The Power of Mapping Financial Services Data

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Background: Financial Services for the Poor's Strategy

Increasing access to better financial tools can help accelerate the rate at which people move out of poverty and help them maintain economic gains. Nevertheless, 77% of those living on less than $2/day do not have a bank account. At the regional level, 86% of all adults in sub-Saharan Africa and 77% in South Asia are disconnected from the banking system.[1] The poor are not so much in a static state of chronic poverty: millions transition out of poverty by capturing opportunities to invest or by finding new jobs, but large numbers fall back into poverty every few years due to various economic shocks. Evidence shows that poor people intensively need finance during the pivotal moments associated with transitions in and out of poverty, as well as in their day to day life to make ends meet. Research supports the notion that improved financial tools will give poor people greater ability to capture opportunities and move out of poverty at faster rates, while slowing the rate at which they are knocked back into poverty due to adverse shocks. Impacts will occur at three levels: *i)* reducing transaction costs; *ii)* managing health, lifecycle and agricultural shocks; and *iii)* economy-wide efficiencies.

Despite significant individual and social benefits of greater use of formal financial services by poor people, several barriers exclude most poor families:

- High run-rate costs (cash handling; documentation; IT) of serving poor customers relative to the revenues generated by their small transactions and balances.
- High costs of building a distribution system to acquire and serve poor customers.
- Asymmetries of information about poor people's financial lives, which make it difficult to develop products tailored to meet their needs and create large risks to providers.
- Misguided regulations that impose costs disproportional to their intended benefits.

Addressing these barriers will require a fundamental shift in the cost structure of financial service delivery, availability of products that are valuable to poor people, and appropriate regulations. Shifting the bulk of the poor's financial transactions into digital form is the catalytic change that will strip enough costs out of the system to stimulate aggressive commercial efforts to reach the poor. In addition, as people migrate more of their financial lives into digital form, many of the asymmetries of information that make product design and risk mitigation difficult and expensive are addressed. Finally, digital mechanisms can better connect the poor to a broader set of services in ways that also enable more efficient social payments, tax collection, and reduced corruption.

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[1] *Global Findex (2011).*

An Interactive Geospatial Tool for Financial Inclusion Analysis

As poor people seek to access modern financial services, one of the greatest barriers to doing so is the lack of physical infrastructure linking them to digital platforms. The build-out of bank branches, agents, and other "cash in/out" (CICO) points is a critical first step giving poor people a bridge from cash to the digital domain. Solving the access barrier is a key priority before the adoption and the usage of financial services can occur to impact poor people's lives.

Measuring physical financial access is currently calculated through a standard but crude access measure – i.e., branches per capita or ATMs per 100,000 people.[2] This does not give an indication of where people – and especially poor segments of the population – live in relation to the financial access points. The Bill & Melinda Gates Foundation and its partners[3] are developing a new tool that will help facilitate better measurement and tracking of financial access through Geospatial Information System (GIS) based methodologies. Using a proximity measure tool, such as the Interactive Geospatial Tool for Financial Inclusion Analysis *Fspmaps.com*, can provide a more nuanced picture of the actual financial access within a market. The new MapsTool's current preferred measure is the percentage of poor people within five kilometers of a financial access point, though many other sorts of metrics are possible through the GIS framework described below. In the future, the data will be further augmented to include travel time to an access point rather than simple distance to more accurately measure and track this key barrier to financial access.
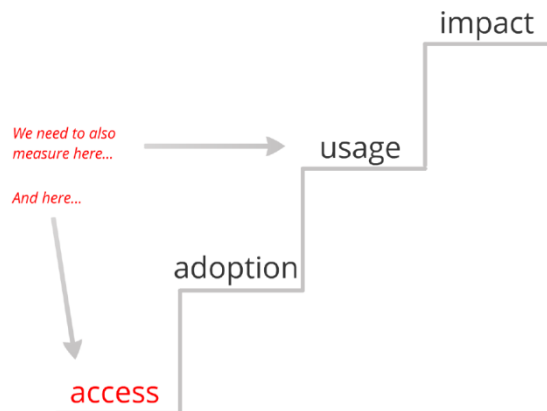
Information to Feed the Interactive Web Map

The Bill & Melinda Gates Foundation's Financial Services for the Poor (FSP) team has invested in a number of resources to support these new measures including:

- GIS location information for all financial access points in the country
- High-resolution population and poverty maps
- Development of a web portal that makes this information and analytical tools publicly accessible.

Country specific, supply-side data of financial service providers is being integrated into the interactive web map. Data for Tanzania, Uganda, Nigeria, Kenya and Bangladesh will be made accessible on *Fspmaps.com*. Uganda, Tanzania and Nigeria are already available. Kenya and Bangladesh will be added to the website by September 2013.

The web-based tool uses the data to present a geospatially accurate, visual representation of the landscape of financial access points for each country. These access types generally include:

- Commercial Banks
- ATMs
- Micro-Finance Institutions
- Mobile Money Agents
- Micro-finance Deposit Taking Institutions
- Credit Institutions

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[2] *See e.g. Financial Access 2010 and Financial Access 2009.*

[3] *Partners include: Spatial Development, Southampton and Oxford Universities, Brand Fusion, Local partners within Tanzania, Uganda, Kenya, Nigeria and Bangladesh includes: Central Banks, Ministries of Finance, Financial Service Providers, Financial Sector Deepening Trusts, CGAP and National Statistical Bureaus.*

- Savings and Credit Cooperatives Organizations (SACCOs)
- Post Offices
- Other outlets specific to individual countries.

The information captured includes observable characteristics for financial access point locations such as background information, service providing organizations, and photographs. The high-resolution population data for all of the countries mentioned above are now available at Afripop.org and Asiapop.org. The poverty data for those countries, developed to the same, one-kilometer resolution, will be publicly available later this year. Fspmaps.com currently includes poverty data for Uganda and Nigeria.

Purpose of the Interactive Web Map

The interactive web map is designed to inform decisions for expanding financial services access in sub-Saharan Africa and South Asia. The data and tools will help users target investments that expand financial services access for maximum impact, and will help them optimally place retail access points. A blog post published last year identified possible applications for a range of decision-makers, as shown in Table 1.

Table 1. How the Web Map Can Inform Decision-making

User Type	Use Cases
Service Providers	To optimize the Cash-In and Cash-Out agent network expansion, improve liquidity management, identify new potential customers and market products, assess proximity and scale of competitors/partners.
Government Agencies	To design effective social transfer programs and incentives for the private sector to extend their offer to underserved and unserved areas e.g. government cash-transfer programs - payments to government employees, pension and safety-net payments.
Policy-makers and Regulators	Design efficient policies for financial inclusion and monitor their implementation. Provides financial market data and information to guide the market players in designing products, identifying opportunities and responding to constraints/challenges.
Donors and Development Partners	To evaluate impact/outreach of financial inclusion initiatives. Create a geo-referenced information base – enable sector coordination and leverage e.g. agricultural/health synergies with financial services.

Additional use cases will be identified and vetted by communities of practice within each focus country.
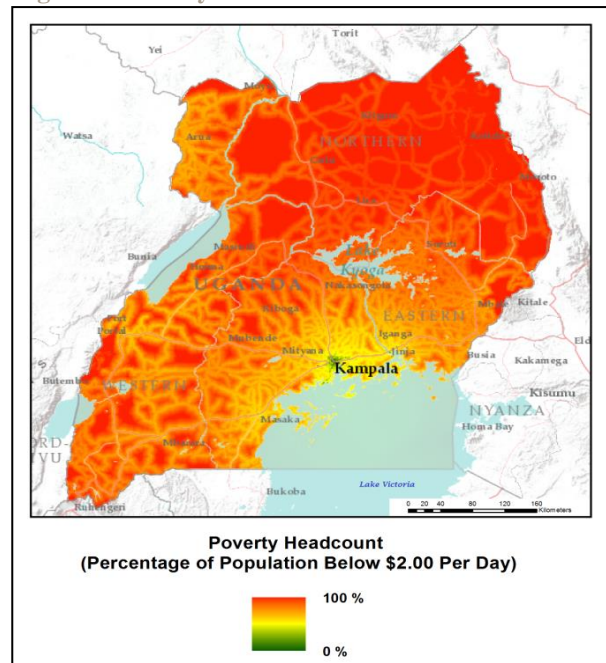
Poverty Mapping

Similar to measuring financial access, measurement data of poverty is often reported at national levels, which hide important spatial differences. Analysis of poverty and its determinants, aids the targeting of poverty reduction interventions, and the monitoring of impact therefore requires disaggregated information. For years there have been ongoing debates about how best to measure poverty. Approaches range from consumption and income-based metrics (which can be derived from household surveys such as the LSMS) to health, education, and well-being aspects (such as the Multidimensional Poverty Index (MPI), which can be derived from household surveys such as those conducted for the Demographic and Health Surveys (DHS) Program).

The poverty layer on the web map was developed in partnership with the Universities of Southampton and Oxford using geolocated household survey data collected cooperatively by the World Bank and national statistical bureaus. These survey data are integrated into a spatial statistical model to produce estimates at a 1 kilometer by 1 kilometer grid square with associated measures of uncertainty. This is the basis of the "poverty layer", which the web tool drapes over a map to visually show – in a very simple manner – the complex statistical model results.

Figure 1. Poverty estimation at 1km resolution.

Poverty Headcount
(Percentage of Population Below $2.00 Per Day)

100 %

0 %

The poverty layer enables spatial analysis in the form of estimation of the number of poor people living within, for example, a five kilometer radial distance to a financial access point. Poverty is measured using household expenditures, which are used as the primary indicator in estimating well-being. The expenditures are adjusted for household size and family composition (number of adults and children), and are converted to dollar/day thresholds to represent internationally-recognized poverty levels (e.g., persons living on $2/day or less). The resulting poverty values are adjusted using country currency prices to reflect differences in purchasing power. The poverty map can be combined with modeled estimates of population distribution (AfriPop/AsiaPop) to estimate the number of people living in poverty at a 1 kilometer resolution.

Current Features of the Interactive Web Map

The web map is designed to allow users great flexibility in selecting the information they want to view on a map. The interactive map clusters financial service locations over population, administrative boundaries, and wireless coverage. A layer list provides a table of additional layers that can be displayed on the map. Another main element of the MapsTool is an analysis toolbox that allows the user to analyze selected data. Lastly, the reporting panel below the map provides overview statistics and analysis results based on selections and interactions by the user. In addition to these main elements, a set of map tools is provided so users can navigate the map and swap basemaps between a simple street map, aerial imagery only, and a hybrid of the two. A city/town name search on the map allows a user to quickly navigate to a geographical place of interest.

Figure 2. The Fspmaps.com user interface.
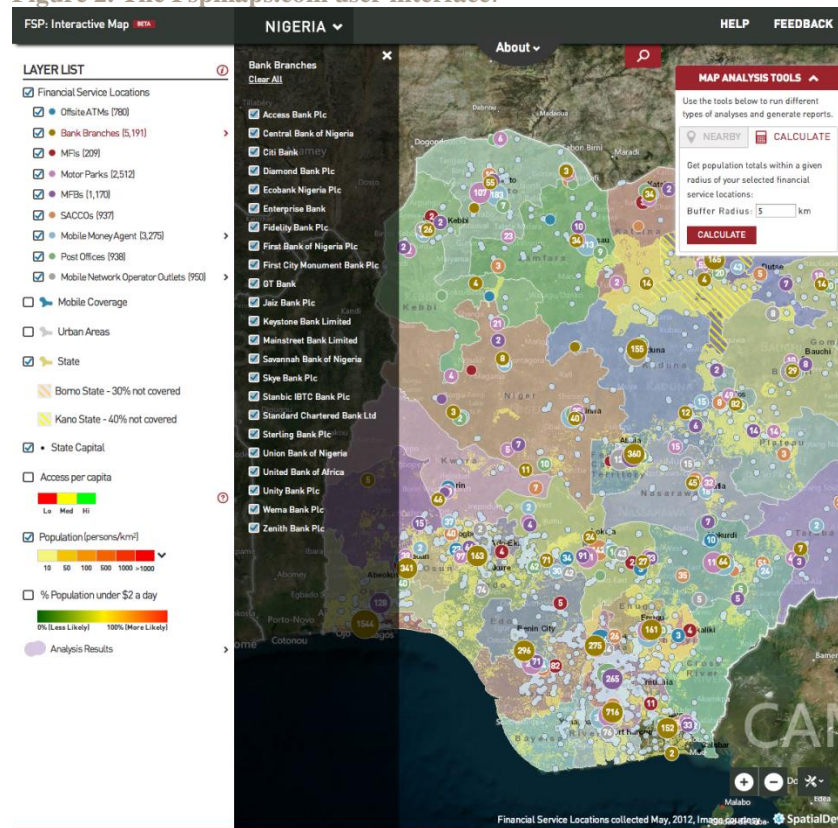
Analysis Toolbox

Currently, the analysis toolbox contains two tools: a location proximity query and a basic inclusion access calculator.

The location proximity "nearby" query allows a user to drop a pin on the map, calculate a radial area of interest (based on a specified distance in kilometers), and return a list of all financial services accessible within that area. The tool also calculates the potential customer base within the selected area.

Figure 3. Results of the "Nearby" proximity query.
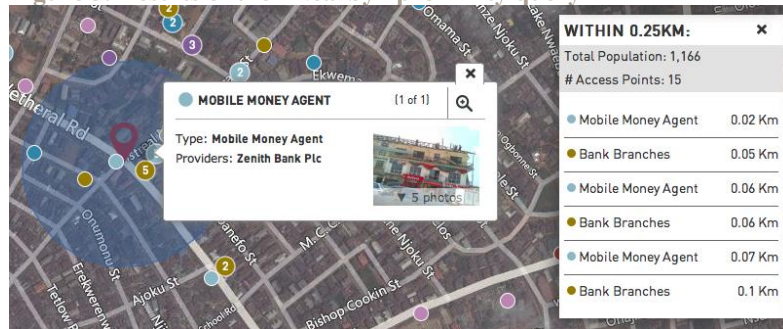
Service providers and government agencies can evaluate the type and extent of service at specific locations. Using this information, service providers can plan to expand their networks and government agencies can design programs and incentives for the private sector to improve services.

The inclusion analysis tool uses selected financial access points to summarize total population and populations in poverty within a user-defined distance of the access points – also referred to as "Buffer Radius". For example, the web portal user can select any financial access type(s) along with a radial service area (distance in kilometers) to assess its current or potential customer base. The summary results are disaggregated by urban and rural populations as well as impoverished segment of the total population. A map showing the results accompanies the summary report. It should be noted that the datasets on the web portal are accurate but not yet complete, and only represent a snapshot in time. The specific time period of data collection varies by country.

Some analyses have been pre-calculated for the user and are provided as map layers. An "Access per Capita" layer is available to visually classify access to financial providers by population within a small, pre-defined aggregation unit (a hexagon of roughly 100 square kilometers, e.g., ~9,200 cells in Nigeria and 2,300 in Uganda).
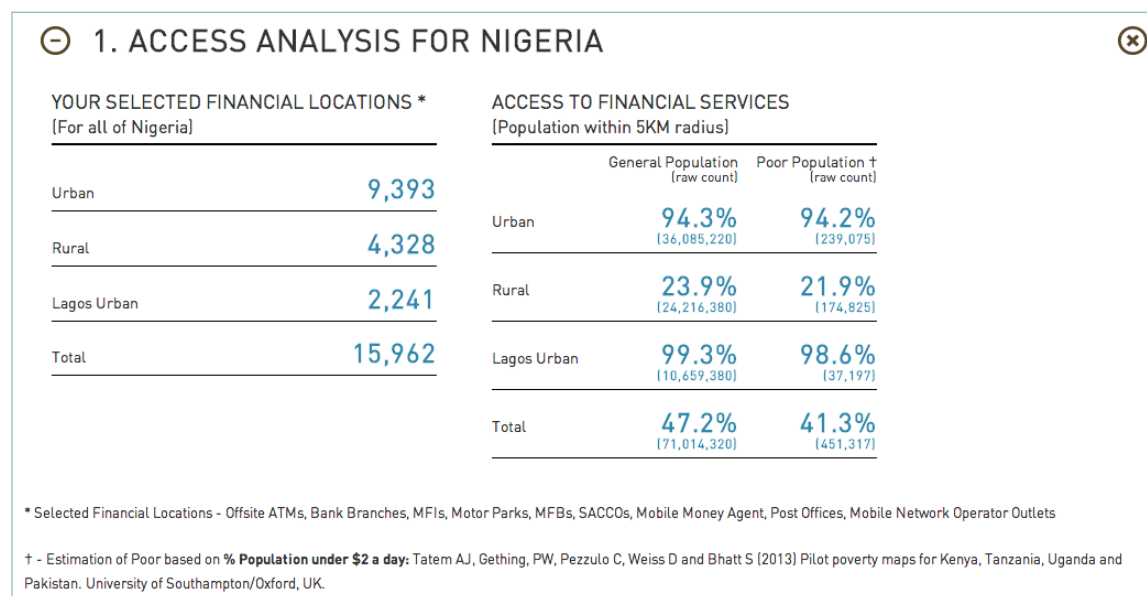
Figure 4. Analytical outputs include basic country statistics.

The pre-calculated access per capita map layer quickly indicates to service providers which parts of their market are underserved.

The "Access per Capita" value of a cell is derived from the ratio of access points to total population within that cell. All values greater than zero are grouped into three equal classes representing high, medium, and low access levels, which are then displayed on the map as cells colored green, yellow and red, respectively. The values contained in the three different classes are specific to the country dataset and will therefore differ from country to country due to population density, total number of access points, and the proximity of people to access points. As mentioned earlier, in addition to these analytical outputs, represented as map layers, basic statistics are provided for the country overall in the reports and results section of the website below the map.

Figure 5. Analytical outputs include basic country statistics.

⊖ 1. ACCESS ANALYSIS FOR NIGERIA   ⊗

YOUR SELECTED FINANCIAL LOCATIONS *
(For all of Nigeria)

Urban	9,393
Rural	4,328
Lagos Urban	2,241
Total	15,962

ACCESS TO FINANCIAL SERVICES
(Population within 5KM radius)

	General Population (raw count)	Poor Population † (raw count)
Urban	94.3% (36,085,220)	94.2% (239,075)
Rural	23.9% (24,216,380)	21.9% (174,825)
Lagos Urban	99.3% (10,659,380)	98.6% (37,197)
Total	47.2% (71,014,320)	41.3% (451,317)

* Selected Financial Locations - Offsite ATMs, Bank Branches, MFIs, Motor Parks, MFBs, SACCOs, Mobile Money Agent, Post Offices, Mobile Network Operator Outlets

† - Estimation of Poor based on **% Population under $2 a day:** Tatem AJ, Gething, PW, Pezzulo C, Weiss D and Bhatt S (2013) Pilot poverty maps for Kenya, Tanzania, Uganda and Pakistan. University of Southampton/Oxford, UK.

DEEP DIVE FINDINGS

Nigeria

TOTAL POPULATION:
150,802,704

POPULATION WITH CELL COVERAGE, <5KM ACCESS:
70,830,792

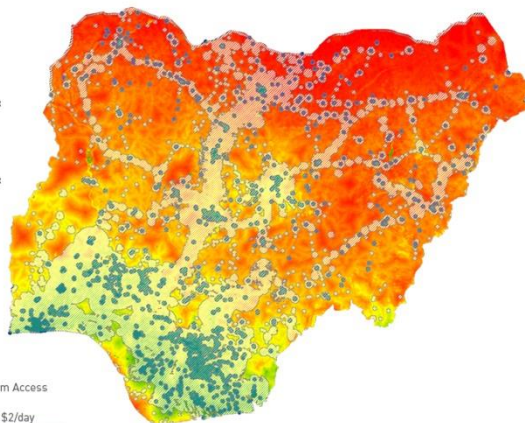**POPULATION WITH CELL COVERAGE, >5KM ACCESS:**
44,880,992

LEGEND
- Cell Coverage, 5km Access
- Cell Coverage, more than 5km Access

Likelihood of living on under $2/day
0% — 100%

For Nigeria, a population of more than 150 million people, a vast majority of the financial access points are within areas with wireless network coverage. According to the Nigerian data, only 71 of the financial access points captured are not within the wireless coverage area (out of the 15,962 access points captured). 115.7 million Nigerians (~77% of the population) live in an area with cell coverage (covering 33 percent of the geographical area of Nigeria).

The opportunity for greater financial inclusion through mobile money models is significant: there are nearly ~44.9 million people (30% of the entire population) living in Nigeria who live in an area with cell coverage, but more than five kilometers away from a financial service location. Changes to the current Agent Banking Guidelines could further advance these opportunities. As cell coverage continue to expand it will allow financial services providers to extend their reach with mobile-enabled models even further.
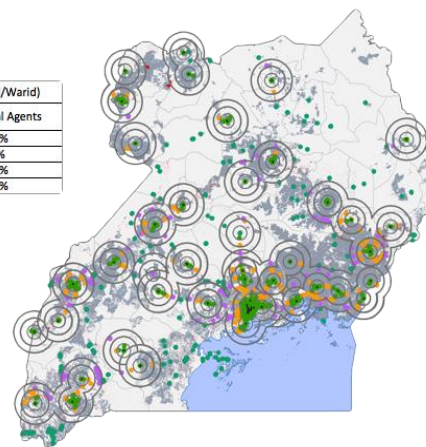
Uganda

In Uganda, 96% of the country's 33 million people live in areas with cell coverage. 18 million people (~54 percent) of the entire population have cell coverage but live more than five kilometers away from a financial access point.

Agents Access to Liquidity Management Support (MTN + Airtel/Warid)		
	Number of Agents	% of Total Agents
Within 10 km	9,116	52%
Between 10 - 20 km	1,628	9%
Between 20 - 30 km	1,967	11%
Beyond 30 km	4,811	27%

An interesting finding is that 52% of the mobile money agents are located within 10 kilometers away from their super-agents*. 20% are within the range of 10-30 kilometers. And 27% are more than 30 kilometers from a super-agent. As agents have to collect liquidity from their super agents (usually bank branches) on a daily basis, truly penetrating into rural areas and improving on financial access remains a challenge. Although it can be argued that mobile money agents are reaching more rural areas, the majority of agents are located in close proximity to their super-agents. Going forward, and with additional transaction level information, analysis could be made to compare the efficiency of individual agents in relation to their super-agents.

* A *super-agent* is a business, sometimes a bank, which purchases electronic money from a Mobile Network Operator wholesale and then resells it to agents, who in turn sell it to users. A person or business that purchases e-money from an MNO wholesale and then resells it to agents, who in turn sell it to users. (Unlike a super-agent, *master-agents* are responsible for managing the cash and electronic-value liquidity requirements of a particular group of agents). GSMA definition.
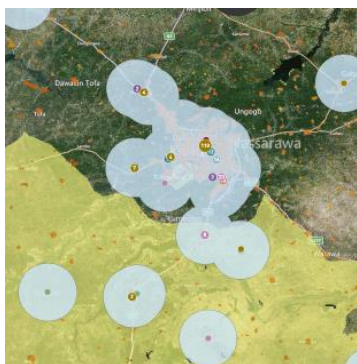
Future Analytical Features and Tools

The new proximity-based measures of financial inclusion enabled by FSP maps provide information much more useful than any previous metrics for making investments aimed at increasing financial access. Going forward, as more demographic data layers become available on the interactive web site (e.g. population age distribution or travel time), service providers will have detailed information to help optimize access, liquidity management, credit availability and product marketing.
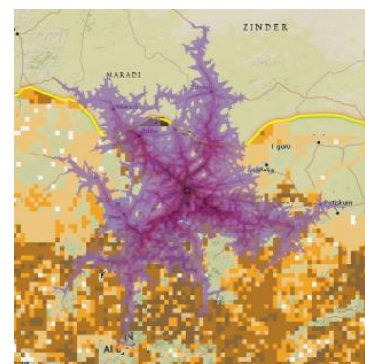
Figure 6. The evolution of the financial access geospatial application.
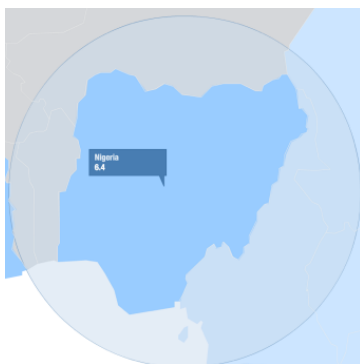
Prior efforts: Country-level statistics   Current: Fspmaps.com   Future: Travel time analysis

There are a number of enhancements planned for the interactive web map over the next five months. New data and features will be released monthly. Some features to look for by the end of Summer 2013 include:

- Additional data layers and tools will allow for new density and proximity-based financial access measures, e.g. poverty data layers to analyze the access to financial services points for people living under <2$/day will be added by August 2013. (This data is currently available for Uganda and Nigeria).
- Additional summary options for analysis results that will include UN administrative unit levels 1 (State or Province) and 2 (Local Government Administrative [LGA] district) will be added in August 2013.
- An opportunity analysis tool to calculate population (within income thresholds) served with mobile coverage but lacking adequate financial access (summarized by administrative units) will be added in September 2013.

Additional data sharing options will also be available in the Fall of 2013.

- Additional analysis by overlaying demand-side data (e.g. FinScope data) and comparing radial access distance to the population with accounts (and potentially usage data) summarized by administrative units. This will be available in September 2013.
- A "Drag and Drop" tool will allow analysis to be performed with user-provided data. This feature will make it easy for users to analyze data they are not able to share publicly. A template will be provided to ensure that the data contains the key fields needed to perform the analysis. Once the user has adapted the data to the format (and they may include additional fields as well), the user simply drags the file from their PC desktop into the browser window for Fspmaps.com. The system will load the data into the session (all of the data remains on the user's computer and is not uploaded to the Fspmaps.com database unless the user choses to) and the analysis can begin. The outputs of the analyses can be exported and saved; as can images of the maps. Nothing persists after the user ends their web session.
- An enhanced comparative analysis tool. This will return a side-by-side comparison of people's access to different types of service providers within a user-defined service radius both within and across countries. It will be available in September 2013.
- Ability to generate a printable document for using analysis results offline. Output options will include maps, charts, and tables. Available in October 2013.
- Travel time analysis will be a new way of measuring access which follows road infrastructure networks rather than just linear distance. Available in November 2013.

We are currently in the process of developing a longer-term plan for this overall effort and are in discussion with potential partners to take on the role of growing and maintaining data collection, as well as marketing its applications. For this public resource to be fully useful, however, all providers and regulators will have to do their part to keep it current and up-to-date, and encourage financial services providers to systematically capture and share geospatial coordinates of their outlets. We are currently working with Central Banks and local stakeholders to build tailor-made long-term sustainability systems.

INDUSTRY LAUNCH IN NIGERIA

The Event

The Nigerian data portrayed on Fspmaps.com was launched at an industry stakeholder event in Lagos on July 8, 2013. The event was co-hosted by the Central Bank of Nigeria (CBN) and the Bill & Melinda Gates Foundation. Governor Sanusi Lamido Sanusi provided the keynote speech and expressed great enthusiasm with regards to the web portal. He underscored how the data and analysis tools will support the government in tracking progress against the National Financial Inclusion Strategy and make evidence-based decisions.

In all, 80 individuals representing 40 different institutions participated in the launch event. These institutions covered the sector broadly and included the CBN, Commercial Banks, Micro Finance Banks, Mobile Money Operations, Mobile Network Operators, Development Agencies and Enhancing Financial Innovation and Access (EFInA), which supports financial sector deepening in Nigeria.

Use Cases Discussed

- Support to the CBN in validating their existing data and measuring the progress of the spatial expansion of financial access over time. With proximity-based information, financial access variations between population density and administrative levels will become clear.

- Baseline and trend analysis to mark progress towards channel and product targets under the National Financial Inclusion Strategy and against the Maya declaration commitments. The commitments are to reduce the percentage of adult Nigerians that are excluded from financial services from the current 46.3% to 20% by 2020 (demand-side data - EFInA Access to Financial Services in Nigeria 2012 Survey). Furthermore, the data can be used to measure progress relative to other countries.

- Inform digital payment streams of civil service staff to ensure on-time payment and incentivize performance, thereby measuring effectiveness of other government agencies' efforts.

- Help providers make business decisions for expanding their distribution channels, particularly in rural areas.

Invitation to Participate

The FSP interactive web map offers a platform to visualize and analyze accessibility for those working to expand financial inclusion. Fspmaps.com is now open as a public beta and all are encouraged to visit the site, explore the data, do some analysis, and leave feedback on issues and ideas. Beyond simply using the site and its current content, those interested can add their financial service access point data to the database to help others who are working in financial services. Service providers who upload their data will immediately have service area maps, a branch finder service for their customers, and be able to pursue any number of applications for customer targeting and market analysis. There is also a how-to manual available on the web site for institutions who want to build in-house analytical geo-spatial capabilities. The picture of mobile financial services access changes at a rapid speed. For optimized use of the tool, it is important that regulators and financial service providers systematically and frequently capture latitude and longitude coordinates of access points to ensure meaningful analysis.

The long-term vision of Fspmaps.com goes well beyond serving as a MapsTool to the financial inclusion field. It holds great potential to be expanded and linked to improve management information systems of ministerial entities and local governance. Furthermore, the MapsTool can become useful for donors and commercial players including those involved in agriculture, health and financial services, mobile telephone services as well as fast moving consumer good companies. Access barriers are faced by poor people in many ways - in health clinics, disease distribution, vaccine delivery, electricity, warehouses, market squares, agro-dealers and more. Overlaying geo-spatial data-sets to improve information in an easy, transparent, and digestible way across many sectors holds great potential of truly assessing underserved areas. By using the MapsTool, these players can better invest (government, commercial and donor funds) in effectively reaching their desired populations and markets.

While only recently released as a beta version, the interactive web map is already expanding its reach through new partners and is used in ways not previously envisaged. A number of Central Banks are interested in sharing their geo-spatially referenced data through the web portal to increase transparency and enable the industry to access the types of analytical tools and datasets that can help them effectively partner in expanding access to services. Beyond the financial sector, access point data for western Uganda from Fspmaps.com was used by the Red Cross to identify

pathways for distributing money digitally to flood victims. These examples provide great testimony to the value of financial access mapping. And we are just getting started!

How to Provide Feedback

You can provide your input to the priority and sequence of these features, and submit ideas for new data and features through the feedback form on http://*Fspmaps.com*.

Acknowledgements

Many have contributed to conceive and develop the outputs for this project. Several members of the FSP team have made important contributions to this work. Karthik Balasubramanian originated the idea through his vision to change the way industry measures financial access to proximity-based measurement. Mireya Almazan conducted analytical work on implementing the Bill & Melinda Gates Foundation's geospatial investments. Brand Fusion collected access point data in Tanzania, Uganda, Nigeria, Kenya, and Bangladesh. Southampton (Andy Tatem) and Oxford University (Peter Gething) have developed the gridded poverty surfaces. Spatial Development brought it all together into a database, conducted much of the baseline statistical analyses, and developed the web portal.