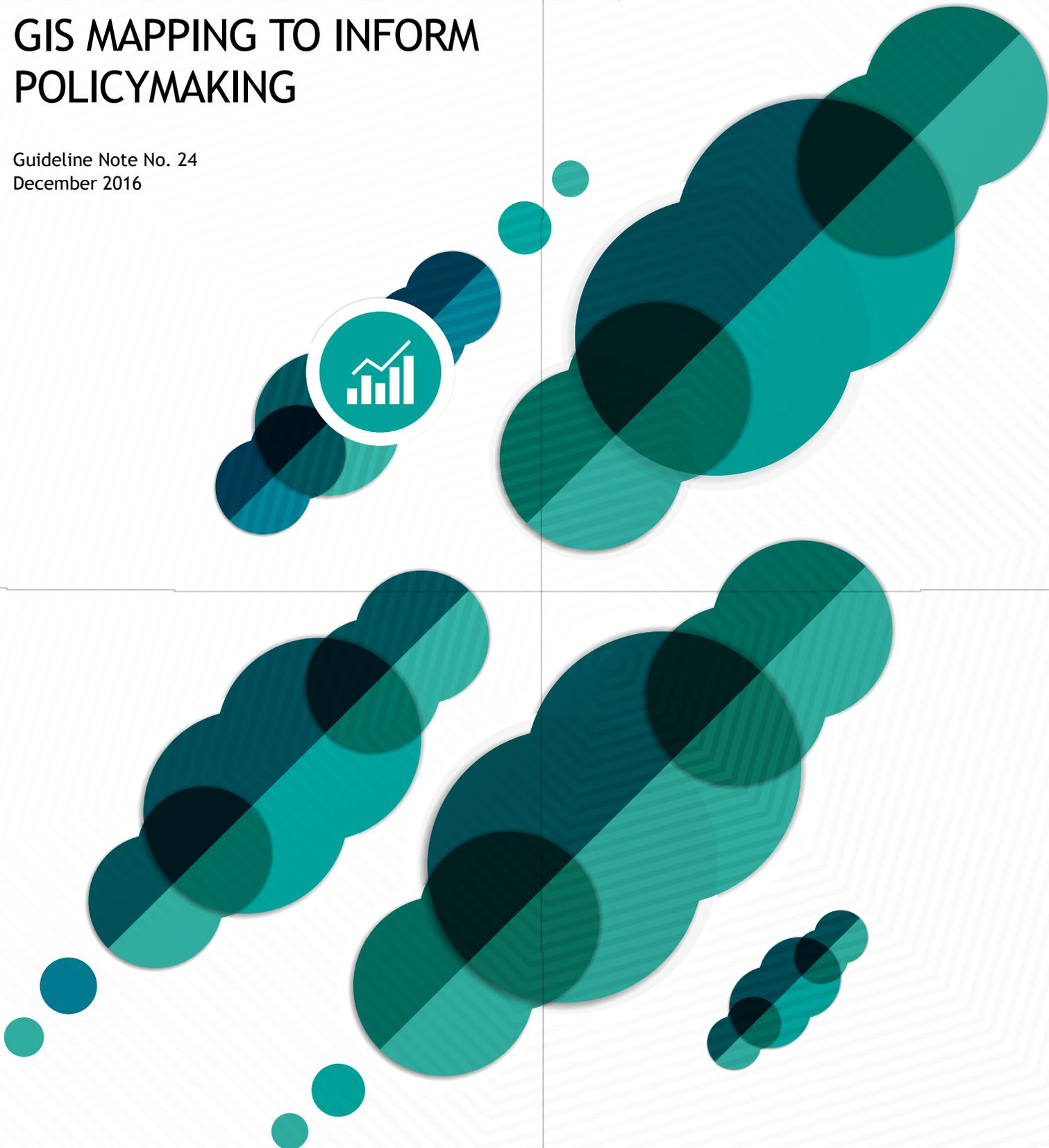


# FINANCIAL INCLUSION DATA TRACKING AND MEASUREMENT: GIS MAPPING TO INFORM POLICYMAKING

Guideline Note No. 24  
December 2016



## INTRODUCTION

In recent years, members of AFI's Financial Inclusion Data (FID) Working Group have discussed and debated the value of geospatial mapping for measuring financial inclusion. While the overall benefits are now clear to members of the working group, each needs to carefully consider how useful geospatial data would be for their national financial inclusion strategy. Some members are already experienced with geospatial mapping; others are planning to launch their first geospatial mapping exercise in the coming year; and others are still deciding whether geospatial mapping is the right solution for them. MIX, a financial inclusion data and analytics firm, has been gathering and mapping financial inclusion data of 23 countries on its public platform, FINclusion Lab, since 2013. Together, MIX and FID working group have a wealth of geospatial mapping experience they are ready to share with the AFI network.

In April 2016, FID working group members and MIX met in San Salvador to discuss the best way to document and share these experiences with AFI members who are considering the costs and benefits of planning, implementing and maintaining an effective geospatial data and mapping system. The group conducted two surveys. The first surveyed members with experience in geospatial mapping to learn the practical considerations involved in conducting a successful mapping exercise. The second surveyed those less experienced in geospatial mapping to understand their key questions and concerns.

The vast majority of survey respondents agreed that geospatial mapping is a powerful tool for achieving financial inclusion objectives. Every AFI member has approached geospatial mapping differently, and although all encountered obstacles, they remain committed to geospatial data as a way to both monitor progress and identify opportunities to achieve full financial inclusion. In this focus note, we feature the experiences of AFI members and the expertise of MIX to help guide others as they embark on their geospatial mapping journey.

**SECTION 1: WHAT IS GEOSPATIAL MAPPING AND HOW CAN IT SUPPORT FINANCIAL INCLUSION?**

**1.1 WHAT IS GEOSPATIAL DATA?**

Geospatial data makes it possible to visualize data on a map. Each data point has location information assigned to it in the form of XY coordinates, an address or administrative unit. Some AFI members capture and display the exact XY coordinates of each financial touchpoint on a map of their country, which allows users to identify the precise locations of banks, banking agents, microfinance institutions (MFIs), mobile money agents and other service providers (see Figure 1). Others aggregate financial touchpoints to an administrative unit, such as a district, commune or village, which provides a snapshot of how financial touchpoints are concentrated in a country (see Figure 2).

Financial touchpoints are then overlaid with contextual data, such as population, poverty levels and infrastructure, which helps users to answer questions like:

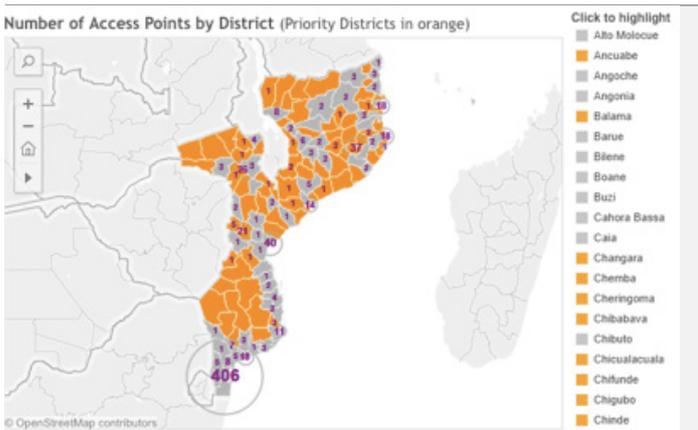
- > Where are large segments of the population not currently being served?
- > What types of financial service providers or products are most common in high-poverty areas?
- > Where might we need to make infrastructure investments so that banks and other providers can begin providing services?

**1.2 HOW DOES GEOSPATIAL MAPPING SUPPORT FINANCIAL INCLUSION?**

Geospatial mapping helps regulators, policymakers and financial service providers (FSPs) identify different levels of financial access in a particular country or region. The richness of the data and the benefits of visualization make it possible to pinpoint areas with limited access to finance and unmet demand. FID working group members experienced with geospatial mapping use these maps not only to inform new policies, but also to track progress towards their financial inclusion goals. Below are three examples of how AFI member countries are using geospatial mapping to support their financial inclusion efforts.

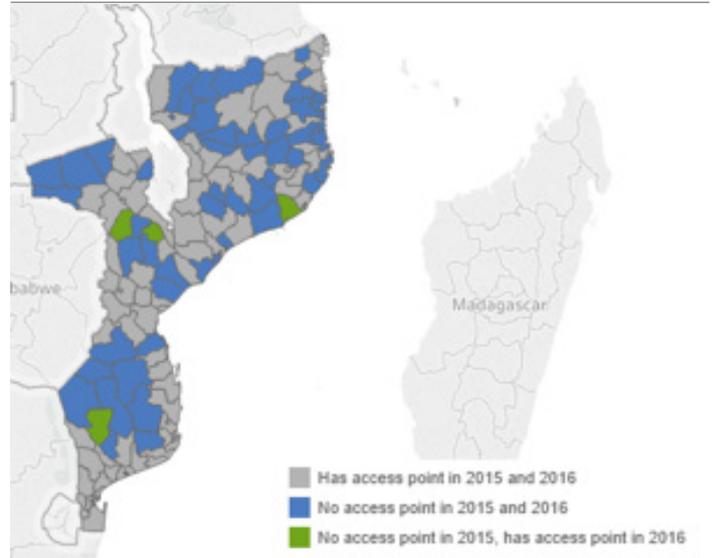
**1.2.1 In Mozambique,** Banco de Moçambique is enforcing a recently introduced policy that requires all banks to prioritize the opening of new branches in underserved districts. By plotting bank locations on a map (see Figure 3), the central bank can track compliance with this policy and identify and prioritize the areas needing more financial services.

**Figure 3:** A map of Mozambique’s priority districts for financial inclusion and the number of financial services touchpoints in each (2015)



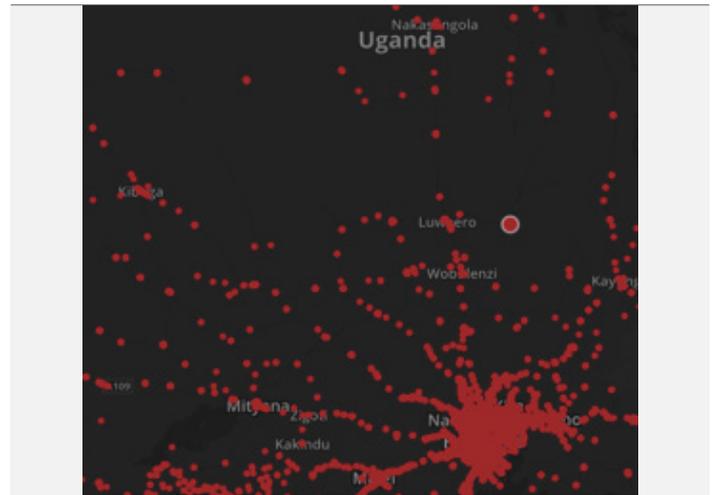
Source: FINclusion Lab (MIX)

**Figure 4:** A map of financial access points in Mozambique and the districts (green) that opened their first formal financial touchpoint in 2016



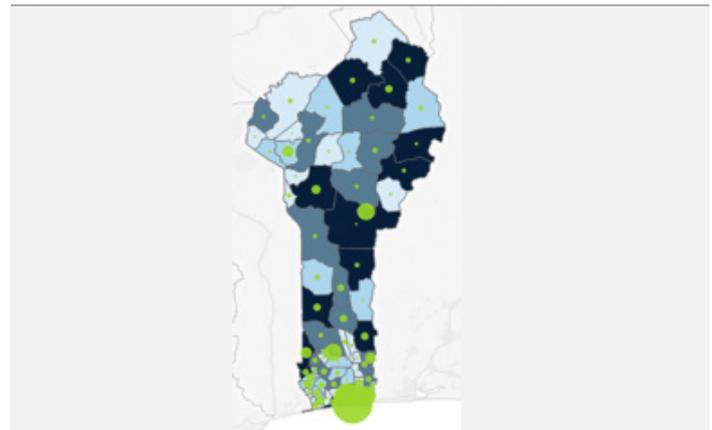
Source: FINclusion Lab (MIX)

**Figure 1:** A map of Uganda displaying the XY coordinates of different types of financial touchpoints



Source: fspmaps.com

**Figure 2:** A map of Benin showing the total number of mobile money agents in each commune (green circles) overlaid by population (darker blue shading = highest population)



Source: finclusionlab.org

**1.2.2 In Nigeria**, financial inclusion maps allowed the Central Bank of Nigeria’s Financial Inclusion Secretariat to identify areas that had high population density but no financial services. Armed with this information, the Secretariat was able to demonstrate to the Bankers’ Committee—a group of representatives from each commercial bank—the tremendous opportunities for expansion throughout the country. This exercise united government regulators and the private sector as they worked together to identify and prioritize underserved areas. The data helped them set targets for each of the 21 deposit money banks (DMBs) to increase the number of bank branches, bank agents and ATMs in Nigeria, increase the number of savings accounts and expand access to credit.

*“It’s safe to argue that as a result of this target breakdown exercise, the National Financial Inclusion Strategy targets are not just hanging in space. Every bank in the country knows exactly what it needs to do in order to increase the number of financially included people. Banks submitted implementation plans to the Secretariat, which in turn created a monitoring and evaluation framework to ensure that it can track progress towards the Bank’s targets.”*

Peter Olayinka Adeyemi, Central Bank of Nigeria

**1.2.3 Bangko Sentral ng Pilipinas (BSP)** has been mapping financial touchpoints for more than five years. The initial mapping exercise revealed a number of municipalities did not have any formal financial touchpoints. To fill these gaps, BSP waived bank processing fees in underserved municipalities to encourage banks to open microbranches. BSP also uses geospatial mapping to measure the effectiveness of this policy. After implementing the microbranch incentive, annual map updates have shown a reduction in the number of underserved municipalities and a subsequent increase in financial access throughout the country.

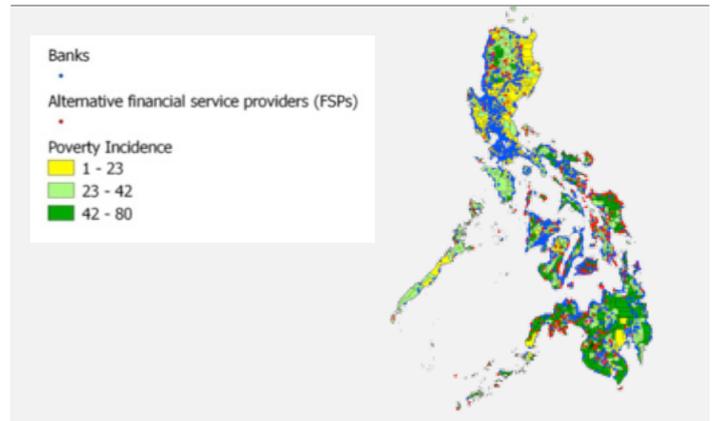
Many of the questions currently being answered by geospatial data tend to be related to supply. However, mapping can also be an extremely powerful tool for governments to measure the overall health of the financial system. As geo-referenced datasets expand to include information on transaction levels, client volume or credit/deposit ratios, we can begin to answer how or whether people are using financial services. We may even begin to address questions about quality, such as measuring customer satisfaction by geographic area. Some governments are even using mapping to measure risks like client over-indebtedness in India (see Figure 7) and to detect money laundering activities in the United States. Mapping financial inclusion data also has many benefits for market actors who do not have the information they need to make decisions about strategic growth or develop new products for unserved or underserved markets.

Figure 5: A map of densely populated areas (red and orange) in Nigeria without any access to financial services (colored dots)



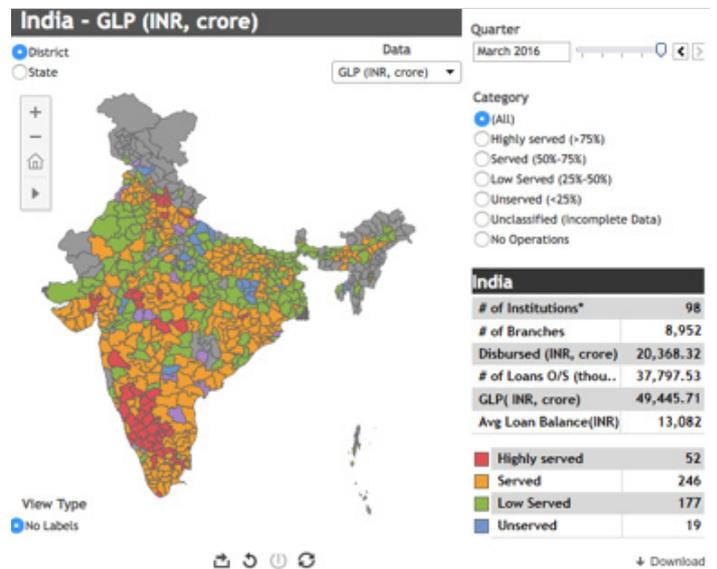
Source: fsprmaps.com

Figure 6: A map of the Philippines showing the geographic distribution of financial touchpoints overlaid with poverty levels



Source: Bangko Sentral Ng Pilipinas (BSP)

Figure 7: A map of microfinance institutions in India by service concentration



Source: FINclusion Lab (MIX)

## SECTION 2 GEOSPATIAL MAPPING: KEY CONSIDERATIONS

### 2.1 IS GEOSPATIAL MAPPING RIGHT FOR MY COUNTRY?

Before getting started with geospatial mapping, there are a few key questions you should ask:

- 1 Will geospatial mapping support the implementation of our financial inclusion strategy? Will mapping help to measure progress towards our financial inclusion goals?
- 2 Could financial markets benefit from geospatial mapping? What do banks and other financial sector actors currently use to evaluate market opportunities and risks? Do private companies already supply this information to the market or should a government entity step in to supply it?

### 2.2 HOW WILL THE MAPS BE USED?

Prior to embarking on a geospatial mapping exercise, it is important to understand and document how the maps will be used and who the main users will be. Will the maps be used internally or will they be shared more broadly with the market to support banking expansion and new product development? Forming a representative committee of stakeholders to guide the process from the beginning will help to ensure your data and maps meet user needs.

### 2.3 CAN EXISTING DATA SUPPORT GEOSPATIAL MAPPING?

Once stakeholder needs are identified, the next step is to take stock of existing data. Key questions to ask are: Do we currently capture location information from banks or other providers? At what geographic level do we capture this data

(e.g. province/state, district/municipality, township/village, or XY coordinates)? Most of the survey respondents reported that some or all data is reported to a specific geographic unit, usually state/province or district/municipality. Bank Indonesia and Bank Negara Malaysia currently require XY coordinates from supervised entities.

While most of the survey respondents periodically receive some level of geospatial data, they also report many challenges with data quality. Data can be prone to error due to the use of unstandardized or free-form address fields in reporting templates, or it may be incomplete since some providers, particularly informal (NGOs or savings groups) or non-traditional channels (mobile money agents, POS, etc.) do not report to the same entity as traditional FSPs. Harmonizing these differences requires consulting multiple entities and undergoing a potentially lengthy data standardization exercise to determine whether all data sources can be mapped. For a more in-depth look at the state of financial inclusion data, see MIX's 2015 State of the Data Report, available on the AFI Member Zone.

Once you take a more in-depth look at the data, you will need to decide whether you can work with it as-is or will need to make some changes. You may need to ask the following questions:

**2.3.1 How can geospatial data be collected? For example, do all FSPs report to the same entity? Or do they report to different entities using distinct reporting templates?** During a supply-side data assessment in Rwanda in 2015, MIX found that

Table 1: Use cases by FID working group members who have collected and mapped geospatial data

COUNTRY	NUMBER OF ACCESS POINTS MAPPED	DATA COLLECTION APPROACH	FREQUENCY	USE CASE
Nigeria	51,000	Enumerators	Biennial (once every two years)	<ul style="list-style-type: none"> <li>&gt; Identifying partners in a given geographic area to facilitate conditional cash transfer disbursements</li> <li>&gt; Informing bank expansion targets by mapping local market infrastructure and population density (i.e. market potential) in unserved states or Local Government Authorities (LGAs)</li> </ul>
Uganda	43,626	Enumerators	One-time project	<ul style="list-style-type: none"> <li>&gt; Visualizing the limited footprint of regulated FSPs to inform the Agency Banking Law passed in 2016</li> <li>&gt; Providing FSPs with a comprehensive map of financial touchpoints to inform expansion plans</li> </ul>
Bangladesh	34,000	Enumerators	One-time project	<ul style="list-style-type: none"> <li>&gt; Monitoring the presence of different types of FSPs to identify which types of providers/products are lacking in the country</li> </ul>
Malaysia	10,000	Self-reporting by FSPs	Annual	<ul style="list-style-type: none"> <li>&gt; Monitoring served and underserved sub-districts to support bank expansion plans</li> </ul>
Philippines	82,000	Self-reporting by FSPs	Annual	<ul style="list-style-type: none"> <li>&gt; Identifying unserved areas for targeted programming</li> <li>&gt; Identifying distribution partners (e.g. non-traditional providers) for digital financial services</li> <li>&gt; Raising the visibility of different types of providers (e.g. rural banks) seeking to attract new investors</li> </ul>
Fiji	7,000	Self-reporting by FSPs	Annual	<ul style="list-style-type: none"> <li>&gt; Mapping the mobile money landscape (agents) and cellular coverage to identify areas for future mobile money expansion</li> <li>&gt; Mapping cooperatives and credit unions together with population density to identify unserved areas and attract partners and investors to support the central bank's financial inclusion strategy</li> </ul>

different types of FSPs reported different types of data to the National Bank of Rwanda (BNR), making it impossible to map or compare institutions. MIX therefore provided recommendations for standardizing these reporting templates so that all FSP data could be reported consistently.

Another important detail to consider is the geographic granularity of the data. Do you need to know the precise location of all access points (e.g. XY coordinates) or will aggregating the data to a specific geographic unit suffice? It is likely that data will have some inconsistencies that will need to be addressed prior to mapping. To complete your dataset, you may need to:

**A Conduct a thorough census of all access points.** Our survey revealed that some countries in Africa (Tanzania, Kenya, Uganda, Nigeria, Zambia) and parts of Asia (Bangladesh, certain states in India) have undergone a census of all financial touchpoints. This usually involves hiring a survey firm to deploy enumerators with GPS-enabled devices to capture financial and, in some cases education, agriculture and health-related access point data. These rich datasets provide valuable market intelligence to both government and the private sector. However, they also age quickly, particularly in markets where providers are rapidly expanding through agent or correspondent networks. Data quality challenges may also arise when contracting a survey firm. After a survey firm in Uganda carried out its initial census, the Bank of Uganda (BoU) discovered some gaps in the dataset likely due to the surveyor's lack of familiarity with the local market. To complete the dataset, the BoU had to deploy its own staff and resources to gather the missing data points.

**B Revise reporting templates and reporting systems to begin requiring more consistent and granular location data from supervised FSPs.** When done effectively, this approach can have long-term benefits and provide users with a steady flow of data to track progress and monitor market developments and risks. A few countries, such as Mexico, Colombia, Mozambique and Malaysia, have opted to invest internally in developing data systems to gather geospatial data from FSPs.

Revising reporting systems may introduce new challenges, however. For example, all regulatory bodies need to agree to require the same level of data in their reporting templates, it often requires an overhaul of databases and reporting systems and it may also require time and training to ensure reporting institutions adapt their systems to the new reporting requirements. In other words, it requires a great deal of collaboration with a range of stakeholders and may very well require the support of an external data expert to facilitate the process.

**C A hybrid approach.** Throughout the revision process, you may determine that some types of FSPs can adapt their information systems to report geospatial data more quickly than others. Those providing digital or mobile money services, for example, may be able to capture and report their XY coordinates more easily than traditional banks or cooperatives. In this case, you may want to require certain providers (e.g. mobile money agents) to report XY coordinates while deploying enumerators to periodically gather XY coordinates for other types of providers, such as SACCOs or MFIs.

### Box 1: New and Promising Data Collection Technology

If adapting reporting templates or engaging a survey firm are not good options, there are examples of promising new approaches worth considering.

One approach leverages the power of open source technology. In Uganda in late 2015, the [Humanitarian OpenStreetMap](#) team launched a pilot in which university and local community volunteers reported the location of financial touchpoints via the OpenStreetMap mobile app. The data is now hosted online and is available for free download.

**Premise**, a data collection innovator, employs local enumerators to continuously gather and update financial location information via mobile apps.

Both these approaches aim to reduce the ongoing cost of updating data, and employing local experts with knowledge of the communities helps to ensure the data is valid and current.

#### 2.3.2 Do you have an updated shapefile that reflects the latest boundaries and administrative units of your country?

A shapefile is the map you use to display your geospatial data. It is a digital file composed of polygons representing the different administrative boundaries within a country. A country may have multiple shapefiles, which can be sourced through local government bodies such as the statistics office, or through public databases such as the Global Administrative Areas Database (GADM).

Prior to mapping your data, you must ensure that the place names in your dataset match the place names in your shapefile. For example, countries can redraw boundaries or create new provinces or districts in response to population growth. However, these new boundaries are not always updated regularly in open source map databases. Cote d'Ivoire, for example, redrew its boundaries after the end of its civil war in 2012. In 2015, MIX attempted to create a financial inclusion map, but was unable to locate a shapefile with these new boundaries. After six months of searching, MIX sourced one from the GADM with the most recent boundaries. These boundary changes are an important consideration when mapping data, particularly when aggregating data to a specific administrative unit.

### 2.4 HOW WILL THE MAPS BE DISPLAYED?

Once you identify the use cases for geospatial mapping in your country, you will need to determine how the maps will display the data and where they will be hosted. Will they be used internally or shared with a wider audience? Will the maps contain public data, private data or some of each? Will the maps be static or interactive? Each of these questions brings additional considerations that will need to be weighed prior to making your mapping software choice. Below are a couple of options.

**1 Interactive online maps.** These maps allow the user to experiment with different map layers, for example, combining access points with population density, cellular coverage or poverty level. They can be shared publicly on a website or maintained internally for private use. There are several mapping solutions available, such as QGIS, OpenStreetMaps, ArcGIS, Carto and MapBox.

There are also business intelligence solutions, such as Tableau and Qlikview, that allow you to view maps with other types of data visualizations to analyze trends and monitor data on an ongoing basis. One key consideration is whether you have staff or can hire staff to build and maintain the maps. Mapping skills can be difficult to find and you may need to hire a firm to create and maintain the maps. MIX's FINclusion Lab ([www.finclusionlab.org](http://www.finclusionlab.org)) hosts financial inclusion maps and visualizations for 23 countries. Impact2Insight (<http://www.i2i.org>), a new financial inclusion data facility, also has a mapping portal that can host and share public financial inclusion data. You may also have local vendors that can provide mapping solutions for your specific needs.

**2 Static maps.** If you simply want to include maps in print reports and other publications, a static mapping solution may work well. Financial institutions in Indonesia, Philippines and Malaysia have all opted for this solution. These institutions generally have mapping experts on staff to maintain the maps, which are added to print reports and disseminated at major financial inclusion meetings and events.

## 2.5 WHAT ARE THE COST CONSIDERATIONS OF GEOSPATIAL MAPPING?

Finally, you will need to determine the cost of your geospatial mapping exercise. While we cannot provide an exact estimate, we can provide a list of cost considerations that will give you a general idea of what to expect. If the options below produce more questions than answers, we suggest you enlist the help of a geospatial data specialist who can work with your team to assess your current data collection and management systems, document your use cases and provide a range of data solutions and mapping options to meet your needs.

### 2.5.1 Deploying Enumerators to the Field

If a census approach is the right fit for your country, you will need to hire a survey firm to conduct the census. Many firms also provide analytical products and may even host the data for public access. These firms range in cost depending on the country, however, our survey respondents indicated that these firms tend to charge US\$8-15 per financial touchpoint. Depending on the size of the market, data collection costs can easily surpass US\$500,000. Additional costs to consider include managing the survey firm, quality checking the data and supplementing missing data, as in the earlier Bank of Uganda example.

### 2.5.2 Adapting Reporting Systems

If your institution decides to adapt reporting systems, building or revising data templates and reporting systems using internal staff resources may start at around US\$100,000. However, the costs will likely increase if an external firm is needed at any stage. The technology costs will also vary depending on whether you can build on existing servers and databases or you need to purchase new technology.

### 2.5.3 Data Storage and Map Hosting

Another important consideration, regardless of your data gathering approach, is how you will store the data and host the maps. This is particularly relevant if you have chosen to use interactive mapping software for public access. If your institution requires full ownership of the data and maps, then you will need to purchase a software license, often called a "server" to host the data and maps.

Server licenses for these types of mapping or business intelligence solutions can begin at US\$40,000-150,000 upfront and usually cost between US\$5,000 and \$30,000 annually. They also require skilled staff to manage the server and associated data infrastructure. An alternative to in-house management is a web-based approach that hosts data and data visualizations on a secure cloud server. Cloud-based options help to significantly lower the cost of data hosting and can be good options for institutions that want to share their geospatial data with the market.

### 2.5.4. Data Visualization

Geospatial business intelligence is a rapidly expanding field and there are many free and low-cost solutions available, including QGIS, OpenStreetMaps, ArcGIS, Carto and MapBox. The solution you choose will depend on the types of maps and visualizations you want to create and the capacity of your staff. Regulators in the Philippines and Malaysia have chosen a solution based on cost and existing staff capabilities. BSP chose a free open-source software solution, Quantum GIS, because it had a highly qualified geospatial mapping expert on staff who could use the software to build and maintain a unique mapping solution for BSP. Bank Negara Malaysia opted to purchase two ArcGIS desktop licenses (starting at US\$1,500 each), which allowed staff to build and maintain high-quality maps and included tech support for less experienced mappers.

## CONCLUSION

FID working group members strongly agree that geospatial data helps to uncover the geographic challenges low-income people face in accessing and using financial services, and it also reveals opportunities to expand or create new financial products and delivery channels. Using geospatial data, decision-makers can formulate new policies and programs to facilitate the expansion of agent banking and e-money, or to implement new financial education schemes in areas where uptake of financial services is low.

Harnessing the power of geospatial data requires a significant commitment from senior decision-makers to spearhead and then drive the process of gathering, storing, mapping and disseminating data to relevant stakeholders. The various mapping options laid out in this focus note will continue to evolve as new technologies adapt to the growing data needs of financial inclusion stakeholders. We look forward to tracking and sharing these developments with AFI members.

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## ANNEX 1: GLOSSARY OF TERMS

### ADMINISTRATIVE LEVEL/ADMINISTRATIVE UNIT

A low level administrative division of a country, ranked below a province, region, or state. Not all countries describe their locally governed areas this way, but it can be descriptively applied anywhere to refer to counties, municipalities, etc. In Zambia, for example Admin 0=Zambia, Admin 1= Province, Admin 2=District and Admin 3=Ward.

### CLOUD BASED COMPUTING

A kind of Internet-based computing that provides shared processing resources and data to computers and other devices on demand. It is a model for enabling ubiquitous, on-demand access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services), which can be rapidly provisioned and released with minimal management effort. Cloud computing and storage solutions provide users and enterprises with various capabilities to store and process their data in third-party data centers. It relies on sharing of resources to achieve coherence and economy of scale, similar to a utility (like the electricity grid) over a network. (source: Wikipedia)

### FINANCIAL TOUCH POINT

A physical location where a consumer can conduct financial transactions such as cash deposits or withdrawals, or make digital payments.

### FSP

Financial Service Provider. An entity, either regulated or unregulated, who is engaged in different types providing financial services to consumers.

### Alliance for Financial Inclusion

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