

# INVESTING TO CONNECT

A framework for assessing the commercial opportunity and social impact of mobile and internet connectivity





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# TABLE OF CONTENTS

Executive Summary .....	5
Acronyms and Abbreviations .....	8
How to Read this Paper .....	10
Section 1: Introduction: State of the Sector .....	11
Background .....	12
Emerging Solutions .....	15
Enterprise Perspective .....	16
Investor Perspective .....	17
Section 2: Value of Connectivity .....	19
Section 3: Key Performance Indicator Framework .....	29
Approach .....	30
Theory of Change .....	31
Section 4: Core Indicators .....	34
Business Indicators .....	35
Sector-specific Impacts of Connectivity .....	38
Agriculture .....	41
Education .....	44
Financial Services .....	47
Government Service Delivery .....	50
Healthcare .....	53
Moving Forward .....	56
Annexure 1: Additional Business Indicators .....	57
Annexure 2: Sector-specific Key Performance Indicators .....	59



# EXECUTIVE SUMMARY

## Context

Mobile and internet connectivity is a key enabler for USAID's partner countries on their journey to self-reliance - it is rapidly transforming service delivery and amplifying the potential of individuals, businesses and economies. But in many places, the benefits have not sufficiently reached low-income and remote communities. While mobile connectivity has reached more than two-thirds of the world's population, there exist significant rifts in access to and use of connectivity-enabled services. Divides in access persist between developed and developing regions, urban and rural areas, age groups, topographies and genders. Analysis shows that unconnected populations consist largely of economically, socially and culturally marginalized groups and rural communities.

Challenges related to availability, affordability, literacy, awareness, relevance and social norms restrict significant populations in low-and middle-income countries from utilizing and leveraging mobile and internet for improved well-being and economic enhancement. The world's four billion lowest-income consumers have an estimated \$308 billion to spend annually on communications, but do not have sufficiently affordable and high-quality services available. To ensure affordability, entry level broadband should cost less than two percent of consumers' monthly incomes per gigabyte (GB) of data consumed.<sup>1</sup> However, costs are often above the ideal two percent because of issues such as insufficient infrastructure, prohibitively high capital expenditure costs<sup>2</sup> and low profitability for mainstream mobile network operators (MNOs) and internet service providers (ISPs).

It is essential to provide connectivity and/or improve its quality and affordability for underserved populations to engender the social, developmental and economic benefits associated with access to connectivity. Closing the access gap requires enterprise-driven approaches that catalyze investment in innovative business models. To this end, a growing number of mobile, ISPs and community networks are extending access to low-income and/or rural and remote populations, prioritizing providing access over enterprise viability, while seeking both. These providers, known as last-mile connectivity (LMC) enterprises, operate by leveraging innovative business models that demonstrate technical and commercial viability at low ARPUs (Average Revenue per User). They represent a range of delivery models, some of which focus on providing access via complementary technologies while others support extending (core) connectivity infrastructure. In pursuit of delivering access, LMC enterprises have established partnerships with MNOs, governments and other service providers to add value to the connected populations.

Despite the promise of eventual commercial viability, potential impact and market to scale, LMC enterprises and investors face a range of challenges in scaling up. Limited access to capital, lack of networks for support, use of sub-optimal metrics to evaluate performance and a lack of knowledge of the LMC sector are key among these challenges.

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<sup>1</sup>A4AI (Alliance for Affordable Internet), [The 2015-16 Affordability Report](#), (2015)

<sup>2</sup>There are, however, emerging exceptions to this rule, wherein new LMC enterprises incur relatively lower capital expenditures due to inclusion of innovative, cheaper infrastructure technologies in their supply value chain. For example, [Open Cellular Project](#), a part of [Telecom Infra Project](#), (TIP)

## Overview of the White Paper

This white paper seeks to articulate the impacts of connectivity and propose a framework of financial, social and economic key performance indicators (KPIs) for the LMC sector, in order to ultimately drive investments in the sector. The purpose of the framework is to illuminate impact pathways that link investments in LMC enterprises to positive development outcomes. The paper builds on the existing literature pertinent to impact measurement in the connectivity sector and lays out a set of business, outcome and impact metrics that can be used by enterprises and investors to tangibly measure and articulate the anticipated commercial value and positive social impacts of connectivity.<sup>3</sup>

The approach to develop this framework involved extensive research, stakeholder interviews and feedback from an expert advisory panel. Publications from a wide range of organizations and journals were reviewed as part of an extensive literature review on the impact of mobile and internet connectivity in the development context. Over 30 stakeholders with expertise in areas such as investment, technology and enterprise models related to LMC provided insights to guide the development of the framework. An advisory panel of experts reviewed a draft of the report to offer early feedback and incorporate suggestions for inclusion.

A comprehensive list of possible business performance indicators for LMC enterprises was determined, reviewed and proposed for inclusion. From this list, eight core business indicators have been identified. These indicators have been proposed on the basis of their potential to enable LMC enterprises to objectively measure performance and engage investors. In addition, a list of outcome indicators has been proposed. These outcome indicators will enable LMC enterprises to articulate the positive social impacts of connectivity. The proposed core business indicators and outcome indicators can be found in Section 4: Core Indicators. Together, these two sets of measures comprise the KPI framework referenced throughout this paper.

Where applicable, the KPI framework provides references to development-aligned products and services that can be delivered more efficiently through connectivity, particularly in the agriculture, education, financial services,<sup>4</sup> government services and health sectors. The impact of connectivity on various sectors is assessed from two perspectives:



### Individual/institution level impact

Impact on individuals (such as farmers, students, teachers, patients) and institutional subscribers (such as enterprises, suppliers, farmer aggregation points/other aggregators, schools, healthcare centers and government intermediaries) in various sectors who benefit from access to information and services over a period of time.



### Sector/ecosystem & community level impact

Impact that accrues over time to the wider community of beneficiaries—the general population, the sector and the economy as a whole in the medium and long terms.

<sup>3</sup>At this stage, the business and impact core indicators, as well as sector specific indicators to follow later in the document, have been proposed and require verification through appropriate field tests

<sup>4</sup>Financial services in this context refers to locally contextualized products and services, which can only be provided with concomitant access to existing well-developed payment systems, sufficient physical infrastructure, appropriate regulations and vigorous consumer protection safeguards

The following figure portrays the multi-sectoral impacts of access to connectivity over time, including medium- and long-term impacts.

Figure 1: Multi-sectoral impact of connectivity<sup>5</sup>



<sup>5</sup>Assumed over a sufficiently long observation period, tentatively 3-6 years

# ACRONYMS & ABBREVIATIONS

<b>2G</b>	Second Generation
<b>3G</b>	Third Generation
<b>AIDS</b>	Acquired Immune Deficiency Syndrome
<b>ARPA</b>	Average Revenue per Account
<b>ARPU</b>	Average Revenue per User
<b>ART</b>	Antiretroviral therapy
<b>B2B</b>	Business to Business
<b>B2G</b>	Business to Government
<b>CHW</b>	Community Healthcare Worker
<b>CVAWG</b>	Combat Violence Against Women and Girls
<b>DPT</b>	Diphtheria, Pertussis and Tetanus
<b>GCI</b>	Global Connectivity Index
<b>GDP</b>	Gross Domestic Product
<b>GNI</b>	Gross National Income
<b>GSM</b>	Global System for Mobile communications
<b>HIV</b>	Human Immunodeficiency Virus
<b>HNIs</b>	High Net-worth Individuals
<b>ICT</b>	Information and Communications Technology
<b>IMR</b>	Infant Mortality Rate
<b>INR</b>	Indian Rupee
<b>ISP</b>	Internet Service Provider
<b>ITU</b>	International Telecommunication Union
<b>KPI</b>	Key Performance Indicator
<b>KYC</b>	Know Your Customer
<b>LDC</b>	Least Developed Countries
<b>LMC</b>	Last-Mile Connectivity
<b>LTE</b>	Long-Term Evolution
<b>M&amp;E</b>	Monitoring and Evaluation
<b>MIS</b>	Management Information System



<b>MMR</b>	Maternal mortality ratio
<b>MNO</b>	Mobile network operator
<b>PAN</b>	Permanent Account Number
<b>PMMY</b>	Pradhan Mantri MUDRA Yojana
<b>QoQ</b>	Quarter on Quarter
<b>SDG</b>	Sustainable Development Goals
<b>SIM</b>	Subscriber Identification Module
<b>SMS</b>	Short Message Service
<b>TVWS</b>	TV White Space
<b>UID</b>	Unique Identification Number
<b>UNAIDS</b>	United Nations Programme on HIV and AIDS
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>USD</b>	United States Dollar
<b>YoY</b>	Year on Year



# HOW TO READ THIS PAPER

The intention of this paper is to articulate the commercial opportunity and potential social impact of mobile and internet connectivity for rural and/or marginalized populations and to develop and propose a common framework for understanding the pathways to impact. It has been written with LMC enterprises, current investors and potential investors and partners in mind. By developing a common framework and proposing metrics, this paper aims to drive investment in the sector by investors, including mainstream investors, impact investors, patient capital providers and Development Finance Institutions.

The paper first introduces the reader to the state of the connectivity sector in last-mile service provision in Section 1, offering viewpoints from both enterprises and investors and then touches upon the social impacts of connectivity in identified sectors in Section 2. The latter portion of the paper, Sections 3 and 4, proposes a KPI framework for understanding and measuring business outputs and then proposes indicators on the potential social impact of connectivity for each of five sectors: agriculture, education, financial services, governance and healthcare. The paper includes annexures which provide definitions and guidance for using the indicators.

It is hoped that this paper can help industry stakeholders to:

**1. Understand the socio-economic impacts of voice and internet connectivity:**

This paper shall provide organizations including manufacturers, distributors, investors, multilateral programs and industry groups a summary assessment of the potential impact of voice and internet connectivity.

**2. Critically evaluate the proposed indicators:**

There are a range of development outcomes that may be specific to a region, type of service or company. Users are encouraged to adopt, assess and critically review the indicators and comment on their suitability. This shall enable creation of a robust framework for assessment.

Section I

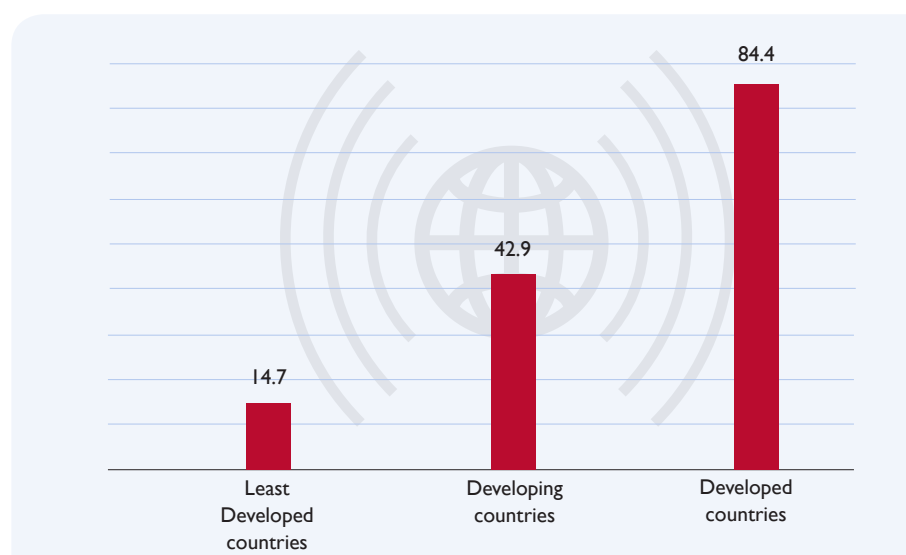
# INTRODUCTION: STATE OF THE SECTOR



## Background

Mobile and internet connectivity is a key enabler for USAID's partner countries on their journey to self-reliance - it is rapidly transforming service delivery and amplifying the potential of individuals, businesses and economies. But in many places, the benefits have not sufficiently reached low-income and remote communities. Mobile connectivity reached more than five billion people (66 percent of the current world population) globally by the end of 2017<sup>6</sup>, and there will be an estimated 5.9 billion unique mobile subscribers, equivalent to 71 percent of the estimated global population, by 2025. Countries in Southeast Asia, Latin America and sub-Saharan Africa, particularly India, China, Pakistan, Indonesia and Bangladesh, drive much of this growth.<sup>7</sup> While internet access is available to over 69 percent of the world (via 3G coverage) as of 2015<sup>8</sup>, significant populations within low- and middle- income countries remain unconnected.

**Figure 2: Global internet connectivity coverage for households by economic status of regions, 2017 (in percentage)<sup>9</sup>**



Historical analyses show that access to connectivity exhibits persistent divides: between developed and developing regions, urban and rural areas, age groups, topographies and genders. While the global average suggests that less than half the world is online, this varies greatly across regions: only 25 percent of people in sub-Saharan Africa and 42 percent in Asia and the Pacific and the Arab states are online, in contrast with two-thirds of people in North and South America.

The unconnected population consists largely of the urban poor, socially and culturally marginalized groups and rural communities. Analysis further finds that the offline population is disproportionately female, rural, poor, illiterate and elderly.<sup>10</sup> The reasons behind these digital divides are manifold and complex. A recent review of principle barriers to mobile and internet access and use identified four main categories of issues: lack of infrastructure, low incomes and affordability, low user capabilities (digital literacy and basic literacy) and lack of incentives, such as unsuitable content and low social acceptance.<sup>11</sup>

<sup>6</sup>GSMA Intelligence, *The Mobile Economy 2018*, (UK, 2018)

<sup>7</sup>Ibid

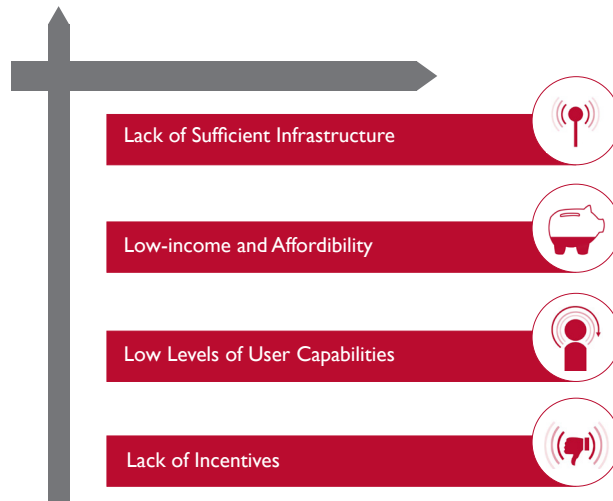
<sup>8</sup>UN ITU, *ICT Facts & Figures 2015*, (2015)

<sup>9</sup>UN ITU, *ICT Facts & Figures 2016*, (2016)

<sup>10</sup>World Bank, *World Development Report Digital Dividends*, (WBG, 2016)

<sup>11</sup>SSG Advisors, *Connecting the Next Four Billion: Strengthening the Global Response for Universal Internet Access*, (2017)

**Figure 3: Key barriers to access**



### Lack of Sufficient Infrastructure

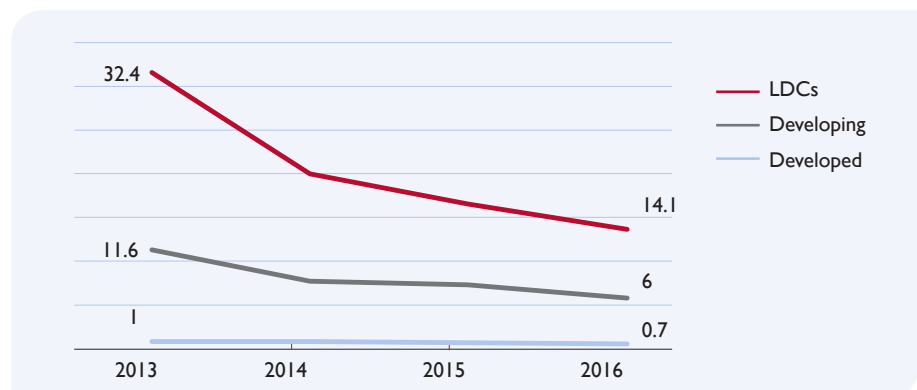
A significant part of the problem is the need for and lack of access to, suitable infrastructure for mobile and internet service. The majority of uncovered and under-covered populations live in remote, rural areas, with low population densities, low per capita incomes and low-to-no levels of enabling infrastructure, such as access to electricity and roads. As a result, capital expenditure costs to extend connectivity have traditionally been comparatively high and revenues comparatively low.<sup>12</sup> These factors limit service provision by mainstream mobile providers and ISPs in these areas.

### Low Incomes and Affordability

High poverty penalties exist for internet access in developing and emerging countries for both fixed and mobile broadband connections. Many ISPs and MNOs currently only offer data and voice packages that are prohibitively expensive for low-income consumers, who should pay less than two percent of monthly income for every GB of data consumed. For example, low-income consumers in South Africa spend up to US\$1-2 for 25 MB to 30 MB of data;<sup>13</sup> such high costs result in limited data consumption by these consumers.<sup>14</sup>

Prices are falling but not sufficiently to make mobile and internet accessible for all in developing countries. While the steepest decreases in mobile broadband prices occurred in the least developed countries (LDCs), costs as a percentage of gross national income (GNI) per capita as of 2016 continued to be the highest for the LDCs.

**Figure 4: Mobile Broadband prices per GB consumed, as a percentage of GNI per capita, 2016<sup>15</sup>**



<sup>12</sup>GSMA, [Connected Society: Unlocking Rural Coverage](#), (2017)

<sup>13</sup>Primary interview insights from: [TooMuchWifi](#), (South Africa)

<sup>14,15</sup>Ibid

## Low Levels of User Capabilities

Lack of basic literacy and digital skills is a significant barrier to using mobile devices and accessing the internet. A recent survey in Africa<sup>16</sup> identified lack of knowledge of how to use the internet as the most significant barrier in usage. The digital literacy gap renders low-income populations unable to conduct basic operations on smartphones or desktops, such as switching on the internet connection, using a mouse or navigating icons.

## Lack of Incentives

A number of social, cultural and gender-based issues hinder adoption for target populations within range of geographies with internet accessibility. Of the 4 billion people not using the internet, 2.5 billion live within range of a 3G network; it can be inferred that uptake is hindered at least in part by lack of informed incentive. These include a lack of awareness, dearth of relevant local content and low social/cultural acceptance.<sup>17</sup> Online content is also available in limited languages, with approximately 80 percent of content available in only ten languages, which represent the first language for only about three billion of the world's population.

Significant digital divides exist for women and marginalized groups, impeding their ability to access the internet and leverage its potential benefits. The gender gap in low and middle-income markets is significant, with women 26 percent less likely than men to use mobile internet. Yet closing this gap, as well as the gender gap in mobile ownership, could generate up to \$15 billion over the coming year alone for providers.<sup>18</sup>

Divides in access exist across age groups as well. Internet adoption is spearheaded by youth across all regions, although access levels vary by region: nine out of ten young individuals not using the internet live in Africa or Asia and the Pacific.<sup>19</sup> About 67 percent of youth<sup>20</sup> use the internet in developing countries and only 30 percent in LDCs in comparison to 94 percent in developed countries.

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<sup>16</sup>GSMA, [Connected Society: Consumer Barriers to mobile internet adoption in Africa](#), (UK,2016)

<sup>17</sup>World Bank, [World Development Report 2016: Digital Dividends](#), (WBG, 2016)

<sup>18</sup>GSMA, [The Mobile Gender Gap Report, 2018](#), (2018)

<sup>19</sup>94 percent of young people in developed countries use internet

<sup>20</sup>Categorized as the population between ages 15 and 24

## Emerging Solutions

This paper focuses on emerging solutions to address several of these barriers and the potential commercial and social impact of these solutions. A growing number of last-mile mobile and internet connectivity enterprises, ISPs and community networks are extending access to low-income urban, remote and rural populations that to date have not been the focus of the majority of MNOs. Such LMC enterprises are employing innovative business models that demonstrate technical and commercial viability at low ARPUs. The following section provides a brief overview of the various types of LMC enterprises and the challenges these enterprises face in scaling operations as well as those faced by investors in the space.

### *What is a Last-Mile Connectivity Enterprise?*

A Last-Mile Connectivity (LMC) enterprise is an entity which enables voice or data connectivity to the last-mile. In this context, last-mile is defined as geographies in developing countries with limited, low-quality and/or high-cost access to voice and data connectivity.




LMCs enterprises are those that work on:

1. Setting up or extending (including leveraging/re-purposing existing) infrastructure where it may be unavailable, for example, through TVWS, micro waves, mobile networks, etc.
2. Improving efficiency in operations to lower costs, thereby making connectivity affordable for low-income populations. Enhancing relevance of connectivity services for local populations to improve levels of engagement and use for diverse purposes.
3. Enhancing relevance of connectivity services for local populations to improve levels of engagement and use for diverse purposes.

## Enterprise Perspective

LMC enterprises can be classified according to the technology they use, the backhaul they leverage and the type of services they provide. Table 1 provides a classification system for LMCs, the challenges they address and how they do so, with accompanying examples.<sup>21</sup>

**Table 1: Last-Mile Connectivity Enterprise Classifications**

Challenge Addressed	Description of business models	Access Network	Technologies Deployed	Enterprise Examples
 <p>Lack of network coverage: Extending Infrastructure</p>	These models seek to deploy infrastructure that will extend more cost-effective access to underserved populations.	Wi-Fi / TVWS / Licensed Mobile Network / GSM	Fiber, satellite, TVWS, microwave depending on availability, cost and regulatory constraints	Mawingu, AirJaldi, Vanu, Zenzeleni Network
 <p>Lack of affordability where connectivity exists: Complementary Technologies</p>	These models use new Technologies - or repurpose existing technology in new forms - to provide an alternative, or complement, to mobile access.	Wi-Fi / Ethernet	Fiber, satellite, TVWS, microwave depending on availability, cost and regulatory constraints	poa! internet, Project Isizwe, Roke Telecom
 <p>Lack of incentives and relevance where connectivity exists: Improving Value</p>	These models use new technologies - or repurpose existing technology in new forms -to provide an alternative, or complement, to mobile access.	Licensed mobile networks	Mobile Network	Gigato

### Key Challenges Faced in Scaling LMC Enterprises

In seeking to scale their solutions and attract new investment, LMC enterprises face several key challenges, detailed below.<sup>22</sup>

#### Low levels of access to finance

While there are multiple LMC enterprises operating at a pilot level, lack of commercial capital limits LMC enterprises from scaling their operations. Financing needs for LMC enterprises are different from those of the typical, larger ISPs and MNOs. LMCs typically require funding in smaller tranches and have longer breakeven periods. Investors' lack of awareness of LMC business model types limits the provision of such customized funding options, including impact investors, who may view the LMC business model as unproven and high-risk. Small ticket sizes also lead to higher transaction costs for investors.

<sup>21</sup>Digital Access in Africa, Caribou Digital, UKAid

<sup>22</sup>In primary interviews, discussants also cited challenges not directly addressed in this white paper, including low levels of regulatory and policy patronage; disproportionately high costs of skilling ground staff and on-boarding experienced personnel; and lack of infrastructure and suitable hardware.





### Limited networks for business support and low LMC investment awareness

LMCs' technical nature demands a high standard of credibility within the industry to gain initial traction. At the same time, they require expansive on-ground reach to penetrate low-income markets. The former is needed to establish critical partnerships in support of backhaul and financing while the latter is crucial for achieving scale. LMC enterprises often struggle to find the right mix of human resources to be able to effectively tackle these varying business requirements. Additionally, LMC enterprises lack active networks of investors, industry stakeholders, advocates and advisors.



### Literacy levels

Generic, numerical and digital literacy are major barriers when first-time users of connectivity interact with pre-existing, out-of-context (non-local language) content. In remote, rural areas, there are many who cannot read or write even in their indigenous language, driving a need for internet connectivity that leverages audio and video content to bridge communication challenges.<sup>23</sup>

## Investor Perspective

### The Opportunity Offered by LMC Enterprises

To be affordable to target audiences, telecom devices and services should cost less than two percent of consumers' monthly incomes.<sup>24</sup> While device costs have been going down through low-cost feature phones and smartphones, service fees<sup>25</sup> drive costs higher than the appropriate two percent.<sup>26</sup> Irrespective, it is estimated that the world's four billion lowest-income consumers have \$308 billion to spend annually on communications.

**Table 2: Global per capita communication spend by income levels<sup>27</sup>**

Billions of people	Average annual income	Affordable monthly communications spend	Total attainable market (billions)
1st Billion	\$29,206	\$205	\$2,460
2st Billion	\$12,722	\$53	\$636
3st Billion	\$5,540	\$23	\$276
4st Billion	\$2,987	\$12	\$144
5st Billion	\$1,771	\$7	\$84
6st Billion	\$1,065	\$4.40	\$53
7st Billion	\$540	\$2.25	\$27

Source: Data: ITU and UN Data; Analysis: Richard Thanki, University of Southampton

Despite the cost burden, many low-income populations, this represents a large market for LMC enterprises and investors to address. Low-income populations are already customers of voice and data connectivity because of the multifold benefits. Scaled and extensive usage can be encouraged by building on the existing advantages of connectivity. Pilots from some LMC enterprises show promising results. These LMC enterprises have incorporated different models such as partnerships with MNOs, governments and other service providers to deliver services and add value to the

<sup>23</sup>For example, Spoken Tutorials by IIT Bombay

<sup>24</sup>ITU & UNESCO, The Broadband Commission, [State of Broadband 2015](#), (Geneva, 2015)  
World Economic Forum & Boston Consulting Group, [Internet for All: A Framework for Accelerating Internet Access and Adoption](#), (Geneva, WEF, 2016)

<sup>25</sup>For example, a data package for a mobile phone, a monthly Wi-Fi subscription or access to a fixed line

<sup>26</sup>Alliance for Affordable Internet, [UN Broadband Commission Adopts A4AI "1 for 2" Affordability Target](#), (2018)

<sup>27</sup>Schmid, Williams & Lovegrove, [Business Models for the Last Billion](#), (USAID, 2016)

connected population. LMC enterprises often seek anchor clients that provide sustained business and a steady source of revenue – typically from B2B and B2G anchor clients; however, establishing long-term B2B or B2G arrangements may not always be achievable for LMC enterprises. Some of the more innovative and successful LMC enterprises have been backed by prominent tech-incubators, HNIs and foundations. They are able to reduce costs for end-users by up to 50 percent while still maintaining margins at the site level.<sup>28</sup>

## Key Challenges Faced by Investors

Despite early promise, there are several perceived challenge limiting greater investment in LMC enterprise, as detailed below.<sup>29</sup>

### Mismatch in existing metrics

Many investors are unaware of the appropriate metrics for assessing the scalability and profitability of LMC enterprises. For instance, investors often view LMC enterprises as telecom companies and apply traditional metrics such as ARPU. However, given that LMC enterprise business models are often designed to be profitable in the long run at a site level, rather than a user level, there is a mismatch between indicators from the investor and enterprise sides.

### Lack of pipeline

Because of low awareness, investors, DFIs and patient financiers can struggle to source a pipeline of credible enterprises in which to invest. To evaluate LMC investment opportunities, investors are required to make high outlays of time and money, more so for first time LMC investors.

### High costs of due diligence and monitoring

The problem of sourcing a credible pipeline of LMCs is compounded by a vacuum in customized business and social impact monitoring services for LMC enterprises—even those that have managed to attract tranches of investment. In addition, there is a lack of monitoring and evaluation (M&E) frameworks and accompanying diagnostic tools, to astutely assess the levels of success/failure of LMCs in delivering products and services. These factors lead directly to high costs of due diligence and M&E, both for investors and LMCs.

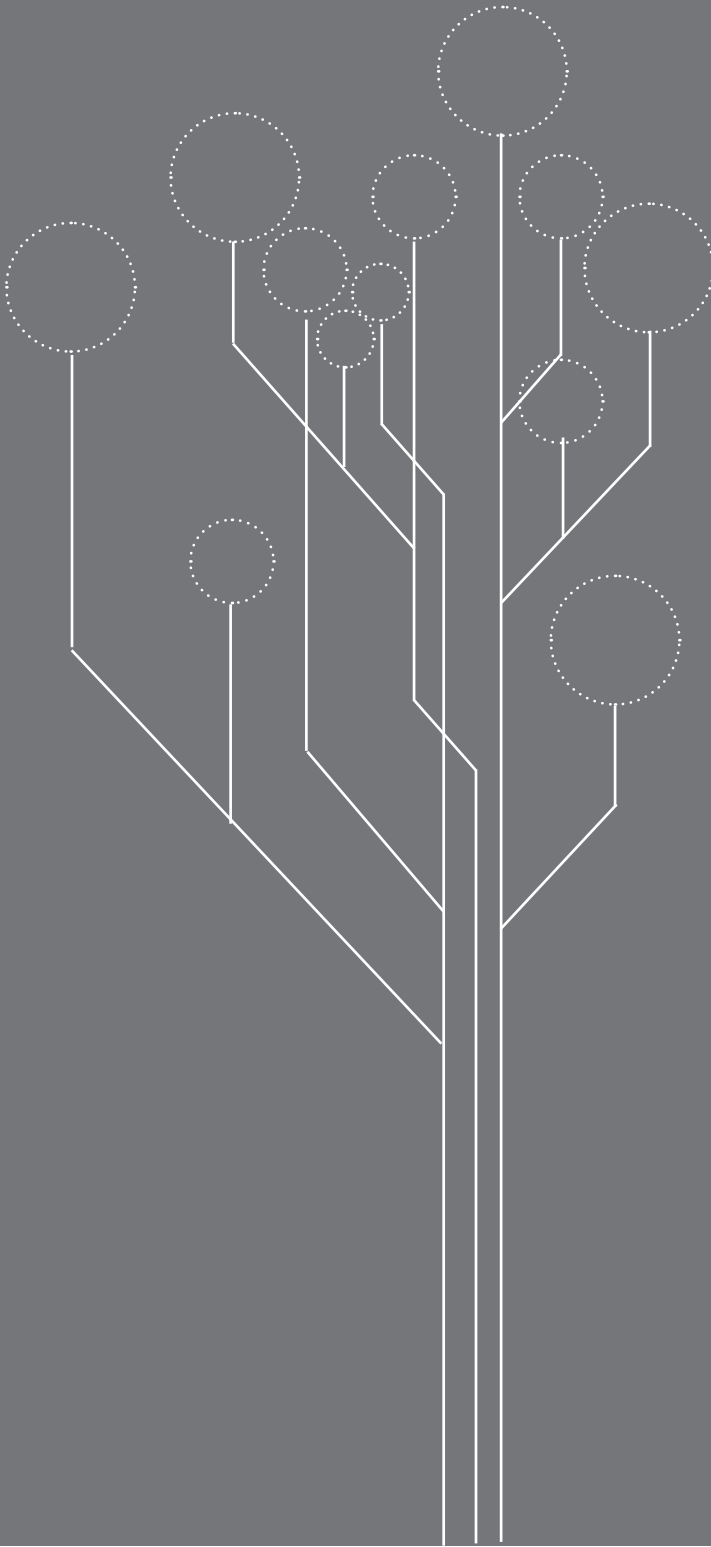
Despite many of these challenges, investors are learning quickly and LMC enterprises are gaining increasing amounts of attention and access to private capital. A recent landscape of investors in LMC estimated that there are over 100 investors that consider LMC enterprises as potential investees and, based on publicly available information only, over 50 have already made investments.<sup>30</sup>

<sup>28</sup>Primary interview insights

<sup>29</sup>In primary interviews, discussants also cited challenges not directly addresses in this white paper, including the fragmented nature of the field and small scale of transaction sizes, perceived lack of exit options and long pay-back periods, lack of infrastructure and services and uncertain competitive landscapes while high-profile efforts, such as Free Basics and Project Loon are underway.

<sup>30</sup>See for example, the web resource [Last-Mile Digital Connectivity Initiative: Investor Landscape](#), (USAID, 2018)

# VALUE OF CONNECTIVITY



Connectivity has the power to enable economic growth and facilitate social development. Evidence suggests that increased digital competitiveness can lead to increases in GDP, more so for emerging economies.<sup>31</sup> Evidence from various studies also shows that connectivity can have a positive impact on employment and earnings.<sup>32</sup> It is estimated that equalizing internet access between developing and developed countries could lead to 140 million new jobs and create up to US\$2.2 trillion in GDP.<sup>33</sup> In the last two decades, connectivity is increasingly being used to facilitate social development. For instance, a 2014 study observed a positive correlation between the use of mobile money and nutrition in Niger: households receiving mobile money transfers exhibited increases of 10-16% in household diet diversity, and an increase in number of meals among children.<sup>34</sup>

A review of existing literature shows that connectivity can be leveraged to help achieve the Sustainable Development Goals (SDGs). Specifically, improvements and innovative applications of mobile connectivity alone can create significant impact and drive progress towards SDGs 1: No Poverty, 3: Good Health and Well-being, 5: Gender Equality, 9: Industry, Innovation and Infrastructure and 13: Climate Action.<sup>35</sup>

While the potential of improved connectivity to enable economic and social impact is well understood, there is a need to recognize the various channels through which connectivity creates impact across sectors. More importantly, to legitimize and increase investments, there is a need to effectively measure and attribute this multi-sectoral impact through well-defined causal relationships. It is important to note that connectivity is an enabler and a catalyzer across sectors, which nevertheless requires other enabling infrastructure. For example, for connectivity to be of value to small-holder, low-income farmers, they must first have access to physical implements and items like seeds, mechanization and tools for value addition and funding for the same. These features of enabling infrastructure are a pre-requisite before small-holder farmers can match with domestic customers, certifiers and agents through connectivity.

There is an existing body of guidance frameworks available connecting social impact and commercial value measurement in several sectors and corresponding impact investments in sectors such as education, improved agricultural productivity and access to healthcare. However, there is a lack of frameworks connecting social impact and commercial value for mobile and internet connectivity. This impact can be delivered through expedited access to products and services across core sectors such as agriculture, education, financial services, government service delivery and health. Improved connectivity within these sectors can lead to increases in productivity and efficiencies in the economy.

<sup>31</sup>Stewart Baines, "[Is there a link between connectivity and GDP?](#)" (2014)

<sup>32</sup>World Bank, [World Development Report 2016: Digital Dividends](#), (WBG, 2016)

<sup>33</sup>UNDP, [Human Development Report 2016, Human Development for Everyone](#), (2016)

<sup>34</sup>Aker, Boumnijel, McClelland, and Tierney, [Payment Mechanisms and Anti-Poverty Programs: Evidence from a Mobile Money Cash Transfer Experiment in Niger](#), (Tufts University, 2014)

<sup>35</sup>GSMA, [2017 Mobile Industry Impact Report: Sustainable Development Goals](#), (2017)

Figure 5: Sectors impacted by connectivity



The following section briefly highlights several key development sectors that can be impacted by improvements in mobile and internet connectivity.

## Agriculture

Agriculture is location-specific and farmers need accurate local weather forecasts, advice on agricultural practices and input use, and real-time information about prices and market logistics. Access to connectivity is critical to help farmers obtain the information they need to promote transformative agricultural development. Connectivity also allows farmers to collaborate and strengthen the local agro-economic ecosystem by sharing information. It enables farmers to increase revenues by providing access to pricing information and markets.<sup>36</sup>

Evidence from mAgriculture programs in a number of developing countries demonstrate that improved mobile and internet connectivity can improve farmer livelihoods. Results from a study in Niger that evaluated the impact of mobile phone coverage on agricultural markets and pricing show that the introduction of mobile phones is associated with a 10 to 16 percent reduction in dispersion in prices across markets, with a larger impact on markets with higher transport costs. The study also provides evidence that mobile phones have a stronger equalizing effect on dispersion in prices once the mobile phone coverage has crossed a critical mass.<sup>37</sup> In Zimbabwe, a research study explored the impact of mobile phones on small scale farmers. Results from the

<sup>36</sup>World Bank, [Mobile Technologies aiding poor farmers](#), (WBG, March 2012)

<sup>37</sup>Jenny C. Aker, [Information from markets near and far: Mobile phones and agricultural markets in Niger](#), (American Economic Journal: Applied Economics 2, no. 3 (2010): 46-590)

study show that 57.5 percent of farmers who owned mobile phones used mobiles for agriculture related activities such as acquiring production and market information, planning meetings and financial transactions. Evidence from the study also shows that the adoption of mobile phone use for farming purposes was influenced by age, commercial farming activities and total income.<sup>38</sup> A survey of 1,200 farmers was conducted in India to examine the role of mobile phones in reducing information search costs and asymmetries and increasing market efficiencies. Results from the survey show that farmers experienced an increase in yield due to improved access to agriculture related information on their mobile phones. Furthermore, it has helped farmers increase farm earnings through access to markets and higher price realization.<sup>39</sup>

## Impact Across the Value Chain

Evidence for the impact of connectivity on enhanced agricultural productivity can be classified by benefits accrued at several points in the agriculture value chain. Examples from the agriculture sector include:

### Planning

- The International Centre for Tropical Agriculture ([CIAT](#)) in Colombia leveraged Big Data to help farmers plan when and what to plant, saving US\$3,000 by avoiding losses.
- Evidence from the fishing community in India shows that fishermen can use mobile phones not only to track weather conditions but also to compare wholesale prices. Results show that mobile phone use led to an eight percent increase in profits for fishermen, along with a four percent drop in prices for consumers.<sup>40</sup>
- The Clinton Health Access Initiative ([CHAI](#)) made weather-related information available in rural Uganda, leading to a 40 to 65 percent reduction in crop losses.
- The Satellite Assisted Pastoral Resource Management ([SAPARM](#)) Initiative in Ethiopia leveraged a year-long pilot observing pastoral resource management, leading to a 50 percent reduction in herd deaths.

### Inputs

- [myAgro](#), an application developed for farmers, helped 18,000 farmers in Mali and Senegal save for seeds and fertilizers through custom-made agricultural financial access products, leading to yield increases of 50 to 100 percent—an annual increment of about US\$150 in income.
- Yelp for Cows combines crowdsourcing and artificial insemination to improve public service delivery in Punjab, Pakistan. A randomized control trial found that farmers leveraging Yelp for Cows had 26 percent higher artificial insemination rates than the control group.

### On-farm Productivity

- [Digital Green](#) is a low-cost video service deployed in India and Ethiopia, which helps improve cost effectiveness and promotes adoption of new technologies for farmers who use it. The service also addresses language and context barriers for illiterate farmers.
- Kenya Livestock Insurance Program ([KLIP](#)), an initiative by the government of Kenya and Swiss Re, provided livestock insurance to over 5,000 households by applying satellite-based index insurance. The program led to a 36 percent reduction in the probability of farmers relying on distress sales of livestock and a 25 percent reduction in the probability of farmers reducing household meals.

### Post-Harvest

- One Acre Fund's loans and farmer training systems to improve storage and maximize profits from sales have led to significant increases in farm profits for small-holders in sub-Saharan Africa.
- Naatal Mbay is a farmer-owned cloud platform that collates databases of pertinent information. It has resulted in better prices for quality fertilizer, improved agricultural practices, information dissemination and a 25 percent increase in maize yields for small-holder.

<sup>38</sup>B. Masuka, et al., [Mobile phone use by small-scale farmers: a potential to transform production and marketing in Zimbabwe](#), (South African Journal of Agricultural Extension 44, no. 2 (2016): 121-135)

<sup>39</sup>Surabhi Mittal et al., [How mobile phones contribute to growth of small farmers? Evidence from India](#) (Quarterly Journal of International Agriculture 51, no. 3 (2012): 227)

<sup>40</sup>Deloitte, [Value of connectivity Economic and social benefits of expanding internet access](#), (February 2014)



## Education

Connectivity facilitates access to additional learning resources for both students and teachers. For students, tangible improvements have been recorded via the WorLD program in technical learning, communication, reasoning, analytical skills and academic knowledge. The same program's modules have been used to train 1.3 million teachers and have aided continuous professional development, thereby furthering teachers' quality of instruction in classrooms as well as their technical and pedagogical development.<sup>41</sup> Research evidence collected by InfoDev further shows that specific applications<sup>42</sup> of information and communications technology (ICT) help boost student knowledge, attitudes and skills—for both genders, as well as those with special needs—and changes in teaching practices, school innovation and community services conducted by schools.<sup>43</sup> Such improvements in learning contribute to preparation of better-skilled labor. Evidence such as this has led to mobile technology being leveraged to deliver education content in many low-resource communities.

The SMS Story project in rural Papua New Guinea<sup>44</sup> and Rajasthan<sup>45</sup> in India is one example of an innovative approach to using a “new” technology in ways that meet local needs. In Papua New Guinea, where reading proficiencies in elementary and primary schools are low, the SMS Story used 2G to deliver daily mobile phone text message stories and lesson plans to teachers. This simple strategy to promote literacy through connectivity achieved statistically significant results, indicating that the treatment group (measured against the control group) performed better on four out of five reading skills tests, while teachers in the treatment group were much more likely to have identified and implemented best teaching practices. For teachers, the benefits accrued due to access to learning resources and contributed directly to their skills, quality of communication and employability. A study conducted in three school districts in the state of Virginia in the United States found that providing teachers with online access to lessons correlated with increases in student math achievement.<sup>46</sup>



## Financial Services

Digital technologies enabled by connectivity could help to facilitate financial inclusion for close to two billion individuals<sup>47</sup> who do not have access to formal financial services. Connectivity can facilitate financial inclusion by providing under-served individuals with access to financial services and tools such as mobile money and digital wallets. In several development contexts, digital financial services can often bridge the access gap faster than traditional providers of formal financial services. A study conducted on the impact of access to mobile money in Kenya found that access increased per capita consumption levels for households, lifting 194,000 households—or close to two percent of Kenyan households—out of poverty.<sup>48</sup> In China, digital payments enabled by e-commerce and social networks are helping millions in the low-income category

<sup>41</sup>Deepti Bhatnagar et al., [World Links for Development Program \(WorLD\): Empowerment case studies](#), (World Bank, 2003)

<sup>42</sup>Specific applications refer to introducing technology with “national policies and programs related to changes in curriculum, pedagogy, assessment, and teacher training, instead of simply putting computers in school”

<sup>43</sup>Robert Kozma, [Monitoring and Evaluation of ICT for Education Impact: A Review](#), (Infodev)

<sup>44</sup>Kaleebu N., et al., [SMS Story: A Case Study of a Controlled Trial in Papua New Guinea](#), (Singapore, Springer, 2017),

Murphy A., Farley H., Dyson L., Jones H. (eds), [Education in the Asia-Pacific Region: Issues, Concerns and Prospects, vol 40](#), (Singapore, Springer, 2017)

<sup>45</sup>VSO International, [SMS Story Project: Bundi, Rajasthan](#), (2015)

<sup>46</sup>Maya, Escueta et al, [Education technology: an evidence-based review. No. w23744](#), (Massachusetts, National Bureau of Economic Research, 2017)

<sup>47</sup>World Bank, [The Global Findex Database 2017](#), (WBG, 2017)

<sup>48</sup>Tavneet Suri & William Jack, [The long-run poverty and gender impacts of mobile money](#), (December, 2016)

invest, save and build credit scores: as of September 2016, the Chinese Alipay platform had successfully provided US\$107.3 billion in finance to 4.11 million small and micro-enterprises and entrepreneurs.<sup>49</sup>

Globally, 19 markets in developing countries have a higher number of mobile money accounts than bank accounts, while 37 markets have 10 times more registered agents than branches.<sup>50</sup> There are several potential benefits of extending access to digital/mobile financial services. For low-income customers, these include access to various services (banking, payments and benefits), lower risk of theft and lower costs (due to reductions in travel and time costs). For providers, there can be a significant reduction in the cost of providing services. One study shows that for financial service providers, such as banks, the cost of providing services digitally is 80 to 90 percent lower than providing services through physical branches. With automation virtually eliminating costs of providing a full suite of credit, savings and insurance products, it is possible to serve a broader range of customers instead of focusing on high value segments only.<sup>51</sup> The potential avenues for reducing vulnerability through financial inclusion are manifold: for example research from Bolivia, Peru and the Philippines found that sending SMS 'nudges' to households increased savings made by households.<sup>52</sup>

## Government Service Delivery

Connectivity has a critical role to play in government service delivery and can lead to improved efficiencies in benefit payment programs<sup>53</sup>, subsidy distributions and citizen registration processes.<sup>54</sup> Connectivity has enabled government agencies to significantly increase efficiency and reduce transaction costs for citizens across the developed world. As a result, government agencies in developing countries are progressively using mobile and internet to deliver services to citizens, bypassing institutional and bureaucratic constraints and reducing leakage of benefits. By leveraging connectivity, governments can evolve service delivery and engage with citizens. Figure 5 provides a brief overview of the stages of connected government and the implications of each for citizens.

<sup>49</sup>Zennon Kapron & Michelle Meertens, [Social Networks, e-Commerce Platforms, and the Growth of Digital Payment Ecosystems in China: What It Means for Other Countries](#), (Better than Cash Alliance April, 2017)

<sup>50</sup>Ericsson, [Mobile Financial Services: Insights from around the World](#), (2016)

<sup>51</sup>McKinsey & Company, [Digital Finance for All](#), (2016)

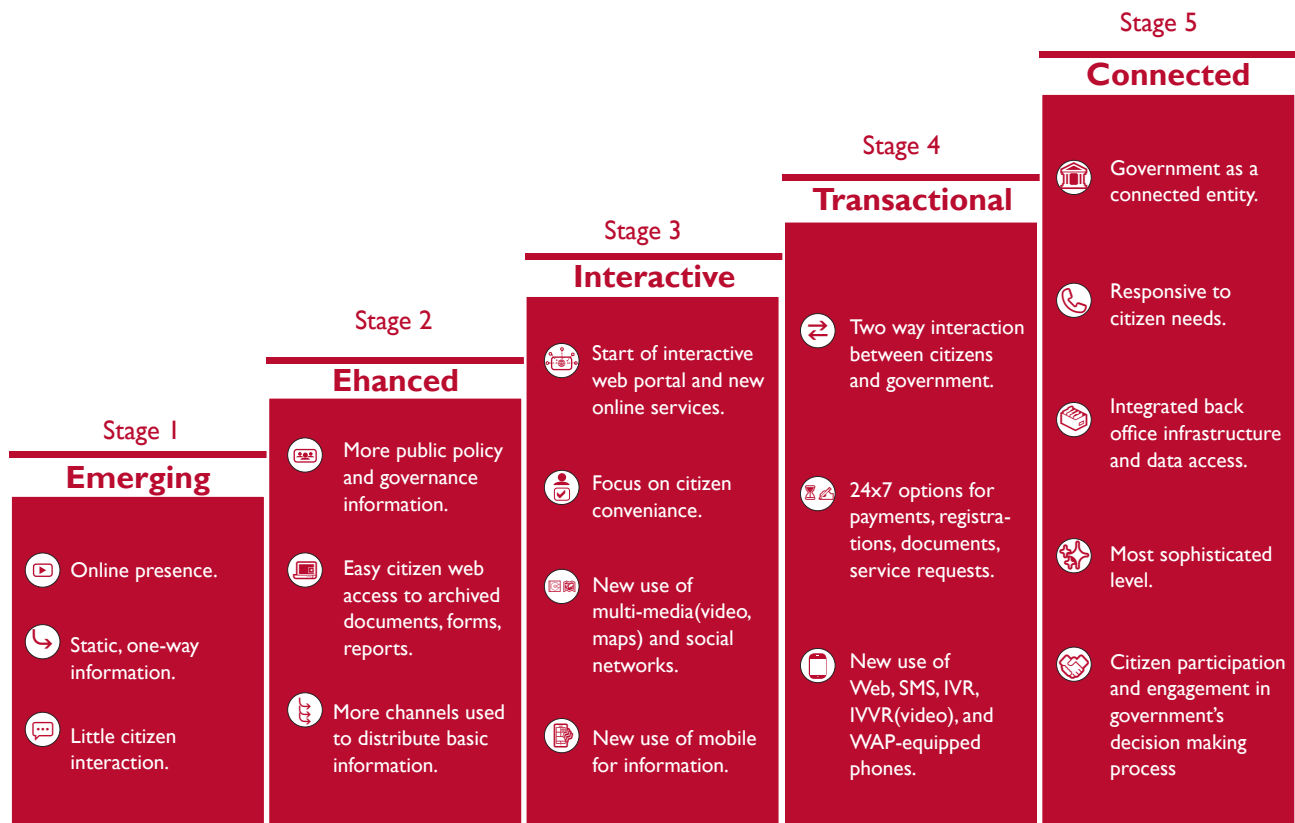
<sup>52</sup>Dean Karlan et al., [Getting to the Top of Mind: How Reminders Increase Saving](#), (National Bureau of Economic Research, 2010)

<sup>53</sup>World Bank et al, [The Opportunities of Digitizing Payments](#), (WBG, 2014)

<sup>54</sup>Joshua Masinde, [Tanzania is ramping up its mobile phone birth certificates to end invisible babies](#), (Quartz Africa)



Figure 6: Stages of Connected Government



DESA (2010), E-Government Survey 2010, United Nations, New York <sup>55</sup>

In the context of service delivery in developing countries, connectivity enables government agencies to overcome infrastructure-related challenges and deliver services and benefits to hitherto excluded communities. For example, in Tanzania, the government has successfully transitioned into Stage 3 of Connected Government, as defined by UN DESA and is using mobile phones to register and issue birth certificates. Mobile registration of births facilitates formal identification for millions of babies who previously might have remained invisible. For children in rural and remote communities of Tanzania, birth certificate documentation increases the possibility of children gaining access to formal education, financial inclusion, and healthcare.<sup>56</sup> Within four weeks of the launch, this decentralized birth registration system helped to register more than 220,000 Tanzanian children under the age of five.<sup>57</sup>

Such transactional benefits are being increasingly leveraged in other developing country contexts as well. Improvements in connectivity have enabled government agencies in India to digitize targeted direct benefit transfers such as subsidies for kerosene and cooking gas. Evidence shows that digitizing direct benefits transfer in India has helped identify over 33 million duplicate/fake/inactive beneficiaries.<sup>58</sup>

<sup>55</sup>ITU, *Benefits and Outcomes of m-Government*, (2011)

<sup>56</sup>Joshua Masinde, *Tanzania is ramping up its mobile phone birth certificates to end invisible babies*, (Quartz Africa)

<sup>57</sup>UNICEF Innovation, *Advancing The Birth Registration System in Tanzania: Providing Under-Five Children their right to protection*, (29th December 2016)

<sup>58</sup>DBT Mission Cabinet Mission Secretariat, *The Direct Benefit Transfer*, (India)

## Health

Mobile and internet connectivity has the potential to expand health services in developing countries, increase health system efficiency and lead to better patient outcomes through enabling digital-health interventions. Digital health encompasses the full range of uses of ICTs—from traditional administrative reporting systems to broader Health Management Information Systems, telemedicine, electronic medical records, clinical decision support and patient portals some of which are internet and mobile based applications.<sup>59</sup> Evidence from numerous studies and systematic reviews shows that connectivity-enabled health applications such as text reminders have the potential to improve patient awareness and knowledge in low-resource settings, eventually impacting health outcomes.<sup>60</sup> Mobile and internet connectivity can impact health outcomes through several avenues. In many contexts, connectivity-enabled tools are being used to improve maternal, newborn and child health. In Zanzibar, a mobile phone intervention that focused on improving knowledge and awareness among pregnant women was associated with a reduction in perinatal mortality in 1,311 pregnant women who received the intervention (compared against 1,239 pregnant women in the control group). There is also moderate evidence indicating that text-based messages improve health checkup reminder follow-throughs.<sup>61</sup>

Another important way in which mobile and internet can be leveraged is for better management of chronic diseases such as diabetes and HIV. In India, results from a pilot study show that frequent communications via SMS were acceptable to diabetic patients and helped to improve health outcomes.<sup>62</sup> In Kenya, text messaging improved HIV treatment outcomes: SMS based interventions, albeit sensitive to intervention costs, would likely increase the efficiency of Antiretroviral therapy (ART) programs by boosting outcomes of HIV treatments, while also facilitating the UNAIDS goals of viral suppression of 90 percent among patients on ART by 2020.<sup>63</sup>

## Economy

Connectivity has a positive impact on the economy through improvements in productivity and efficiency. Businesses stand to benefit as connectivity reduces transaction costs and enhances labor productivity for existing operations.<sup>64</sup> Mobile and internet connectivity enables farmers, small businesses and entrepreneurs to source timely market information, access new markets and suppliers and improve productivity of labor through specialized trainings. It aids entrepreneurship, competitive markets and innovation in the economy as it reduces barriers to entry.<sup>65</sup> Connectivity further enables development of entrepreneurs and small businesses by facilitating access to learning materials, networks and financing opportunities.<sup>66</sup>

Research also shows that improvements in connectivity have a positive impact on employment, earnings and economic growth, particularly for low-income segments. A survey of 1,600 East African households in 2007 and again in 2010, revealed that

<sup>59</sup>The World Health Organization (WHO) adopted a resolution in 2018 underscoring the importance of digital health and called for international and regional collaboration to help member states promote digital health.

<sup>60</sup>Shayda M Sabet, Anna C Heard, Scott Neillitz, Annette N Brown, Assessing the evidence base on science, technology, innovation and partnerships for accelerating development outcomes in low- and middle-income countries, International Initiative for Impact Evaluation, March 2017

<sup>61</sup>S Lund & others, [Mobile phones improve antenatal care attendance in Zanzibar: a cluster randomized controlled trial](#), (PubMed, 2014)

<sup>62</sup>Shetty & others, [Reinforcement of adherence to prescription recommendations in Asian Indian diabetes patients using short message service \(SMS\)--a pilot study](#), (PubMed, 2011)

<sup>63</sup>Anik R Patel & others, [Economic evaluation of mobile phone text message interventions to improve adherence to HIV therapy in Kenya](#), (PMC, 2017)

<sup>64</sup>World Bank, [World Development Report 2016: Digital Dividends](#) (2016)

<sup>65</sup>Deloitte, [Value of connectivity Economic and social benefits of expanding internet access](#), (February 2014)

<sup>66</sup>Zhen-Wei Qiang et al. Chapter 3: [Economic Impacts of Broadband](#), (February, 2014 Information and Communication for Development, 2009)

[Extending Reach and Increasing Impact: ITU, 2012, Impact of Broadband on the Economy: Research to Date and Policy Issues; Scott, C., 2012, Does broadband Internet access actually spur economic growth?](#)

access to ICT positively affects income levels of the very poor. Those with access to ICT (and who could leverage connectivity) gained an estimated US\$21 per month more than comparable groups without the same access.<sup>67</sup> Another study from rural and remote areas of Peru shows that internet access increased wage employment. In the study, internet access for rural and remote areas was subsidized through broadband and internet kiosks. Internet use and mobile and home phone use subsequently increased. The program increased wage employment, the prices farmers received for their traditional products and the production of processed goods. The wage employment effects were observed in individuals that were educated, single or young.<sup>68</sup>

Connectivity has also been linked to alleviating poverty among the very poor. A study conducted in rural Tanzania links poverty alleviation to access to ICTs: the study compared two villages having different access to ICTs and while the village which had no access exhibited reduction in only two indicators of poverty reduction, another village with five months of access to airtime and internet access exhibited reduction in all seven areas of poverty tracked in the study. A similar study in Peru in 2010, comparing income levels of users who accessed the internet between 2007 and 2009 and those who did not, found that the former group of ‘nascent’ internet users had incomes 19 percent higher than the non-users.<sup>69</sup> Introducing broadband services in an Ecuadorian municipality led to individual labor gains of 3.7 annually between 2009 and 2011.<sup>70</sup>

## Gender Equity

Improved mobile and internet connectivity has the potential to help bridge gender inequities and create social and economic impact for females. In some instances, connectivity has not only reduced gender inequities through access to products and services in various sectors such as agriculture, education and healthcare, but also enabled women to exercise their social rights. As a result of connectivity, women have enhanced access to information on healthcare such as prenatal care and nutrition. A review of the literature shows that internet access and usage increases women’s sense of empowerment and freedom as well as their sense of equity. More than 70 percent of internet users interviewed in a 2012 Dalberg study found the internet to be “liberating,” while 85 percent said it “provides more freedom.”<sup>71</sup> Nonetheless, where technology is still seen as a predominantly male domain, girls and women can be discouraged from attempting to access ICT training or employment; those who do must overcome mobility constraints, poverty and limited investment from family to successfully graduate, overcome discriminatory hiring practices and find jobs with comparable wages.

<sup>67</sup>Robert Pepper & John Garrity, [ICTS, Income Inequality, and Ensuring Inclusive Growth](#), (Cisco, 2015)

<sup>68</sup>Ritter et al., [The effect of Internet and cell phones on employment and agricultural production in rural villages in Peru](#) (2014)

<sup>69</sup>Elder, Samarajiva, Gillwald, and Galperin, [Information Lives of the Poor](#), (International Development Research Centre, 2013)

<sup>70</sup>Ibid

<sup>71</sup>Dalberg, [Women and Web: Bridging the Internet Gap and creating new global opportunities in low and middle income countries](#), (Intel Corporation, 2012)

A study conducted in rural areas of South Africa found evidence that mobile phone coverage increased wage employment by 15 percent. This effect was mostly due to increased employment by women, in particular those who are not burdened with large child care responsibilities at home.<sup>72</sup> An Accenture study further found that women derive higher value from 'digital fluency' in the workplace than men.<sup>73</sup> In Kenya, an M-PESA study illustrated that digital financial services have helped increase the participation of women in the workforce and created opportunities for women in the formal workforce.<sup>74</sup> Most importantly, the impact of connectivity on women can result in manifold development outcomes, as women tend to have a disproportionate influence on critical decisions around family and community, investing more of their income in key decisions (related to healthcare, education, nutrition, etc.) related to the family's wellbeing.<sup>75</sup> Furthermore, removing obstacles to women reaching parity with men, including limited access to connectivity could contribute directly to creating an estimated \$28 trillion worth of new global value in a decade.<sup>76</sup>

With all the potential benefits of connectivity, it is important to be cognizant of the security concerns that pervade a connected society. These include, but are not limited to, increased vulnerabilities of men and women (Combat Violence Against Women and Girls or CVAWG issues) who are new/first time users of connectivity. The security of user data among low-income groups is afforded low priority, possibly stemming from lack of protective policies; ultimately, poor security can lead to online crimes like harassment, modern slavery, hate speech and spread of misinformation in politically sensitive regions. In some cases, the vulnerability of user data reflects poorly constructed laws that may be influenced by corruption. This paper assumes best practices in data protection by LMC enterprises and focuses on the developmental benefits embedded across sectors through access to connectivity.

<sup>72</sup>Stefan Klöner et al., [Cell phones and rural labor markets: Evidence from South Africa](#), (Ideas, 2010)

<sup>73</sup>Accenture, [Getting to Equal: How Digital is Helping Close the Gender Gap at Work](#), (2016)

<sup>74</sup>Tavneet Suri and William Jack, [The long-run poverty and gender impacts of mobile money](#), (ScienceMag, 2016)

<sup>75</sup>Melinda Gates, [Why Development Begins with Women](#), (Impatient Optimists, 2014)

<sup>76</sup>Jonathan Woetzel et al., [How advancing women's equality can add \\$12 trillion to global growth](#), (McKinsey, 2015)

# KEY PERFORMANCE INDICATOR FRAMEWORK



As discussed in the previous section, connectivity can enable economic growth and facilitate social development. Evidence from research shows that connectivity, namely mobile and internet, can have a positive impact on socio-economic status and on employment and earnings.<sup>77</sup> Improved connectivity has the potential to have a direct impact on various aspects of community wellbeing—such as health and education indicators, agricultural and economic output, access to government services and gender equity.

LMC enterprises have developed new, financially sustainable models of mobile and internet service delivery capable of expanding access for unconnected or under-connected populations. The purpose of the following framework is to put forth a theory of change to highlight impact pathways that connect investments in LMC enterprises to positive development outcomes. A set of business, outcome and impact KPIs accompany this model, which can be used by investors and enterprises to objectively measure the performance of an LMC intervention. It is envisioned that these KPIs will help the field understand how to attribute development outcomes to improved connectivity.

## Approach

The framework described in this section was developed through a three-step approach.

1. **Extensive secondary research** of existing literature, including journals and publications by sector-leading organizations, academic papers, dissertations and industry briefs. This secondary research was used to develop the proposed Theory of Change and Impact Pathways for the KPI framework.
2. **Stakeholder interviews** with over 30 respondents with LMC expertise in various areas such as investments, technology and enterprise modelling. Insights from these interviews helped guide and refine the development of the KPI framework.
3. **Feedback from an expert advisory panel** of over a dozen experts formed for the express purpose of providing early feedback and suggestions.

**Figure 7: KPI Framework Development Approach**

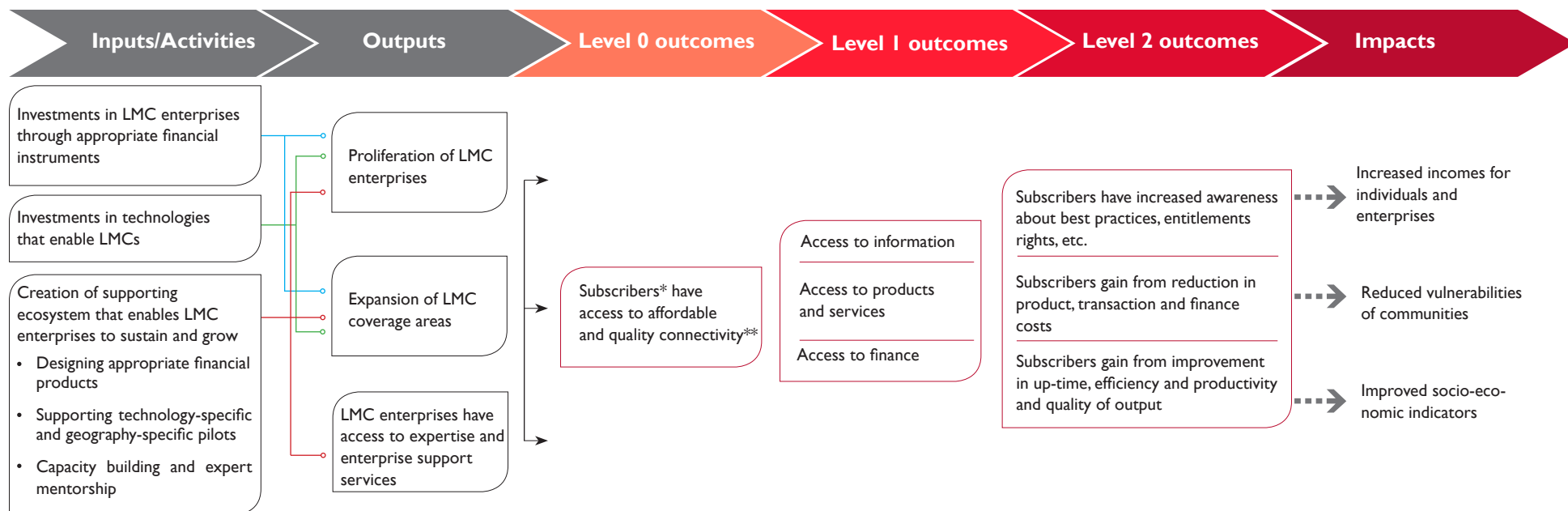


<sup>77</sup>World Bank, [World Development Report Digital Dividends](#), (WBG, 2016)

# Theory of Change

## CONTEXT

- Potential subscribers in low-income / rural / remote populations can benefit from access to affordable and quality connectivity services
- LMC enterprises that use innovative business models and technologies to serve such target subscribers need financial and non-financial support from investors to help them sustain and grow



## ASSUMPTIONS

- |  |  |   |   |   |
|--|--|---|---|---|
| <ul style="list-style-type: none"> <li>• There exists demand for connectivity in low income rural/remote or urban unconnected population</li> <li>• Target population has existing/low cost access to phones or other devices like tablets and computers</li> <li>• LMCs can expand their offerings due to availability</li> </ul> | <ul style="list-style-type: none"> <li>• There exist information dissemination channels that can be used to create awareness about access to connectivity</li> <li>• Subscribers are willing to spend on connectivity</li> <li>• LMC enterprises continue to provide connectivity over time</li> </ul> | <ul style="list-style-type: none"> <li>• Affordable access to connectivity will drive adoption</li> <li>• Increased access will lead to increased usage</li> <li>• Relevant information, products and services are available or become available in local languages and contexts</li> </ul> | <ul style="list-style-type: none"> <li>• Subscribers are able to effectively internalize and apply information</li> <li>• Subscribers are able to choose the right product/service for them</li> <li>• Systems providing connectivity-enabled services are scalable enough to support increased uptake</li> </ul> | <ul style="list-style-type: none"> <li>• Market demand and livelihood opportunities exist for improved efficiencies to translate to increased incomes for subscribers</li> <li>• Subscribers prudently use increased incomes to reduce vulnerabilities and create wealth</li> <li>• Mechanisms to track socio-economic indicators are robust enough to reflect changes within said time period</li> </ul> |
|--|--|---|---|---|

\* Subscribers refers to individuals and/or enterprises

\*\* Sector specific impact pathways branched out from here have been depicted separately in subsequent sections. This includes pathways for agriculture (Section 1.1), healthcare, (Section 2.1), education (Section 3.1), government service delivery (Section 4.1) and financial services (Section 5.1).

## Assumptions

Multiple assumptions have been made in the development of this model, and each set of assumptions corresponds to the logical connect between the steps of the model – from ‘Inputs to Outputs,’ from ‘Outputs to the Level 0, 1 and 2 Outcomes’ and from ‘Outcomes to Impacts’ (Theory of Change model on page 31).

For the interventions [(1) Investments in LMC enterprises through appropriate financial instruments, (2) Investments in technologies that enable LMCs and (3) Creation of supporting ecosystem that enables LMCs’ sustained growth] to result in the Outputs [(1) Proliferation of LMC enterprises, (2) Expansion of LMC coverage areas and (3) LMC enterprises have access to expertise and enterprise support services] the following enabling factors must be met:

- The last mile populations forming the target unconnected or under-connected segments exhibit a demand for connectivity and associated services, such as entertainment content and demand for ICT applications such as access to e-wallets or m-wallets, e-health and education technologies. Such demand is representative of the market need that LMC enterprises are seeking to tap. Target segments need to be aware of the advantages to be gained from being connected and have the willingness and ability to pay for it.
- Target subscriber segments have an already sufficient and increasing level of access to connectivity-supporting feature and smartphones, tablets, computers and other devices. This in turn is possible if such devices are available at low costs through increased availability in local markets.
- LMC enterprises are able to access credit, in desired fund sizes, through blended finance or traditional equity or debt investments, to serve their capital and operational expenditure needs, particularly when setting up and expanding operations.
- Appropriate technology and business mentorship support is available at the location of operations of the LMC enterprises. The supports provided by these enablers can be translated into specific action items that allow the LMC enterprises to strengthen their offerings, expand their coverage and make their business models sustainable.

To progress from the Outputs to Level 0 Outcomes, the following enabling factors are assumed:

- There exist well-known and effective information dissemination channels which can be leveraged to create awareness about expanded access to connectivity through LMC enterprises in new geographies. These channels can also serve to proliferate usage apart from creating awareness—by, for instance, being points of sale for devices, SIM cards and recharge vouchers.
- Subscribers’ demand for connectivity and associated products and services also contributes to their willingness and ability to pay for connectivity within defined, appropriate proportions in accordance with their income brackets.
- There exist sufficient data privacy and security measures to prevent misuse of user data at the LMC enterprise level as well as downstream levels.<sup>78</sup>
- Increased access to capital, innovations, expert support and enterprise support lead to further innovation and create an ecosystem that enables LMC enterprises to move into the growth phase of this niche market space. This is expected to result in sustained, affordable and good-quality connectivity provided to subscribers as the market becomes increasingly competitive.

<sup>78</sup>Includes institutional, entrepreneurial (including sector specific enterprises envisioned in the core sectors selected for this paper – financial services, agriculture and healthcare), government, schools and other anchor clients



To progress from the Level 0 Outcomes to Level 1 Outcomes, the following enabling factors are assumed:

- Affordable access to connectivity drives increased adoption of connectivity, enabled by availability of low cost devices.
- This increased level of accessibility will, in time, contribute to increased usage of connectivity to access information on immediately-accessible development benefits like agricultural information and digital or mobile wallet services, among others.
- Relevant information, products and services are available or become available in local languages and contexts. This will be possible once there exists a locally developed ecosystem engendering development of locally- and regionally-relevant content and services.

To progress to Level 2 Outcomes the following enabling factors are assumed:

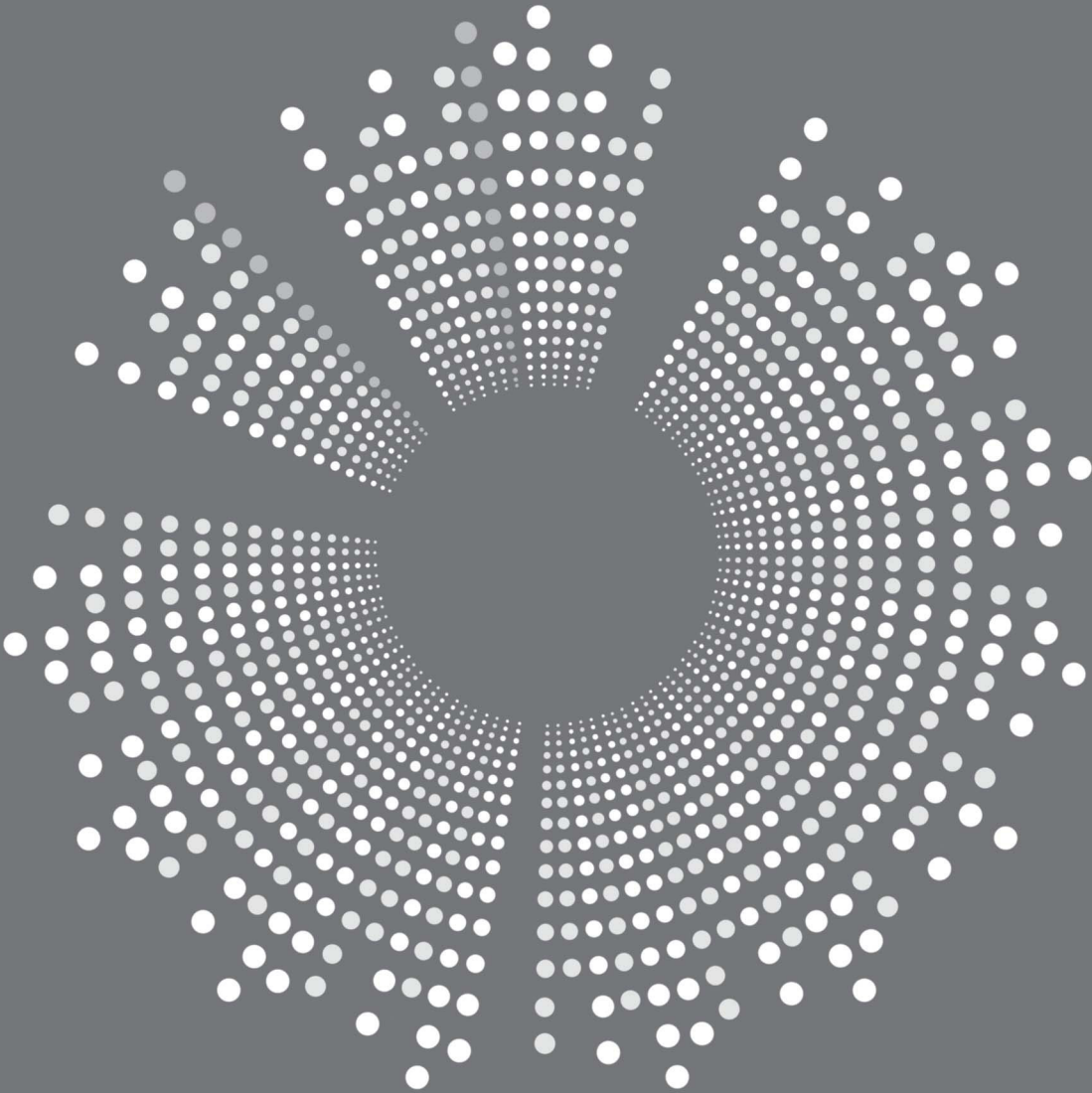
- Subscribers have been exposed to connectivity and associated benefits sufficiently long for them to successfully look for, access and effectively internalize and apply information in their chosen vocation.
- Subscribers are sufficiently aware and discerning to compile and compare the various connectivity-enabled products and services available to them, leverage them to find more affordable products and inputs and finance and reduce transaction costs to their advantage.
- Increased coverage and proliferation of LMC enterprises result in deployment of sufficiently scalable technological and operational systems to support increase in uptake of connectivity and associated services. These include both hard and soft infrastructural systems—of the LMC enterprises themselves and of any supporting service providers.

To progress to Impacts, the following enabling factors are assumed:

- There exist sufficient market demand and livelihood opportunities that improved individual skills and productivity and enterprise efficiencies—resulting from sustained access to connectivity and associated products and services—lead to corresponding increases in incomes for subscribers.
- Resultant increases in incomes are utilized by subscribers to exercise prudence and combined with informed financial decision-making to create wealth, build assets and reduce vulnerabilities.

To validate these assumptions and document the impact of LMC enterprises, it is important to track the socio-economic status of the target populations as well as success metrics reported by LMC enterprises themselves and third-party evaluators. The KPIs derived from the theory of change provide a framework to capture social impact in a coherent, robust and granular way and can be leveraged as a tool by governments, DFIs, enterprises and investors to assess the potential for and result of, investments in LMC.

# CORE INDICATORS



The indicators provided in this section can be used to measure the outcomes delineated in the theory of change model. These indicators have been classified as 'Core Business Indicators' and 'Core Outcome Indicators', followed by sector-specific indicators for the key sectors impacted by connectivity. These indicators enable LMC enterprises and investors to access a set of standardized business metrics to measure and articulate the anticipated commercial value and to expedite investment while lowering the time and monetary requirements of evaluation. It is the hope of the authors that the framework and the indicators provide additional value to donors, policy-makers and researchers seeking to tie connectivity services to impact in social and economic outcomes, measured by a set of business metrics, outcome and impact metrics. These metrics can be used by enterprises and investors to measure and articulate the anticipated business value and positive social impacts of connectivity.

It is recommended that performance on at least the core indicators be evaluated and reported over time in order to assess the performance of an enterprise comprehensively. From the additional indicators, specific indicators will be relevant to specific interventions; these should be identified and included in reporting.

## Business Indicators

There are various indicators that can be used to measure performance of a LMC enterprise. As a result of extensive research and stakeholder interviews, a set of core business indicators has been identified and proposed for use as business KPIs. These indicators cater to both investors and LMC enterprises. The core business indicators aim to guide investors to not only make investment decisions but also to track LMC investments.

In order to measure impact, the KPIs have been organized into Core Business Indicators (Table 3) and Core Outcome Indicators (Table 4) which can be tracked by LMC enterprises to objectively measure performance and engage investors. The proposed business indicators encompass both Outputs and Outcomes; the proposed social impact indicators are listed under Impact Indicators.

**Table 3: Core Business Indicators**

Core Business Indicators			
S. No.	Indicator	Type	Rationale / Insight
1	ARPU (Average Revenue per User <sup>79</sup> )	Revenue	Enables measurement of revenues per unit of LMC enterprise's unit model. The definition of a unit depends on the LMC enterprise model: one customer, one router/hotspot or one tower-equipped site.
2	Outstanding Revenues	Revenue	Relevant for post-paid, pre-paid <sup>80</sup> /PayG models, facilitates understanding of what percentage of the LMC enterprise revenues to discount from the balance sheet, as they have been outstanding for a period greater than 30 days. It helps with improving the efficiency of financial projections for an LMC enterprise in other geographies where the model is to be replicated.

<sup>79</sup>The globally accepted unit for ARPU indicates measurement per user. Depending on the LMC business model, a user may be an individual customer, an institutional customer (in B2C cases), one router / hotspot or one tower-equipped site (in B2B cases)

<sup>80</sup>Pre-paid included, as this is preferred even by the more high-paying consumers (insight from Novostar Ventures which has invested in multiple LMCs), and service is extended for a short period even after a customer's plan is expired, out of goodwill

3	EBITDA	Revenue	It indicates the ability of the LMC enterprise to absorb business volatility.
4	EBITDA Margin	Revenue	An upward trending EBITDA margins are a proxy for the growth of a company and low volatility in the cash flow of a company.
5	ROI	Revenue/ Cost	It is a measure of the profitability of investment in the LMC enterprise
6	Capital expenditure per 100 users	Cost	Aids understanding of capital expenditure at the last mile (typically, remote rural locales) per 100 subscribers, which is close to the minimum accepted number of subscribers which make a new site viable for LMC enterprises.
7	Operating expenditure per 100 users	Cost	Aids understanding of operational expenditure, particularly energy and backhaul costs at the last mile (typically, remote rural locales) per 100 subscribers, which is close to the minimum accepted number of subscribers which make a new site viable for LMC enterprises.
8	Number of routers/sites deployed	Cost	Aids understanding of the ongoing operational expenditure incurred by the organization, while also providing an estimate of their spatial spread of operations.
9	Total number of subscribers	Customer Base	Provides an insight into the reach of the LMC enterprise. With the number of routers/sites deployed, it also provides insight into the unit economics for the LMC enterprise in particular geographies.
10	Customer Lifetime Value	Customer Base	Provides an insight about the net profit attributed to the entire future relationship with a customer.
11	Churn in subscriber base	Customer Base	Provides insights about typical churn rates related to the market in which the LMC operates.
12	Call drop rate	Quality	Provides insights on the quality of voice connectivity. Conclusions can be drawn by comparing this with national and international average call drop rates.
13	Down Link Packed Drop Rate (DL-PDR)	Quality	Provides insights on the quality of data connectivity when used for voice or video calls in downlink.
14	Up Link Packed Drop Rate (UL-PDR)	Quality	Provides insights on the quality of data connectivity when used for voice or video calls in uplink.
15	Throughput <sup>81</sup>	Quality	Provides insights on the quality of data connectivity. Conclusions can be drawn by comparing this with national and international average throughput rates.
16	Latency	Quality	Proxy for network quality: a low-latency network connection is one that experiences small delay times, while a high-latency connection suffers from long delays.
16	Uptime	Quality	Measure of the time an LMC enterprise network has been working and available.

<sup>81</sup>Refers to actual throughput, in contrast with maximum throughput

**Table 4: Core Outcome Indicators**

Core Outcome Indicators			
S. No.	Indicator	Type	Rationale / Insight
1	Percentage increase in the number of unique users (YoY)	Customer Base	Provides insights on the increase in the LMC enterprises' level of reach in the target area.
2	Average usage per subscriber ratio	Customer Base	Provides insight into trends of overall (data, voice, other) customer usage and provides the rate of increase/decrease.
3	Percent increase in voice traffic (QoQ)	Customer Base	Provides insights on the cumulative increase in voice connectivity usage by both existing and newly acquired customers of the LMC enterprise across a cross section of time.
4	Percent increase in data consumption/traffic (QoQ)	Customer Base	Provides insights on the cumulative increase in data connectivity usage by both existing and newly acquired customers of the LMC enterprise across a cross section of time.
5	Percent increase in the number of users accessing value added services <sup>82</sup>	Customer Base	Provides insights on the number of new and existing customers who leverage improved connectivity to access value added services, of the total new/existing customers. This helps build useful insights to interpret and articulate adoption patterns for new geographies.
6	Average savings on connectivity related expenditure per user	Customer Base	Comparative savings on connectivity (calculated for both voice and data) incurred by new and existing customers. Calculated by comparing against rates offered by typical providers in the same region (or, in regions without any connectivity, in a comparable region).
7	Number of livelihoods supplemented by the LMC enterprise	Customer Base	Enables understanding of the number of agent <sup>83</sup> per LMC model type deployed on the ground to drive connectivity adoption.
8	Percent of subscribers that are female users	Customer Base	Provides insights on gender disparity related to connectivity access at any particular geography served by the LMC enterprise.

Aside from the core indicators, the theory of change yields related additional business and outcome indicators which are listed in [Annexure I](#). It is up to the discretion of the LMC enterprises and their respective investors to decide whether the additional business and outcome metrics are relevant to their business models and thus worth the data collection.

<sup>82</sup>In this context, VAS refers to access to information and an enabler to availing improved services related to education, healthcare, financial access, government services, agricultural implements and resources, etc.

<sup>83</sup>Agents refer to operatives involved in the value chain of LMCs, either at the field level (independent agents, mom-n-pop shop owners, others) or in local geography operations

## Sector-specific Impacts of Connectivity

Investments in LMC enterprises have direct and indirect impacts on the level of development across sectors. Evidence from multiple studies points clearly towards the positive development impact that access to connectivity can have across key development sectors including agriculture, education, financial services, government service delivery and healthcare. This section propose detailed causal “impact pathways” that link impacts in various sectors to the availability of connectivity to subscribers, whether individual subscribers or institutions (such as enterprises, education and healthcare providers and government intermediaries).

The impact of connectivity on each sector is assessed from two perspectives:

- Individual/institution level impact: Impact on individuals (such as farmers, students, teachers and patients) and institutional subscribers (such as enterprises, suppliers, farmer aggregation points/other aggregators, schools and healthcare centers, and government intermediaries) in various sectors who benefit from access to information and services over a period of time.
- Sector/Ecosystem & Community level impact: Impact that accrues over time to the wider community of beneficiaries—the general population, the sector and the economy as a whole in the medium and long term.

Figure 7 articulates the multi-sectoral impacts of access to connectivity over time, including medium- and long-term impacts.

Figure 8: Multi-sectoral impact of connectivity<sup>84</sup>



The theory of change also yields additional sector-specific impact pathways and outcomes; the outcomes discussed here assume a point in time when subscribers in the sector have acquired access to connectivity and are familiar with ways to use it.

The document draws from three broad sources of information to identify and in some cases, theorize potential sector-level impacts of connectivity and relevant indicators to track them:

1. Extensive review of existing literature for examples of processes and metrics used to assess impact of access to connectivity on different sectors.<sup>85</sup> Some of these instances have been highlighted in this document for each sector.
2. Input from experts in various sectors, including LMC enterprises and investors that have realized sector-level impacts or are looking to assess and invest in sector-level impact via LMC.
3. Hypotheses created by the research team based on expertise and information gathering.

<sup>84</sup>Assumed over a sufficiently long observation period, tentatively 3-6 years

<sup>85</sup>The authors made extensive efforts to capture existing literature that examines the impact of connectivity in the sectors examined, however many publications or articles may not be directly cited in this white paper or highlighted.

Consequently, while the document has made every attempt to find direct or indirect evidence or use-cases, of the list of indicators proposed, it also theorizes indicators that can potentially be used by LMC enterprises and investors in the future. Case-specific and sector-specific research will be required to conclusively establish the practical use of these indicators and the authors of this document hope that the list herein serves to inspire such investigation.

The following sections highlight the assumptions underlying each stage of the impact pathway and causal links thereof. The impacts of connectivity have been envisioned in three stages: Levels 0, 1 and 2 which correlate to stages in development across each sector.

**Table 5: Impact Pathway Levels**

Impact Pathway Levels		
Level	Connectivity Benefits	Time Frame <sup>86</sup> (Estimated)
0	Provision of connectivity, data or internet. <sup>87</sup> At this stage, consumers get first-time or increased (and in many cases, newly productive) access to voice and internet connectivity.	Accessible in an estimated 6 months from a connectivity related program deployment.
1	Relatively immediate benefits, including access to information about and products related to the sector. At this stage, consumers are beginning to understand sectoral implications and economic benefits of access to connectivity opening economic gains, through program efforts and peer usage.	Accessible in an estimated 1-2 years from a connectivity related program deployment.
2	Long term benefits, or impacts derived from actual consumption of connectivity, in conjunction with other necessary ecosystem & infrastructure requirements per respective sector.	Accessible in an estimated 3-4 years from a connectivity related program deployment.

Finally, the causal links yield sector-specific KPIs of value to connectivity-leveraging product and service providers across sectors and can be found in [Annexure 2](#). It is up to the discretion of the LMC enterprises and their respective investors, to decide whether the sector-specific metrics are relevant to their business models and to determine the adequate level of rigor required for measuring their impact.

<sup>86</sup>In this case, time frames in the TOCs are more notional than precise, and rely on estimates, because of lack of a study unifying connectivity and short and long-term impacts on development across sectors

<sup>87</sup>With an emphasis on data. Primary interviews implied a focus on internet connectivity for new interventions, as illiterate populations were seen to respond better to audio and video content for sectoral impact practices





## Agriculture

Once new or affordable mobile and internet connectivity is introduced, participants in the agricultural economy can benefit from access to information almost immediately given the widespread availability of agriculture-related best practices on the internet. Additional benefits can accrue through the provision of locally-contextualized information on weather, agricultural inputs and market information. This information can become available through pre-existing service providers or through new providers that emerge due to newly available connectivity. Such information may include local language content through YouTube, local radio/TV programs accessible through connectivity, and dedicated apps by third party social enterprises/government initiatives, as has been observed in many successful use-cases. Farmers can improve productivity through access to and use of relevant information to reduce costs, improve yields and gain access to financial services and to enhance revenues through better market linkages.<sup>88</sup>

### IMPACT EVIDENCE – AGRICULTURE

#### **Mobile-based advisory service results in adoption of better agricultural practices**

A study undertaken by Harvard Business School found that mobile-based agricultural advice increased agricultural yield and income for farmers in India. Results from the randomized control trial show that farmers from the treatment group are more likely to adopt effective pesticides and reduce expenditure on hazardous ineffective pesticides. It resulted in increased yields for cumin (28 percent) and cotton (8.6 percent, for the sub-group receiving reminders).<sup>89</sup> Over the program's two-year duration, household profits for the intervention groups were more than US\$200 (16 percent) greater than those of the comparison group.<sup>90</sup>

#### **Text alerts enable small-holder farmers to improve practices, gain financial literacy and be better prepared for risks from pests, disease and weather**

In the Philippines, Grameen Foundation leveraged mobile connectivity to provide small-holder coconut farmers with relevant information to increase awareness of best practices and improve agricultural productivity. Small-holder coconut farmers face challenges related to low farm productivity, lack of access to financial services and reduced yields due to weather, pest and disease outbreaks.<sup>91</sup> The intervention addresses these challenges and aims to reduce vulnerabilities of these farmers. Registered farmers receive text messages on good agricultural practices, pest and disease management and financial literacy. In the case of challenges related to weather, pest and diseases, farmers receive a text message on the challenge and practical recommendations to mitigate risks to their farms. Over 3,200 farmers received text alerts on extreme weather conditions. 128 farmers participated in a feedback survey and results show that 86 percent of the farmers learned how they could take appropriate actions to mitigate the risk of drought and pests.<sup>92</sup> The intervention has directly reached over 27,000 small-holder coconut farmers and their families—benefitting upwards of 135,000 family members.<sup>93</sup>

<sup>88</sup>Evidence collated and cited in Agriculture, Value of Connectivity

<sup>89</sup>Shawn Cole et al., [Mobilizing Agricultural Advice: Technology Adoption, Diffusion and Sustainability](#), (Harvard Business School, 2016)

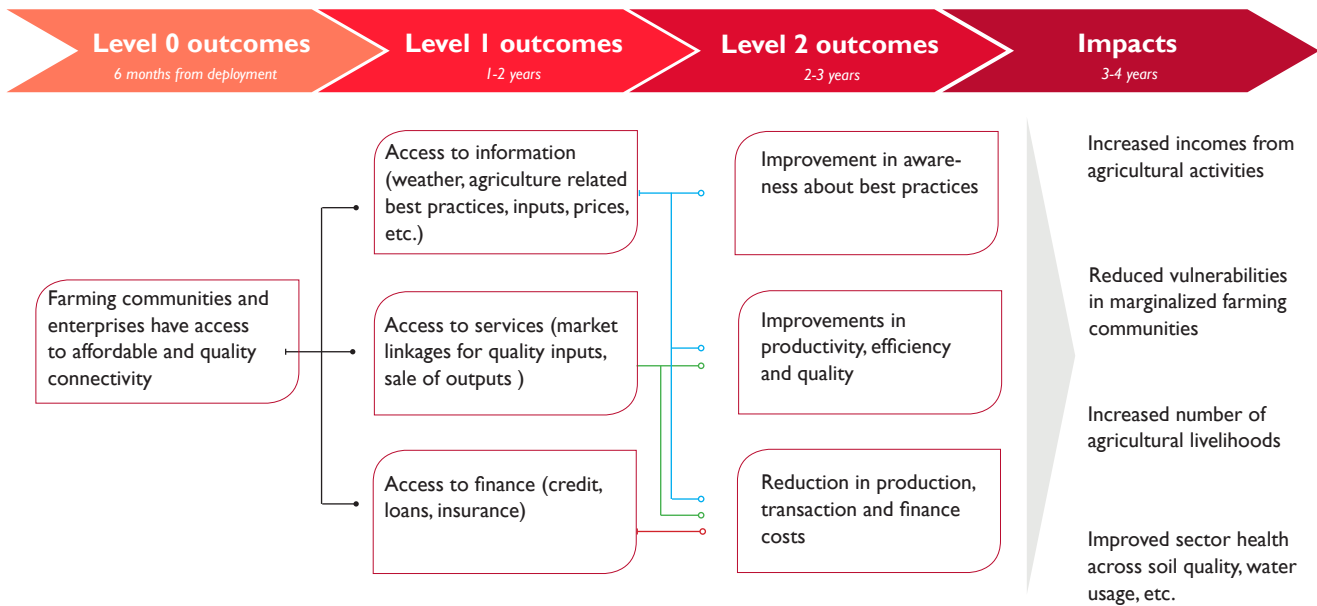
<sup>90</sup>Shawn Cole et al., [Mobile Phone-Based Agricultural Extension in India](#), (J-PAL, 2012)

<sup>91</sup>FAO. [Bringing Coconut Farmers into the 21st Century through Mobile Agriculture](#) (2017)

<sup>92</sup>Grameen Foundation, [Building Resilience of Coconut Smallholder Farmers in the Philippines: The Case of Grameen Foundation's FarmerLink Program](#)

<sup>93</sup>Gigi Gatti, [The Power of SMS: How Simple Texts Can Provide a Lifeline for Farmers](#), (next billion, 2017)

## Impact Pathway : Agriculture



### ASSUMPTIONS

- |  |  |  |
|--|--|--|
| <ul style="list-style-type: none"> <li>• Users are aware of ways to leverage connectivity for agriculture related activities</li> <li>• Relevant localized information such as weather, inputs, etc. is available for farmers</li> <li>• Connectivity-enabled financial services cater to farmers</li> <li>• Localized connectivity-enabled market linkages, including farmer aggregation points (such as FPOs) are available</li> </ul> | <ul style="list-style-type: none"> <li>• Users are able to appropriately apply information and best practices to their operations to reduce costs, improve yields and price realizations</li> <li>• Users are able to stay connected over time to improve awareness about best practices, improve productivity and efficiency and product quality</li> </ul> | <ul style="list-style-type: none"> <li>• Continued application of best practices results in sustained reduction in costs and improvement in efficiencies which results in increased incomes from agricultural activities</li> <li>• Reduction in costs and improvement in processes allows more livelihoods in agriculture to be created</li> <li>• Improved product quality and efficiency results in improved nutrition for the community</li> <li>• Sustained application of best practices improves soil quality, water usage, etc.</li> </ul> |
|--|--|--|

## Assumptions

Multiple assumptions or enabling factors, are involved in progressing from the outcomes to the impacts in this model. These assumptions are summarized in Table 6.

**Table 6: Assumptions for Agriculture Impact Pathways**

Enabling Factors	Level 2 Outcome	Impact
<ul style="list-style-type: none"> <li>• Subscribers are aware of how to use connectivity for agriculture-related activities.</li> <li>• Relevant localized information such as weather and inputs is available for farmers in locally contextualized formats (visual, local dialect/text, etc.).</li> <li>• Financial services that leverage connectivity to provide access to their products and services also serve small-holder farmers' needs such as working capital, liquidity and equipment finance.</li> <li>• Localized connectivity-enabled market linkages, including farmer aggregation points, near farm packing houses, processing sites, etc. are available.</li> </ul>	<ul style="list-style-type: none"> <li>• Subscribers are able to appropriately apply information and best practices to their operations to reduce costs, improve yields and realize higher prices. To be able to do this, information should be available in locally accessible formats (if needed), accommodating for low literacy levels. For example, visual aids, audio aids, and text aids should be contextualized to local dialects.</li> <li>• Subscribers are able to stay connected over time to improve awareness about best practices, form networks with local aggregation points, improve productivity and efficiency and product quality.</li> </ul>	<ul style="list-style-type: none"> <li>• Farmers, suppliers and other enterprises consistently and continuously apply best practices to leverage connectivity and derive sustained reduction in costs and improvement in efficiencies. They eventually realize increased incomes from agricultural activities.</li> <li>• Reduction in costs and improvement in processes allows more livelihoods in agriculture to be created.</li> <li>• Improved product quality and efficiency results in improved nutrition for the community.</li> <li>• Sustained application of best practices improves soil quality, water usage, reduces carbon emissions, etc.</li> </ul>

It is critical to monitor the usage of connectivity to access agriculture-related information, financial services and market linkages to measure the economic progress of subscribers in a region with new or improved access to connectivity over time. It must be noted that there may be factors other than improved access to connectivity that contribute to the increase. KPIs for the agriculture sector are listed in [Annexure 2](#).



## Education

Education technology holds immense potential to supplement existing educational content in areas where affordable, quality education is inaccessible due to challenges like lack of quality schools, lack of well-trained personnel and insufficient purchasing power. Affordable connectivity and low-cost devices have resulted in an increase in the number of education technology interventions across the globe, enabling students and teachers to gain access to digital content and an array of digital learning tools. Evidence shows that a mix of online and in-person tutoring can be leveraged to improve student learning outcomes.<sup>94</sup> Teachers with ed-tech have proven to result in increased competitiveness, communication and skill levels and thus, employability for teachers. For education suppliers like social enterprises and other institutions, automation and the resulting savings on operational and personnel costs open new markets, inclusive of low (individual) income markets which yield higher potential by way of volumes.<sup>95</sup>

### IMPACT EVIDENCE – EDUCATION

#### **Mobile phone program improves adult student learning outcomes**

Catholic Relief Services implemented Project ABC, a two-year mobile-based adult education program serving 140 villages in rural Niger. The project delivered traditional literacy and math classes as well as basic mobile phone skills in the Dosso and Zinder regions. An evaluation conducted by Tufts University and Oxford University found that the adult education classes had a significant impact on adults' learning outcomes. The adult literacy participants achieved a first-grade writing level and a second-grade math level after eight months of classes. Students in ABC villages achieved additional literacy and numeracy gains, with test scores nine to 20 percent higher than those in non-ABC villages. These effects also remained seven months after the end of classes. Overall, the evaluation demonstrates that use of mobile phones is a simple, low-cost method to improve adult education outcomes in rural Niger.<sup>96</sup>

#### **Mobile phone program improves pedagogy and content delivery**

In Nigeria, UNESCO and its partner organizations (Nokia, the British Council and the Nigeria Teachers' Institute) deployed a mobile learning service to improve pedagogy and content delivery of primary school teachers. This service targeted English language primary school teachers that worked in low-resource settings within the country. Teachers used the mobile phone service to access high quality English teaching techniques, resources, activities and other materials to help them in the classroom. The content was broken into daily messages of 50-100 words, accompanied by one image or graphic. Feedback from participating teachers shows that there were significant shifts in teachers' views regarding the value and utility of mobile learning. Teachers also reported that the project exceeded their expectations by helping them accomplish more than they had initially anticipated. Although the project only targeted 50 teachers, there is significant uptake of the application beyond the pilot group. It was observed that at the end of the project, the UNESCO-Nokia mobile learning service had reached approximately 70,000 subscribers. Furthermore, there was a positive correlation between the increased subscriber numbers and daily page views.<sup>97</sup>

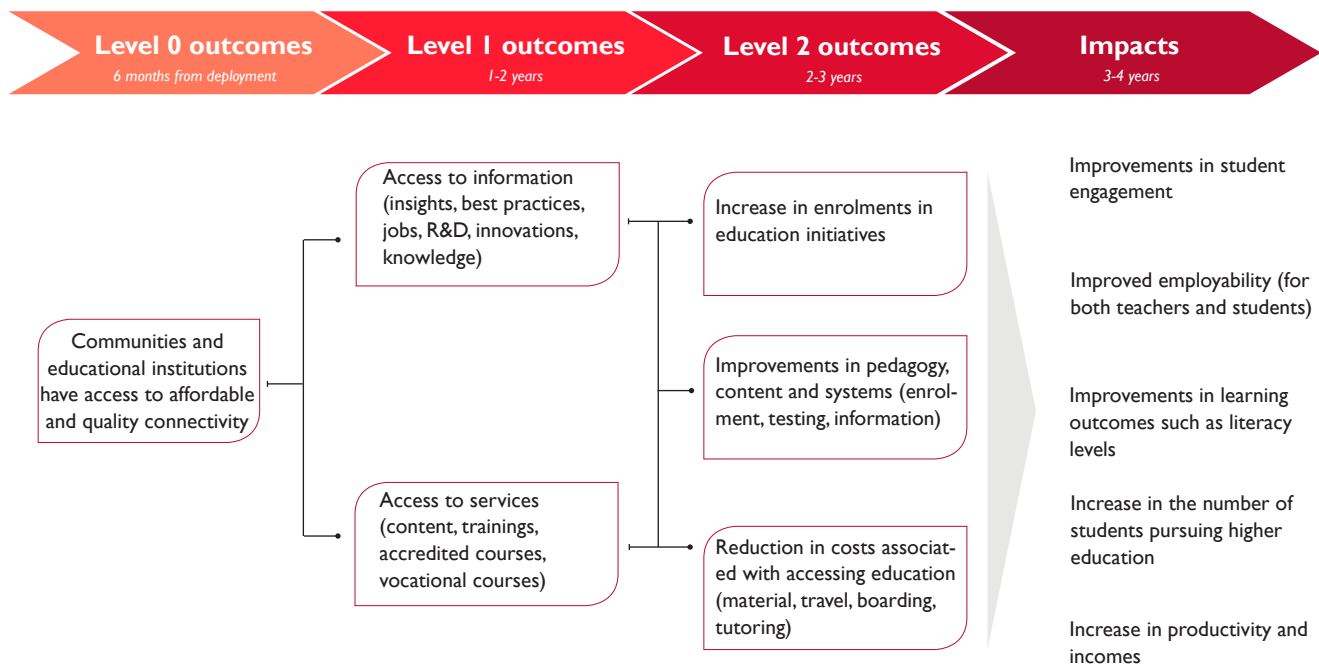
<sup>94</sup>Muralidharan, Singh and Ganimian, Disrupting Education? Experimental Evidence on Technology-Aided Instruction in India, American Economic Review, 2018

<sup>95</sup>Evidence collated and cited in Education, Value of Connectivity

<sup>96</sup>Jenny C. Aker, Tufts University, Christopher Ksoll, [Project ABC: The impact of crs' adult education and abc program on education, agriculture and migration](#) (Oxford University, June, 2011)

<sup>97</sup>Fengchun Miao & others, [Supporting teachers with mobile technology: Lessons drawn from UNESCO projects in Mexico, Nigeria, Pakistan and Senegal](#), (UNESCO, 2017)

## Impact Pathways: Education



ASSUMPTIONS		
<ul style="list-style-type: none"> <li>• Users are aware of ways to leverage connectivity for education related activities</li> <li>• Relevant educational content in regional languages and contexts is available</li> <li>• Connectivity-enabled educational accreditation is available to users</li> <li>• Connectivity makes remote or low-income geographies attractive for qualified teachers</li> </ul>	<ul style="list-style-type: none"> <li>• Access to information and services facilitates informed decision-making</li> <li>• Users are able to effectively internalize educational content to reduce costs</li> <li>• Users are able to stay connected over time to improve knowledge and skill levels</li> <li>• Teachers are able to leverage content and methods to improve pedagogy</li> <li>• Sustained exposure to improved pedagogy encourages attendance and improves skills within community</li> </ul>	<ul style="list-style-type: none"> <li>• Improved pedagogy and improved skills increases literacy rates and employability of students</li> <li>• Improved employability promotes entrepreneurship and makes better job opportunities available, thus increasing income levels</li> <li>• Improved productivity, innovation and entrepreneurship result in generation of more livelihoods</li> </ul>

### Assumptions

Multiple assumptions or enabling factors, are involved in progressing from the outcomes to the impacts in this model. These assumptions are summarized in Table 7.

**Table 7: Assumptions for Educational Impact Pathways**

Enabling Factors	Level 2 Outcome	Impact
<ul style="list-style-type: none"> <li>• Subscribers are aware of how to use connectivity for education-related activities, including seeking information on available content, courses, sites, apps across all levels of education (primary, secondary, graduation and after). To be able to do this, the subscribers should have:               <ul style="list-style-type: none"> <li>○ Access to devices.</li> <li>○ A basic level of digital literacy to access the first order of information typically accessed proactively.</li> <li>○ Knowledge of how to leverage connectivity to avail education related information, courses and content through free or paid content through familiarity of usage and word of mouth or through partner action in the education sector locally.</li> </ul> </li> <li>• Relevant content related to information about and leading to increased access in academic/vocational education is available in local, easily-understood dialects, texts and modes (visual, audio-based, text based, other).</li> <li>• Educational accreditation and vocational training programs are available and accessible for courses by leveraging connectivity.</li> <li>• Improved connectivity opens new, heretofore un/under-served low-income and remote geographical markets to qualified teachers, thereby engendering business and other remunerative opportunities for qualified teachers.</li> </ul>	<ul style="list-style-type: none"> <li>• Improved access to educational information and services encourages and catalyzes informed, expedited decision making related to critical choices like school/college selection and subject selection. It is also expected to reduce costs related to research and due diligence required for these decisions through access to and use of connectivity. This in turn is expected to lead to an increase in enrollment rates at academic and vocational training education provider sites, both at online and physical sites.</li> <li>• Sustained exposure to education through access to connectivity enables subscribers (teachers, students) to effectively internalize improved and new educational content to the effect that:               <ul style="list-style-type: none"> <li>○ Teachers have been trained in using digital aids for teaching and have successfully internalized methods.</li> <li>○ There is a marked increase in knowledge levels of both students and instructors, bringing them closer to world median levels in terms of quality of education acquired.</li> <li>○ New and improved content includes improved teaching techniques and methods, including parent engagement for current performance and higher study planning. This in turn is expected to lead to higher engagement and adoption for students (measured by increases in enrollment and attendance levels) and higher skill and employability levels for instructors.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Improved pedagogy and improved skills for instructors lead to higher levels of student engagement in classrooms, thereby leading to increases in literacy rates and employability of students.</li> <li>• Improved primary and secondary school-level educational outcomes for students, combined with higher access to connectivity-enabled student performance accountability and tracking systems at the household and community level, is expected to lead to an increase in the number of students pursuing higher education at graduate and post-graduate levels.</li> <li>• Improvements in literacy and employability levels for both students and teachers will lead to an improved local entrepreneurial ecosystem, as well as higher rates of salaried employment, leading directly to increases in the number of people deriving higher income levels at the community level.</li> <li>• An improved economic ecosystem engendered by positive educational and vocational outcomes is also expected to drive productivity and innovation in enterprises, to lead to a higher frequency of people deriving livelihoods locally.</li> </ul>

It is critical to monitor the usage of connectivity to access education-related information, access to educational services and to finance to measure the economic progress of subscribers in a region with new or improved access to connectivity over time. It must be noted that there may be factors other than improved access to connectivity that contribute to the increase. KPIs for the education sector are listed in [Annexure 2](#).

## Financial Services

Financial services and by way of extension, financial inclusion, can immensely benefit from access to connectivity, more so because of the recent proliferation of financial technology companies, that have knowingly or unknowingly pushed the agenda of financial inclusion. Connectivity has allowed innovative financial technology-based service providers to devise ways to assess the creditworthiness of borrowers. This has enabled a significant ongoing shift from lending against collateral, to collateral-free lending. This in turn, has brought a large part of hitherto unserved markets into the formal financial fold. Formal financial inclusion of low-income populations is also a priority of governments. Leveraging connectivity to bring people and micro-enterprises into the formal economy is thus being implemented at large scale by several governments, through programs and schemes enabling online transactions and documentation, and direct transfers. Individuals and enterprises are able to access financial products such as bank accounts, loans and insurance, which ultimately serve to have a positive impact on businesses as they reduce transaction costs and enhance labor productivity for existing operations. Availability of formal financing also allows individuals and enterprises an opportunity to move away from informal and often unscrupulous moneylenders, reducing vulnerabilities and potentially improving lives in the long run. Furthermore, it enables creation of subscriber credit history which enables these subscribers to access loans with higher ticket sizes. For financial service providers, this leads to better inputs for decision-making and thus reduction of non-performing loans in their portfolio.

### IMPACT EVIDENCE – FINANCIAL SERVICES

#### **Leveraging mobile connectivity to access credit and increase savings for rural weavers in Nigeria** <sup>98,99</sup>

The supply chain of Aso Oke, a traditional African cloth that is typically hand-woven and is used in traditional attire for cultural ceremonies, involves a high number of geographically dispersed touch points with rural producers who have no access to intermediaries who would typically receive orders on their behalf. The application of mobile technology to this supply chain exhibited manifold benefits, from financial access to increases in savings. In an environment of payment uncertainty, weavers used mobile phones to access credit from fabric vendors who would serve as market points for weavers' wares. In this way, weavers could access payments for orders and working capital. The poorest last mile producers saved time and money on journeys, some up to 200 km one way. This also led to increases in weaver and intermediary productivity through reduction in the turnaround time between the first order and final fulfilment (Aso Oke may be produced and delivered in batches depending on order size). Monetary savings could be recorded by comparing the cost of calls to the transport costs. In this context, calls completed in five minutes charged at US\$0.4 per minute substituted for taxi cost for an average journey of roughly US\$8.

#### **Connectivity-leveraged instant credit service exhibits a pull effect in the last mile market**

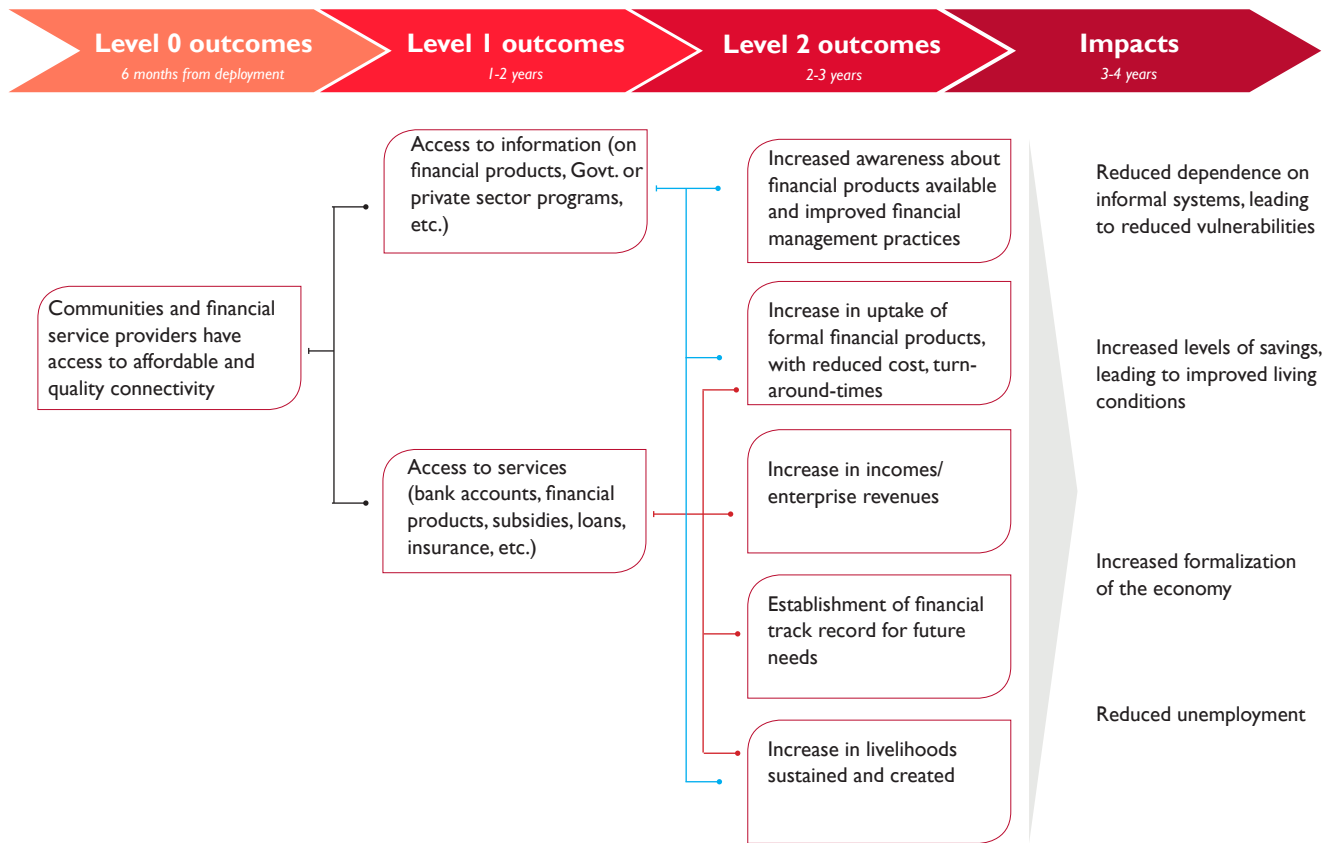
Concero Connect, active in multiple geographies, provides access to connectivity and connectivity-enabled services to low-income populations at the rural last mile. The enterprise sets up connectivity infrastructure and brings in appropriate financial service partners for e-wallet set-up. The e-wallet system has proven to be successful in areas where Concero Connect offers its financial services; micro-credit is available on the spot through a process of instant know-your customer (KYC) approval at the agent level, using identity cards. Mom-and-pop stores at the community level are selected as agents, who derive additional income from hosting data channelling and broadcasting routers. The e-wallet marketplace features financial products on offer from local banks and mobile money providers, as well as other local product and services suppliers, providing Google-like local marketing support through internet access sites. An output of this is that the product sells itself: micro-credit seekers can instantly access loans and similarly pay off in instalments with ease. In addition, they save on cost of travel to banks. On the enterprise side, this leads to improved efficiencies and a trove of exclusive data, creating a credit history for customers, often recorded formally for the first time, at the last mile.

<sup>98</sup>A Jagun et al. The impact of mobile telephony on developing country micro-enterprises: a Nigerian case study, (University of Strathclyde, 2008)

<sup>99</sup>Jonathan Donner et al., [A review of evidence on mobile use by micro and small enterprises in developing countries](#), (Journal of International Development, 2010)



## Impact Pathways: Financial Services



### ASSUMPTIONS

- |   |   |   |
|---|---|---|
| <ul style="list-style-type: none"> <li>• Users are aware of ways to leverage connectivity to access information on available financial products/services and the products/services themselves</li> <li>• Relevant information on financial best practices, book-keeping processes and standards for enterprises is available in local language</li> <li>• Relevant products/services are available in local languages and contexts</li> </ul> | <ul style="list-style-type: none"> <li>• Users are able to effectively internalize information and apply best practices</li> <li>• Users are able to choose the right product/service for them</li> <li>• Systems providing connectivity-enabled services are scalable enough to support increased uptake</li> <li>• Improved access to finance is used productively by users to increase incomes/revenues and sustain/create livelihoods</li> <li>• Data generated by the system is effectively captured to generate credit histories for users</li> </ul> | <ul style="list-style-type: none"> <li>• Increased uptake of formal financial products/services nudges users away from informal and often unscrupulous financial systems</li> <li>• Sustained usage of formal finance increases further access to finance and allied benefits improve income levels</li> <li>• Increased livelihoods from formalization reduces unemployment</li> </ul> |
|---|---|---|

### Assumptions

Multiple assumptions or enabling factors, are involved in progressing from the outcomes to the impacts in this model. These assumptions are summarized in Table 8.



**Table 8: Assumptions for Financial Services Impact Pathways**

Enabling Factors	Level 2 Outcome	Impact
<ul style="list-style-type: none"> <li>• Subscribers are aware of how to leverage connectivity to access information on available financial products and services, as well as how to access such products and services. These products and services may include credit for personal liquidity, entrepreneurial or agricultural productivity improvement, micro-saving services, insurance for crops, and enterprises and other ventures, among other case- and context-specific financial services and products. To be able to do this, the subscribers should have:               <ul style="list-style-type: none"> <li>○ Access to devices.</li> <li>○ A basic level of digital literacy to access the first order of information typically accessed proactively.</li> <li>○ Knowledge of how to leverage connectivity to financial services and products-related information, through free or paid content formats, accessed through familiarity of usage and marketed by word of mouth or through provider action.</li> </ul> </li> <li>• Relevant content—related to information on financial best practices for both enterprises and individuals, bookkeeping, processes and standards for enterprises, and the knowledge that is necessary to formalize (micro/small) enterprises—is available.</li> <li>• Relevant financial products/services are available and accessible in local, easily understood dialects, texts, and modes (visual, audio-based, text based, other).</li> </ul>	<ul style="list-style-type: none"> <li>• Individual and enterprise subscribers of connectivity are able to successfully access, process and implement data and information related to appropriate financial access routes for their specific needs. This includes applying connectivity-enabled information related to best practices in the fields of application.</li> <li>• Public and private initiatives and businesses provide access to systems providing connectivity-enabled services and these services are scalable by design, so as to support increased uptake of formal financial products. Leveraged through connectivity-enabling automation, these services are expected to be provided at low processing and transaction costs and turnaround times.</li> <li>• A direct outcome of this increase in awareness is connectivity-enabled understanding and discretion by individual and enterprise subscribers, so that they are now empowered to choose the most suitable financial products among those available, as well as to access and implement best financial management practices for available financial products and services.</li> <li>• Improved access to finance, combined with good financial management practices at both the individual and the enterprise level, will improve liquidity, thus improving working capital, productivity and innovation. This will in turn lead to an increase in the number of livelihoods created and sustained, and income levels for individuals. For enterprises, this will translate to increases in revenues.</li> <li>• Data generated by government-employed systems leveraging connectivity are effectively captured to generate credit histories for enterprise and individual users. These credit histories lead to formalization of the economy at the last mile community level and better inputs for financial service providers to make decisions and thus reduce non-performing loans in their portfolio.</li> </ul>	<ul style="list-style-type: none"> <li>• Connectivity enables easier adoption of formal financial access services and products, thereby encouraging last mile individual and enterprise subscribers towards formalized credit and other services/products, in contrast with choosing informal, often exorbitantly expensive credit-providing sources. This in turn leads to reductions in vulnerabilities arising from improper financial management and informal credit access.</li> <li>• Sustained access to formal financial services and products at the last mile for individual and enterprise subscribers increases further access to finance and allied benefits due to availability of credit histories. This in turn leads to higher savings by individuals (in the absence of high costs of credit required unexpectedly due to access to formal finance). This in turn leads to reduction in vulnerabilities and improvements in living conditions for individuals.</li> <li>• For enterprises, this will lead to an increase in the scale of business, thereby leading to increases in livelihoods for employees and employers. This type of formalization in turn reduces unemployment, increasing livelihoods at the community level.</li> </ul>

It is critical to monitor the usage of connectivity to access financial services-related information and financial services and products to measure the economic progress of subscribers in a region with new or improved access to connectivity over time. It must be noted that there may be factors other than improved access to connectivity that contribute to the increase. KPIs for the financial services sector are listed in [Annexure 2](#).

## Government Service Delivery

Connectivity enables enhanced administration of government direct benefits, subsidies and other benefits.<sup>100,101</sup> It enables efficient targeting of policies and schemes for remote, excluded and rural populations, and helps improve awareness. Improved awareness engenders increased participation and thus, increased accountability, benefiting governance across all levels of administration. Availability of data through increased connectivity enables the government to better administer benefits to the targeted population segments. Applications of connectivity to automate operations like registrations, approvals and even utility payments benefit both households and institutions and enterprises. Individuals save on travel and accommodation-related monetary outlays, as well as time-related wage opportunity cost. Enterprises and institutions derive similar benefits, leading to reduced costs for both households and enterprises, and most importantly, an increased proliferation of micro, small and medium enterprises at the last mile due to reduced costs of doing business formally.

### IMPACT EVIDENCE – GOVERNMENT SERVICE DELIVERY

#### **Providing access to state and central government financial, direct transfer and free service schemes to rural India**

Government services—particularly direct transfers for households below the poverty line, services like free treatment for women in public health centres in rural India, government-funded scholarships and low-cost loans like MUDRA (Pradhan Mantri MUDRA Yojana or PMMY) for micro enterprises—are available through (sub) national government intermediaries at the national, state and municipality/village Gram Panchayat levels. Access, however, is markedly weak at the last mile; lack of connectivity compounds the problem of lack of awareness of the current regime's policies and programs. This leads to unspent pre-allocated budgets at the end of regimes at the (sub) national level.

Haqdarshak, a social enterprise that leverages connectivity through its customized mobile application, has addressed this problem through a network of agents in rural areas. Progressing state by state, the enterprise invests in researching available schemes at the last mile: the block office level. Agents can operate even without internet at the last mile, enabling creation of government-verified identity cards (UID/Aadhar Card, Voter ID, PAN card, other), access to loans, scholarships and a wide range of services which would have otherwise not been known or available at the last mile. For this, the agent charges a nominal fee, depending on the exclusivity of the scheme being offered: the better-known schemes are available for lower costs, while the more exclusive schemes are available for higher amounts. The agents in turn pay Haqdarshak for the use of their application, earning up to INR 4,000 (~US\$59) per month. Haqdarshak's customized application enables capturing respondent information even without internet access. Captured information is then uploaded to cloud servers once internet is available at another site.

#### **Online government services increase efficiencies for individuals and businesses**

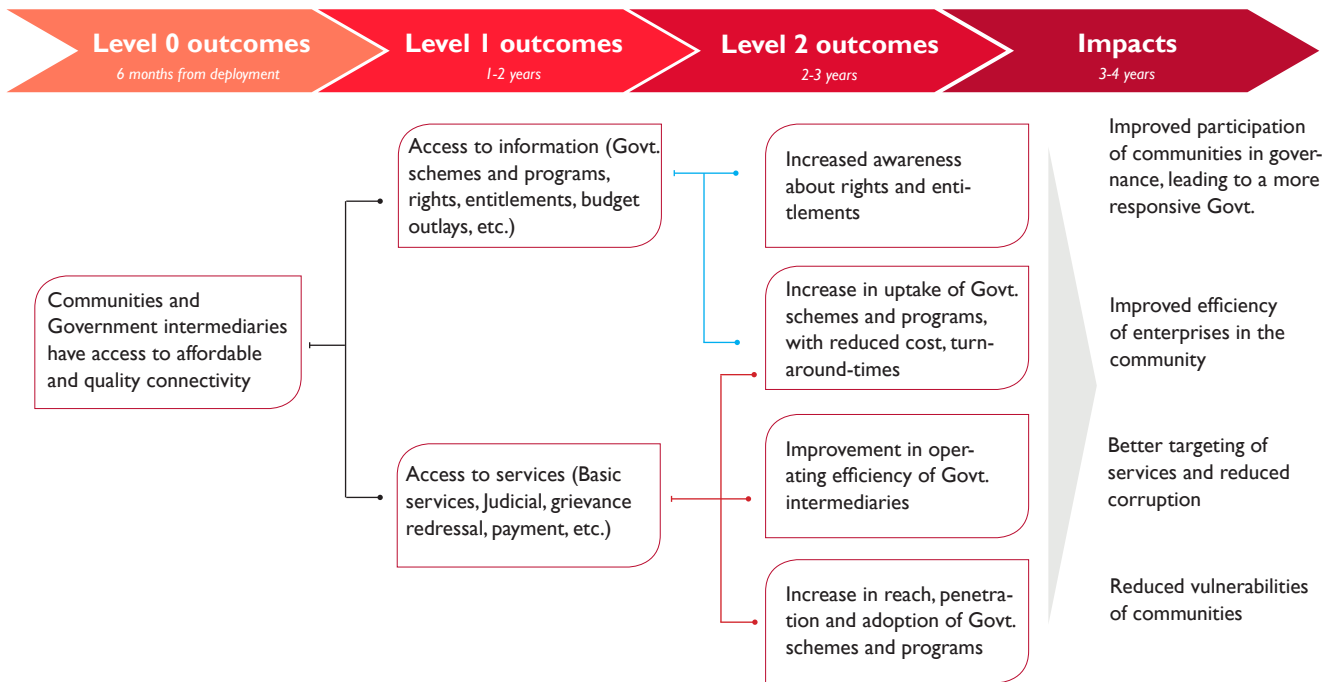
In Estonia, the e-government system offers nearly 3,000 services from 900 government and private sector agencies to the citizens online.<sup>102</sup> The number of queries made through this e-government system increased from half a million in 2003 to 5.6 million by 2017. This e-government system offers a wide range of services to the general public. Through the country's online services, citizens can avail various services such as filing taxes and paying parking charges. Businesses can be registered online and business owners can access their property and legal records online. Health records are digitized, while residents can also sign legally-binding contracts online. Estimates show that the e-government system has improved efficiencies for Estonians as it has enabled them to save 800 years of working time every year.<sup>103</sup>

<sup>100</sup> World Bank, The Opportunities of Digitizing Payments, (WBG, 2014)

<sup>101,102</sup> World Bank, [World Development Report 2016: Digital Dividends](#), (WBG, 2016)

<sup>103</sup> Estonia, [Interoperability Services](#).

## Impact Pathways: Government Service Delivery



### ASSUMPTIONS

- |   |  |   |
|---|--|---|
| <ul style="list-style-type: none"> <li>• Users are aware of ways to leverage connectivity to avail Government services and offerings</li> <li>• Relevant Government services and information in regional languages and contexts is available</li> <li>• The data backbone and systems able to interface with connectivity-enabled requests exist within the Government</li> <li>• Connectivity enables tracking of demographic and socio-economic information of communities while adhering to appropriate protocols about privacy</li> </ul> | <ul style="list-style-type: none"> <li>• Users are able to effectively internalize information about Government schemes and avail entitlements</li> <li>• Data generated through the system can be used to better target existing programs</li> <li>• Government intermediaries have systems and skills to leverage data generated through connectivity to improve efficiency</li> </ul> | <ul style="list-style-type: none"> <li>• Increased access of Government programs imbibes a behaviour change towards increased participatory governance</li> <li>• Sustained availability of rights and entitlements improves trust in Government</li> <li>• Users are able to channel savings and extra income to reduce vulnerabilities</li> </ul> |
|---|--|---|

## Assumptions

Multiple assumptions or enabling factors, are involved in progressing from the outcomes to the impacts in this model. These assumptions are summarized in Table 9.

**Table 9: Assumptions for Government Service Delivery Impact Pathways**

Enabling Factors	Level 2 Outcome	Impact
<ul style="list-style-type: none"> <li>• Subscribers are aware of how to use connectivity to avail pertinent government services and related activities. To be able to do this, the subscribers should have:                             <ul style="list-style-type: none"> <li>○ Access to devices.</li> <li>○ A basic level of digital literacy.</li> <li>○ Knowledge of applications of connectivity for availing government services.</li> </ul> </li> <li>• Relevant localized information on government services and associated content such as schemes, program subsidies, direct transfers and government-enabled financial services is available for the population in locally contextualized formats (visual, local dialect/text, etc.).</li> <li>• Relevant government agencies have implemented the data backbone and systems able to interface with connectivity-enabled government service delivery to enable access to basic services, judicial assistance, grievance redressals, utility and tax payments, etc.</li> <li>• Connectivity built into the delivery ecosystem enables tracking of demographic and socio-economic information of communities while adhering to appropriate protocols about privacy, which catalyze timely information provision to promote efficient provision of government services.</li> </ul>	<ul style="list-style-type: none"> <li>• Subscribers are able to effectively internalize information about government schemes and avail entitlements in accordance with their rights at lower costs. This is also expected to yield a reduction in turnaround times due to connectivity-enabled automation, which adds value to beneficiaries by way of increase in paid worker days otherwise spent on travel.</li> <li>• Individual demographic and socio-economic data gathered by way of dispensing government services can be effectively analyzed and applied to improve and make efficient existing and planned programs.</li> <li>• Government intermediaries are positioned by way of systems and skills to effectively implement intelligence gathered from data to improve efficiency of government services. This in turn is expected to improve reach, penetration and adoption of government schemes and programs.</li> </ul>	<ul style="list-style-type: none"> <li>• Improved access to government schemes and programs encourages more participatory behavior within the community. This is expected to lead to an increase in community participation through local administrative points, and to ultimately engender a more responsive government through continued demand, review and feedback from the community, better targeting of government services and reduced corruption.</li> <li>• Sustained availability of rights and entitlements, as well as connectivity-enabled, enterprise-related services from the government, and better allocation of government resources (partly due to decrease in corruption) will lead to improved trust in the government among target communities. This is also expected to:                             <ul style="list-style-type: none"> <li>○ Lead to an improvement in operating efficiency of community-based enterprises.</li> <li>○ Lead to reduction in vulnerabilities in the community as subscribers will channel extra savings and income towards building resilience.</li> </ul> </li> </ul>

It is critical to monitor the usage of connectivity to access government service delivery-related information and access to services to measure the economic progress of subscribers in a region with new or improved access to connectivity over time. It must be noted that there may be factors other than improved connectivity that contribute to the increase. KPIs for the government service delivery sector are listed in [Annexure 2](#).



## Health

Research on the use of ICT in healthcare shows that the expansion of mobile and internet connectivity can bring multiple benefits. Uses range from preventative care to treatment at the primary, secondary and tertiary level with increased efficiencies and reduced costs. SMS or other push notifications, on available devices can have a significant impact on healthcare-related behavior change of target populations; notifications can include logistical information related to critical checkups and doses and pertinent, location-specific health tips. Evidence from various research studies shows that mHealth applications, such as text reminders, have the potential to improve patient awareness and knowledge in low-resource settings. Healthcare enterprises can train local healthcare workers remotely and engage in continuous medical education by leveraging ICT. There are also significant cost savings and thus, a higher market potential for underserved areas, when ICT enables remote tele-diagnosis, efficient patient management and diagnostic tracking.

For locally-sourced health workers, time and travel cost savings are accrued from automated data collection and reporting, ultimately improving healthcare outcomes at the community level. Connectivity can facilitate the creation of patient-unique identification systems, the recording of medical information and the deployment of other management information systems that can be accessed remotely; this further reduces time and resource investments to manage patient data across primary, secondary and tertiary levels. Connectivity-enabled operational efficiencies accrue at the supply chain for healthcare providers: automated management systems help with early warnings for stock outs and can contribute to epidemic management and containment through real-time data access.

Overall, access to mobile and internet connectivity can enable patients, healthcare workers and health institutions to take advantage of digital tools and services.<sup>104</sup>

### IMPACT EVIDENCE – HEALTH

#### **Providing affordable primary eye-care to remote, rural populations through video conferencing for tele-ophthalmology**

Aside from reliable and quality access to healthcare, access to eye care is a challenge in the remote, rural areas in the developing regions of the world. Particularly in India, this problem is compounded by lack of primary eye care centers in rural areas. This problem is currently being addressed by Aravind Eye Care Systems, which leveraged connectivity to successfully provide affordable access to rural populations in close to 36 centers in south India.

To provide affordable eye care at the last mile characterized by low purchasing power, Aravind Eye Care leveraged connectivity to connect to base hospitals through wireless networks. This model leveraged a collaborative approach to create awareness of eye care and provide tele-ophthalmology through trained professionals. Instead of a certified ophthalmologist unlikely to be located in a remote location, the model employs a coordinator and a technician. The coordinator acts in the capacity of a counsellor, while the technician handles basic equipment (Slit Lamp, Streak Retinoscope, Direct Ophthalmoscope, Trial sets, Schiottz Tonometer, Basic sterilizers, BP apparatus and 90D Lens and a computer with a digital camera), while also helping to treat minor ailments. After the examination and tests conducted at this level, the patients can consult and obtain diagnosis and medical assistance from an ophthalmologist via video conferencing. Alternative options in eye care centers—usually close to urban areas and requiring travel costs—were available for INR 350, compared with INR 120 for Aravind Primary Eye Care Vision Centers, leading to savings of INR 230 for patients. Patients also save on wages lost due to travel time. About 90 percent of the patients could be effectively treated at the Vision Center, while 10 percent of the cases were escalated to the base hospital.

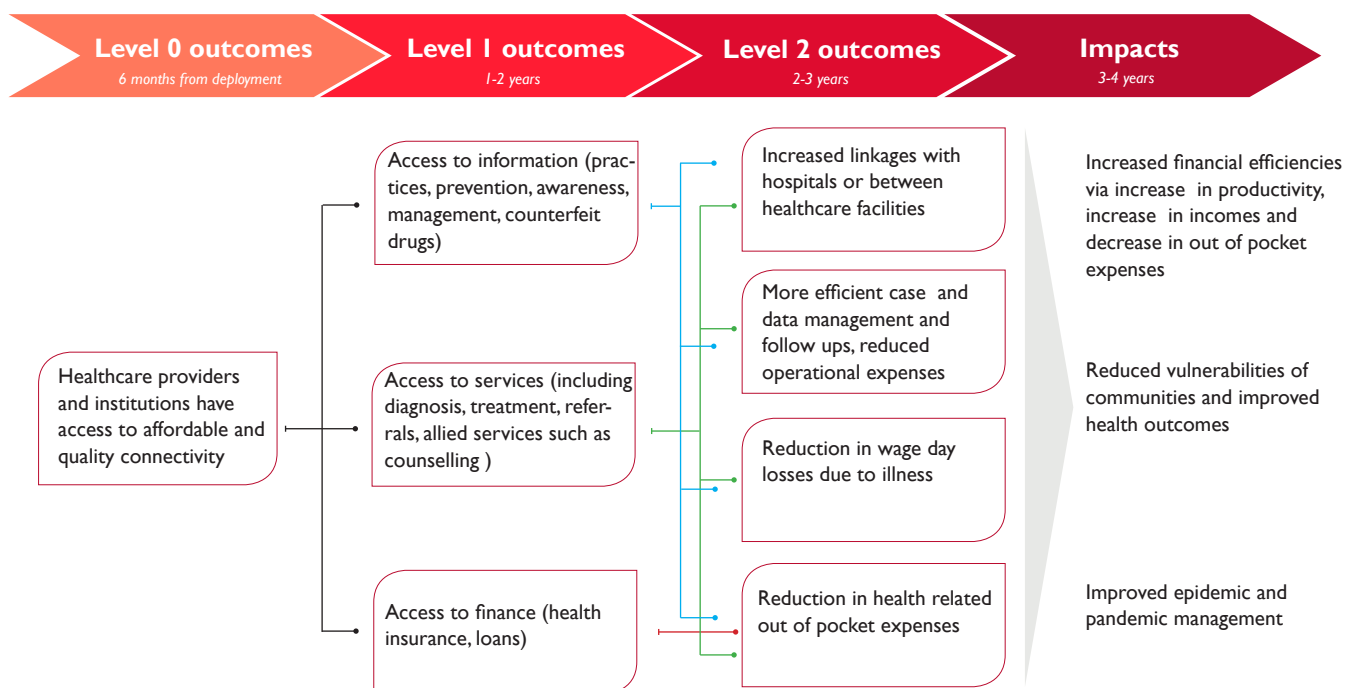
<sup>104</sup>Evidence collated and cited in Healthcare, Value of Connectivity

## IMPACT EVIDENCE – HEALTHCARE

### SMS intervention improves efficiencies and reduces operation expenses for hospitals

In Malawi, rural hospitals often serve large catchment areas with poor or absent means of transportation. Community Health Workers (CHWs) serve as intermediaries between the healthcare institution and the communities in the catchment area. Although they improve overall patient-physician accessibility, CHWs lose enormous amounts of time in transit between the hospital and villages. This limits their ability to obtain health care advice, transport medical supplies or request emergency care in a timely manner. A pilot at St. Gabriel’s Hospital in Namitete used SMS services to reduce travel undertaken by CHWs. A group of 75 CHWs were supplied with cell phones and trained to utilize the network for a variety of usage cases, including patient adherence reporting, appointment reminders and physician queries. At the end of the pilot, the hospital saved approximately 2,048 hours of worker time, US\$2,750 (US\$3,000 in fuel savings minus US\$250 in operational costs) and doubled the capacity of the tuberculosis treatment program (up to 200 patients).<sup>105</sup>

## Impact Pathways: Health



## ASSUMPTIONS

- |   |   |   |
|---|---|---|
| <ul style="list-style-type: none"> <li>• Users are aware of ways to leverage connectivity for healthcare related activities</li> <li>• Relevant health-related content in regional languages and contexts is available</li> <li>• Connectivity-enabled healthcare services related to insurance and finance are available to users</li> <li>• Connectivity enables linkages between primary, secondary and tertiary healthcare providers</li> </ul> | <ul style="list-style-type: none"> <li>• Users are able to effectively internalize, inform decision-making and adopt health-related content/ best-practices to reduce costs</li> <li>• Users (providers and individuals) are able to stay connected over time to improve health outcomes and reduce incidences of illness</li> <li>• Healthcare payers and providers are able to leverage connectivity for linkages and better case management</li> <li>• Health data are available to improve system efficiency</li> </ul> | <ul style="list-style-type: none"> <li>• Increased adoption of health-related best practices improves health outcomes and indicators of the community</li> <li>• Improved health indicators improves productivity and leads to increased incomes/ revenues</li> <li>• Users are able to decrease health related expenditures</li> </ul> |
|---|---|---|

<sup>105</sup>N Mahmud & others, [A text message-based intervention to bridge the healthcare communication gap in the rural developing world](#), (Pub Med, Technol Health Care. 2010;18(2):137-44)



## Assumptions

Multiple assumptions or enabling factors, are involved in progressing from the outcomes to the impacts in this model. These assumptions are summarized in Table 10.

**Table 10: Assumptions for Healthcare Impact Pathways**

Enabling Factors	Level 2 Outcome	Impact
<ul style="list-style-type: none"> <li>• Subscribers (including individuals and local healthcare providers) are aware of how to use connectivity for accessing healthcare-related information, including information on preventive healthcare, best practices, symptoms, drugs, treatment and locations to obtain secondary and tertiary care. To be able to do this, the subscribers should have:                             <ul style="list-style-type: none"> <li>○ Access to devices.</li> <li>○ A basic level of digital literacy.</li> <li>○ Knowledge of applications of connectivity for availing health care-related information and content.</li> </ul> </li> <li>• Relevant health-related content is available in local, easily-understood dialects, texts and modes (visual, audio-based, text based, other).</li> <li>• Connectivity-enabled healthcare services related to insurance and finance are available to subscribers in the target community.</li> <li>• Connectivity-enabled linkages between primary, secondary and tertiary healthcare providers, which can be accessed at the point of the target community level, are available. This includes case-based escalation to hospitals through access to connectivity from the point of community access. This mechanism also opens up new, heretofore un/underserved markets for healthcare providers.</li> </ul>	<ul style="list-style-type: none"> <li>• With available access, subscribers are able to effectively internalize content to inform healthcare decision-making and adopt health-related best practices that reduce out-of-pocket costs of preventable diseases. This in turn leads to reduction in wage losses due to preventable illnesses and subsequent increases in productivity.</li> <li>• Access to connectivity empowers subscribers to stay connected and thus have access to healthcare-related information and services consistently over time. Consistent access leads to a marked improvement in health outcomes and reduction of incidences of illness in the target communities.</li> <li>• Healthcare payers and providers are able to leverage access to connectivity for increased linkages, efficient case evaluation (through tele-health initiatives), case escalation and better case and patient data management.</li> <li>• Health related data management services are available to improve system efficiency, which in turn improves adoption of better healthcare practices within the community.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased adoption of health-related best practices improves health outcomes and indicators within the community. There are reduced health-related vulnerabilities, including epidemic and pandemic break outs, because of adoption of best practices in preventive care.</li> <li>• Improved health indicators result in improved productivity and lead to increased incomes/revenues. This is a consequence of reduced out-of-pocket expenditures resulting from improved financial management for health-related expenditures through formally accessible loans, insurance schemes, etc.</li> <li>• Subscribers are able to channel savings and extra income gained from reduced out-of-pocket expenditures and improved productivity from no loss of daily wage due to illnesses to reduce vulnerabilities.</li> </ul>

It is critical to monitor the use of connectivity to access health-related information, healthcare services and finance to measure the economic progress of subscribers in a region with new or improved access to connectivity over time. It must be noted that there may be factors other than improved access to connectivity that contribute to the increase. KPIs for the healthcare sector are listed in [Annexure 2](#).



## MOVING FORWARD

The theory of change, impact pathway models and KPIs proposed in this white paper were developed to help assess the commercial opportunity and social impact of mobile and internet connectivity. By developing these frameworks and KPIs, the research team hopes to aid investors in understanding the key indicators associated with LMC and the potential social impacts of expanding mobile and internet access and affordability across development sectors. The team also hopes to aid LMC enterprises seeking to measure and track their impact on the individuals and communities they serve.

In addition to private investors, we believe that this framework will be useful for donors, including government and other funding agencies, to assess the impact of any voice/internet connectivity-centric intervention. It is hoped that this white paper will enable improvement in the quality of discussions between investors and LMC enterprises, contribute towards standardizing indicators for the sector and hopefully result in fresh capital into the industry. Further engagement with the wider development and telecom community on the practical deployment of the framework will assist in further refining the model.



# ANNEXURE I

## Additional Business Indicators

Additional Business Indicators		
S. No.	Indicator	Type
1	Total Revenue	Revenue
2	Revenue per site	Revenue
3	Average margin per site	Revenue
4	Number of revenue sharing partnerships	Revenue
5	Number of value added services associated with the LMC	Revenue
6	Number of anchor clients for connectivity <sup>106</sup>	Revenue
7	Average Gross Margin per Unit (Annual)	Revenue
8	Change in ARPA (QoQ) (percentage)	Revenue
9	Average Gross Margin (Annual)	Revenue
10	Revenue from voice	Revenue
11	Percentage of revenue from voice	Revenue
12	Revenue from voice measured in minutes per account (QoQ)	Revenue
13	Revenue from messaging	Revenue
14	Percentage of revenue from messaging	Revenue
15	Revenue from messaging per account	Revenue
16	Revenue from data	Revenue
17	Percentage of revenue from data	Revenue
18	Revenue from data per account	Revenue
19	Revenue from other sources	Revenue
20	Percentage of revenue from other sources	Revenue
21	Revenue from other sources per account	Revenue
22	Change in revenue per site (QoQ) (Percentage)	Revenue
23	Outstanding revenues per site	Revenue
24	Revenue from voice measured in minutes per site	Revenue
25	Percentage of revenue from voice measured in minutes	Revenue
26	Revenue from messaging per site	Revenue
27	Percentage of revenue from messaging per site	Revenue
28	Revenue from data per site	Revenue
29	Percentage of revenue from data per site	Revenue
30	Revenue from other sources per site	Revenue
31	Percentage of revenue from other sources per site	Revenue
32	Cost per site	Cost
33	Capital expenditure per site	Cost
34	Capital expenditure per 100 users	Cost
35	Operating expenditure per site	Cost
36	Operating expenditure per 100 Users	Cost

<sup>106</sup>Anchor clients refer to clients who provide steady business, like schools, government offices, other offices, and are a source of repeat and monetarily reliable business

37	Average cost per account	Cost
38	Total Capital Expenditure	Cost
39	Total Operating Expenditure per Quarter	Cost
40	Customer acquisition cost per site	Cost
41	Change in the number of subscribers (QoQ) (percentage)	Consumer Base
42	Value (\$/local currency) of contracts/purchase agreements that the organization holds for purchase of its products/services on a quarterly basis.	Consumer Base
43	Value (\$/local currency) of revenue/cost sharing partnerships on a quarterly basis	Consumer Base
44	Number of subscribers for voice measured in minutes (Quarterly)	Consumer Base
45	Increase in voice measured in minutes consumption/traffic (QoQ) (percentage)	Consumer Base
46	Number of subscribers for data (Quarterly)	Consumer Base
47	Increase in data customer base (QoQ) (percentage)	Consumer Base
48	Volume of voice measured in minutes usage per site	Consumer Base
49	Volume of data usage per site	Consumer Base
50	Increase in data usage per site (YOY) (percentage)	Consumer Base
51	Increase in data consumption/traffic (QoQ) (percentage)	Consumer Base
52	Increase in voice consumption (QoQ) (percentage)	Consumer Base
53	Latency	Quality of Service
54	SMS delivery success	Quality of Service
55	Average time for SMS delivery	Quality of Service

### Additional Outcome Indicators

S. No.	Indicator	Type
1	Percentage increase in the number of sites connected / improved connectivity (YoY)	Consumer Base
2	Number of unique users	Consumer Base
3	Number of users accessing value added services	Consumer Base
4	Number of institutional clients for connectivity	Consumer Base
5	Percentage increase in the number of institutional clients for connectivity (YoY)	Consumer Base
6	Number of female users of voice connectivity	Consumer Base
7	Percentage increase in the number of female users of voice connectivity (YoY)	Consumer Base
8	Number of female users of data connectivity	Consumer Base
9	Percentage increase in the number of female users of data connectivity (YoY)	Consumer Base

# ANNEXURE 2

## Sector-specific Key Performance Indicators

It is critical to monitor the use of connectivity to access agriculture, education, financial services, government services delivery and health-related information to measure the economic progress of subscribers in a region with new or improved access to connectivity over time. The following section provides a list of proposed indicators to track the positive externalities of access to connectivity in the aforementioned sectors. It must be noted that there may be factors other than improved access to connectivity that contribute to the measured changes.

### ■ Agriculture

Serial No.	Beneficiary Type	Outcome / Impact	Indicator
<b>Level 0 Outcome</b>			
0	Individual / Institutions	Farming communities and enterprises have access to affordable and quality connectivity	Outcomes are measured through core outcome indicators listed <a href="#">here</a> .
<b>Level I Outcome</b>			
1	Individual / Institutions	Access to information (weather, agriculture related best practices, inputs, prices etc.)	Number of farmers or agri-enterprise utilizing connectivity for agriculture-related information services (information and knowledge on agriculture practices, inputs, weather, etc.)
			Percentage increase in number of farmers or agri-enterprises utilizing connectivity for agriculture-related information services (YoY)
			Number of woman farmers or woman-led agri-enterprises utilizing connectivity for agriculture-related information services (information and knowledge on agriculture practices, inputs, weather, etc.)
2	Individual / Institutions	Access to finance (credit, loans, insurance)	Percentage increase in number of woman farmers or woman-led agri-enterprises utilizing connectivity for agriculture-related information services (YoY)
			Number of farmers / agri-enterprises utilizing connectivity for agriculture-related financial services
			Percentage increase in number of farmers / agri-enterprises utilizing connectivity for agriculture-related financial services (YoY)
			Number of woman farmers / woman-led agri-enterprise utilizing connectivity for agriculture related financial services
			Percentage increase in number of woman farmers / woman-led agri-enterprise utilizing connectivity for agriculture-related financial services (YoY)

3	Individual / Institutions	Access to services (market linkages for quality inputs, sale of outputs)	Number of farmers utilizing connectivity for market linkages
			Percentage increase in number of farmers utilizing connectivity for market linkages (YoY)
			Number of woman farmers / woman led agri-enterprise utilizing connectivity for market linkages
			Percentage increase in number of woman farmers / woman-led agri-enterprise utilizing connectivity for market linkages (YoY)
<b>Level 2 Outcome</b>			
4	Individual / Institutions	Reduction in production costs	Cost of producing one tonne of agriculture produce
			Percentage reduction in the cost of producing one tonne of agriculture produce
5	Individual / Institutions	Reduction in transaction costs	Additional cost incurred for selling the produce per tonne post-harvest (transactions)
			Percentage reduction in cost of transactions (input providers, aggregators, etc.)
6	Individual / Institutions	Reduction in finance costs	Cost of credit
			Percentage reduction in the cost of credit
7	Individual	Improvements in agricultural productivity	Yield per hectare per crop
			Percentage increase in yield per hectare per crop
			Percentage reduction in time required per crop life cycle
<b>Impact</b>			
8	Individual / Enterprise	Increase in income from agricultural activities	Income from agricultural activities
			Percentage increase in income from agricultural activities (YoY)
9	Individual	Reduction in vulnerability (Improvement in quality of life)	Number of small holder subsistence farmers (below poverty line)
			Percentage reduction in the number of small holder subsistence farmers (below poverty line) (YoY)
			Percentage reduction in the number of farmer suicides

10	Community	Reduction in water use	Number of farmers using efficient irrigation practices
			Percentage increase in the number of farmers using efficient irrigation practices (YoY)
			Increase in ground water levels (YoY)
11	Community	Improvements in soil quality	Physical, chemical and biological indicators for soil quality
12	Community	Increase in the number of agriculture related livelihoods	Number of new agri-enterprises that have emerged with improved connectivity in the local community
			Increase in the number of new agri-enterprises that have emerged with improved connectivity in the local community

## ■ Education

Serial No.	Beneficiary Type	Outcome / Impact	Indicator
<b>Level 0 Outcome</b>			
0	Individual / Institutions	Communities and institutions have access to affordable and quality connectivity	Outcomes are measured through core outcome indicators listed <a href="#">here</a> .
<b>Level 1 Outcome</b>			
1	Individual / Institutions	Access to information (insights, best practices, jobs, R&D, innovations, knowledge)	Number of individuals / institutions utilizing connectivity to search for education-related information
			Percentage increase in number of individuals / institutions utilizing connectivity for education-related information (YoY)
			Number of females utilizing connectivity for education-related information
2	Individual / Institutions	Access to services (content, trainings, accredited courses, vocational courses)	Percentage increase in number of females utilizing connectivity for education-related information (YoY)
			Number of individuals / institutions utilizing connectivity to access education content (accredited courses, teaching material, etc.)
			Percentage increase in number of individuals / institutions utilizing connectivity to access education content (accredited courses, teaching material, etc.)
			Number of females utilizing connectivity to access education content (accredited courses, teaching material, etc.)
			Percentage increase in the number of females utilizing connectivity to access education content (accredited courses, teaching material, etc.) (YoY)

Level 2 Outcome			
3	Individual / Institutions	Improvements in teaching techniques/pedagogy and content	Number of teaching professionals leveraging connectivity to deliver education content
			Percentage increase in the number of teaching professionals leveraging connectivity to deliver education content (YoY)
			Number of female teaching professionals leveraging connectivity to deliver education content
			Percentage increase in the number of female teaching professionals leveraging connectivity to deliver education content (YoY)
			Percentage reduction in teacher absenteeism (YoY)
4	Institutions	Increased enrolment in education initiatives	Number of students enrolled
			Percentage increase in the number of students enrolled (YoY)
			Average improvements in numeracy and literacy based standardized test scores
			Percentage reduction in student absenteeism (YoY)
5	Individual	Reduction in costs associated with accessing education (material, travel, boarding, tutoring)	Cost of education related out-of-pocket expenditure
			Percentage reduction in the cost of education related out-of-pocket expenditure
6	Institutions	Reduction in costs associated with accessing education (material, travel, boarding, tutoring)	Cost of education-related expenditures (communication bills, teacher salaries, etc.)
			Percentage reduction in the education-related expenditure (communication bills, teacher salaries, etc.)
Impact			
7	Individual / Institutions	Improvements in student engagement	Number of students that completed the required courses
			Percentage increase in the number of students that completed the required courses (YoY)
8	Individual / Institutions	Improved employability (for both teachers and students)	Number of students employed after course completion
			Number of students employed after course completion for at least 6 months
9	Individual / Institutions	Improvements in literacy levels	Percentage of population aged 15 years and over who can both read and write <sup>107</sup>
			Percentage of population aged 15 years and over who can both read and write

<sup>107</sup>Adult literacy rate measure used by UNESCO

## ■ Financial Services

Serial No.	Beneficiary Type	Outcome / Impact	Indicator
<b>Level 0 Outcome</b>			
0	Individual / Institutions	Communities and financial service providers have access to affordable and quality connectivity	Outcomes are measured through core outcome indicators listed <a href="#">here</a> .
<b>Level 1 Outcome</b>			
1	Individual / Institutions	Access to information (on financial products, Govt. or private sector programs etc.)	Number of individuals / enterprises leveraging connectivity to access information on financial products and services
			Percentage increase in the number of individuals / enterprises leveraging connectivity to access information on financial products and services (YoY)
			Number of women / woman led enterprises leveraging connectivity to access information on financial products and services
2	Individual / Institutions	Access to services (bank accounts, financial products, subsidies, digital wallets and e-payments, loans, insurance, etc.)	Number of individuals / enterprises leveraging connectivity for financial products and services
			Percentage increase in the number of individuals / enterprises leveraging connectivity for financial products and services (YoY)
			Number of women / woman led enterprises leveraging connectivity for financial products and services
3	Individual / Institutions	Increased awareness about financial products and financial management practices	Percentage increase in the number of individuals / enterprises leveraging connectivity to acquire information about the type of financial services available (YoY)
			Percentage increase in the number of women / women-led enterprises leveraging connectivity to acquire information about the type of financial services available (YoY)
			Number of individuals / enterprises using financial products and services
4	Individual / Institutions	Increase in uptake of formal financial products, with reduced cost, turn-around-times	Percentage increase in the number of individuals / enterprises using financial products and services (YoY)
			Total number of transactions conducted through mobile and internet
			Percentage increase in number of transactions conducted through mobile and internet (YoY)
			Total value of transactions conducted through mobile and internet
<b>Level 2 Outcome</b>			

			Percentage increase in the value of transactions conducted through mobile and internet (YoY)
			Time it takes to avail financial products and services
			Percentage reduction in time taken to avail financial products and services
5	Individual / Institutions	Establishment of financial track record for future needs	Number of individuals / enterprises with formal credit histories
			Percentage increase in the number of individuals / enterprises with formal credit histories (YoY)
6	Individual / Institutions	Increase in incomes/enterprise revenues	Number/value of assets owned
			Percentage increase in number/value of assets owned
			Increase in monthly income/revenue
7	Institutions	Increase in livelihoods sustained and created	Number of people with formal employment (or self-employment)
			Percentage increase in number of people with formal employment (or self-employment)
<b>Impact</b>			
8	Community	Reduced dependence on informal systems, leading to reduced vulnerabilities	Number of people borrowing from informal money lenders
			Percentage decrease in the number of people borrowing from informal money lenders
9	Community	Increased wealth creation, leading to improved living conditions	Average number of household assets owned
			Percentage increase in the average number of household assets owned (YoY)
10	Community	Increased formalization of the economy	Number registered enterprises
			Percentage increase in the number of registered enterprises (YoY)
			Number of instances of uptake in Government programs or schemes (for individuals or enterprises)
			Increase in number of instances of uptake in Government programs or schemes (for individuals or enterprises)
			Amount of tax contribution
			Percentage increase in the amount of tax contribution
11	Community	Reduced unemployment	Number of unemployed people
			Percentage decrease in the number of unemployed people (YoY)



## ■ Government Services Delivery

Serial No.	Beneficiary Type	Outcome / Impact	Indicator
<b>Level 0 Outcome</b>			
0	Individual / Institutions	Communities and government intermediaries have access to affordable and quality connectivity	Outcomes are measured through core outcome indicators listed <a href="#">here</a> .
<b>Level 1 Outcome</b>			
1	Individual / Institutions	Access to information (Govt. schemes and programs, rights, entitlements, budget outlays, etc.)	<p>Number of individuals / enterprises leveraging connectivity to acquire information about the type of available govt. schemes, eligibility and budget allocation for each</p> <p>Percentage increase in the number of individuals / enterprises leveraging connectivity to acquire information about the type of available govt. schemes, eligibility and budget allocation for each (YoY)</p> <p>Number of women / woman-owned enterprises leveraging connectivity to acquire information about the type of available govt. schemes, eligibility and budget allocation for each</p> <p>Percentage increase in the number of women subscribers / woman-owned enterprises leveraging connectivity to acquire information about the type of available govt. schemes, eligibility and budget allocation for each (YoY)</p>
2	Individual / Institutions	Access to services (Basic services, Judicial, grievance redressal, payment, etc.)	<p>Number of individuals/enterprises leveraging connectivity to access various available govt. schemes, basic services, judicial assistance, grievance redressal, online payments, etc.</p> <p>Percentage increase in the number of individuals/enterprises leveraging connectivity to access various available govt. schemes, basic services (financial assistance, subsidies, policies), judicial assistance, grievance redressal, online payments, etc. (YoY)</p> <p>Number of women/woman-led enterprises leveraging connectivity to access various available govt. schemes, basic services (/financial assistance, subsidies, policies), judicial assistance, grievance redressal, online payments, etc.</p> <p>Percentage increase in the number of women/woman-led enterprises leveraging connectivity to access various available govt. schemes, basic services (financial assistance, subsidies, policies), judicial assistance, grievance redressal, online payments, etc. (YoY)</p> <p>grievance redressal, online payments, etc. (YoY)</p>
<b>Level 2 Outcome</b>			
3	Individual / Institutions	Increased awareness about rights and entitlements	<p>Percentage increase in the number of individuals / enterprises leveraging connectivity to acquire information about the type of available govt. schemes, eligibility and budget allocation for each (YoY)</p> <p>Percentage increase in the number of women subscribers / woman-owned enterprises leveraging connectivity to acquire information about the type of available govt. schemes, eligibility and budget allocation for each (YoY)</p>

4	Individual / Institutions	Increase in uptake of Govt. schemes and programs, with reduced cost, turn-around-times	<p>Percentage increase in the number of individuals/enterprises leveraging connectivity to access various available govt. schemes, basic services (financial assistance, subsidies, policies), judicial assistance, grievance redressal, online payments, etc. (YoY)</p> <p>Percentage increase in the number of women/women led enterprises leveraging connectivity to access various available govt. schemes, basic services (financial assistance, subsidies, policies), judicial assistance, grievance redressal, online payments, etc. (YoY)</p> <p>Total monetary value of schemes accessed through access to connectivity</p> <p>Percentage increase in monetary value of schemes accessed through access to connectivity (YoY)</p> <p>Savings accrued per household/business from online payments</p> <p>Percentage increase in savings accrued per household/business from online payments (YoY)</p> <p>Average reduction in time to access service/scheme for individual / enterprises</p>
5	Government	Improvement in operating efficiency of Govt. intermediaries	<p>Number of claims processed per service/scheme at local administrative office</p> <p>Percentage increase in the number of claims processed per service/scheme at local administrative offices (YoY)</p> <p>Reduction in time taken to process a claim</p>
6	Government	Increase in reach, penetration and adoption of Government schemes and programs	<p>Percentage of population accessing government schemes and programs from existing population set</p> <p>Percentage increase in population accessing government schemes and programs (YoY)</p>
<b>Impact</b>			
7	Individuals	Improved participation of communities in governance, leading to a more responsive Government	<p>Total voter turn outs</p> <p>Percentage increase in total voter turn outs for each (sub) national election (YoY)</p>
8	Individuals / Institutions	Improved efficiency of enterprises in the community	<p>Amount in payments to government (taxes, utility bills, other) made through leveraging connectivity</p> <p>Increase in amount in payments to government (taxes, utility bills, other) made through leveraging connectivity (YoY)</p>
9	Government	Better targeting of services and reduced corruption	Reduction in leakages related to benefit payments
10	Community	Reduced vulnerabilities of communities	<p>Number of households below poverty line</p> <p>Percentage reduction in the number of households below poverty line (YoY)</p>

## Healthcare

Serial No.	Beneficiary Type	Outcome / Impact	Indicator
<b>Level 0 Outcome</b>			
0	Individual / Institutions	Communities, healthcare providers and institutions have access to affordable and quality connectivity	Outcomes are measured through core outcome indicators listed <a href="#">here</a> .
<b>Level I Outcome</b>			
1	Individual / Institutions	Access to information (practices, prevention, awareness, management, counterfeit-drugs related)	Number of individuals / institutions utilizing access to connectivity for health-related information (good practices for preventive healthcare, closest private/public primary/secondary healthcare facilities and medical shops, etc.)
			Percentage increase in number of individuals / institutions utilizing access to connectivity for health-related information (YoY)
			Number of women utilizing access to connectivity for health-related information
2	Individual / Institutions	Access to services (including diagnosis, treatment, referrals, allied services such as counselling)	Percentage increase in number of women utilizing access to connectivity for health-related information (YoY)
			Number of individuals / institutions utilizing connectivity to access healthcare facilities (diagnosis, treatment, referrals)
			Percentage increase in the number of individuals / institutions utilizing connectivity to access healthcare facilities (diagnosis, treatment, referrals)
3	Individual / Institutions	Access to finance (health insurance, loans)	Number of females utilizing connectivity to access healthcare facilities (diagnosis, treatment, referrals)
			Percentage increase in the number of females utilizing connectivity to access healthcare facilities (diagnosis, treatment, referrals)
			Number of individuals diagnosed with infectious diseases.
3	Individual / Institutions	Access to finance (health insurance, loans)	Percentage increase in number of females diagnosed with infectious diseases
			Number of individuals among the community with insurance coverage
			Percentage increase in insurance coverage among individuals in the community (YoY)
3	Individual / Institutions	Access to finance (health insurance, loans)	Number of females in the community with insurance coverage
			Percentage increase in insurance coverage among females in the community (YoY)
			Number of individuals in the community accessing medical loans
3	Individual / Institutions	Access to finance (health insurance, loans)	Percentage increase in individuals in the community accessing medical loans
			Number of females in the community accessing medical loans
			Percentage increase in females in the community accessing medical loans

Level 2 Outcome			
4	Individual	Reduction in health related out-of-pocket expenses	Average out-of-pocket health-related expenses per household
			Percentage reduction in out-of-pocket health-related expenses per household (YoY)
5	Individual / Institutions	Reduction in wage day losses due to illness	Average number of wage days lost due to illness
			Percentage reduction in the number of wage days lost due to illness
6	Individual	More efficient case management and follow ups, reduced costs	Average time required for case follow-ups
			Percentage reduction in average time required for case follow-ups
7	Individual	Increased linkages with hospitals	Number institutions with partnerships / referral agreements with hospitals established outside the community
			Number of patients referred annually to hospitals / doctors established outside the community
			Percentage increase in the number of patients referred to hospitals / doctors established outside the community (YoY)
Impact			
8	Individuals	Reduced vulnerabilities of communities and improved health outcomes	Number of maternal deaths per 100,000 live births (MMR)
			Percentage reduction in the number of maternal deaths per 100,000 live births
			Number of deaths of children under five years per 1000 live births (IMR)
			Percentage reduction in the number of deaths of children under five years per 1000 live births (IMR)
			Incidences of communicable disease (tuberculosis, malaria, etc.) cases per 100,000 people
			Percentage reduction in the incidences of communicable disease cases per 100,000 people (YoY)
			Incidences of non-communicable disease (cancer, diabetes, blood pressure, heart disease, etc.) cases per 100,000 people
			Percentage reduction in the incidences of non-communicable disease (cancer, diabetes, blood pressure, heart disease, etc.) cases per 100,000 people (YoY)
			Number of new detections of HIV/AIDS among the age group 15-49
			Percentage of adults (aged 15-49) living with HIV/AIDS
Number of children under 5 years immunized for measles, polio, DPT, etc., per 100,000 children			
Percentage increase in the number of children under 5 years immunized for measles, polio, DPT, etc., per 100,000 children			



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