *Zambia 2010 Census of Population and Housing* reports were used:

    2010 Census – National Analytical Report
    2010 Census – Population and Demographic Projections 2011–2035
    2010 Census – Atlas

These were used in conjunction with web-based visualisations of the underlying data available via Thomas Brinkhoff's CityPopulation, http://www.citypopulation.de. Examples of the output used appear on the following pages of this annex.

Supporting definitions of urbanisation

According to the ILO Inventory of Official National-Level Statistical Definitions, rural/urban areas are based on population size, and predominance of agricultural/non-agricultural activities. Urban areas are defined as localities of 5,000 or more inhabitants, the majority of whom depend on non-agricultural activities. The 2010 CENSUS Atlas further refines this definition of urban areas as having access to piped water and electricity and having a health centre and school within close proximity and a road network to the area. There is no documented definition for peri-urban.

The 2010 Census Migration and Urbanisation Analytical Report contains a discussion of the challenges of measuring urbanisation, a concept it describes as ambiguous: *The demarcation of urban places being done on the basis of administrative and municipal boundaries rather than by their functional and built up area. As a result, towns tend to be either over- or under bounded. In the former, some rural areas and hence rural population tends to be included in the population of the city while the latter excludes urban areas that are outside city boundary limits.*[8] This exactly describes one aspect of the peri-urban challenge covered in the main report, namely suburban spread into the rural surrounding area of towns. The same census report also describes how enumeration area maps have been demarcated within wards, which can either be rural or urban, but that it is common to find one part of the urban ward having a component of rural population. In the 2010 census, only enumeration areas that constitute the built-up area were categorised as urban and contributed to the urban share of the population. This creates a tighter definition of urban than the emerging UN Habitat/EU-DEGURBA methodology would suggest. These allow for two levels for urbanisation:

1. Cities or large urban areas, where:
    *   at least 50 per cent of the population lives in contiguous, square-kilometre (sqkm) grid cells with a density of at least 1,500 inhabitants per square kilometre and a minimum population of 50,000.

2. Towns and suburbs or small urban areas, where:
    *   less than 50 per cent of the population lives in the high-density clustering described for cities and large urban areas;
    *   less than 50 per cent of the population lives in rural grid cells with population densities of less than 300 inhabitants per square kilometre; and
    *   a minimum population of 5,000 can be encompassed this way.

This approach allows for some rural intrusions into urban areas to be classed 'urban' so that less complicated bounded shapes can be created to describe a town's limits. This at least creates a

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[8] Section 1.3.2, *2010 Census Migration and Urbanisation Analytical Report*, Central Statistical Office, Lusaka December 2013.

conceptual framework for treating what might be called the 'fuzzy-edge' issue but that edge is only partially served, not just in terms of financial access but also in terms of access to basic municipal services, and is therefore better described as peri-, not fully, urban.

On the basis of these two approaches, SatF has defined five levels for Zambia along the urban spectrum:

Gridded urban	Self-organised infill in large urban	Peri-urban edge to large urban	Mid-sized towns	Out-of-town peri-urban trading centres
Large urban densities (1,500/ sqkm or more) + visible road grids *Combining to form towns of 50,000+*	Very high density with little visible traffic-width road gridding	Suburban density (300+/sqkm) forming the edge of a contiguous large urban area	Standalone cont-iguous densities of 300+/sqkm in areas totalling 15,000–50,000 people	All other areas classed as urban under Zambian rules

This creates two grades of fully urban – large and mid-sized towns – where the differentiation is by size but both grades have access to a range of municipal services. By matching to the Zambian threshold for naming a population cluster as an urban centre (see map below), a mixed banking presence is likely to be available (see Table A1 below) at both these levels.

Map A1: Distribution of urban centres with a population of 15,000 or more, census 2010
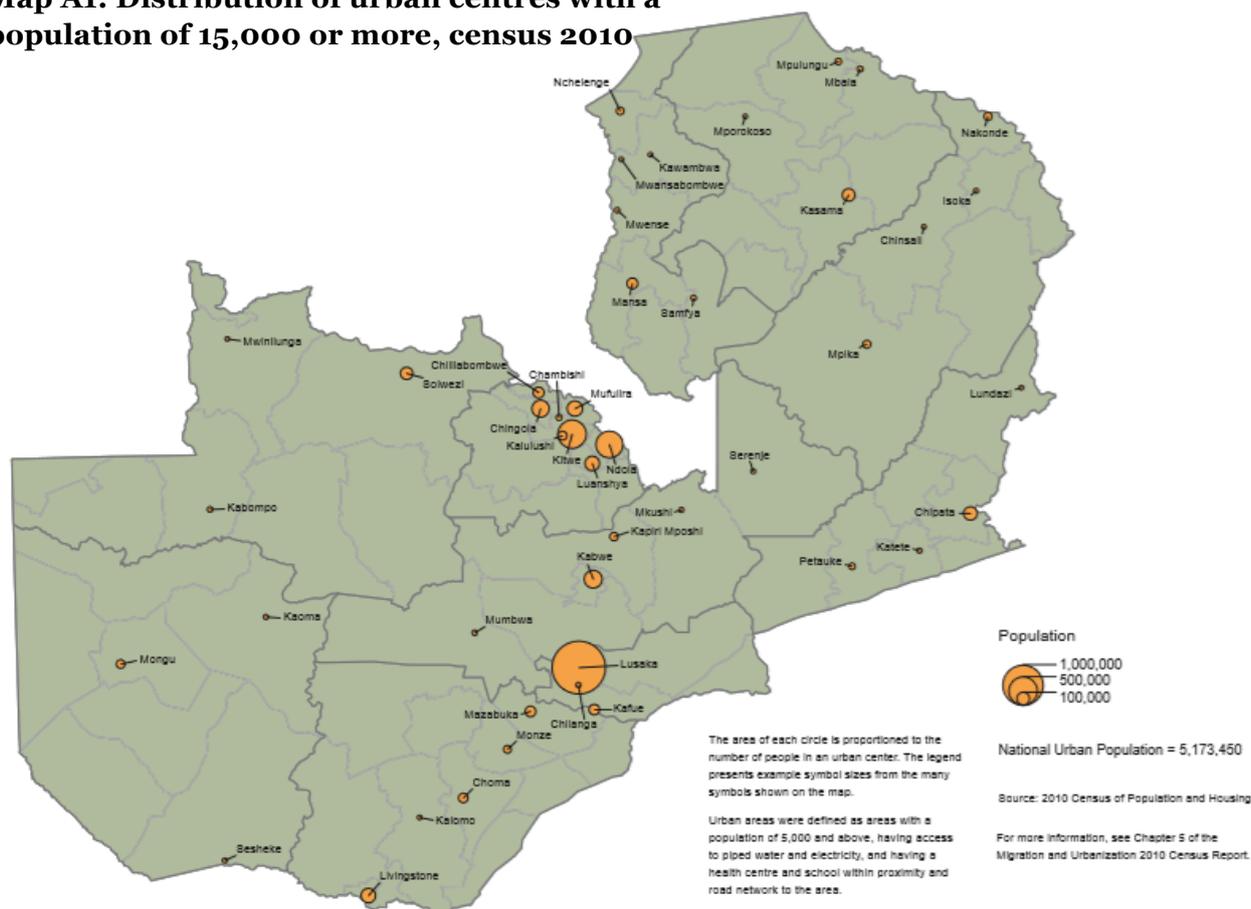
Following these definitions, there were 42 mid/large urban centres in 2010 although this is now more likely to be around 50 if the differential urban–rural growth rates from the 2000 and 2010 censuses have been sustained.

Another 25 clusters that class as urban following Zambian definitions (populations over 5,000 but under 15,000) were identified using settlement listings from CityPopulation.de but for SatF

purposes, these are considered peri- rather than fully urban because this is a group for which the balance of probabilities shifts to there not being any full banking or MFI presence.

Table A1: Urban locations graded by size with indication of number of banks present

Lusaka and other large towns (population projected over 50,000)		Mid-sized towns (population projected 15,000 - 50,000)		Small clusters too small to class as full towns (5,000–15,000)	
Lusaka	18 banks	Petauke	2	Siavonga	1
Kitwe	16	Mpulungu	2	Mwansabombwe	
Ndola	15	Chambishi		Luwingu	
Kabwe	9	Mbala	3	Lukulu	
Chingola	10	Mumbwa	2	Zambezi	
Mufulira	6	Samfya	1	Kabompo	1
Livingstone	9	Kaoma	1	Mufumbwe	1
Luanshya	6	Mkushi	4	Kaputa	
Chipata	9	Chilanga		Nampundwe	
Kasama	7	Katete	1	Mungwi	1
Solwezi	9	Serenje	2	Chama	
Mansa	6	Isoka	1	Nyimba	1
Chililabombwe	5	Mwense	1	Chunga	
Mazabuka	5	Kawambwa	1	Namwala	1
Kafue	4	Lundazi	4	Mulele	
Kalulushi	1	Mwinilunga	1	Lundashi	
Choma	9	Mporokoso		Luangwa	
Mongu	6	Kalomo	2	Chavuma	
Kapiri-Mposhi	2	Chinsali	4	Kasempa	1
Nakonde	3	Mpongwe		Chibombo	
Monze	3	Maamba	1	Chilubi	
Mpika	3	Senanga	1	Mwandi	
Nchelenge	1	Itezhi-Tezhi		Manyama/Chisasa/Mutanda (three smaller locations in Solwezi)	
		Chirundu	2		
		Sesheke	1		
		Manyinga (Loloma)			
		Chongwe	1		
78% of all urban/peri-urban bank presences		19% of all urban/peri-urban bank presences		3% of all urban/peri-urban bank presences	

Source: Bank of Zambia – https://www.boz.zm/BankbranchNetworkMarch2017.pdf

The chart shows the split of total population by the degrees of urbanisation/rurality laid out above apart from self-organised infill within major towns and the fuzzy edge around large towns. These can only be assessed on a town-by-town basis and with only 50 fully urban towns in Zambia, this can be done using Google Earth and ward-level population data.
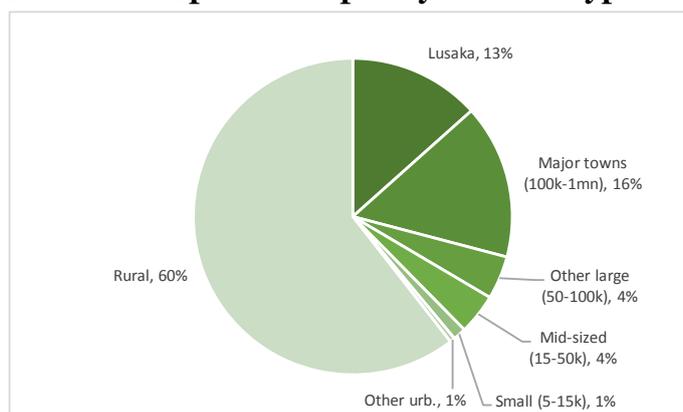
This is what was done with one SatF partner FSP in Chongwe District, Lusaka Province (to address the issue of rural reach) and in Lusaka itself to address the issue of gridded urban versus self-organised peri-urban infill within a large city context).

Chart A1: Population split by location type

Primary research/field work

Mixed qualitative methods were used to conduct the primary research:

- Working with local partners to identify potential centralised sources for ISM locations.

- Fixing research locations using CityPopulation.de/Google Earth.

- Focus group discussions: FSP project teams and staff and ISMs where they live and work, as well as NGOs known to be active in setting up and supporting ISMs.

- Mapping of partner locations, ISM locations and agent footprint using publicly available tools including Google Earth and 'what3words' to collect coordinates and summary visuals shared for confirmation via GoogleMyMaps:

https://drive.google.com/open?id=1KJxu_0lqXB24wVy4wfe8eVPPm03tp-LV&usp=sharing

https://drive.google.com/open?id=1Tc1Zmtn7T50nQRSVieTloMDRWSACs6mn&usp=sharing

The final synthesis is an overlay of target locations and four examples of this are shown on the following pages:

- Three summary graphics from CityPopulation.de showing Lusaka city and the adjacent Chongwe District/ward/town. These are purely for context but useful for framing any discussion about a proposed target area.

- Chongwe ward (the lowest level at which population data is published) with ward boundaries defined and a contiguous square-kilometre grid that captures the town's denser inner core plus its peri-urban fuzzy edge.

- Chongwe ward with potential access points and realistic catchment areas (that vary according to terrain and road quality – see below) marked as circles. In some cases, these were visited locations with functioning mobile money agents identified (marked as yellow circles). In other locations that were also visited, possible agents were identified in focus group discussions (white circles) and finally, locations without agents but near major roads were identified onscreen and checked for size to see if they would support agents in other contexts (also white circles).

- Lusaka city with the whole city outlined in yellow but also with the self-organised contiguous peri-urban infill outlined separately in white.

The final Chongwe ward mapping was used in two ways. An early onscreen scan using Google Earth to confirm the likely proportion of the ward rural population that would be reachable if the feasible catchment area radius was assumed to be 3km and the population within the location and its surrounds were of a size to support an agent if it was set up. The 3km radius was agreed in discussion with group coordinators as a reasonable distance to walk/cycle to access cash-in/out in the Chongwe area.

For Chongwe ward, the estimate is that 80–90 per cent of the rural population outside the main town are potentially reachable provided three new out-of-town agents are established along the roads running west and north-west from Chongwe town (one on tarmac road and two on graded murram). The partner FSP will line groups up to use the new agents and create the positive inward cash flow that helps offset the normal net outward mobile money flow that makes float balancing so difficult for many rural mobile money agents across Africa. This, combined with a super-agency model, has worked in other SatF projects that have made linkage a viable proposition in rural areas otherwise beyond the reach of the FSP concerned.

Partner FSP staff are now geolocating savings groups as part of this exercise. This is ongoing work using a mobile phone app that provides geo-coordinates for each captured location. This is being done for each group's meeting place and the home base of its facilitator. As commercially and personally sensitive data, permission has not been sought to show it here and this next stage is being established on partner, not SatF, laptops. Once captured, the coordinates are available to upload to Google Earth, creating coloured pins that show up within or outside the proposed agent catchment areas. In this way, the staff of the FSP concerned can create detailed rollout plans for each new area they target. The practicality of doing this is already established for half of Chongwe District and is now being tested in one other district.

Visualisation 1:

Isolation of Chongwe District/ward as potential sample area using CityPopulation density and urbanisation maps
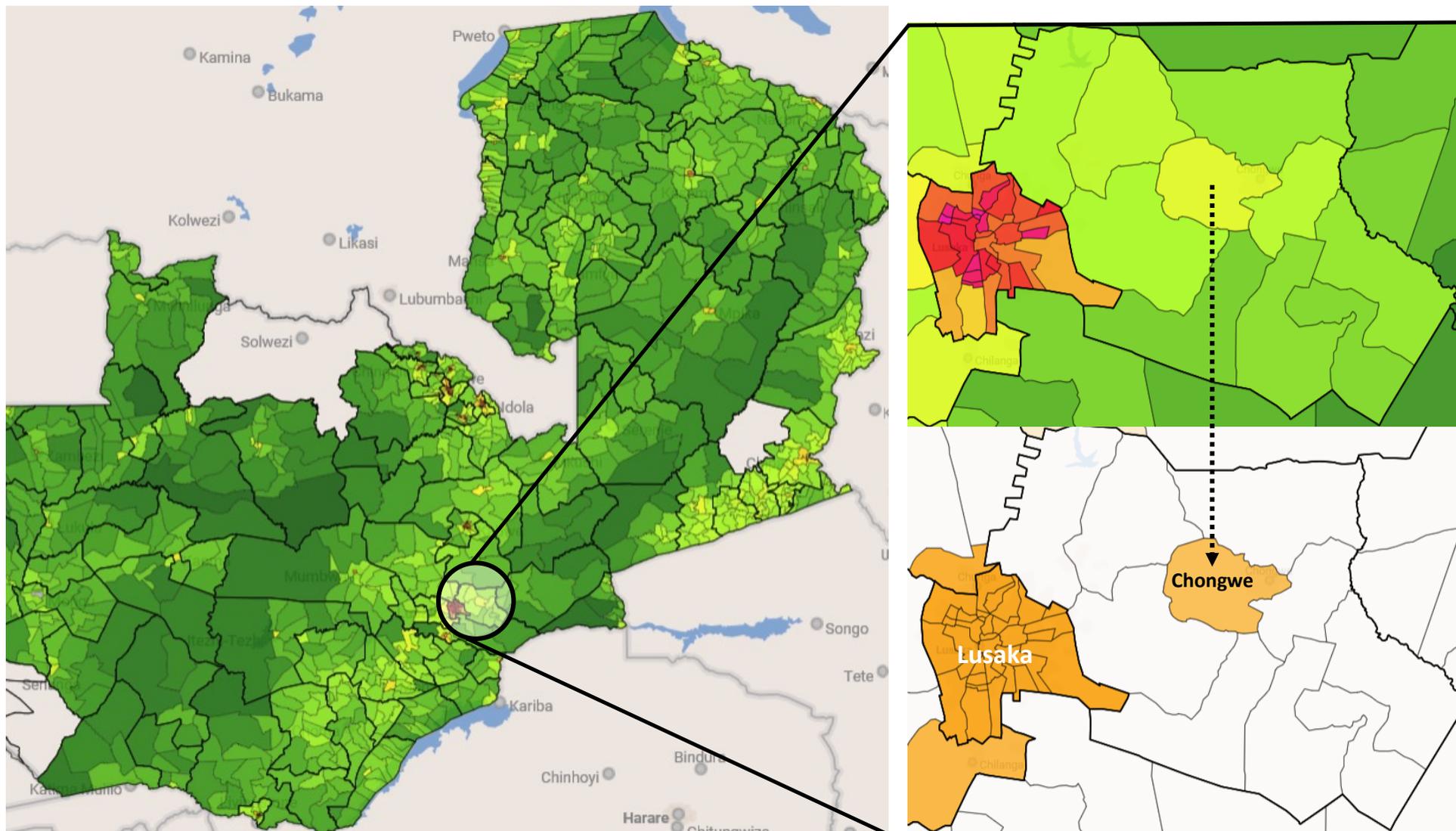
Visualisation 2:

Transfer of Chongwe ward boundary and isolation of Chongwe town within ward in Google Earth

Two approaches were tried for mapping Chongwe town:

- In the first, we used low altitude Google Earth settings to identify the borderline of the denser gridded urban space and the polygon tool in Google Earth provided an area estimate of 5.5sqkm with an implied density of just under 3,000/sqkm for the urban core.

- The 3x3 sqkm EU-DEGURBA contiguous grid approach was much easier to draw. It probably captures an additional 5,000 people within the fuzzy edge, leaving a further 5,000–10,000 of the Chongwe ward population as pure rural.

Visualisation 3:

Agent catchment plots overlaid on Chongwe ward (yellow equals 3km radius around actual, white equals potential)

Quite separately, the same partner FSP is now being supported to look at the potential informal voluntary savings business that could be added to its established solidarity group lending programme that it runs in both urban and rural areas. To support this, a SatF consultant joined FSP staff on visits to urban loan groups and asked about savings habits. They discovered a mix of self-organised rotating and accumulating savings and loan *chilimba*, which were at much bigger contribution rates than are typically seen with facilitated rural groups. All the same conditions precedent for linkage as exist for rural groups were observed – for example, concern about cash-box risk and coordinator fraud plus evidence of forced lending to avoid money being stored in the cash box.

The Lusaka mapping shown here is an early stage scan that demonstrates market potential. Later on, the same mobile money agent catchment area and group location plotting that has been started for Chongwe will take place as a support to planning a deposit mobilisation drive in the towns where the partner has a branch presence.

In this case, the issue is not physical proximity – the partner FSP has offices near two major peri-urban infill zones – but, rather, it is a matter of convenience and social proximity; group meetings do not take place during working hours and group members may feel more comfortable cashing-in/out via a deposit collector or a mobile money agent even if there is a branch within easy reach.

Visualisation 4:

Lusaka mapping
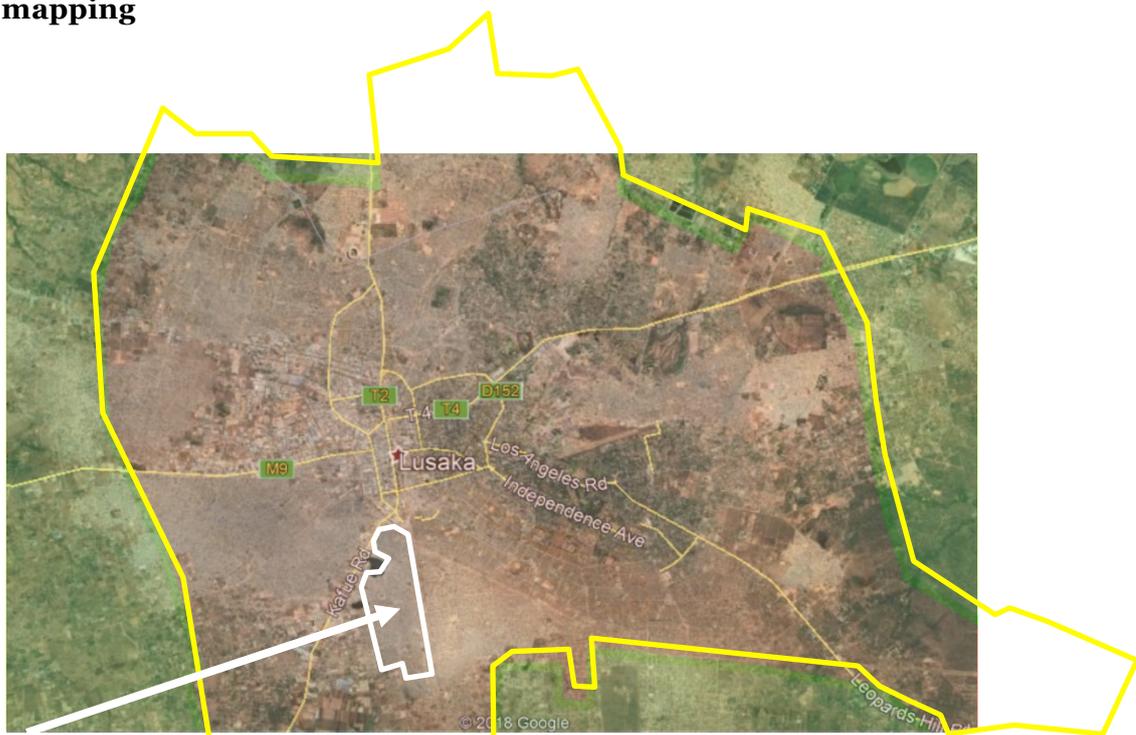
Chawama Lilayi peri-urban infill area with partner FSP on edge of infill. Loan groups with significant self-organised saving activity found within infill area.

Contrasting housing patterns at eastern edge of Chawama Lilayi self-organised peri-urban infill

Chawama Lilayi peri-urban infill

Kamwala (North) gridded urban

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   Ghana – Key Findings, http://finclusionlab.org/country/ghana/analytics

   Tanzania – Key Findings, http://finclusionlab.org/country/tanania/analytics

About the SatF consortium

The Savings at the Frontier programme is being implemented by OPM in collaboration with Bankable Frontier Associates, MicroSave, PSD Consulting, Development Pioneer Consultants and Kadale Consultants.

For more information – and to read the full SatF strategy – visit www.opml.co.uk/projects/savings-frontier

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