Global Roadmap of Action Toward Sustainable Mobility

PAPER 1 | Universal Rural Access

SUSTAINABLE mobility™ FOR ALL

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GLOBAL ROADMAP OF ACTION

Toward Sustainable Mobility

UNIVERSAL RURAL ACCESS

SUSTAINABLE mobility™ FOR ALL

WORLD BANK GROUP

german cooperation
DEUTSCHE ZUSAMMENARBEIT

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LIST OF ACRONYMS

ADB	Asian Development Bank
AFCAP	Africa Community Access Partnership
BMZ	German Federal Ministry for Economic Cooperation and Development
CBOs	Community Based Organizations
CCB	County Communications Bureau
CNY	Chinese yuan
CO2	Carbon dioxide
DBTI	Dar Teknohama Business Incubator
DFID	United Kingdom's Department for International Development
DOR	Director of Roads
DOT	Department of Transport
EIRR	Economic Internal Rate of Return
ETB	Ethiopian Birr (local currency)
GDP	Gross Domestic Product
GIZ	German Development Agency (Deutsche Gesellschaft für Internationale Zusammenarbeit)
GMR	Global Mobility for All
GTP	Growth and Transformation plan
HVRR	Higher Volume Rural Roads
ICAO	International Civil Aviation Organization
IFPRI	International Food Policy Research Institute
IMT	Intermediate Means of Transport
IMT	Intermediate Means of Transport
IsDB	Islamic Development Bank
ISO	International Organization for Standardization
ITS	intelligent transportation system
KZN-DOT	Kwa Zulu Natal Department of Transport
LCA	Life Cycle Analysis
LIC	Low Income Countries
LVRR	Low Volume Rural Roads

MIC	Middle-Income Countries
MORD	Ministry of Rural Development
MSD	Medical Store Department
NDOs	Non-Government Organization
NRRDA	National Rural Roads Development Agency
NRRP	National Rural Roads Program
PDR	Lao People's Democratic Republic
PIARC	World Road Association (Permanent International Association of Road Congresses)
PMGSY	Pradhan Mantri Gram Sadak Yojana (India's National Road Programme)
PPPs	Public Private Partnership
RAI	Rural Access Index
RAMS	Road Asset Management System
ReCAP	Research for Community Access Partnership
SDGs	Sustainable development goals
SMS	Short Message Service
SRRDA	State Rural Roads Development Agency
SSATP	Sub Saharan Africa Transport Policy Programme
SuM4All	Sustainable Mobility for All
TCRA	Tanzania Communication Regulatory Authority
TNC	Transport Network Company
UAS	Unmanned Aircraft System

FOREWORD

Sustainable Mobility for All (SuM4All) is an umbrella platform that brings together 55 public and private organizations and companies with a shared ambition to transform the future of mobility. Its unique value lies in bringing key influential actors to work together. It serves as the principal platform for international cooperation on sustainable mobility, a center of excellence, and a repository of policy, knowledge and resource on sustainable mobility. Its mission is to play a leading role in the ongoing transformation of the global mobility system, and support countries in their transition towards sustainable mobility.

Established in 2017, SuM4All's first task at hand was to find common ground on what countries wanted to achieve. We all agreed that transport was a key contributor to economic development and core to people's quality of life. We also agreed that the transport that we have is not the transport that we want—congestion in cities, segregation among rural and urban communities, carbon emissions, air and noise pollution, and traffic mishaps that are symptomatic of a systemic problem with mobility. We set our ambition high for the mobility of the future: we need an equitable, efficient, safe and green mobility.

The consensus on what sustainable mobility meant set us on our next task to establish the imperative for action. The Global Mobility Report 2017 benchmarked countries' performances on mobility relative to four policy goals. The findings of that report were alarming: not a single country in the world—developed or developing—has achieved sustainable mobility.

With evidence at hand, SuM4All embarked on a major drive in 2018 to develop a comprehensive policy framework to assist decision makers in cities and countries as well as practitioners at development banks to identify gaps, necessary steps, and appropriate instruments to attain the Sustainable Development Goals, and improve the sustainability of their transport sector.

We are pleased to share the outcomes of these efforts that embody the collective knowledge of all its members and more than 180 experts, and feedback from more than 50 public decision makers and 25 large private corporations. The Global Roadmap of Action builds on six policy papers, including this Universal Rural Access paper, whose content is made accessible and usable to all in a web-based tool for decision making.

Sustainable Mobility for All Steering Committee
(On behalf of our 55 Member organizations)
July 2019, Washington, D.C.

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EXECUTIVE SUMMARY

One billion people in the world do not have access to transport, with the majority living in rural Africa. In line with the United Nations (UN) Sustainable Development Goals (SDGs), rural access should be affordable to vulnerable populations and equitable, of good quality, reliable, sustainable and resilient.

SDG target 9.1 aims at achieving universal rural access by 2030 with indicators that relate to transport infrastructure (9.1.1) and transport services (9.1.2). The UN has adopted two indicators for the SDG target 9.1; the proportion of the rural population who live within 2 kilometers of an all-season road (the SDG indicator 9.1.1 also known as Rural Access Index), and the volumes of passenger and freight by mode of transport (SDG indicator 9.1.2).

Index values show differences among countries ranging from 5 to 99 percent. Countries with a lower index faced constraints because of geography, climate or demography (e.g. low population density), and limitations in financial, technical and institutional capacity. Countries with a higher index had fewer constraints (e.g., high-income countries).

This paper finds that:

- Governments of low-income countries (LIC) and medium-income countries (MIC), with support from development partners, will have to meet all or most of the investment costs, with assurances from their local governments and communities to commit firmly to contributing to future maintenance. Such costs and assurances relate to procurement, technical support, finance and communications. To finance the large investments needed, countries should establish a dedicated source of financing (e.g., fuel tax).
- The policy goal of achieving universal rural access by 2030 is ambitious and challenging but achievable. In many developing countries, it will entail providing access for more than half the rural population which may take 10 to 20 years to implement. Illustrative calculations for the MICs estimate that it may cost more than $100 per head of population served to achieve universal access using higher volume rural roads, but only $5 to $10 per head served using basic access and motorcycle trails. At this lower level of costs, it may be possible for even the poorest countries to approach universal rural access by 2030.
- All countries can progress toward universal and inclusive access. Those with lower financial and technical capacity may initially give priority to basic access or motorcycle trails. Those with higher capacity may prioritize low volume rural roads and higher volume rural roads. When a lower cost access type is provided initially, it can later be upgraded when justified by traffic growth. Improvements in rural access make it more attractive for transport operators to provide bus and freight services and attract further improvements in service availability and quality.
- Substantial capacity building is needed to provide the skills required to implement the program and maintain the assets (e.g., technical leadership within central government, program planning and implementation by local government, and skills training for contractors and communities).
- Waterborne transport facilities such as providing small piers and safe landing places is especially relevant in remote coastal, lakeside and island communities, and in remote inland areas served by rivers. On the other hand, air transport is not a core rural transport issue, although it is acknowledged that in specific countries (e.g., Papua New Guinea and Brazil) it may have considerable significance.

1. INTRODUCTION

Improvement of access is one of the four goals set by the global Sustainable Mobility for All (SuM4All) initiative, aimed at ensuring the sustainability of the transport sector and helping countries move along the path to achieving the SDGs. Universal rural access is embodied in SDG target 9.1: "Develop quality, reliable, sustainable, and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all." In presenting its parallel vision of SuM4All, the Global Mobility Report (GMR) refers to the global objective of achieving universal access: to ensure equitable access to economic and social opportunities for all by 2030.

Access connects people and communities to jobs, schools, and health care, and enables the delivery of goods and services to rural and urban areas. It depends upon the availability and usability of transport infrastructure and services. Universal access can be broadly defined as the ability for any member of society to reach a wide range of opportunities through a mode of transport, and for goods to be transported between a wide range of origins and destinations. This attaches value to everyone's individual travel needs and aims to provide everyone with at least some basic level of access, leaving no one behind, and paving the way for meeting the mobility needs of all.

1.1. The goal of rural access

In the case of rural access, infrastructure encompasses various standards of rural roads and tracks, and also includes inland waterborne transport; services cover a variety of modes, including motorized modes such as motor vehicles and motorcycles, and non-motorized modes such as animal-drawn carts, bicycles, and head loading. The GMR also acknowledges that work is still needed to arrive at an internationally agreed definition of access that will include waterborne transport and aviation services that are playing a valuable role of transporting people and goods in remote areas.[1]

The key elements of the rural access goal are that:

- Access should be provided for all people.
- Access should be affordable and equitable.
- Infrastructure should support economic development and human well-being.
- Infrastructure should be quality, reliable, sustainable, and resilient.

Affordable and equitable rural access takes into account the needs of various income groups, including the poor; those in vulnerable situations, including women, children, persons with disabilities, and older persons; and people living in various geographic locations. It also aims to reduce transport barriers faced by such groups, notably women and girls. By referring to infrastructure supporting economic development and human well-being, it identifies the importance of providing access to jobs and productive opportunities, and access to markets and basic services such as health and education. By mentioning quality, reliable, sustainable and resilient infrastructure, the target points to the need for rural access infrastructure and services to be well designed, built, managed and maintained, with in-built climate resilience.

The two principal indicators related to SDG target 9.1 are SDG 9.1.1: proportion of the rural population who live within 2 km of an all-season road; and SDG 9.1.2: passenger and freight volumes, by mode of transport. Indicator SDG 9.1.1 is also referred to as the rural access index (RAI). When the RAI was originally developed, it was recognized that 2 km was a compromise.

For some rural population members, such as the disabled or those carrying heavy loads, 2 km may be too far to walk to reach transport services. In many remote settings, such as the hills of rural Nepal or remote areas of rural Africa, people may be accustomed to walking for considerably longer than 2 km.[2] A different access would need to be derived to measure access by other modes, such as waterborne transport.

Based on the original RAI data, the GMR estimated that more than 1 billion people, or one-third of the global rural population, lacked access to all-season roads and transport services in 2006.[3] In Africa, the total was 450 million people, more than 70 percent of the continent's rural population. Most of the world's poor live in rural areas isolated by distance, terrain and poverty from employment and economic opportunities, markets, and healthcare and education facilities. The RAI refers to land transport by road. This is appropriate in the large majority of rural access settings where land transport by road is the predominant means of access. It is not clear how the RAI should be applied if access is provided by other modes such as waterborne transport particularly in extremely remote or geographically challenging regions where the use of waterborne transport or small aircraft will prove beneficial to rural populations.

While the two principal indicators are well defined, both suffer from problems of limited data availability. In the case of SDG 9.1.1, the RAI was originally developed using one-off country-level household surveys and other sources, that have generally not been updated since. In the case of SDG 9.1.2, while rural traffic is a very relevant indicator, it is generally not collected by countries. It is hoped that new methods of data collection will in the future help to overcome the present lack of data for the principal indicators. Through its Research for Community Access Partnership (ReCAP), the United Kingdom's Department for International Development (DFID) has been exploring development of a new RAI methodology uses geospatial technique and satellite imagery.[4] Based on initial piloting in northern Nigeria, this approach shows some promise, but some technical issues need to be resolved before it could be used more widely. Similarly, new methods of carrying out traffic counts are being developed using mobile phone data, satellite imagery and drones, and these may in future make it possible to obtain reliable rural traffic data at low cost.

The GMR suggests several possible supporting indicators that would be useful for measuring various dimensions of rural access but that currently lack methodologies or data. For infrastructure, these include (i) the proportion of rural roads in "good and fair condition," (ii) the percentage of markets accessible by all-season roads, and (iii) the percentage of national government budget spent on low volume rural transport infrastructure. For rural transport services these include (i) the ratio of national to local passenger transport fares, (ii) the percentage of household monthly expenditure spent on transport, (iii) the percentage of the rural population with at least daily transport service (using Living Standards Surveys), and (iv) the percentage of households that make one motorized trip per month.

In examining how countries can achieve universal rural access by 2030, it is useful to consider four main types of rural access, each of which has a role to play depending on needs and resource availability. They also provide a basis for upgrading rural access in stages, using a less costly approach when traffic is low, and investing in upgrading when traffic is higher. The rural access types and their characteristics are:

- Basic access
- Motorcycle trails
- Low-volume rural roads
- Higher-volume rural roads

These are discussed here and summarized in Annex A.

Basic access investments commonly take the form of spot improvements to overcome problems at specific locations on existing un-engineered roads and tracks, to make them passable in all seasons. Such roads and track use in situ soils or rocks as a running surface and carry relatively low traffic volumes—fewer than 50 motorcycles and bicycles per day. The benefits of all-season basic access on an all- season basis are often high, while the costs of improvement are relatively low and maintenance requirements are modest.[5] Among the main impediments to be overcome are watercourse crossings and steep alignments. Provision of simple stone drifts and culverts can provide solutions in areas prone to flooding. In mountainous regions and where

there are rivers to cross, the provision of low-cost trail bridges—usable by pedestrians, bicycles, motorcycles and livestock—can improve safety and save time. For people living near rivers, lakes or coastlines, the construction of a simple vessel landing facility can provide all-season access using vessel services.

Motorcycle trails offer faster point-to-point, all-season access by motorcycle. They are used in countries where the initial stages of motorization have seen rapid growth in motorcycle ownership and the proliferation of privately- operated motorcycle taxi services (50–100 motorcycles per day). This has been seen in Southeast Asian countries since the 1970s and in some African and Latin American countries over the past two decades. Trails can be developed at fairly low cost, using existing earthen tracks where passable, together with engineering improvements such as small bridges and narrow paved running strips. Connecting remote rural villages by motorcycle trails can be transformational: motorized transport becomes widely available for the first time, providing improved access to markets, medical and educational facilities, and making it easier for service-providers to reach villages. Although tariffs for motorcycle taxi services can be high, and there are traffic safety issues, the speed and convenience of motorcycle taxis are attractive to many users, until such time that regular services using motor vehicles and buses become available.

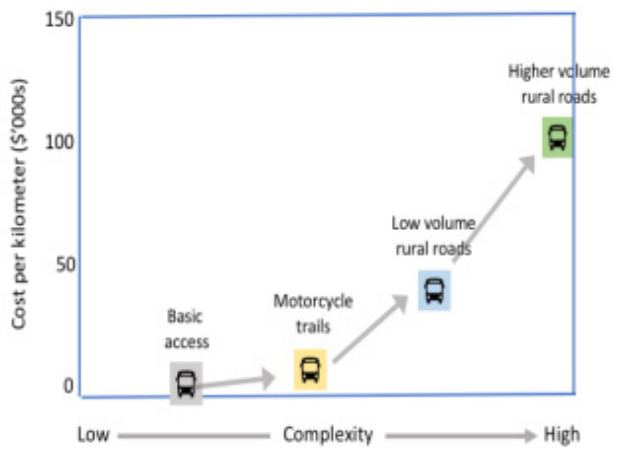
Low volume rural roads (LVRR) are an option to consider when motor vehicle traffic is somewhat higher (50–200 motor vehicles per day). Compared with basic access and motorcycle trails, LVRR provide a higher quality and capacity of service, which encourages more private operators to offer passenger and freight services. A wider roadway and other limited engineering improvements are needed to provide a more uniform surface, raise safe driving speeds, and provide drainage to ensure all-season access and avoid damage from water penetration. LVRR are still generally constructed using earth or gravel, although climatic and terrain environment considerations may require sealed or paved options. They are more costly than basic access improvements, and introduce significant requirements for routine and periodic maintenance. Recent research in Africa and Asia has shown that conventional bitumen sealing is not always cost-effective, and that other low-cost paving options using locally available materials can offer a proven alternative that may be more appropriate and sustainable in particular circumstances.

Higher volume rural roads (HVRR) are a further option, offering a relatively high quality and capacity of service for busier sections of the rural road network—100–500 motor vehicles per day—and attracting further increases in private passenger and freight services. HVRR may be needed in areas with large populations, or where agricultural production has expanded to include the increased production of higher-value perishable crops. Generally, work involves constructing a fully-engineered road with a bitumen sealed surface or, where required, a more durable pavement such as concrete.[6] This is relatively costly. If surfaced, the roads require significant routine and periodic maintenance. If built using concrete, the construction cost is substantially more but maintenance requirements are less.

In choosing between basic access, motorcycle trails, LVRR and HVRR to serve a particular route, a first consideration should be to determine what level of improvement is sufficient to address the needs of the different users. This should focus especially on economic uses—such as for agriculture, employment, health, education and rural development—while also considering access to the rural population for public and private service providers. A fundamental principle is that the level of improvement should aim to be fit for purpose. A second consideration is the overall availability of finance for construction and maintenance of rural access infrastructure. If financing is abundant, more rural access needs can be met using LVRR and HVRR, subject to each investment being economically justified. If funding is scarce, as is more often the case, it is better to channel more of the investment into basic access or motorcycle trails (if motorcycle taxis are widely used) since this is the least-cost way of achieving the overall rural access goal, and to limit investments in LVRR and HVRR to those where traffic conditions indicate an urgent need for upgrading.

It is also useful to look at rural access improvement as an evolving, sequential, longer-term process. Providing basic access or motorcycle trails enables people to expand their economic activities and increase their incomes. This leads to higher traffic levels, and

Figure 1.1: Cost and Complexity of Rural Access Interventions



Source: Authors

eventually to a need to further improve transport quality and efficiency to compete in larger and higher value markets (e.g. fruit and vegetables), which may initially justify upgrading to LVRR and, if this process continues, may eventually justify HVRR. The process perspective has several advantages. Basic access becomes an initial priority, supporting an equitable, fast-track approach to achieving universal basic access. The risk of investing prematurely in more costly types of infrastructure is mitigated. Also, once investment in LVRR or HVRR becomes justified, the local economy has expanded, so more resources are available for meeting the costs of future maintenance (Figure 1.1).

In many cases, urban access is enhanced when access to and from major transport nodes, such as seaport or airport, are duly considered. Without the need to construct many hundreds of miles of road, a small air strip with services to larger regional centers or cities can provide a remotely located population with access to healthcare and other services in a cost-effective way. Airports and seaports serve as cargo and passenger processing and distribution points between air transport and other modes. They impact urban access as multimodal connectivity is required to ensure efficient access to/from the airport. The interrelationship with other modes is critical for air transport to be efficient for the end user and in leveraging full economic benefits and impacts they have on cities and countries.

ENDNOTES

1 Aviation services include the use of drone technology that have proved to be valuable in providing rural towns and villages with access to emergency aid, commercial goods and medical supplies.

2 Roberts, Peter, K. C. Shyam, and C. Rastogi. 2006. *Rural Access Index: A Key Development Indicator.* Transport Papers TP-10. World Bank: Washington, DC.

3 Starkey, P. and Hine, J. 2014. *Poverty and Sustainable Transport: How Transport Affects Poor People with Policy Implications for Poverty* Reduction. ODI: London.

4 World Bank. 2016. *Measuring Rural Access: Using New Technologies*. World Bank: Washington, DC.

5 Spot improvements along the "first mile" between farm and produce collection point can have a major beneficial impact by reducing transport costs and damage to produce. Studies indicate that backloading is the predominant means of "first mile" transport in Kenya and Tanzania, but the unit cost of backloading is 16 times the cost of using a truck in Kenya and 23 times in Tanzania. Njenga, P., Willilo, S. and Hine, J. 2015. *Overcoming the First Mile—Lessons from Farmers in Kenya and Tanzania*. World Road Association Presentation. Seoul.

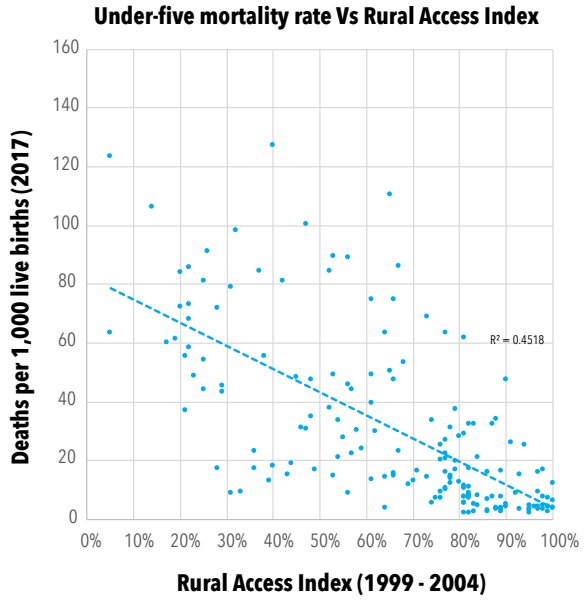
6 Design standards should be adjusted in line with projected traffic. For example, a HVRR to serve 400 vehicles per day should provide a higher level of service than one to serve 200 vehicles per day

2. THE STATE OF PLAY

There is currently very limited country level data available for the rural access indicators within the SDG framework and the additional indicators proposed by the GMR. This makes it difficult to identify trends in rural access at thecountry, regional, and global levels. Most countries do not yet collect RAI data, although there is a DFID-UKAID funded initiative currently aiming to improve this situation. The limited existing data is mostly derived from the original surveys conducted by the World Bank and other development partners around the time of first proposing the RAI, supplemented by a recent pilot study that used satellite imaging technologies to collect RAI data in eight countries together with some additional country data recovered on an ad hoc basis. For each of the other main and supporting indicators, there is currently no data available.

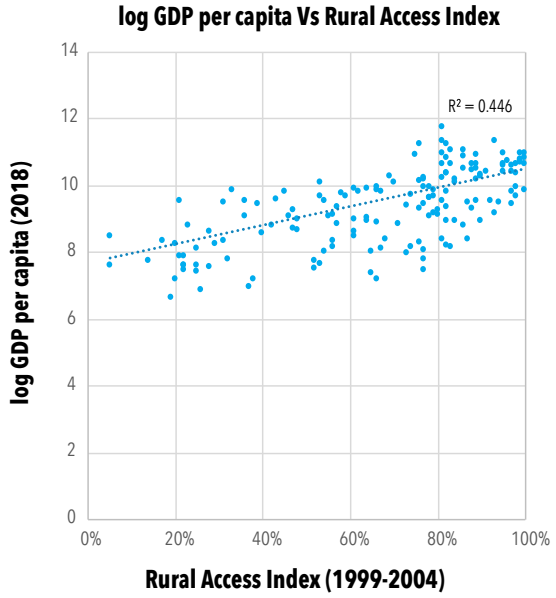
A comparison of original RAI estimates with those produced a decade later by the pilot and other studies suggests that in Asia rural access has improved, but in Africa there has been little overall improvement.[7] In Asia, the past decade saw a series of large-scale rural access programs being implemented, including in Bangladesh, Cambodia, China, India, Nepal, and Vietnam. These were often on a large scale. For example, India's National Rural Roads Program (Pradhan Mantri Gram Sadak Yojana, PMGSY) has completed more than 550,000 km of all- season rural roads since it began in 2000. In Africa, many countries established rural access programs, but because of financial, institutional, and other constraints, few reached the scale needed to deliver major improvements. A notable exception has been Ethiopia which, since 2010, has

Figure 2.1: Rural Access Index versus log GDP Per Capita



Source: World Bank raw data and analysis

Figure 2.2: Under-Five Mortality Rate versus Rural Access Index



Source: World Bank raw data and analysis

built 56,000 km of rural roads under the Universal Rural Road Access Program, 29,000 km under the Productive Safety Nets Project, and 7,000 km under other programs.

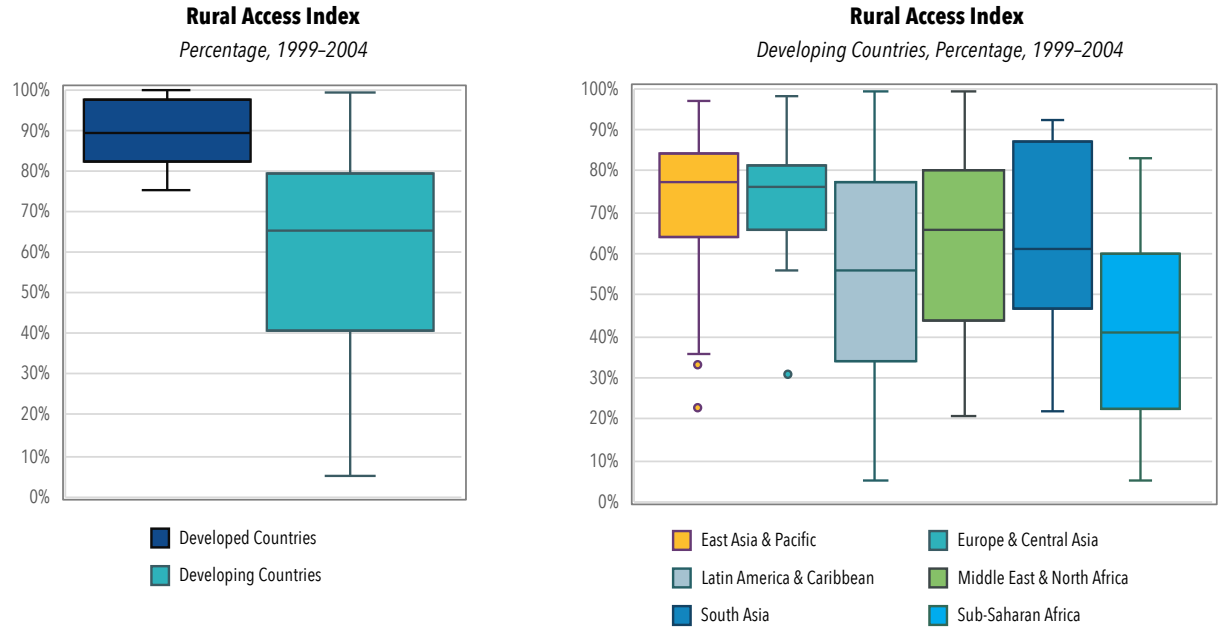
Analysis of an expanded dataset of original RAI surveys for 62 countries in six regions indicates that the RAI is positively correlated with per capita GDP, but with large differences in country performance. Better access improves the competitiveness of agriculture and other rural economic activities,[8] while higher GDP generates increased public revenues that can be used to finance access improvements (Figure 2.1).

The GMR referred to the significant role rural access plays in reducing multiple dimensions of poverty, including by increasing school enrollment rates for boys and girls and disadvantaged groups. In Ethiopia, proximity to a road in good condition reduces the likelihood of being chronically poor by 36 percent[9]. Also, better rural transport access is associated with lower morbidity and mortality rates and better health and poverty outcomes. Based on the expanded original RAI dataset for 62 countries, there is an inverse correlation between rural access and the under- five mortality rate, again with substantial differences in performance between countries (Figure 2.2). Improved access enables people to make increased use of health services and to quickly obtain medical assistance at times of emergency.

Figure 2.3 shows the distribution of Rural Access Index (RAI) in developed and developing countries, and in six regions of the world for developing countries only. The line in the box shows the median of the variable. The width of the box on either side of the median shows the "spread" of one quartile of the observations. The "Whiskers" show where the more spread out observations lie (two quartiles). Individual dots show observations which are outlying extreme values beyond the quartiles. For example, the median for Europe and Central Asia is about 76%. The values within one quartile range from about 66% to 81% (the Box) and the broader values range from about 55% to 97% (the Whiskers). There exists an outlying extreme value at about 31%.

Developed countries were found to have a higher median RAI than developing countries. There were also clear differences between regions in the median of the RAI and in the variability (spread) of RAI among countries within a region. Ranked by median, the re-

Figure 2.3: Rural Access Index by regions of the World



Source: World Bank raw data and analysis

gions, from lowest to highest, would be: Sub-Saharan Africa, Latin America & Caribbean, South Asia, Middle East & North Africa, Europe & Central Asia and East Asia & Pacific.

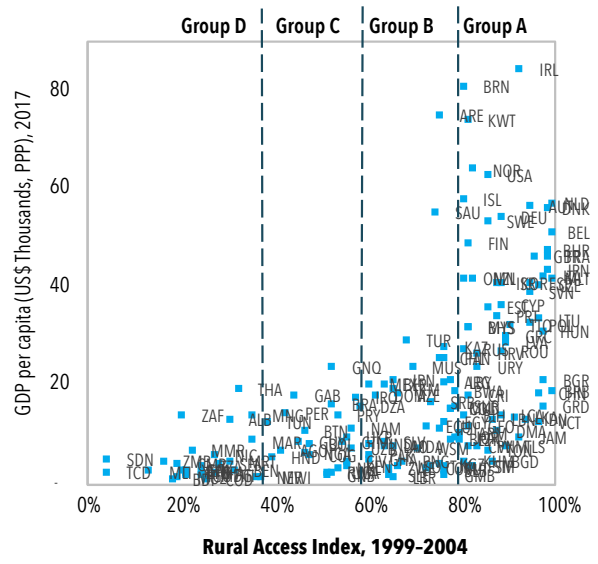
In Figure 2.4, data on Rural Access Index is plotted against GDP per capita and used to compare countries on Universal Rural Access. Countries are divided into four groups (A to D) based on distance to best performance.

Group D represents countries that, compared with their peers, have made the least progress; Group C represents those that have made less progress; Group B represents those that have made more progress; and Group A represents countries that have made most progress. It may be noted that each country group includes countries from most or all regions.

Based on review of published studies of rural access provision, a simple set of attributes has been identified to characterize the four country groups. This makes it possible for the actions proposed within the rural access roadmap to be tailored to the circumstances of each group.

Group D countries typically have experienced great difficulty in expanding rural access. Often, they have geographical, climatic, or demographic characteristics, together with underlying weaknesses in institutional, technical, and financing capacity, that make it harder to expand rural access. Group C countries have performed better than Group D but have made only limited progress in expanding rural access. They face similar types of difficulties, but these are less severe than for Group D countries. Group B countries have made relatively good progress expanding rural access. They tend to have fewer geographical, climatic, and demographic difficulties. With moderate-to-good institutional, technical, and financing capacity, they are able to prepare and implement rural access programs of suitable scale and quality and raise necessary financing from domestic sources and development partners. Group A countries have made good progress and are now within reach of universal rural access. They have fewer geographical, climatic, and demographic difficulties, and have a strong capacity to prepare, implement, and finance rural access programs (Table 2.1).

Figure 2.4: Scatterplot of Rural Access Index vis-à-vis GDP per capita by Country



Source: World Bank raw data and analysis

Table 2.1: Attributes of Four Country Groups for Rural Access

Attribute	Group D: Least progress	Group C: Less progress	Group B: More progress	Group A: Most progress
Distance from RAI target	Very high	High	Moderate	Low
Geographical, climatic, or demographic difficulty[a]	High	Moderate	Moderate	Low to moderate
Institutional and technical capacity	Low	Low to moderate	Moderate to high	High
Financing capacity	Low	Low to moderate	Moderate to high	High

a For example, hilly terrain, heavy rainfall, large terrain, low population density.

Source: Authors

ENDNOTES

7 Due to the limitations in the existing RAI data, it is used in this paper for illustrative purposes only.

8 In developing countries, 40 percent of food losses occur post-harvest, including degradation and spillage from poor transport conditions. World Bank 2017. *Enabling the Business of Agriculture 2017*. Washington, DC: World Bank.

9 Dercon, S., et al. 2008. *The Impact of Agricultural Extension and Roads on Poverty and Consumption Growth in Fifteen Ethiopian Villages*. IFPRI Discussion Paper 00840

3. LEGAL AND REGULATORY AGREEMENTS

While rural access is critical for inclusive development and poverty reduction, it has received comparatively little attention in international agreements and commitments on transport. It is currently addressed by two such agreements, namely the Ashgabat Statement[10] and the Vientiane Declaration on Sustainable Rural Transport[11]

Ashgabat Statement. This was endorsed by more than 50 member countries attending the first-ever UN Secretary- General's Global Conference on Sustainable Transport held in Ashgabat, Turkmenistan in November 2016[12]. It referred to the integrated and cross-cutting nature of sustainable transport solutions and the multiple roles of transport in supporting the SDGs, including leaving no one behind, securing prosperity, enabling access to services, and protecting the environment. With regard to rural access, countries reaffirmed their commitment to:

"support efforts to provide communities in rural areas in developing countries with access to major roads, rail lines, and public transport options that enable access to economic and social activities and opportunities in cities and towns and that unleash productivity and competitiveness of rural entrepreneurs and smallholder farmers."

Vientiane Declaration on Sustainable Rural Transport. This voluntary declaration was adopted by representatives of 23 member countries and 14 observer countries at the 10th Regional Environmentally Sustainable Transport Forum in Asia, convened by the UN Centre for Regional Development on 14–16 March 2017 in Vientiane, Lao PDR. Participants expressed their commitment to (i) inclusive, affordable, accessible and sustainable rural transport infrastructure and services, (ii) climate-adaptive rural infrastructure, (iii) environmentally sustainable and low- carbon rural transport, (iv) transport contributing to integrated rural development, (v) efficient rural access, rural-urban connectivity and sustainable freight movement, (vi) national strategies and policy frameworks to improve rural transport connectivity, (vii) rural transport safety, (viii) environmental and social impact assessment, (ix) take-up of innovative approaches to improving rural access, and (x) capacity building and technology transfer.

The Ashgabat Statement and the Vientiane Declaration on Sustainable Rural Transport provide a useful outline of the role of rural access in sustainable development and identify some of the most important challenges for achieving universal rural access. Being voluntary and nonbinding in nature, they have no legal force and do not establish commitments to take follow-up actions.

ENDNOTES

10 Ashgabat Statement. 2016. *Ashgabat Statement on Commitments and Policy Recommendations of the Global Sustainable Transport Conference*. Global Sustainable Transport Conference, 26–27 November 2016. Ashgabat.

11 Vientiane Declaration, 2017. *Vientiane Declaration on Sustainable Rural Transport towards Achieving the 2030 Agenda for Sustainable Development.* 10th Regional Environmentally Sustainable Transport Forum in Asia, 14–16 March 2017. Vientiane.

12 See also: General assembly resolution 70/197 and website: https://sustainabledevelopment.un.org/Global-Sustainable- Transport-Conference-2016.

4. CATALOGUE OF MEASURES

While individual investments in rural access are not technically complex, a great many investments are needed at relatively remote locations to realize an overall improvement in rural access. When countries have been successful in expanding rural access, this has generally been based on having suitable policies and programs and implementing them consistently in different parts of the country over many years (for example, 1–2 decades). To guide these investments and attract participation from stakeholders, the overall aim and approach need to be defined by a rural access policy, and a national rural access program needs to be established to set standards, procedures, implementation arrangements, and accountabilities. The catalogue of measures that countries can take to improve rural access is summarized in Table 4.1.

The GMR also discusses synergies and trade-offs between universal rural access and the other SuM4All goals of efficiency, safety, and green mobility. Higher efficiency can increase capacity and lower costs, thereby increasing access. Higher accessibility can lead to benefits by increasing job density and market competition. However, increased access can also lead to traffic growth and road capacity bottlenecks and can result in transport being provided in sparsely populated areas where it may not be financially viable. With respect to safety, increased vehicular travel can lead to more crashes, fatalities and injuries if road safety awareness and systems are not improved. With respect to green mobility, increased use of motorized transport can lead to additional environmental externalities (Table 4.1).

Table 4.1:. Summary of Catalogue of Measures

Toolbox/ subject	Action	Synergies or Trade- Offs with Other Goals				
		Urban	Efficiency	Safe	Green	Gender
Policy-maker and lawyer toolbox						
Rural access policy	Establish a comprehensive and pragmatic policy that targets universal rural access within a defined time frame, preferably by 2030	◆	◆	◆	◆	◆
	Adopt a multi-tiered, multi-modal approach that supports both early attainment of universal rural access and further upgrading to higher access tiers based on affordability and feasibility		◆			
	Obtain prior commitments from stakeholders on planning, financing, and performing maintenance–to mitigate past problems of unsustainability from lack of maintenance					
	Include measures to expand and improve transport services and rural logistics	◆	◆	◆		◆
Institutional and governance	Establish a national program to implement the policy through a stakeholder partnership involving central and local governments, communities, and the private sector	◆	◆	◆	◆	◆

Capacity building	Provide capacity building to assist stakeholders to perform their roles in the program					◆
	Countries with large programs to establish materials testing and research capacity		◆			
Engineering toolbox						
Technical standards	Establish technical standards for each of the multiple tiers of rural access, ensuring protection against water penetration, screening for climate vulnerability, use of local materials and resources where feasible, and incorporation of traffic safety		◆	◆	◆	◆
Maintenance	Establish reliable approaches to asset management, with communities performing routine maintenance where feasible and contractors performing periodic maintenance selected using a RAMS, and implement measures to control axle loads		◆	◆		
Contracting	Procure contractors on a competitive basis, using packaging of batches of projects to attract sufficient numbers of bids by capable contractors					
	Prepare procurement rules, procedures, standard bidding documents and contract documents for the program, supported by an e-procurement platform					◆
Feasibility, design, supervision and quality assurance	Recruit qualified consulting firms to perform the tasks of preparing feasibility reports and engineering designs, and supervising civil works					
	Establish a pool of independent experts to undertake technical and financial audits of projects to support quality assurance, value-for-money and anti-corruption					
Economist toolbox						
Project selection and rural access network planning	Establish a set of project selection criteria and disseminate these widely among rural communities with a view to attracting their participation		◆			
	Use participatory planning methods to help communities propose interventions					◆
	In selecting and planning groups of projects to serve a geographical area, give attention to ensuring the efficiency of the future rural networks		◆			
Economic analysis of projects	Require rural access projects to meet an economic viability threshold based on cost-effectiveness comparison for basic access and small motorcycle trails projects, and estimation of the EIRR for large scale motorcycle trails projects, LVRR and HVRR		◆			
	Allow a modest proportion of rural road projects (e.g. 15 percent) to use a lower EIRR threshold if high need and economic potential can be demonstrated					

EIRR=economic internal rate of return, HVRR=higher volume rural road, LVRR=low volume rural road, RAMS=road asset management system

Source: Authors.

4.1. Regulatory and Institutional toolbox

Rural access policy and program. The government should establish a rural access policy and program that targets universal rural access within a defined time frame, preferably by 2030. The objective may be expressed in various ways, such as raising the proportion of the population within a specified distance of an all-season road, or providing a defined level of infrastructure needed for various sizes of settlements. The objective should take into account the level of investment financing expected to be available and should be sufficiently ambitious to bring about a major improvement in rural access within the timeframe.

The **policy** should adopt a multi-tiered, multi-modal approach that supports both early attainment of universal rural access, and further upgrading to higher access tiers based on affordability and feasibility. If rural access is low, or if financing and implementation capacity are constrained, an initial focus on basic access, or low-cost motorcycle trails, will be the fastest, least costly, and most equitable way of achieving universal rural access. Even if constraints are less, the policy may still focus on basic access or motorcycle trails until universal rural access is achieved, while also investing in rural roads, depending on needs and feasibility. The policy should include measures to expand and improve transport services and rural logistics. This should encompass service quality, frequency, efficiency, affordability, and safety, taking into account the needs of users, including poor and vulnerable groups.

Lack of maintenance has been one of the most serious shortcomings of past rural road programs in many countries. It leads to unsustainability—from deterioration in the quality of service, reduced benefits, and the shortened economic life of rural access assets. To avoid repeating these past problems, the program should require local governments and communities receiving support for rural access improvements to enter into firm commitments to plan, finance, and execute routine and periodic maintenance. Also, they should face sanctions—such as suspension of new construction financing—if they fail to meet the commitments. Local sources of maintenance financing may include earmarked local taxes (for example, crop cess), local government budget allocations, and community cash and in-kind contributions.

Institutional and governance arrangements. The government should establish a national program to implement the policy via a stakeholder partnership involving central and local governments, communities, and the private sector. The central government should provide or facilitate the majority of the investment finance, but local government and communities should provide matching contributions, both cash and in-kind[13]. In return for receiving program funding, local governments and communities should implement the program in accordance with agreed principles, practices, and procedures. These should include planning and investment selection, technical standards, implementation modalities, responsibilities for maintenance, regulation of transport services, approaches to providing access to vulnerable groups, governance and administrative procedures, and reporting and monitoring.

Recognizing that it is costly to construct and maintain rural access infrastructure, the program should require careful planning, selection, and sequencing of rural access projects with a view to quickly achieving substantial progress toward the objective of universal basic access, and prioritizing investments expected to bring significant net socio-economic benefits. This will help the areas served to advance economically, make it more affordable for them to meet the costs of future maintenance, and generate additional government tax revenues that make it possible to extend rural access to additional areas in the future.

A central government ministry—such as the ministry for rural development or transport—should lead the process of establishing the program and should consult with stakeholders; coordinate with other government agencies with transport-related responsibilities and needs; formulate the objectives, approach, financing, implementation arrangements, oversight, and reporting; and initiate program implementation. The relevant minister should obtain political support and act as national champion for the program. A Road Agency operating at an arm's length of the ministry—staffed with qualified engineers and other specialists—should guide technical aspects of the program, oversee implementation, provide technical advice to local government counterparts, and design and implement capacity building programs. The central ministry should prepare a detailed set of guidelines for stakeholders,

to ensure a consistent approach across the country. The guidelines should include all elements of the program design and implementation.

Local governments should be responsible for implementing the program in their areas, working closely with communities. They should establish an agency operating at an arm's length of the local government to lead implementation activities[14], which include rural access network planning, project selection, planning and executing maintenance, arranging maintenance financing commitments, procuring contractors and supervision services, regulating transport service providers, liaising with communities, and arranging further capacity building activities. Field-based project implementation units should be established, with day-to-day responsibility for implementation of civil works. Local governments should also coordinate the rural access program with other rural development programs, including other transport and infrastructure programs, agriculture development, enterprise development, health and education provision, and programs for disadvantaged and vulnerable groups.

Community organizations such as village committees should represent communities participating in the program and interface with local governments. They should take part in preparation of the rural access network plan for their areas and nominate projects to be implemented by the program. Where relevant, they may also be responsible for organizing labor-based community contractors.

Capacity building. The government should facilitate capacity building to assist stakeholders to perform their roles in the program. Initially, it should conduct a capacity assessment of the main entities responsible for planning, implementation, and maintenance of rural access infrastructure, and regulation of local transport services. This should identify capacity gaps and types of capacity building activities needed. Capacity building support may cover subjects such as rural access program leadership, management and oversight, rural network planning, community consultation, technical standards, rural access engineering and construction materials, social and environmental safeguards, construction supervision, project management by private contractors and labor- based community contractors, rural access asset management, and methods of regulating local transport services.

Capacity building activities should be generally conducted through existing national or regional institutions such as engineering institutes and universities, training centers for road sector professionals and technical staff, and local government and rural development training organizations.

All countries with large rural access programs will need to progressively build capacity in materials testing and research to establish databases of local materials and how they may be used in construction. Many countries could significantly reduce rural access costs by making greater use of local materials, either through appropriately modified designs or by their mechanical or chemical stabilization—but few countries have enough domestic capacity in construction materials testing and research. Countries may initially make use of simple testing kits and seek support from regional entities (such as ReCAP). Another option is to outsource the materials testing and research to the private sector.

4.2. Engineering and Technology toolbox

Technical standards. Drawing upon available national and international standards and taking into account the findings of national engineering and related technical research, the government unit or agency responsible for technical aspects of the program should prepare a set of technical standards and geometric design standards for the program. It should establish technical standards for each of the main types of rural access—basic access, motorcycle trails, LVRR, and HVRR. These should include protection against water penetration, screening for climate vulnerability, use of local materials where feasible, and incorporation of traffic safety.

The standards should provide a menu of technically and economically feasible options to safely and affordably serve traffic over the intended economic life of the infrastructure, taking into account traffic characteristics, geography, and climate conditions, materials availability and climate adaptation risks, and the need to limit costs to match available resources. To protect against damage from water penetration, roadside drainage and simple drainage structures such as culverts should be provided where needed and, where appropriate, pavements of rural roads should be sealed.

In countries that expect to make significant use of labor- based methods of construction and maintenance, the government should prepare a technical handbook describing acceptable labor-based methods and procedures.

The standards should encourage use of locally available materials wherever feasible. In doing so, they should draw upon available research findings on the types of locally- available materials, their physical properties, and methods of using such materials in road construction. In many cases, additional research should be carried out to support the use of locally-available materials.

A climate-risk screening index should be established for use by local governments to identify projects requiring climate adaption measures to be included in the engineering design. To guide design of adaptation measures, the technical standards should indicate service levels, taking into consideration the maximum number of impassable days per year.

Road safety audits should be carried out when designing all road-based access improvements. While basic access improvements may not significantly change the safety of pedestrians and other road users, it is likely that—with higher motorized traffic levels and speeds—motorcycle trails, LVRR, and HVRR will often introduce additional hazards. The road safety audit should identify road safety risks along the alignment, leading to design of engineering measures to mitigate these risks (such as traffic calming measures and design of road shoulders for use as footpaths).

In large countries with strong in-country technical expertise, the development of technical standards will require extensive consultation with national centers of technical expertise including the engineering and related professions, technical institutes and universities, contractors and consultants. In small and low-income countries, there may be less local expertise, so preparation of technical standards may initially require external support. In such cases, capacity development support should be provided for engineering research.

Maintenance. Communities should establish reliable approaches to asset management and should perform routine maintenance where feasible. Contractors or road authorities responsible for performing periodic maintenance should preferably use a road asset management system (RAMS) and implement measures to control axle loads.

All rural access assets require routine maintenance. This is preventive in nature, focusing on removing vegetation and obstructions from the road alignment, clearing drainage, and repairing minor defects before they lead to significant damage (including camber preservation, water management and dispersal, pothole patching, crack filling, and repair of pavement edges). Since routine maintenance should be conducted regularly and frequently and the tasks are generally quite simple, it can often be carried out by communities located nearby. The communities need to receive remuneration to be motivated for this role. An option that has been used successfully in some settings is to engage community maintenance groups through performance-based contracts (for example, the Dehong pilot project in China).

Periodic maintenance is essential for LVRR and HVRR; otherwise the assets may be depleted prematurely (for example, within 10 years). It is generally conducted after some years of use (for example, 7 years for sealed roads), when the asset condition has deteriorated and needs to be restored. In the case of HVRR, periodic maintenance involves repair of damage to the road structure and resurfacing the pavement. Periodic maintenance is also needed for basic access infrastructure and motorcycle trails, but less work is likely to be involved., Less maintenance is also required for pavements or structures made of concrete can last for 20–40 years if properly designed, constructed and appropriately maintained.

Since periodic maintenance of rural roads is costly, and each road deteriorates differently—depending on factors such as climate, topography, soil conditions, construction quality and materials used, and traffic characteristics—the timing and types of periodic maintenance treatment need to optimized using a RAMS. Drawing upon road inventory data, and surveys of road conditions and traffic levels for all roads in the network, the RAMS prioritizes periodic maintenance works within the available budget on the basis of economic returns. The RAMS also estimates the budget for routine and periodic maintenance to provide a desired level of service across the network. In the case of

rural roads, a relatively simple form of RAMS is appropriate (such as Tanzania's District Road Management System), one that uses objective data on road condition and traffic, but limits the amount of data collection and simplifies the data analysis.

The government should establish or adapt a RAMS suitable for the program, establish technical capacity to operate the RAMS at central or local government level, and make available simplified tools for preparing road inventories and conducting annual surveys of road condition and traffic. One option may be to outsource RAMS operation, data collection, and analysis to a firm specializing in RAMS (this approach is commonly used in advanced countries).

A further essential part of managing rural access assets is the effective control of axle overloading. This is especially important for surfaced rural roads. Axle load control may require the preparation or updating of axle load regulations, together with effective arrangements for enforcement of the regulations using portable weigh scales to check axle load compliance.

Contracting. Competitive procurement is generally the best way to obtain value for money when undertaking civil works for construction and periodic maintenance of the rural access infrastructure. Labor-intensive, community- based contractors may be suitable for performing basic access improvements and routine maintenance of rural roads.

Local governments should generally be responsible for procuring contractors subject to obtaining prior or post- facto central government approval of contracts[15]. Procurement packages should generally group together batches of individual projects in the same geographical area, to provide contract sizes capable of attracting competition among capable contractors. This will also support the administrative efficiency of the program by limiting the number of contracts to be procured and administered.

In some very remote areas it may be difficult to attract the most capable contractors, and local governments may need to use smaller contractors—including labor-intensive community contractors—and provide them with capacity building support.

With a view to encouraging competition and ensuring that the procurement process is timely, efficient and transparent, the government should prepare procurement rules, procedures, standard bidding documents and contract documents for the program, supported by an e- procurement platform. Contract documents should provide for core labor standards and equal pay for women and men and reserve a proportion of construction employment for local residents and disadvantaged groups such as women and the poor. The e-procurement platform should provide guidance on how to prepare bids; information on forthcoming tenders; support the process of qualifying eligible contractors and inviting and receiving bids; announce the contract awards; track contact performance; and provide a repository of procurement related documents for the program.

The time allowed for submission and evaluation of bids should be less than allowed for major highway construction contracts. Bid evaluation procedures may allow for a modest pricing preference for community- based contractors (5–10 percent).

Feasibility, design, supervision, and quality assurance. Local governments should generally recruit qualified consulting firms to perform the tasks of preparing feasibility reports and engineering designs (including the preparation of basic engineering drawings and bills-of- quantity) and supervising civil works. Feasibility reports are required to confirm compliance with program eligibility criteria and technical and economic feasibility. Engineering design and supervision are needed to ensure that construction and maintenance works will meet required technical standards, to provide the technical documentation required for procurement of contractors, and to supervise contractor performance. Since the rural access programs typically comprise a large number of relatively small rural access projects, each consulting firm should cover batches of proposed projects within the same geographical area. Where labor-intensive methods are adopted, there will be a need for increased inputs for day- to-day supervision inputs.

When formulating the rural access program, the central government should establish a pool of independent experts to undertake technical and financial audits of projects, to support quality assurance, value-for-money and anti-corruption. The technical audit

should physically verify that all executed works have been carried out in compliance with the contract and in accordance with technical standards and specifications. This requires inputs from engineers and other technical experts. The financial audit should examine financial records and reports, verifying compliance with procurement laws and procedures, and determining whether audited projects have provided value-for-money. Engineers should conduct the technical audits, and accountants and other financial specialists should conduct the financial audits.

4.3. Economic and Finance toolbox

Project selection and rural access network planning. The selection of individual projects within a rural access program should be closely aligned with the overall objective of the national rural access policy, and project proposals should reflect the views and priorities of the rural communities to be served. If there is a large gap in rural access and the policy prioritizes early achievement of universal rural access, greater emphasis will initially be given to small investments in spot improvements to provide basic access, followed later by increased emphasis on more costly investments in rural access networks.

The government should establish a set of project selection criteria and disseminate these widely among rural communities with a view to attracting their participation. Criteria may cover minimum settlement size, eligible types of investment in each of the main categories of rural access improvement (including basic access, motorcycle trails, LVRR, HVRR), preferred sequencing of investments (for example, initial priority for basic access improvement, precedence among different types of roads within the network, including links to settlements, links to trunk road networks, and links to neighboring areas), an economic viability threshold, special provisions to support projects serving very poor and vulnerable groups, safeguarding of environmental and social impacts, and the commitment required on maintenance financing.

Use participatory planning methods to help communities propose interventions. Communities know best how present access limitations affect their economic activities (including agricultural production and marketing) and access to essential services (such as health and education). They can also provide important insights into how these limitations can be overcome, both through infrastructure investments and by tackling shortcomings in transport service provision and rural logistics. Local government should also coordinate with key sectors and rural development projects that may depend upon or influence the use of transport services by the community. If a major rural development project is planned, the approach to rural access and rural development should be closely integrated.

In selecting and planning groups of projects to serve a geographical area, communities should ensure the efficiency of the future rural networks—with a view to realizing the potential socioeconomic benefits of improved access while limiting both the investment required and the size of the local network to be maintained. This is needed for LVRR, HVRR, and more comprehensive motorcycle trails projects. Rural access network planning should assess choices between competing eligible project proposals and project routings proposed by different communities and identify how the local network will connect with neighboring areas and the national road network. It should also identify the preferred sequencing of investments in the network. In practice, the rural access network plan proposals prepared by individual communities should be consolidated into rural access network plans by the next level of local government (for example, a district rural access network plan), and eventually into a national rural access network plan approved by the central government. To support the network planning process, the government should prepare a manual containing the requirements for rural access network plans and the preparation and approval process.

Economic analysis of projects. The government should require rural access projects to meet an economic viability threshold based on: a cost-effectiveness comparison for basic access and small motorcycle trails projects; and an estimation of the economic internal rate of return (EIRR) for large-scale motorcycle trails projects, LVRR, and HVRR. Investments in rural access need to be capable of producing favorable socio-economic returns; otherwise, they may displace other more productive investments and become a

financial burden with a higher likelihood that the assets created will not be well maintained. If a proposed project cannot meet the threshold, alternative types of improvement should be considered, or the project should be deferred until it can meet the economic viability threshold.

Ideally, a cost-benefit analysis should be used to determine that each project meets a minimum level of EIRR (for example, 8 percent). The analysis should take into account estimated investment and maintenance costs and economic benefits over the life of the project. However, it can be difficult to quantify the socio-economic benefits of rural access projects, particularly for smaller investments where there is no reliable basis for projecting traffic. The type of economic analysis should therefore be adjusted depending on project type.

For basic access—and smaller motorcycle trails projects that generally consist of a series of spot improvements—it is generally not possible to prepare reliable ex ante cost- benefit analysis so economic analysis should be limited to a cost-effectiveness comparison of alternatives.

For rural roads projects and motorcycle trails investments that involve construction of larger networks, a cost-benefit analysis should be prepared. Because of their higher cost, a cost-benefit analysis is needed to confirm that expected returns will meet the EIRR threshold. The estimated returns should also be considered when prioritizing and sequencing a program of rural roads investments. In most cases, a low-quality road or track already exists, and this provides a basis of existing traffic that can support estimation of economic benefits. For large motorcycle trail investments, there will often be a basis of existing traffic data that can support estimation of economic benefits.

The government should allow a modest proportion (for example, 15 percent) of LVRR, HVRR, and motorcycle trail projects to use a lower EIRR threshold if high need and economic potential can be demonstrated. For some projects—especially those serving very poor and remote communities—it may be difficult to obtain reliable data, or the available data on traffic and economic activity may lead to an underestimation of the effect of rural access improvement.

Transport services and rural logistics. Rural transport encompasses a wide variety of services using buses, minibuses, taxis, motorcycle taxis, trucks, pickups, agricultural vehicles or intermediate means of transport (IMT), animal-drawn vehicles, and bicycles; as well as waterborne vessel services. These may follow a schedule, be arranged on demand (such as motorcycle taxis) or have no schedule. Rural logistics concerns the efficiency of the supply chain from farm gate to market, including the availability of facilities for storage and consolidation, and systems to coordinate and monitor consignments and backloads. The extent that rural access infrastructure leads to improved rural access depends on the availability, suitability, quality, and affordability of transport services, and rural logistical arrangements.

It is important to identify opportunities to improve the quality, safety, and competitiveness of private transport services through the use of licensing, fare setting, and other regulatory measures. In each geographical area to be served by a rural access program, the government should assess the adequacy of transport services to meet the needs of the local population, identify the main shortcomings, and formulate regulatory and other measures to address the shortcomings. This should cover both motorized and nonmotorized modes.

One of the problems to examine is whether fare levels are inflated. In some parts of the world, competition is relatively effective in lowering fares or keeping fares low. However, in remote rural areas the transport services market is generally small, and can only support a limited number of operators. In such cases, infrastructure improvements may only lead to lower transport fares if competition between operators can be enhanced, or if permissible fares are reduced by the regulator. This has been a significant problem in many African countries, where fares are often several times higher than for equivalent services in Asia. One of the main explanations is that rural transport operators form cartels to share the demand while keeping fares high[16].

Regulatory actions may include: measures to improve service availability and competition (for example, changes in vehicle and route licensing arrangements); steps to enforce service quality and safety standards,

such as operator, vehicle, and driver licensing; the promotion of special emergency services to transport people to health facilities; and setting fares that include discounts for vulnerable groups such as children and the elderly. Given limitations in regulatory capacity, and the difficulties of enforcing regulations in remote areas, such actions need to be relatively easy to carry out and enforce. Local government transport services regulators should periodically consult with community representatives, such as village associations, to obtain feedback on the performance of transport services, so that issues– including noncompliance with regulatory provisions–can be known and addressed.

Simple roadside produce storage facilities need to be established to allow farmers to consolidate produce before collection and reduce losses from perishability. Small farmers often face problems in obtaining fair returns for their produce because of limitations in rural logistics. Since the volume of each farmer's production is low, farmers have little choice over who will buy their produce and are often unable to obtain fair prices. The cost of transporting small volumes of produce to market is high, partly because transport services operate at low levels of capacity utilization, and there are problems of empty backloads. In the absence of basic roadside storage facilities to protect against weather and infestation, the condition of a farmer's produce awaiting collection will deteriorate, leading to lower prices at the time of sale.

Alongside planning access improvements, local governments and communities–in collaboration with agencies responsible for agriculture and rural development–should identify simple rural logistics improvements that can be included within the rural access program. These may include basic access improvements on the first mile, establishing produce collection hubs, and the provision of basic storage facilities to protect crops against damage while awaiting collection. They should also take steps to improve coordination of outbound and inbound consignments with a view to improving the bargaining power of farmers and improving capacity utilization of transport services.

Encourage the private sector–including business incubators and venture capital–to invest in online platforms for service hailing and for other innovative services that improve the convenience, quality, efficiency, and price of freight and passenger services, and to extend credit for financing vehicles. A further option for improving the efficiency and competitiveness of transport services and rural logistics is to introduce a web-based text messaging platform to create a marketplace linking rural transport service users with service providers, and to help streamline the rural logistics chain. Such platforms can, for example, automate the process of scheduling transport services, attract better fares as a result of increased competition, and simplify the tasks of consolidating loads and arranging storage. They could also be used to bypass inefficient transport services cartels. In some cases, the private sector is already providing such platforms (such as Logistimo in India) but in others, the government needs to attract suitable companies or encourage venture capital to finance relevant startups or expansion projects (for example, the Shell Foundation).

There will also be instances where transport services can be improved by extending credit for transport service operators to invest in vehicle improvements and by providing communities with financial support to purchase a community vehicle or IMT. In remote areas, the supply of tractors, transport vehicles, and IMTs is often inadequate at harvest time.

Impact monitoring. Impact monitoring should be included in national rural access programs to improve evidence available to policymakers on the impact of rural access improvements on inclusive development and poverty reduction.

The government should appoint a qualified socioeconomic research institution (such as a national research institute or university) to conduct impact monitoring for a sample of rural access projects. This should use a recognized method of socioeconomic impact monitoring that is capable of distinguishing outcomes that are attributable to the program from those that are not (such as the "double-difference" method which measures impact with, without, before, and after improvement).

Monitoring should cover a sample of rural access improvements that is representative of the program as a whole. Indicators to be monitored may cover traffic,

transport fares, incomes, agricultural activities, enterprise development, employment, migration, education, health, and other social indicators, and should be gender- disaggregated. To the extent possible, indicators should draw upon data that is already reliably collected by existing statistical surveys (national census, household income, and expenditure surveys). These can be supplemented by other quantitative and qualitative indicators obtained through field research. For each rural access improvement to be monitored, baseline data should be obtained before improvement. Post-improvement data should be collected several years after improvement, as it takes several years before the full extent of impacts can be observed.

4.4. Communications toolbox

Stakeholder involvement. From the earliest stages, stakeholder involvement plays a critical role in the development and implementation of a rural access policy and investment program. The government should consult extensively with stakeholders when assessing needs and formulating a rural access policy and program, and should establish an overall framework for continuous shareholder consultation during implementation. This will help to ensure that the policy and program will address the main concerns of stakeholders; that stakeholders will have a sense of ownership over the plans, commitments, and assets being created; and will provide channels of communication for stakeholders to inform the central and local government of issues arising during implementation.

Politicians and decision makers need to be consulted at all stages of rural access programs, as their continuing support is vital. Other key stakeholders are rural communities, including poor and vulnerable groups, other rural transport users (such as wholesalers), transport service providers, the police, institutional stakeholders in the public and private sectors (including national government, local government, transport agencies, funding institutions, transport services regulators, and training organizations), vehicle suppliers (freight and passenger, large and small scale, formal and informal) and suppliers of vehicle support services (manufacturers, importers and retailers, mechanics, fuel suppliers), civil works contractors, and engineering consulting firms, professional associations, unions, and NGOs.

The central ministry or agency responsible for the program should develop a program website to disseminate information, report progress, and support e-procurement. Initially, this can make information available on the objective and scope of the program, eligibility, implementation guidelines, and supporting documents. Once implementation is underway, it can be used for e-procurement and continuous reporting implementation progress[17]

ENDNOTES

13 Many developing countries finance rural access construction programs through a combination of government financing and support from development partners. In some middle-income countries, the government may have the capacity to finance the majority of construction without external support. In addition to earmarking of taxes (e.g. fuel tax) and allocations from the government budget, it may have the option to issue long-term domestic bonds depending on financial market conditions. Some mineral-rich countries may also devote a portion of their mineral tax and royalty revenues to funding a rural access program. In very poor and conflict-affected countries, government revenues may be very low and rural access construction may depend on funding from development partners.

14 Creation of an executive agency can ensure a clear focus on the rural access program which can improve program effectiveness and efficiency. At central level this might take the form of a national rural roads development agency. At local government level, a provincial, state or district rural road development agency could be considered.

15 In some very small countries, the central government may take responsibility for procuring contractors.

16 Hine, J. 2014. *Good Policies and Practices on Rural Transport in Africa: Planning Infrastructure & Services*. SSATP Africa Transport Policy Program, Working Paper No. 100. World Bank: Washington, DC.

17 Some ongoing national rural access programs offer good practice examples of such program websites, notably those of India (http://www.pmgsy.nic.in/, http://omms.nic.in/, https://pmgsytenders.gov.in/nicgep/app) and Bangladesh (http://www.lged.gov.bd/).

5. THE COUNTRY EXPERIENCES

This section presents a selection of good practice country examples from different regions and income groups. The country examples focus on aspects of rural access provision highlighted in the catalogue of measures. These are in Annex B. Lessons from and features of the country examples are shown below (table 5.1)

Table 5.1: Summary of Country Experience Based on Case Examples

No.	Name	Lesson	Features
1	Prime Minister's Rural Roads Program, India	Rural access can be transformed by implementing a well-designed rural roads program for 1–2 decades, and ensuring that sound arrangements for rural road maintenance are in place	• India's large rural roads program has built 555,650 km of good quality rural roads since 2000 • Policy objective is to connect all areas with at least 500 inhabitants (250 in remote areas) • To protect against water damage, roads include basic drainage, and most are sealed • Central government finances investment cost through fuel tax allocation, state governments commit finance for maintenance • Central government rural roads agency responsible for program design, guidelines, and technical oversight; state government rural roads agencies lead implementation, generally using contractors and supervision consultants
2	Rural access using motorcycle trails, Liberia	In countries where motorcycle ownership and motorcycle taxi services have grown rapidly, rural access can be quickly provided in the form of low-cost motorcycle trails and simple trail bridges	• Motorcycle trails use existing earth tracks where these are passable; construct trail bridges, narrow sections of pavement, and basic drainage structures to overcome obstacles and bottlenecks • Motorcycle taxis are self-funded by the private sector • Motorcycle trails and motorcycle taxis were used for rural access in some countries of Asia and Latin America; and there is now high demand in some African countries • Motorcycle taxis do involve safety risks; but these can be mitigated through training, safety awareness, and regulation • Following an initial pilot project, the government is developing a national strategy to rapidly improve rural access using motorcycle trails
3	Labor- intensive perfor- mance-based routine mainten- ance, China	Routine maintenance can be carried out cost-effectively by communities using performance	• An Asian Development Bank pilot project in China's Yunnan province demonstrated that labor-intensive performance based routine maintenance by women's groups is effective and offers value-for-money

No.	Name	Lesson	Features
		based methods, and the remuneration from this work can supplement the incomes of poor households	• Take-up of this approach required preparation of manuals to guide community contractors and their local authority clients, supply of basic tools and safety equipment, and theoretical and practical training • Payments are monthly with set deductions if specified performance indicators are not met • Following the success of the pilot project, Yunnan provincial government increased its funding of labor-intensive performance-based routine maintenance and encouraged prefectures to adopt this approach
4	The "first mile" problem, Tanzania	Improving first- mile access and upgrading basic rural logistics arrangements and storage facilities can reduce damage to perishable crops and fetch better prices	• With first-mile access limitations, smallholders transport tomatoes from farm to roadside mainly by head-loading and also by motorcycle and bicycle • The costs of first-mile transport are high, and rise further in rainy season • At the roadside, smallholders' produce needs to be consolidated into larger loads before collection by transporters and traders • Perishable produce loses value from damage during first-mile transport, delays in roadside collection and lack of roadside storage facilities; these problems also mean that smallholders cannot wait for market prices to improve before selling their produce • There is potential to raise smallholder incomes by improving first mile transport, consolidation, and storage
5	Rural Road Asset Manage- ment in Kwa Zulu Natal, South Africa	The government can mainstream use of road asset management systems (RAMS) for rural roads by developing a suitable RAMS and making access to grant schemes by regional and local authorities conditional on use of RAMS	• A RAMS is needed to provide reliable road condition data to support decision making on rural road construction and maintenance • South Africa's national S'Hamba Sonke (Moving Together) program provides provinces and district municipalities with grants for labor-intensive road maintenance of secondary and rural roads on the condition that they must adopt and implement RAMS • South Africa developed an ISO-certified RAMS that is now used by all provinces • Through use of RAMS, provinces such as Kwa-Zula Natal have reframed their strategic objectives for the road network to focus on achieving a specified road network condition and to use RAMS to optimize choice of road construction and maintenance works, estimate budget requirements and continuously monitor performance
6	National Rural Roads Program, Morocco	Rural access can be transformed by implementing a well-designed rural roads program for 1–2 decades, and ensuring that sound arrangements for rural road maintenance are in place	• More than 60 percent of Morocco's population live in rural areas • The government decided to increase investment in all-season rural access in the mid-1990s, following a survey that found 82 percent of rural roads were in poor condition and 35 percent of communities suffered from difficult access and seasonal isolation • The first two phases of Morocco's large rural roads program upgraded 27,000 km of rural roads during 1995–2012, raising rural access from 43 percent to 79 percent against a target of 80 percent. A third phase is now underway

No.	Name	Lesson	Features
			• There was initially a problem of lack of maintenance as the maintenance budget for classified rural roads was insufficient and there was no budget for unclassified rural roads, but government addressed these problems including by classifying of unclassified roads • Impact studies confirm that rural roads improvement contributed to lower transport costs and fares, shorter trip times, increased school enrolment and access to medical centers, and growth in traffic
7	Universal Rural Road Access Program (URRAP), Ethiopia	Labor-intensive contracting can achieve good quality improvements in rural access while maximizing construction related employment and income generation	• Ethiopia's rural access program focuses on providing all-season road access to all kebele (wards) • The program targeted building 71,523 km of rural roads to provide access to 15,937 kebele which would increase access from 37 percent to 80 percent. By 2014, 36,203 km had been built providing access to 5,837 kebele • Delivery using small-scale labor-intensive contractors has increased construction-related employment and income generation but has been challenging to organize and manage and this contributed to implementation delays in the first phase of URRAP • The URRAP originally favored construction of gravel roads but is now giving increased priority to sealed-surface roads because of difficulties and costs involved in maintenance of gravel roads • Impact studies confirm that providing all-season access has a wide range of positive effects including lower transport cost (including for the "first mile"), shorter journey times, improved transport services and increased use of medical services
8	Causes and circum-stances of motorcycle crashes on low volume rural roads, Tanzania	Use of motorcycle taxis on rural roads introduced additional safety risks linked to driver and passenger behavior, and design and condition of the road, and proximity to pedestrians	• In Tanzania, new motorcycle registrations rose from 45,000 in 2008 to 109,000 in 2012, and annual motorcycle deaths (on all categories of roads) rose from 309 to 930 • Study of two rural roads found many examples of unsafe driving of motorcycle taxis • Most motorcycle drivers had limited formal education, few obtained motorcycle driver training, and most were unlicensed • Many drivers and passengers are too poor to afford safety equipment • Immediate measures to improve safety include training programs, police enforcement of traffic laws and regulations, behavior change programs to empower passengers, safe design of roads taking into account motorcycle use, appropriate road widths, maintenance to keep roads in safe condition, and speed bumps to be included in the engineering design of road sections passing through settlements and places of pedestrian activity
9	Safe and sustainable water transport on Lake Victoria, East Africa	The role of private sector in providing waterborne services for improving rural access	• Private company identified gap in the transport services market on Lake Victoria and adopted a commercial approach for developing, financing, and operating vessel services

No.	Name	Lesson	Features
			• Innovative catamaran-based vessel design provides for fast, affordable and safe transport by Water Bus • Since introduction in 2016, services have expanded rapidly, and are now also being considered for the Uganda side of Lake Victoria.
10	Examples of innovative internet platforms and apps for rural transport services and logistics	Emerging apps for ride hailing, freight hailing and rural supply chain management have potential to transform rural transport and logistics services	• Safe Boda is a motorcycle taxi hailing app used in Uganda that combines the convenience of hailing with improved safety by creating a community of motorcycle taxi riders, training them on road safety, equipping them with safety equipment, and then connecting them with roaming passengers • Uber Freight is a mobile app designed to streamline freight booking, particularly for small carriers and shippers that still rely heavily on manual processes • Logistimo is an open source platform for managing rural supply chains using mobile phones. It is currently deployed in five countries–Democratic Republic of Congo, India, Myanmar, South Sudan, and Zambia–across different types of rural supply chains, including health commodities, agricultural inputs, and energy products

Source: Authors

6. THE GLOBAL ROADMAP OF ACTION

The global roadmap of action outlines a set of priority measures to be taken by the four defined groups of countries to achieve affordable and equitable rural access for all. While most of the items within the catalogue of measures are relevant for all country groups, the global roadmap of action highlights those that are most critical for each respective country group. An overview of the global roadmap is presented in Table 6.1. Details are then provided of actions required by each country group.

Table 6.1: Overview of Global Roadmap of Action

Attribute/action	Group D countries	Group C countries	Group B countries	Group A countries
Country attribute				
Distance from RAI target	Very high	High	Moderate	Low
Geographical, climatic, demographic difficulties	High	Moderate	Moderate	Low-to-moderate
Institutional, technical and financing capacity	Low	Low-to-moderate	Moderate-to-high	High
Action required				
Priority types of rural access	Basic access and motorcycle trails	Basic access and motorcycle trails, begin to include more rural roads when economically justified	Scale up multi- tiered rural access program and strengthen maintenance	Hard-to-reach places, upgrade infrastructure and services in line with needs, maintenance system
Target for SDG 9.1.1	High level of rural access in 10–20 years	High level of rural access in 10–15 years	High level of rural access in 10 years	Universal rural access in 10 years
Actions needed for asset sustainability	Routine maintenance	Mainly routine maintenance, some rural road periodic maintenance	Routine and periodic maintenance	Routine and periodic maintenance
Need for development partner support	High	High to moderate	Moderate	Low

Source of financing	Mainly development partners with modest government contribution	Mainly development partners, government core funding, local governments, and beneficiaries to contribute	Development partners, government core funding, local government and beneficiaries	Mainly government, local government, and beneficiaries
Capacity building needs	High	High to moderate	Moderate	Low

Source: Authors

Group D: Countries that have made least progress. With difficult geographical, climatic, or demographic conditions and weaknesses in institutional, technical, and financing capacity, this group of countries has been unable to make significant progress in improving rural access. The roadmap for this country group should focus on a limited set of actions to establish a momentum of rural access improvement, with a view to achieving a defined high level of rural access within 10–20 years.

For such countries, rural access policy should *give priority to investing in basic access improvements and low-cost motorcycle trails (if motorcycles are commonly used for transport services)*. A rural access program focusing on basic access interventions and motorcycle trails will bemuch simpler, faster, and less costly to implement than one that prioritizes rural roads—rural roads are at least 10–20 times more costly and are more difficult to construct and maintain. While basic access and motorcycle trails require regular routine maintenance, they have only limited requirements for periodic maintenance.

A central government ministry should *develop the policy and program, guide technical aspects and prepare detailed implementation guidelines to be used during implementation by local government, communities and contractors*.

In most Group D countries, the government will need to *obtain support from development partners to provide technical assistance and finance most of the investment costs of the program*. This should potentially be attractive to development partners since the program will directly contribute to implementation of SDG 9.1.1. The level of resources that can be obtained from development partners will influence how quickly a high level of rural access can be achieved.

Given the existing limitations in institutional and technical capacity, *from an early stage the rural access program should give attention to capacity building*. This will include building up the unit or agency responsible for program in the central ministry and familiarizing its staff with rural access planning and implementation methods. Capacity building support should also be extended to local governments, to prepare them for their roles in the selection and implementation of infrastructure improvements and the regulation of transport services; and to contractors interested in working on the program, including community-based contractors that would use labor-intensive construction methods.

To support implementation, *the central ministry should develop simple technical standards for basic access and motorcycle trails interventions*. These should take into account the locally available materials that can be used in construction. A simple method of climate-risk screening should be included so that climate adaptation will be addressed in engineering design when needed. The ministry should also prepare a technical handbook to provide practical guidance to local government and community groups on how to use labor-intensive contracts for construction and routine maintenance.

The central ministry should *prepare a set of project selection criteria and disseminate these widely to rural communities*, to attract their interest in being included for support under the program. Local governments should use participatory planning methods to help rural communities propose interventions. Economic

analysis of basic access and motorcycle trail proposals should generally be confined to cost-effectiveness comparisons, although cost- benefit analysis should be prepared for large motorcycle trail projects.

Local government should *engage engineering design and supervision consultants to support preparation and implementation of projects*. Because of limitations in local government finances, in most cases the costs of these services should be financed by the central government or development partners.

Local government should *introduce routine maintenance of basic access infrastructure and motorcycle trails on a pilot basis, with a view to determining effective approaches and then scaling them up*. As long as routine maintenance is carried out competently and cost-effectively, it should be conducted preferably by community groups receiving remuneration for their work. Models of performance- based routine maintenance by community groups should be included in the pilot testing (for example, the Dehong pilot project in China).

The central and local governments should assess the adequacy of transport services and rural logistics in areas to be served by the program and *identify opportunities to improve transport services and rural logistics using regulatory and other measures*. This could lead to investments in infrastructure improvements, or in the basic means of transport to support the movement of produce over the first mile: establishing simple storage facilities near produce collection points; developing improved coordination arrangements for consolidation and collection of produce; and, in collaboration with the private sector, introducing online platforms or apps to improve the convenience, quality, and price of freight and passenger services (such as service hailing and load consolidation).

The central ministry should *introduce impact monitoring* of projects within the rural access program. It should appoint a qualified research institution to monitor the impacts of a sample group of projects.

During formulation and implementation of the rural access policy and program, *the government will need to consult extensively with stakeholders* to attract their participation and obtain their advice and cooperation when problems arise during implementation. It should establish a program website to make information available about the program, implementation procedures, and implementation progress. The website may later be extended to include e- procurement of civil works contracts under the program.

Group C: Countries that have made some progress. This country group has made some limited progress in improving rural access. It faces similar constraints to Group D, but the constraints are less severe. Like Group D countries, the roadmap should focus on achieving a high level of rural access within 10–15 years. *This can be achieved mainly by prioritizing basic access improvements and motorcycle trails, but Group C countries should also gradually build up support for investment in rural roads when economically justified.*

I*n addition to the roadmap measures indicated for Group D countries, Group C countries should begin to incorporate measures for the preparation and implementation of rural roads projects as part of the rural access program*. In view of the much higher cost of rural roads projects, the program should require *careful planning, selection and sequencing of rural roads projects*. To support this work, the central ministry should prepare a manual on the preparation of rural road network plans, to be used by local governments and communities in proposing road projects that will become part of future rural road networks. Beneficiary communities should also be required to make a firm commitment to finance the costs of routine and periodic maintenance for all rural roads included in the program, to use RAMS, to implement measures to protect against road damage due to overloading and to address road safety.

When consultants prepare engineering designs for rural road projects, they should *incorporate road safety audits.*

With the inclusion of rural roads in the program, *capacity building should also include the development of road materials testing and research capacity. The central ministry should arrange for the preparation of technical and geometric design standards for rural roads*. It will also need to *establish a suitable RAMS for rural roads* and make related data collection tools available.

For rural roads projects, cost benefit analysis should be used to check that proposed projects will exceed the EIRR threshold. Since it can sometimes be difficult to quantify the benefits of rural roads projects, a modest proportion of projects may be allowed to use a lower threshold, if high need and economic potential can be demonstrated.

Group B: Countries that have made more progress. Group B countries have established moderate-to-high levels of institutional, technical, and financing capacity, and in most cases do not face significant difficulties due to geography, climate, or demography. They have already made good progress in increasing rural access, but a significant minority of the population still lack access (for example, a third). *The challenge for these countries is to scale up their existing rural access program to achieve universal access within 10 years, and to strengthen their approach to maintenance of their rural access assets* so that they will remain in good condition over their intended economic lifetime.

In addition to the roadmap measures indicated for Group C countries, Group B countries should scale up the multi- tiered approach to rural access provision, with a view to not only achieving a high level of access through basic access and motorcycle trails interventions but also to expanding the provision of LVRR and HVRR when economically justified. The inclusion of a significant rural roads component will substantially raise total program costs. However, as long as the roads are well chosen, constructed, and maintained, they should enable significant growth in rural incomes through expansion and upgrading of farming and other economic activities.

Since construction of rural roads is much more costly than basic access and motorcycle trails, t*he government will have to secure a large increase in program funding*. It may do so, for example, by earmarking fuel tax revenues to finance the program, and use this to leverage additional funding from development partners.

The central ministry should expand the capacity of its unit or agency responsible for overseeing the technical aspects of the program. It should develop program implementation guidelines covering rural road projects, prepare technical and geometric standards for LVRR and HVRR and take steps to *establish a permanent in-country capacity for road materials testing and research*. It should also conduct an assessment of the capacity of contractors to execute an expanded rural roads investment program and *address identified limitations both by providing capacity building support for contractors and by adjusting the approach to procurement of contractors and contract packaging* to attract more bids from capable contractors. The ministry should *upgrade the program website to support e- procurement of contractors*. To control against any risk of malpractice or corruption, the ministry should *prepare guidelines on the technical and financial auditing of rural access projects and recruit a pool of independent experts* to undertake audits.

Local governments should work with communities to prepare rural access network plans. These should provide efficient solutions to the selection and sequencing of rural roads projects.

An important emphasis for Group B countries will be to *put in place reliable approaches to rural road maintenance*. For routine maintenance the approach can be similar to Group C countries, preferably using community groups working on performance-based contracts. For periodic maintenance, the government should establish and implement a RAMS for rural roads, or obtain this through outsourcing. It should also prepare technical manuals, standard bidding documents and quality assurance protocols for periodic maintenance work. Before approving rural roads projects, *the government should first require local governments and beneficiaries to confirm they will adhere to agreed approaches to periodic maintenance and provide a firm commitment to meet the costs of routine and periodic maintenance*. This can draw upon the example of India's PMGSY program which requires state governments to prepare a state rural roads policy encompassing maintenance and provide confirmation that sources of financing have been secured for the required levels of road maintenance.

Group A: Countries that have made most progress. This country group has strong institutional, technical, and financing capacity, and is already close to achieving universal rural access. While countries may continue to seek support from development partners, this may only cover a small share of total program costs. The government's reason for involving partners may

be more about gaining access to knowledge of best practice than about obtaining additional financing. The roadmap for Group A countries should *focus on achieving universal rural access within 5–10 years, upgrading the standard of rural access infrastructure and services in line with economic needs, and establishing improved systems for maintenance of rural access assets.*

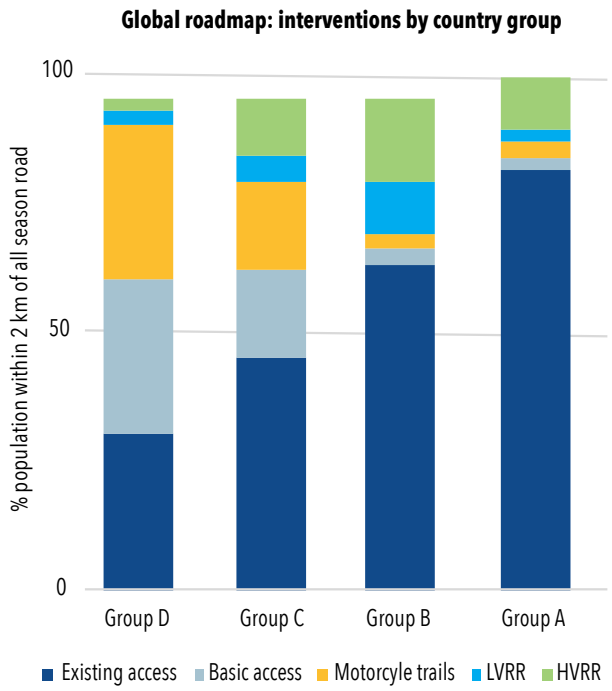
Group A countries have much in common with Group B. The further challenges for Group A countries are to progress from high levels of rural access to universal access, to continue upgrading the quality of rural access infrastructure and services, and to upgrade rural road maintenance to become a fully sustainable system.

To achieve universal access, Group A countries will need to *find solutions for the most remote and difficult to serve habitations, such as those in mountainous, hilly or desert areas*. They will need to examine why some habitations have been difficult to serve, identify technical solutions for some of these cases, and make allowance for other cases to be treated on an exceptional basis (for example, providing a rural road even though the threshold EIRR is not met).

The rural access program should be retained after universal access has been achieved, but its objective should be revised to *target sustainable universal access with a higher quality of service. One option may be to redefine what qualifies as rural access in order to increase the density of coverage*. For example, if the program measures access in terms of all-season connections to habitations of at least a certain size, the size of qualifying habitations could be reduced by, say, 50 percent. If the program measures access based on being within 2 km of an all-season road, this distance could be reduced, say, to 1 km. *Another option is to retain the existing coverage but upgrade infrastructure, transport services, and logistics to a higher standard*. Thus, when basic access and motorcycle trails have led to growth in economic activities and traffic levels, a further stage of upgrading to rural road standard may be justified; growth in traffic on a LVRR may later justify upgrading to HVRR; and transformation of farming activities following rural access improvement may lead to opportunities for high-value agricultural production, if advanced logistics, including cold chain management, can be established to meet the product quality and consistency requirements of the final markets.

The other main emphasis for Group A countries will be to *upgrade their approach to routine and periodic maintenance so that it becomes a fully sustainable system, taking into account the planning, financing, and execution dimensions*. This will require a review of the existing maintenance performance and the upgrading of parts of the existing maintenance system—such as routine maintenance, the RAMS, the adequacy of existing sources of annual maintenance financing, and the quality of periodic maintenance works conducted by contractors. A graphic example the proposed interventions by country group is in Figure 6.2.

Figure 6.2: Global Roadmap: Interventions by Country Group



*Alongside targeting universal access, existing access to be selectively upgraded to LVRR and HVRR by group A and a lesser extent by group B

Source: Authors

7. SCALE OF THE CHALLENGE

The Global Roadmap of Action presents an ambitious but achievable agenda for universal rural access. Both the scale of the challenge and the potential socio-economic benefits are enormous. While comprehensive current global level data on the RAI is not available, it is expected that in many developing countries the achievement of SDG 9.1.1 may entail providing access for more than half the rural population. As successful country examples indicate, once a sound approach to rural access provision has been adopted, it is likely to take 10–20 years of implementation before countries begin to approach universal access.

While the roadmap is global, it will be implemented at country level. Countries will need to find solutions to the various obstacles and challenges discussed below.

Overall scope and cost. Investment costs and financing requirements will also be very large. If one considers the example of rural roads provision in Morocco, an investment of $3.3 billion over 17 years was required to reduce the RAI from 43 percent to 79 percent. Taking into account Morocco's population size of more than 31 million people at the beginning of the program, this was equivalent to a total cost of slightly more than $100 per head of population, or around $3 per head of population for every 1 percent increase in the RAI. Although the costs were high, Morocco was able to afford this level of expenditure and succeeded in attracting large-scale financing and related support from development partners.

By providing a menu of rural access types that range from simple and low cost to technically more complex and higher cost—incorporating the concept of upgrading from one type to another on a staged basis—the global roadmap of action contains built-in mechanisms to allow countries to opt for the mix of rural access types to match their technical and financial capacity. Group D and Group C countries may initially prioritize basic access and motorcycle trails, which are simpler to implement, and one-tenth to one-twentieth of the cost of rural roads. Using the Morocco case as a baseline (for illustrative purposes only), this would reduce total costs to $165–330 million, which is equivalent to $5–10 per head of population, or $0.15—$0.30 per head of population for every 1 percent increase in the RAI. With costs of this lower order of magnitude, spread over a 10–20 year implementation period, it should be possible for even the poorest countries to attain universal rural access.

Developing a clear policy commitment that motivates support and action. A national rural access program should potentially benefit a large portion of the rural population, and therefore be capable of attracting popular support and participation. To gather such support, the government should consult widely with rural communities and other stakeholders when preparing the program. It should also make a high-level policy commitment to improving rural access, preferably at the head of government or at least at the senior minister level, making it easy for rural people to understand why and how rural access will be improved, what level of access they can expect, and when this will happen. The commitment should be credible, taking into account past attempts to improve rural access, the availability of resources and the situation in rural areas to be assisted.

In formulating its commitment, the government should choose realistically among the multiple tiers of rural access improvement, with a view to achieving a high level of rural access by 2030. As indicated in the global roadmap, Group D countries should focus on basic access and motorcycle trails, as should Group C counties which should also gradually include some rural roads interventions when economically justified.

Group B countries should commit to scaling up a mix of intervention types, and Group A countries should commit to serving hard-to-reach countries and upgrading of access types in the future, depending on needs. If Group D and Group C countries choose instead to prioritize rural roads, they may only be able to achieve a small improvement in coverage. Rural roads are much more complex and costly to provide, and these country groups have tightly constrained technical and financing capacity.

Securing financing on the scale needed. Many of the countries with low levels of rural access face significant fiscal constraints that limit their capacity to finance rural access investments. They should examine the scope for introducing an earmarked tax, such as a fuel tax, to increase government funding for the rural access program. Notwithstanding such efforts, they will need to work closely with development partners that can help bridge the gap in available investment financing. Since the program will be directly aligned with implementing the SDGs, many development partners could be receptive to providing financing support. Among the critical requirements for attracting their support will be the quality of the program, its appropriateness to country circumstances, and the level of improvement in rural access that is targeted.

Communications and outreach. To mobilize support and participation in the rural access program, stakeholders need to be informed about the program though communications and outreach. A successful communication strategy will create a sense of ownership among individuals, households, communities, and institutions involved. This will require use of multiple methods of communication and outreach, including promotion by national, regional, and local political leaders, meetings at the village and district levels, dissemination of leaflets and related materials, the use of television and radio, social media, and a program website. Such outreach should be translated into local languages.

Institutional coordination. To realize its potential impacts, a rural access program needs to be coordinated with programs in other relevant sectors, including rural development, agriculture, small and medium enterprise development, poverty reduction, and health and education provision. If a community is being assisted through an agricultural development program, any rural access improvement should take into account the types and locations of the crops to be produced in the future and the associated handling and storage requirements needed to secure higher prices. Similarly, the development of the rural access network needs to be coordinated with the development of the national transport network. To support coordination, such other sectors should be invited to take part in steering committees for the program at national and local government levels.

Building capacity to plan and implement improvements. From the earliest stages of a rural access program, considerable attention should be given to building local capacity. This includes the capacity of the central ministry or agency to provide technical leadership, guidance, and oversight for the program; the capacity of local governments to lead the planning and implementation of infrastructure and services improvements; the capacity of communities to take part in community level planning of access improvements; the skills of private contractors to execute program works; and the organization and skills of community groups and local authorities to implement labor-intensive approaches to the construction of basic access and motorcycle trails, and the routine maintenance of rural access assets.

Appropriate technology. Countries need to incorporate appropriate technologies that can improve the performance and lower the cost of rural access programs. This includes research into methods of using locally available construction materials and the development of new types of motorized and nonmotorized vehicles. Where possible, countries should establish a national road material testing and research unit to progressively build up understanding of suitable local materials and how these can be used and, in some cases, modified. In some Group D or Group C countries, it may take some years before a national unit can be established, so it would be important to develop cooperation with neighboring countries that have such a unit, and to make use of regional initiatives such as ReCAP.

Future maintenance. Even when rural access improvements are successfully implemented, the benefits may be short-lived unless rural access assets are adequately maintained. Countries need to carefully plan their annual maintenance works, provide suffi-

cient annual funding to carry these out, and execute maintenance works efficiently and cost-effectively. In the case of Group D and Group C countries, giving priority to basic access and motorcycle trails will reduce the amount of maintenance needed. Community groups can be assisted to carry out routine maintenance, preferably using performance-based approaches. In the case of Group B and Group A countries, which are expected to invest more in rural roads, a functioning RAMS needs to be established and used. As indicated in the Catalogue of Actions, before agreeing to finance rural roads investments in a particular region or district, the central government should obtain a convincing maintenance commitment from the local authority concerned, covering RAMS, the level and source of annual maintenance financing, and the approach to execution. Based on the example of India's PMGSY program, such commitments could take the form of a regional or district level rural road maintenance policy to be reviewed and endorsed by the central government.

Adverse effects and uncertainties. In addition to positive effects on economic and social development, improvement of rural access can also have negative effects. Rural access can lead to higher rural-urban migration. This is more likely in rural areas that have less agricultural potential. If urban areas have abundant employment opportunities—as was the case for rural-urban migration in China over the last few decades—migration to areas with greater economic potential may be a necessary step toward raising productivity and income levels. If there are fewer urban employment opportunities, migration may swell urban poverty and unemployment and be accompanied by rising crime and social problems. In this latter case, a country should mitigate such problems by coordinating rural access interventions with programs to attract investment and create employment in urban areas.

Other possible negative effects include: increases in road crashes, injuries and fatalities from the higher use of motor vehicles; spread of infectious diseases including HIV/AIDS, and increases in human trafficking. Road safety should be built into rural access programs—including road safety engineering measures identified by road safety audits, driver testing, and educational programs to support safe behavior. Risks of HIV/AIDS and human trafficking should be examined for each rural access improvement and, where risks are found to be significant, educational programs should be provided to help rural residents mitigate the risks.

Monitoring indicators. The existing lack of available data on the RAI and other rural access monitoring indicators is an obstacle to tracking progress at country, regional, and global levels. Ongoing efforts by ReCAP, DFID, the World Bank and others to develop effective approaches to RAI and traffic data collection, using new technologies, are being stepped up with a view to confirming a feasible new approach within the near future (within 3 years). This can then be made available to countries—together with capacity building and advisory support—to be introduced for tracking progress in rural access improvement.

ANNEX A. RURAL ACCESS TYPES AND CHARACTERISTICS

Characteristic	Basic access	Motorcycle trails	Low volume rural roads	Higher volume rural roads
Type of rural access	Existing earth roads and tracks, low-cost trail bridges, causeways, waterborne Transport landing sites, Airstrips	Narrow earth or surfaced tracks, low- cost trail bridges, causeways	Earth roads, gravel roads, low cost surfacing, engineered bridges or causeways	Surfaced roads, paved roads, engineered bridges
Main means of transport served	Pedestrians, bicycles, IMTs, motorcycles, vessel services, some motor vehicles; Aircrafts	Motorcycles, bicycles, pedestrians	Motor vehicles, motorcycles, bicycles, IMTs	Motor vehicles, motorcycles, bicycles
Main transport service providers	Informal services Formal for air transport	Motorcycle taxis	Motorcycle taxis, private passenger and freight services Airservices	Motorcycle taxis, private passenger and freight services
Typical traffic level (vehicles per day) [a]	<50 motorcycles and bicycles (for roads and tracks)	50–100 motorcycles	50–200	100–500
Level of maintenance needed	Routine maintenance to clear vegetation, unblock drainage, control erosion Maintenance of landing sites and airstrips	Routine maintenance to clear vegetation, unblock drainage, control erosion	• Routine maintenance to clear vegetation, unblock drainage, control erosion • Grading (earth and gravel) • Regravelling (gravel)	• Routine maintenance to clear vegetation, unblock drainage, , control erosion, repair potholes • Periodic overlay or reseal of surfaced roads
Type of improvement	Spot improvements to allow vehicles to pass in all seasons e.g. footbridge, ford, culvert, steep gradients, weak soils, vessel landing facilities	Spot improvements on steep gradients weak soils and water- crossings Engineered tracks	Engineering improvements to sections (spot) or entire roads	Construction of engineered road with drainage
Objective of improvement	Remove blockages to achieve all-season access	Faster, safer and more convenient access using motorcycle taxis	Use by a range of vehicle types, increase safe driving speeds, some roughness reduction	Use by all vehicle types, increase safe driving speeds, roughness reduction
Cost	Low	Low	Medium	High

Source: Authors; Lebo and Shelling, 2004; Hine, 2014.

a These typical traffic ranges provide a broad indication of the traffic level that the different rural access types may be suitable to serve. In some countries and settings, there will be exceptions where a higher or lower range should be used, for example in densely or sparsely populated or remote settings, or where the availability of low cost seals using local materials makes it feasible to adopt sealed pavements at lower traffic volumes.

Note: IMT=intermediate means of transport.

ANNEX B. COUNTRY GOOD PRACTICE EXAMPLES

1. Prime Minister's Rural Roads Program, India

In 2000, the Government of India launched the Prime Minister's Rural Roads Program, known as *Pradhan Mantri Gram Sadak Yojana* (PMGSY), to provide the country's rural population with all-season road connections. Since then, PMGSY has been the largest national rural roads program in the world. By 2018, it had completed 550,650 kilometers (km) of all-season rural roads connecting 139,671 habitations. The quality of roads built has generally been good, and improved road connectivity has enabled economic and social development in the areas assisted.

PMGSY includes many features and approaches that may be of interest to other countries. This case study briefly discusses five aspects: the overall policy objective, implementation arrangements, financing, technical scope, and maintenance of completed roads.

Prior to 2000, India had about 2.7 million km of rural roads, but these were generally of poor quality resulting from lack of investment and inadequate maintenance. The government came to recognize that this was holding back economic growth and poverty reduction. Some 70 percent of the population was living in rural areas, but 40 percent of rural habitations lacked an all-weather road connection. Studies suggested that investment in rural roads would have a greater poverty reduction impact than investment in most other sectors, including health and education. Against this background, the government decided to introduce a major rural roads investment program. Drawing upon Indian and international experience it developed a comprehensive new approach through PMGSY.[18]

Overall policy objective. The government framed its overall objective for PMGSY on the basis of community size. All-weather rural road connections were to be extended to all unconnected habitations with a population of 1,000 or more by the year 2003, for all with a population of 500 or more by 2007, and for all with a population of 250 or more by 2007 in hilly, desert or tribal areas as defined by India's constitution.

This approach had several advantages. First, data on size of habitations is regularly collected by the government and available at central, state, and local levels. This provided an easy and reliable way to identify which inhabited areas qualify in terms of population size; those that lacked an all- weather road connection were then included under PMGSY. Second, the transparency of this approach curtailed the scope for eligibility to be manipulated (such as by corrupt officials). Third, members of the rural population could also verify the eligibility of their community. For areas that were eligible, this created a positive expectation for residents and encouraged them to take part in planning of their all-weather road connections. Fourth, PMGSY made allowance for the needs of more remote and disadvantaged groups, lowering the size threshold for habitations in hilly, desert and tribal areas. Fifth, the use of size thresholds helped to focus investment on areas with the potential to grow economically and avoided the issues of high cost and low sustainability if even smaller areas were served.

Financing. When preparing PMGSY, the government recognized that state and local governments lacked the revenue base needed to finance the investment costs. It therefore committed to financing 100 percent of investment costs, while requiring state governments and local councils (*panchayats*) to finance future maintenance. An important part of this arrangement was that state level implementation would follow national guidelines, procedures, and technical standards established by the government[19]

The government identified that PMGSY would have to upgrade a total of 738,000 km of rural roads to pro-

vide all- weather connections for more than 170,000 eligible habitations, at an estimated cost of $30 billion. This was enormous sum, even for a country as large as India. To finance its contribution, the government allocated 50 percent of the excise duty (*cess*) on high-speed diesel. This was expected to cover 30–40 percent of annual costs, with a further 10 percent to be provided by Asian Development Bank (ADB) and the World Bank, leaving a funding gap of 50–60 percent of annual costs. In general, the funding gap led to implementation of PMGSY being spread over a longer period than originally planned. Program completion (100 percent coverage) is now scheduled for 2019, so by completion, the total implementation period will have been nearly 20 years. In the early years, state implementation capacity may often have been more of a constraint than funding. In later years, as the government looked to complete the program, it was able to reduce the funding gap by introducing cost sharing with states. By that time, the revenue base of states had grown after years of rapid economic growth, partly attributable to the enabling effect of PMGSY roads.

Implementation arrangements. PMGSY adopted a centralized approach to program design and oversight, while implementation responsibilities were assigned to the state governments. The Ministry of Rural Development (MORD) had overall responsibility for the program. Since PMGSY was a priority program of the Prime Minister, MORD was required to regularly report progress to the Prime Minister. This raised the profile of program and helped to ensure cooperation at all levels.

When PGMSY was originally being prepared, MORD obtained inputs from a wide range of national experts (such as Indian Road Congress) in order to develop suitable technical standards and implementation arrangements, taking into account differences between states. In 2002, it established a dedicated agency, the National Rural Roads Development Agency (NRRDA), to provide it with technical and management support. The NRRDA was responsible for providing technical leadership, capacity building and overseeing implementation by states, including compliance with the national guidelines, procedures, and standards, and establishing quality monitoring and audit systems[20]. To support uniform approaches to management of PMGSY projects, the NRRDA introduced various computer-based systems—including a system for road planning and maintenance, e-tendering and procurement, and online monitoring management and accounting—and made these available for use at state level[21].

State governments were required to establish effective state-level implementation arrangements. To lead state- level implementation, states generally established a state rural roads development agency (SRRDA). The SRRDA worked closely with *panchayats* in participatory planning of future rural roads networks, in compliance with the PMGSY implementation guidelines. Execution of works was outsourced to private contractors and detailed project preparation and supervision of works were often outsourced to consulting firms. The SRRDA model gave greater flexibility compared with managing implementation from within a state government department, which also helped in attracting well-qualified staff. Outsourcing of civil works using national standard bidding documents helped to ensure value-for-money. Another advantage was that the SRRDA did not require a very large staff and could eventually be downsized or closed once PMGSY construction works came to an end.

Technical scope. A distinguishing feature of PMGSY was that most of the roads built were sealed and included basic drainage to protect against water damage. Previously, it had been common to provide unsealed earth and gravel rural roads since the investment cost was lower. However, it was difficult to keep unsealed roads in good condition. In monsoon conditions they were subject to damage from water and, even in drier conditions, they required frequent maintenance. To contain the costs of providing sealed roads, PMGSY road carriageways were limited to a 3.75-meter width, or 3 meters on roads with lower traffic.

Maintenance of completed roads. From the outset, the government recognized that the longer-term impact of PMGSY would depend upon rural roads assets being well maintained. To ensure adequate maintenance during the initial years of operation, construction contracts included a five-year defects liability period during which the contractors remained responsible for routine maintenance. As a condition for taking part in the program, states had to commit to taking responsibility for the planning, financing,

and execution of routine and periodic maintenance. In particular, states had to make specific commitments on the level and source of future maintenance financing. For example, states could commit a revenue source, such as an agricultural markets tax, to be used to finance maintenance. Over the course of PMGSY implementation, the NRRDA provided states with technical guidance and tools for maintenance planning, and states progressively approved state-level rural roads maintenance policies that formalized their commitment and defined their approach to ensuring that rural road assets were kept in good condition.

In conclusion, the PMGSY rural roads program has extended rural access in India on an unprecedented scale. It is perhaps the leading best-practice example of a national rural roads program, includes many features relevant to other countries, and is especially relevant for large middle-income countries.

2. Rural access using motorcycle trails, Liberia

For villages situated away from the road network and navigable waterways, the access of women, men, and children to markets, healthcare, and important services is severely limited by the time and effort required for walking and carrying goods. This "first-mile" constraint can be greatly reduced if affordable, motorized transport, such as motorcycles, can reach the villages. Motorcycles can travel along simple earth trails, and over low-cost trail bridges. Following successful pilot initiatives in Liberia,[22] and building upon evidence from many countries, the Ministry of Public Works in Liberia has been developing a strategy to enable all off-road villages in the country to be connected to the road network through motorcycle trails and trail bridges.[23]

The problem of access for people in off-road villages remains serious in Liberia and many other countries. Historically, people in villages located away from roads (and waterways and rail lines) had little choice but to walk along footpaths to reach the road network. Journeys to markets, clinics, schools, shops and government services always began with walking, sometimes very long distances. All goods had to be carried by people or animals, and sick people also had to be carried. This could require considerable time, cost, and effort; reduce people's time for agricultural work; and limit their access to health care and education. Public and private service providers—such as vaccination teams and suppliers of agricultural inputs and retail goods—were discouraged by the difficulty of reaching remote villages.

One way of making pedestrian journeys safer and shorter has been to construct pedestrian trail bridges over rivers. In mountainous countries like Nepal and Lesotho, such bridges have greatly improved rural access. In Nepal, 6,500 trail bridges have been built, with 350 more added each year. While the trail bridges were not originally designed for motorcycles, some people realized that motorcycles could also use such infrastructure to ride along some of the pedestrian trails.

The past thirty years have seen huge increases in the use of motorcycles in rural areas in Africa, Asia, and Latin America[24]. Motorcycles are often the most common vehicles on rural roads, and in some areas, they account for three-quarters of pedestrian and freight movements. In most countries in West Africa and in East Africa, motorcycle taxis (known by various names, including *okadas, bodabodas, penpens*) are an increasingly common and important means of transport in rural areas. Both bicycles and motorcycles are thin, linear vehicles that do not require wide roads, and can even travel along footpaths—as people in many off-road villages have discovered. Just as the surge in motorcycle ownership was a spontaneous, market-driven process (that took many planning and regulatory authorities by surprise), so the start of using motorcycles along village-access trails has often been spontaneous and user led. In several Asian countries—including Bangladesh, Myanmar, and Vietnam—local authorities have responded to the demand for two-wheel access to villages by providing simple trail infrastructure (sometimes using bricks or concrete strips) and simple bridges for use by pedestrians, bicycles, and motorcycles. In Liberia there have been pilot projects to assist community-based organizations (CBOs) to construct trails that can be used by motorcycles to reach off-road villages, and the results have been encouraging.

Like many countries, Liberia is gradually rehabilitating its existing rural road network, but the cost of rapid-

ly expanding rural roads to reach all villages is prohibitive[25]. As part of its development of a Multimodal Transport Masterplan, the Ministry of Public Works and the Ministry of Transport initiated a new strategy designed to complement the rural road program. The aim is to gradually connect all off-road villages to the road network through motorcycle trails and trail bridges. This new category of transport infrastructure is not an alternative to rural roads, but a means of rapidly increasing people's basic access that adds to the impact of rural roads, with many beneficial outcomes for the rural population.

The vision of the Liberia Multimodal Transport Masterplan is that, by constructing motorcycle trails and trail bridges, all off-road villages in Liberia can be connected to the expanding rural road network within a few years, at an affordable price.

Pilot trails have been successfully constructed in Liberia by community-based organizations (CBOs). One project was funded by the German Development Agency (GIZ) as part of its post-Ebola health program. As soon as these trails were completed, motorcycle taxis started to serve the off-road villages, and village access to markets and health centers increased markedly. Moreover, after motorcycle access had been provided, a water and sanitation NGO sent agents to the targeted villages to help install clean water and carry out a latrine-building program. The changes have been transformational. People and goods in villages located more than 6 km from the road can now be transported by motorcycle: these off-road villages now have motorcycle access to the national road network.

The labor-based tasks of trail clearing and simple shaping for drainage can be undertaken by CBO women and men, at a cost of about $1,000 per km, rising to $2,000 when simple wooden bridges and culverts are included (assuming one bridge every 2 km, with local timber supplied). In 2018, in cooperation with the Bridges to Prosperity NGO, surveys will be conducted to identify priority sites for trail suspension bridges suitable for pedestrians and motorcycles. Allowing for one 20 m steel truss bridge every 20 km and one 70 m suspension bridge every 70 km of track, brings the average price of trails with bridges to $5,000 per km. Allowing use of concrete for spot improvement paving of difficult sections increases the overall average price to $10,000 per km (assuming 1 km of concrete paving per 20 km of earth trail).

With the relatively low cost of connecting off-road villages to the road network, and the specific benefits to women, children, health, agricultural marketing, and education, several donor agencies have expressed interest in supporting motorcycle trails in their geographical and thematic areas of interest. This will allow a variety of decentralized and separately-funded trail-development initiatives to be coordinated and facilitated by the technical unit of Ministry of Public Works. The Ministry of Transport is implementing a complementary motorcycle safety capacity building initiative, supported by GIZ.

The vision of the Liberian Multimodal Transport Masterplan is that, by constructing motorcycle trails and trail bridges, all off-road villages in Liberia could be connected to the expanding rural road network within a few years, at an affordable price. The envisaged benefits for women, men, and children will be great, as it will be much easier to market agricultural produce and reach the health facility for routine and emergency health care. Similar initiatives could be adopted in other countries, tailored to local needs, conditions, and perceptions.

Construction of trail and wooden bridges can be undertaken by CBOs, supported by simple guidelines, appropriate training, and engineering advice. Trail suspension bridges and truss bridges require technical standards that are already available internationally. A small technical unit for trails and trail bridges can provide advice to decentralized rural authorities responsible for the implementation.

While most residents of off-road villages praise the benefits of motorcycle trails and trail bridges, it is important that this infrastructure option is presented as complementary and additional to the rural road program.

Motorcycles can bring great benefits, and are self-funded by the private sector, but they are not free of risks and costs. Investments in appropriate training, safety awareness, regulation and compliance should accompany trail investments to mitigate the safety hazards that can be associated with motorcycle taxis.

3. Labor-intensive, performance-based routine maintenance, China

A pilot project implemented between 2011 and 2015 in the Dehong Dai and Jingpo Ethnic Autonomous Prefecture ("Dehong") of China's Yunnan Province has demonstrated that poor communities can achieve high standards of routine maintenance of rural roads using a labor-intensive performance-based approach.

Situated along China's border with Myanmar, Dehong Prefecture has a population of 1.2 million, 42 percent of whom are from ethnic minority groups. In 2010, poverty rates in Dehong were much higher than in other parts of the province—with county-level poverty rates of 31 percent in Ruili and 39 percent in Luxi, compared with a provincial rural poverty rate of 15.2 percent.

In 2010, only 27 percent of Dehong's rural roads (township and village roads) were in good condition. This was partly due to limitations in the system of community members conducting routine maintenance on a voluntary basis. In practice, community members were often too busy with farming and other activities to spare time for routine maintenance; and those taking part were mainly women and the poor who lacked necessary skills, tools, and motivation[26].

Building on an earlier technical assistance, the pilot project was approved in 2010 as an output of the Asian Development Bank (ADB)-financed Yunnan Integrated Road Network Development Project. It sought to demonstrate that labor-intensive, performance-based maintenance by women's groups could be effective and offer value-for-money, and to provide technical manuals and training modules to support future upscaling.

The pilot project was implemented from 2012 to 2015. It began by assisting communities to form maintenance groups registered with the county communications bureau (CCB). To be considered for membership of the group, candidates needed to show interest, be aged 18–55 years, and live near the road. People with leadership skills and basic literacy and numeracy were given preference. At least 60 percent of members were to be female, 40 percent from ethnic minority groups, and 50 percent from poor households.

Each group initially received a half-day of theoretical training on the causes of road deterioration and the roles of different types of maintenance in slowing or halting deterioration. When groups were awarded a maintenance contract, members received up to a day of practical training in conducting maintenance tasks using a range of tools. They also received management training to help in planning, organizing, and managing of work, including preparation of weekly work plans, monitoring of days worked, and taking part in monthly performance-based road inspections. The groups also received on-the-job training on an ongoing basis.

The size and workload of each group was based on the idea that group members will spend half their time on maintenance and half on farming and other household activities. This made it easier for community members to participate, especially women.

Through the pilot project the approach to routine maintenance work was standardized. Three categories of routine maintenance were distinguished. The first was clearing obstructions, including landslides, side drains, culverts, bridges and vegetation. The second was repairing minor damage to unpaved roads, stone pavements, road shoulders, drainage systemsand retaining walls. The third was creating protection measures such as side drains, water bars, paved

crossings, retaining walls and planting vegetation. Ten items of equipment were specified for use by maintenance groups—pickaxe, hoe, shovel, rake, bush knife, earth rammer, watering can, basket, wheelbarrow and tractor-trailer. Five types of repair materials were specified—gravel, paving stones, stones, cement, and binding wire[27].

The performance-based contracting model provided fixed monthly payments per km maintained, subject to deductions if road performance indicators were not achieved. Eight performance indicators were chosen to represent the main aspects of routine maintenance needed to ensure a road would be passable in all seasons. These covered road surface, road shoulder, side drains, culverts, bridges, vegetation, landslides and retaining walls. In each case, the performance indicator specified the maximum extent of defects above which deductions would apply. For example, the road surface performance indicator stated: *"In gravel and earthen surfaces there are no potholes larger than 30 cm and no ruts or rills deeper than 5 cm, and water does not flow over or remain on the road. Repairs to gravel surfaces have been made using suitable gravel material. In stone-paved surfaces there are no loose stones, and newly formed holes are filled with new or recovered stones."*

In addition to the fixed monthly payments, the county communications bureau provided groups with tools and safety equipment, accident assurance for workers, and also met the costs of transporting materials to the roadside.

In conclusion, the use of performance-based remuneration was effective in motivating groups to carry out routine maintenance to a satisfactory standard. It also greatly simplified supervision and inspection, as monthly inspections only needed to observe the road condition. The training and other support provided group members with the additional knowledge and skills needed to undertake maintenance.

The pilot project was originally to maintain 650 km of rural roads. However, in 2012 Dehong Prefecture issued a regulation to scale up the approach in each of its five counties. As a result, by 2015, a total of 4,714 km of rural roads had been maintained by 69 village maintenance groups. The share of Dehong's rural roads in good condition had risen to 54 percent, and the share of the rural population with access to an all-season road reached 80 percent.

The pilot project demonstrated that satisfactory levels of routine maintenance could be achieved within the province's existing per km funding allocation for routine maintenance, and this offered value-for-money compared with other delivery models. As a result, Yunnan Province changed its policy on use of the provincial fuel tax subsidy by raising the proportion that can be used for routine maintenance to 50 percent. It also encouraged other prefectures to adopt the performance-based approach.

The pilot project showed that labor-intensive road maintenance can also play an important role in supplementing the incomes of poor households. On average, CCBs paid CNY2470 per km each year for routine maintenance (about $390). More than 80 percent of this was for fixed monthly payments of remuneration to maintenance groups. The average wage was CNY44 per day, and workers earned up to CNY4,000 annually.

The guide for local governments and manual for maintenance groups[28] that were produced by the pilot project are of high quality and could be readily adapted for use in other countries.

4. The "first-mile" problem, Tanzania

The International Forum for Rural Transport and Development prepared a pilot study of "first mile" movements of crops from farm to market in Tanzania. This examined the movement of tomatoes in Kilolo District, Iringa Region in 2015. The study was funded by the Africa Community Access Partnership[29].

First-mile transport refers to the portion of the transport logistics chain between the smallholder farm and the first point of commercial interface (collection point, motorable road, or first market in immediate proximity). This portion is often a critical transport bottleneck for agricultural products, such as tomatoes, vegetables, and fruits, that are time sensitive because of perishability or at risk of bruising and other damage when transported on rough roads and tracks.

Fruit and vegetables are in high demand in the growing urban centers of Tanzania and other African coun-

tries. Many farmers would like to produce fruits and vegetables because they command high prices, are suitable for smallholder farming, and have a shorter growing time (from planting to harvest) compared with traditional staples and cash crops.

Tomatoes are a particularly high-value commodity, with strong demand not only in Iringa Region but also in the more distant markets of Dar es Salaam, Dodoma and Morogoro. Tomatoes are very time-sensitive crops that need to be transported to market soon after harvest because of their perishability. Their fragility also means that the manner in which they are transported can lead to squashing and bruising, which reduces the price they can fetch.

A key factor affecting the profitability of growing high-value products such as tomatoes is the reliability of transport services linking farmers to markets. Smallholder farmers produce low volumes that need to be consolidated before transportation. Consolidation also requires communication and coordination with traders who collect the produce from roadside collection points and transport them to markets.

There is an emerging structure to the way transport service for smallholder agriculture is organized. Typically, this involves several transport segments with individual characteristics and costs. The primary transport segment is from the farm to collection or consolidation points, typically found at the key junctions of motorable, low- volume roads. Key actors in the transport system are the farmers who use their own (household) means of transport, such as headloading or backloading, animal carts, bicycles, and sometimes motorcycles. The intermediate transport segment is from the primary collection points to an intermediate traders' market. Key actors in this segment are transporters and traders, including better-off farmers who may also act as traders. The final segment is from the intermediate traders' market to the big urban markets, using the main arterial road networks. Key actors here are also transporters and traders.

The first-mile study covered Kilolo District's eight tomato growing villages, namely Ibohola, Ihimbo, Isoliwaya, Itimbo, Iwonde, Luwiva, Mlandege and Ndiwiri. There is only one tomato season each year. In the 2014–15 season, there were 127 smallholder tomato farmers in the villages, with an average of 0.4 hectares (1 acre) of each farm under tomato cultivation. Average tomato production per hectare was 7 tons per season. The average profit from tomato production was approximately TZS331,867 ($166) per farmer.

Farmers were selling their tomatoes to traders from Iringa, Dar es Salaam, and Dodoma. Traders typically visited the area ahead of transport in order to organize consolidation from different farmers at collection points along the main road. The farm gate prices for tomatoes are highly variable, with seasonality and availability of transport being key factors. During peak harvest periods (July to November), the price of a 60-kilogram (kg) bag can be as low as TZS4,000 ($2) while in periods of scarcity (March to June) it rises to TZS10,000–25,000 ($5–12.5).

The price of tomatoes rises as they proceed along the transport logistics chain from farm gate to intermediate and major markets. Prices in major markets can be 250 percent higher than at farm gate.

Few farmers own means of transport. Seventy-seven percent of farmers reported they did not own any, while 19 percent own a bicycle, 2 percent own a motorcycle, and 2 percent own a pickup truck or small car. Transport from farm to roadside is mainly by head loading (89 percent), bicycle (7 percent), and motorcycle (4 percent). Transport problems are mainly experienced during the rainy season, when parts of the road become impassable or can only be accessed with difficulty. The average distance from farm to roadside is 1–2 km in the dry season, but as much as 4 km in the rainy season. This is because the villages of Isoliwaya and Luwiva cannot be reached by motorized transport in the rainy season, and their nearest consolidation point becomes the village of Itimbo.

The average transport cost per ton-km on normal days was TZS10,000 ($5) for head loading and TZS6,700 ($3.35) for using motorcycles. When first mile road conditions are difficult, such as on rainy days, the ton-km cost of head loading rises 50 percent, to TZS15,300 ($7.65) and the cost of using motorcycles rises 20 percent, to TZS15,300 ($7.65).

Typically, perishable products are produced in highland areas, where road maintenance is difficult and expensive because of rainfall and terrain. First-mile

transport issues affect many perishable and fragile products. When transport is poor and storage facilities are unavailable, farmers have no bargaining power with traders.

In conclusion, consolidation of small volumes of goods is important for the movement of agricultural produce in rural areas (also for freight such as farm inputs, stock for shops, and household goods). First-mile transport using motorcycles, together with coordination of farmers and traders using mobile phones, can be very useful to support consolidation and the early shipment of loads. There is considerable potential to raise farmers' incomes if produce can be consolidated and loaded onto a truck close to the harvest location and taken directly to market. Further research funded by DFID-UKAID is being undertaken in Tanzania (and Kenya) on the key issues relevant to improving First Mile access.

5. Rural Road Asset Management in Kwa Zulu Natal, South Africa

South Africa's Department of Transport (DOT) introduced the *S'Hamba Sonke* (Moving Together) Programme to provide grants for labor-intensive road maintenance of secondary roads and rural roads, while requiring participating provinces and district municipalities to implement and maintain road asset management systems (RAMS) to support decision-making on road construction and maintenance. Taking the case of Kwa-Zulu Natal, one of South Africa's nine provinces, the programme has successfully extended the use of RAMS for managing the rural roads network.

The *S'Hamba Sonke* Programme was introduced in 2011, following a Road Construction and Maintenance Summit hosted by DOT in 2010 that had drawn attention to the lack of reliable road condition data to support decision making. KwaZulu-Natal joined the programme in 2011, with a view to obtaining grants for labor-intensive rural road maintenance and committed to introducing RAMS for managing the rural road network.

KwaZulu-Natal is South Africa's second most populous province, with a population of about 10.6 million people. It is predominantly rural, with high levels of poverty, unemployment, and deprivation. The provincial road network consists of 32,609 km, comprising 13,175 km of main roads, 11,715 km of district roads and 7,719 km of local roads[30]. Most district and rural roads are graveled, and are managed either by KwaZulu-Natal Department of Transport (KZN-DOT) or the 10 district municipalities. The estimated current replacement cost of these road assets is over R100 billion ($8 billion).

Before DOT can allocate *S'Hamba Sonke* Programme grants for road maintenance, it requires provinces to provide information on the exact length of these roads, the value of the road infrastructure, and its condition. This reflects the aim of the grant program to ensure efficient and effective investment in rural roads through the development and use of RAMS. To support the program, KZN-DOT assisted district municipalities to set up and operate the RAMS, including collection of detailed data on road km, value, and condition of road assets such as pavements, bridges, drainage structures, guardrails, and sidewalks.

In 2013, all South African provinces adopted an improved, domestically-produced RAMS that is ISO 55000 certified. The RAMS has nine parts, covering general and organization, inventory data, asset valuation, usage and condition data, indices, situational analysis, needs determination, asset management plans and the feedback loop. It can produce a variety of asset management plans. For example, it can identify service delivery needs and gaps, and estimate an approved multiyear budget for the most cost-effective method of delivering these. It can also provide a business case for the most feasible options, including projections of full life-cycle-costs, funding sources, and risk assessment[31].

KZN-DOT's strategic objective for maintenance is *"to maintain the provincial road network in a sustainable manner so that [not more than] 10 percent of the road network is in a poor to very poor condition, to ensure the safety of road users and the retention of network asset value."* Through use of the RAMS, KZN-DOT is now able to continuously update the length, condition, and asset value of the rural road network and to plan future road construction and maintenance works in line with policy objectives. In its annual performance reporting it also reports on the proportion of

the network in poor or very poor condition, the level of annual maintenance funding received as a proportion of the funding needed, and the annual outputs of road rehabilitation, resealing and patching[32].

Conditional road maintenance grants that require recipients to have a functioning RAMS are a good practice that could be useful in other developing countries. Using a RAMS adapted to local requirements, and having provincial authorities provide technical support and guidance to rural municipalities on the use of RAMS, can help to ensure system sustainability.

6. National Rural Roads Program, Morocco

Over the past two decades, the Government of Morocco, with support from development partners, has implemented a large-scale rural roads program that has significantly increased rural access.

More than 60 percent of Morocco's poor live in rural areas, where lack of all-weather roads reduces their access to economic opportunities and social services such as health and education.

Until the mid-1990s, the government was building less than 300 km of rural roads per annum. However, a study by the Directorate of Roads (DOR) identified a need to upgrade 38,000 km of rural access roads. It found that 82 percent of these roads were in poor condition; 35 percent of communities suffered from difficult access and seasonal isolation; 19 percent of roads were cut off for at least 30 days during rainy season; 22 percent of areas were completely inaccessible by vehicle; and 28 percent of roads were impassable for trucks and four-wheel drive vehicles[33].

In 1995, the government launched the First National Rural Roads Program (NRRP1). Since 90 percent of the roads under NRRP1 were government roads under the responsibility of DOR, implementation was led by Directorate of Roads which was also to be responsible for future maintenance. Partnership agreements were signed with provincial councils, but there was little involvement with local authorities in road selection and no financial contribution was sought.

At completion in 2005, NRRP1 had upgraded 11,236 km of rural roads to all-weather standard (20 percent of the national road network), of which 46 percent were paved and 64 percent were unpaved. Both paved and unpaved roads had a 4-meter (m) carriageway with two 1m shoulders. As a result of NRRP1, rural access increased from 43 percent in 1995 to 54 percent in 2005.

In 2002, a further DOR study identified an additional 48,200 km of rural roads in need of upgrading. The study also developed an accessibility index that was useful for identifying areas with greatest access needs, to be prioritized for future rural roads investment. Drawing upon this study and the results of NRRP1, the government decided to proceed with a further program and, as part of the 2020 Rural Development Strategy, included a goal of raising rural access to all-weather roads to 80 percent by 2015.

In 2005, the government launched the Second National Rural Roads Program (NRRP2). The program was implemented by the Directorate of Roads in partnership with regional, provincial, and rural councils, which were expected to contribute toward the cost of the program. This partly reflected an increased focus on upgrading unclassified roads.

At completion in 2012, NRRP2 had upgraded a further 15,500 km of rural roads, raising rural access to 79 percent in 2012. The NRRP2 roads comprised 8,730 km of state roads and 6,770 unclassified roads, of which 63 percent were paved and 37 percent were unpaved.

Based on a sample of road subprojects, a completion reviews of NRRP2 estimated the EIRR to be 24.4 percent, which confirmed that the program had a robust economic justification[34].

At the time of completion of NRRP2, DOR's annual maintenance budget for classified rural roads was insufficient, and there was no maintenance budget for unclassified roads. However, the government established a tripartite commission comprising the Ministry of Equipment and Transport, Ministry of Finance, and Ministry of the Interior to identify sustainable solutions to this issue. By late 2015, the government issued a maintenance strategy for the unclassified roads in rural areas. Since then DOR conducted a road classification exercise to allow for future maintenance of the unclassified roads[35].

An ex-post impact evaluation of NRRP2 (based on a sample of 915 households in 84 villages) confirmed that rural roads improvement had brought significant improvements, including: (i) less wasted time on journeys (20 to 25 minutes per person on average); (ii) primary school enrolment increased by 5.8 percent, with girls enrolment rising by 7.4 percent; (iii) the ratio of accessibility in the ten less-served and ten best-served provinces rose from 0.43 in 2002 to 0.65 in 2017; (iv) the quality of service of intercity passenger transport improved on about 80 percent of upgraded roads; and (v) passenger fares decreased by 26 percent and freight costs by 15 percent.

A further impact study of the NRRP1 and NRRP2 found that (i) travel time was reduced by 27 percent; (ii) transport cost reduced by 26 percent for passengers and 20 percent for freight; (iii) average daily traffic increased by 39 percent in both rainy and dry seasons; (iv) agricultural employment rose by 24 percent; and (v) access to medical centers increased by 26 percent.

The combined cost of NRRP1 and NRRP2 was about MD30 billion ($3.3 billion), equivalent to about $125,000 per km.

Given the favorable performance of NRRP1 and NRRP2, the government is planning a further large program of rural roads improvements that could be expected to bring the country close to achieving universal rural access.

Morocco's experience shows how a country can progressively expand rural road access to the point that universal access becomes within reach. It also confirms that rural road improvement leads to a wide range of socio-economic benefits for communities served.

7. Universal Rural Road Access Program, Ethiopia.

In Ethiopia, more than 75 million people gain their livelihoods directly or indirectly from agriculture. Per capita income growth and food security are thus highly dependent on agriculture. However, agriculture has suffered from low growth and low productivity, and is vulnerable to drought and other adverse weather conditions.

In 2008–09, Ethiopia had about 100,384 km of roads serving kebele[36] (wards). Around 37 percent of kebele had all-season access, 20 percent had seasonal (dry season) access, and 43 percent were impassable or unreachable by motorized transport in any season. More than 91 percent of rural households travelled a minimum distance of 15 km to reach a health center. Two-thirds of the rural population was located more than 5 km from an all-season road, with 48 million people more than 2 km from an all-season road. The average distance to an all-season road was 11.3 km, equivalent to more than 3.5 hours walk. During the rainy season, communities are often isolated without any access. Remoteness, isolation, and lack of services increases vulnerability, and constrains people's ability to contribute to the country's economy and development. It also excludes them from exposure to new ideas and influences.

The objective of the government's Growth and Transformation Plan (GTP) is to achieve Ethiopia's long- term vision of sustaining rapid and broad-based economic growth, transforming from a subsistence-based agrarian economy to a modern, industrialized economy underpinned by the agricultural sector.

As part of the GTP, Ethiopia has been implementing the Universal Rural Roads Access Programme (URRAP) since 2010. The overall aim is to provide all *kebele* with all- season road connections. It is planned to build a total of 71,523 km of rural roads, which would increase rural access to about 80 percent.

Under GTP I (2011–2015), the URRAP was to construct a total of 71,523 km of rural roads to provide 15,937 *kebele* with all-season access at an estimated cost of $1.5 billion. Under GTP II (2016–2020), the government plans to construct 90,000 km at an estimated cost of ETB 45.0 billion ($1.6 billion). The majority of investment financing was provided by the government, the national road fund, and community contributions, with the remainder funded by development partners.

Implementation of the URRAP is expected to: (i) improve the access of the rural population to markets, social and other services by reducing transport time and cost; (ii) improve access for isolated areas and communities, enabling further implementation of other poverty reduction programs—such as sector programs in agriculture, health and education—all of

which require reliable transport services and all-year access; (iii) improve administrative and economic integration of the country and facilitation of decentralization by linking rural communities, *wereda* (district), and *kebele* centers with the national economy and community; (iv) support the decentralization process and strengthening of public administration and planning, decision-making, implementation and progress monitoring; and (v) support the private sector and small-medium enterprises that contribute to sustainability and self-reliance in the local construction industry.

The approach to URRAP implementation has been based on conducting works through small-scale contractors using labor-intensive methods. This is intended to reduce costs compared with using capital-intensive contractors and generate employment and incomes in areas with few non- farm economic opportunities.

The DFID-funded Africa Community Access Partnership (AFCAP) assisted URRAP by preparing low-volume road manuals to support program implementation[37]. The manuals were very useful and were widely disseminated to authorities, contractors, and consultants. However, they have not always been adhered to. URRAP rural roads are intended to have a 4.5m wide carriageway but in practice a 6m carriageway was implemented for nearly half of the roads, leading to higher unit road construction costs.

URRAP was originally designed to focus mainly on low- volume, gravel-surfaced roads. Faced with the high level of maintenance required by gravel roads, and rapidly depleting gravel deposits, the government increasingly favors more durable sealed surface options that are easier to maintain.

Under GTP I, implementation was slower than originally planned. By 2014, about 36,203 km of rural road projects had been completed, out of a planned 45,381 km[38]. This provided 5,837 *kebele* with all-season road connections, increasing rural access to 49 percent. Among the main reasons for delay were the large number of small-scale contractors to be administered (945 contractors, 275 consultants); the low financial and managerial capacity of small-scale enterprises; the need to provide the small-scale enterprises with initial training, basic equipment and tools; and delays in the government's payments to contractors[39].

The second phase of URRAP (GTP II) was started in Amhara region in 2017 and works are in progress. Other regions have not yet started works for the GTP II.

A survey of the Tillili–Wumbery Road, Tillili Woreda, Amhara Region was conducted in 2013. The road serves two *kebele* directly, and a further two beyond the end of the road, with a total population of approximately 20,000. Previously it was a muddy track, passable only by pedestrians because of a missing bridge near to the main market of Tillili. Under URRAP, a 6 km road and a 9m span bridge was built. This transformed access to this hilly area. It used to take at least an hour to travel by foot with mud up to knee level in some places. Now it takes no more than 30 minutes along the new gravel road. The new bridge makes it faster, easier, and safer for animal carts and motor vehicles to pass. The area now has access to *wereda* ambulance services, which have transported several women requiring emergency childbirth assistance to medical facilities. The area produces potatoes, gum poles, and cereals. Previously farmers had to head-load their produce to the market at Tillili. Now they can use animal carts. Furthermore, traders have started coming to their farms to buy produce. This has not only saved farmers the time and effort of transporting goods to the market but has created some competition among traders. Consequently, the price obtained for a quintal (100 kilograms) of potatoes, for example, has increased from ETB150 to as much as ETB200.

The URRAP has achieved a major improvement in rural access in Ethiopia. Its focus on providing all-season access to serve all *kebele* has provided a clear program goal to work toward. Use of labor-intensive construction by small- scale contractors been administratively demanding, and caused some initial delays, but played an important role in maximizing the generation of construction-related employment and incomes. The approach to construction and maintenance has evolved, with sealed surfaces now preferred to gravel because of difficulties maintaining gravel roads. Studies of completed roads confirm that these have reduced transport costs and trip duration, expanded the availability of transport services, and improved the prices that farmers can obtain for their produce.

8. Causes and circumstances of motorcycle crashes on rural roads, Tanzania

In 2004, Amend, a non-governmental organization that works on road safety in Sub-Saharan Africa, prepared a research study to determine the causes and circumstances of motorcycle crashes on low-volume rural roads in Tanzania. The study was financed by the Africa Community Access Partnership (AFCAP)[40].

While rural road improvements can lead to significant economic and social benefits, they also introduce additional road safety risks from higher traffic and driving speeds.

In Tanzania and other African countries, the recent influx of affordable motorcycles has transformed rural accessibility and mobility but has also led to a sharp rise in motorcycle-related road traffic injuries and deaths. During 2008–12, almost 500,000 new motorcycles were registered in Tanzania, with annual registrations rising from around 45,000 in 2008 to 109,000 in 2012. Over the same period, the number of officially reported motorcycle deaths on all categories of roads rose from 309 to 930.

The Amend research study sought to examine the causes and circumstances of motorcycle crashes on two low- volume rural roads in Tanzania and identify motorcycle safety risks associated with different surfacing techniques and materials, driver behavior, and other factors.

A total of 45 motorcycle crashes were investigated. Of these, 26 (58 percent) occurred on or near the Lawate– Kibong'oto road and 19 (42 percent) were on or near the Bago–Talawanda road. Nine (35 percent) of the Lawate– Kibong'oto crashes were investigated during the dry season and 17 (65 percent) during the rainy season. Eight (42 percent) of the Bago–Talawanda road crashes area were investigated during the dry season and 11 (58 percent) during the rainy season.

For many people living in the vicinity of the two roads, *boda-bodas* (motorcycle taxis) were often the only available and affordable means of motorized transport. However, several factors meant *boda-boda* drivers and passengers did not give enough attention to safety. Because of low incomes, not all drivers and passengers could afford to buy personal protective equipment. In the absence of any nearby motorcycle training and licensing services, drivers' skill levels were sometimes low. Moreover, drivers' incomes depend on the number of trips they made, so they often chose to drive quickly.

The age of the 45 drivers ranged from 18 to 52 years, with an average of 25 years. All were male, 47 percent being married and 53 percent unmarried. Most drivers (73 percent) described their primary occupation as *boda boda* driver. The other drivers (27 percent) were mainly farmers, small businessmen, and laborers. Work as a boda-boda driver is popular among young uneducated males. Among drivers, 5 percent had received no formal education, 58 percent had completed primary school, but only 9 percent had completed secondary school. Some 82 percent of drivers said that they had no driving license. Of those who said they had a license, only four were able to present it to the study team. Most (73 percent) of drivers learned to ride a motorcycle from a friend or relative, and 24 percent were completely self-taught. One driver learned to ride through a formal training course run by the Vocational Education and Training Authority, but did not complete the course.

The research identified many examples of unsafe driving linked to the lack of driver training and skills. These included: driving at speeds inappropriate for road conditions; not driving defensively; not slowing down in settlements and other areas with many pedestrians; driving erratically—including zigzagging and using the wrong side of the road; driving too close to the vehicle in front; coasting down hills; accelerating fast and braking hard; failing to use the front brake; overloading or poorly attached loads (especially risky on roads with steep gradients); failing to keep both hands on the handgrips; being easily distracted; and failing to use protective clothing and equipment.

It was observed that motorcycle passengers have more power and control over safety than they perhaps realize. Drivers were found to ride more slowly when transporting passengers and tended to follow passengers' requests when given.

Fifteen contributory factors in five categories were identified through crash investigations. Road user behavior factors included driver error, passenger action, obscured driver vision, high speed, other vehicle

error, pedestrian error, and weight-shifting of load. Factors related to road design and condition were lack of signage, narrowness of road, obscured driver vision (road design) and road damaged or poorly maintained. Environmental conditions included poor road conditions and obscured driver vision because of rain. The remaining factors were vehicle failure and risks from animals.

The study also found that poorly maintained roads can increase the risk of crashes for motorcycles and other road users, especially during the rainy season.

The study found that comprehensive and sustainable improvements to rural road safety in Tanzania will require systemic changes, but some of these will only be achievable when the country has reached a more advanced state of socioeconomic development. Improvements are needed in infrastructure, education, healthcare, law enforcement, and many other areas.

In the shorter term, stakeholders can take various actions to improve rural road safety. First, well-researched and well-presented continuing training programs are more appropriate platforms for promoting behavior change than making one-time visits and conveying simple messages. Second, effective police enforcement of existing traffic laws is needed to reinforce safety behaviors in relation to helmet wearing, speed limits, and drunk-driving. Third, behavior-change programs aimed at motorcycle passengers can focus on empowering them with knowledge and strategies to be able to choose a safe driver, and to ask a driver to drive safely. Fourth, planners and engineers should take motorcycles into account in designing road improvements and maintenance works—roads designed for safety are more forgiving of poor road- user behavior. Fifth, with respect to a road's cross-section, the carriageway (including shoulder) should be wide enough to accommodate the traffic (including occasional passing of two vehicles) but not so wide as to encourage excessive speeds (for example, 4.3–4.5m width for roads with daily traffic below 100 vehicles). Sixth, parallel concrete strips should be confined to straight stretches of road where motorcycle drivers are able to see approaching vehicles from afar—allowing drivers time to safely pull off to the side of the road—and should be avoided on corners and at the brows of hills. Seventh, sound maintenance is needed to protect the structure and condition of the road and avoid safety hazards being introduced as a result of road deterioration. Seventh, where roads pass through settlements and other places of pedestrian activity—such as near schools and marketplaces—they should be designed to include speed humps to control the speeds of motorcycles and other vehicles (informally constructed speed humps are less predictable and therefore pose a safety risk for motorcyclists).

9. Safe and sustainable water transport on Lake Victoria, East Africa

Globology is a private company founded by a Scottish investor, which builds and operates affordable, fast, and safe catamaran passenger ferries providing island communities on Lake Victoria with access to the mainland. It has 45 staff members. Its vessels, which carry the Water Bus brand name, are designed and built in Kisumu, Kenya by a team of expert engineers, boat designers, and technicians working in collaboration with Dykstra Naval Architects, an experienced Dutch firm of commercial vessel designers.

Globology was established in 2016 with a total investment of $1.92 million financed by private equity with a contribution from the Shell Foundation. It identified a gap in the passenger services market on Lake Victoria and adopted a commercial approach for developing and operating vessel services. Shell Foundation provided business incubation support to prove the business model and test its scalability. Globology's vessel services have made a notable contribution to improved rural access without any need for public sector funding.

In the past, people travelling to and from the populated islands on Lake Victoria had to rely on canoes, motorized canoes, and motorboats known as "choppers." This has always been a perilous journey, made worse by the poor standard of vessels used and their vulnerability in difficult weather conditions. They rarely have safety equipment such as life jackets. This has resulted in an extremely poor safety record, with more than 2,500 people drowned in Lake Victoria each year.

The existing vessels have other shortcomings. Most are uncovered, offering no protection against the weather. Journey times are long. For example, islanders traveling to Mbita may begin at 2am, and the

Source: http://www.globology.biz/ferries.html

journey takes 5–6 hours. Some journeys take a day or more. Also, on some trips, islanders have to sleep on the boat for close two days while waiting for the waves in order to set sail. The vessels have 2-stroke outboard engines that emit fumes and pollute the lake area.

The Water Bus was specifically designed to provide fast, affordable, and safe passenger transport on the lake. It is a catamaran with two parallel hulls of the same size that provide for maximum vessel stability. An enclosed passenger compartment provides passengers with protection and comfort. It also incorporates up-to-date fuel-efficient engine technology. The inspiration for this innovative design was the catamarans that Polynesians long ago used to sail around the islands in the Pacific.

The interior of the Water Bus is clean and spacious. The seats are metallic but soft and comfortable. They are also larger than normal so, if there aren't many people on board, you can sleep on the seat. There are large windows that provide ventilation and an excellent view of the lake. There is also a small outdoor deck at the back of the vessel. It operates with a crew of six plus a captain.

Globology introduced Water Bus services on the Kenyan side of Lake Victoria in 2016. This was the first major investment in water travel on Lake Victoria for more than two decades. Services have been popular with customers and have expanded rapidly, with the number of vessels in service rising from two in 2016 to four in 2017. Passage is very affordable, with a typical journey to or from the islands costing only Ksh.150 ($1.50). By mid-2018, the total number of passengers was more than 740,000[41].

Following the success of Water Bus, Globology plans to continue expanding services in Kenya to meet the growing passenger demand. It is also in the process of raising private equity financing to expand the Water Bus fleet to six vessels. Globology is also hoping to introduce Lake Victoria services in Uganda.

The successful introduction of passenger vessel services on Lake Victoria by Globology offers an example of both the role of waterborne services in improving rural access and the potential for private business to develop innovative access solutions on a commercial basis, without need for public investment.

10. Role of Aviation and Drone Technology in Transforming Rural Mobility

Traditionally, the aviation sector has been providing a lifeline in areas of the world with non-existent or poor road infrastructure and in many other remote communities and small islands whose access to the rest of the world and to essential services such as health care is often only possible by air. Over 1,000 communities in northern Russia are inaccessible by road and throughout Norway, thanks to an extensive network of regional airports and airline services, 99.5% of the remote population is able to travel to Oslo and back on the same day. Around 400,000 patients are also transported annually on scheduled flights between their homes and hospitals. The speed and reliability of aviation services is perhaps most immediately apparent during times of humanitarian emergency. Air services also play an essential role in assistance to regions facing natural disasters, famine and war. They are particularly important in situations where surface access is constrained, and aid, search and rescue services and medical supplies can only be transported to target areas by air.

Aviation as an enabler to the United Nations 2030 Agenda, is embracing innovation so that the air transport system, with the evolving technology and solutions such as Unmanned Aerial Vehicles (UAV), including drones, are able to improve the lives of people in rural areas while maintaining or increasing existing levels of aviation safety.

The Lake Victoria Challenge is an initiative that aims to explore drones as a new mobility model for the hard-

to- reach, rural communities of the Lake Victoria region. The Lake Victoria Challenge aims to improve the lives of the 30 million people who live in the world's most densely populated rural area – the shores of the Lake Victoria basin, and anchor Mwanza as a gateway to the Lake region, its economy and services. Key challenges around the lake include the rugged terrain, remoteness of habitats, and the underdeveloped transport infrastructure, hence the rural island communities in and around Mwanza are often only accessible by boat, which can be slow and expensive. Life-saving cargo such as blood packs, critical medication, anti-venom, or spare parts for hospital machines often cannot reach those who need them in sufficient time. The high cost of transportation also means that local producers have difficulty in getting their products and produce to market, particularly perishable goods.

The Lake Victoria Challenge is hosted by the Republic of Tanzania, and receives support from sevral donors. Dar Teknohama Business Incubator (DTBi) partnered with WingCopter to use UAVs to deliver emergency medicines to the Ukerewe island health facilities (blood, anti -venom and vaccines). The Wingcopter UAV has a wingspan of 178 cm and a weight of 9.6 kg, carries up to 6 kg payload and reaches a top speed of 130 km/h with a maximum round-trip flight time of 2 hours with a cruising altitude of 5000 m.

The drone takes off like a helicopter, flies like an aeroplane and lands like a helicopter at its destination.

The Lake Victoria Challenge project involved training of 4 Pilots, collaborating with telecommunication operators who allowed their towers to host the communication antennas and TCRA (Telecom Regulator) who provided the frequency to be used for pilots to communicate with drones and monitor them on screens (M2M with sim cards). The Government parastatal Medical Stores Department (MSD) and blood bank provided the essential medical supplies. Approximately 6 flights are carried out per day transporting the essential supplies in various parts of the lake.

The impact of the project has been significant as essential medicines and emergency supplies are now delivered in 1 hour instead of 1 to 3 days. The blood samples/slides from health facilities are transported to Bugando referral hospital in 1 to 2 hours instead of 3 to 5 days; with the results of blood samples being transmitted back to health facilities in less than 6 hours. The other impact is that there is a transfer of digital knowledge to Tanzanian youths, as well as job creation, and possible extension to other parts of the country.

The main challenges of the project include limited knowledge and experience on the new technology, budget to meet the daily operational costs, limited distance coverage of the drones, and their limited carriage capacity in terms of volume and weight. These challenges are partly being addressed by International Civil Aviation Organization (ICAO), a specialized agency of the United Nations that has a leadership role in the development of guidance material for the proper harmonization of regulations for unmanned aircraft systems (UAS). As part of these efforts, ICAO has formed a UAS for Humanitarian Aid and Development Task

Force (UHAD TF). The aim of this group is to create guidance material and regulatory templates for States in order to harmonize best practice for such operations and ensure they are done safely. ICAO has been continuously undertaking the development of a harmonized regulatory framework and structure for the safe evolution of UAS. Defining technical, operational and legal issues to ensure safety of this emerging industry remains highest priority to ICAO and its Member States.

11. Innovative apps and platforms for rural transport services and logistics

Over the past decade, internet platforms and apps have been transforming the way transport services are provided, including in shipping, civil aviation, freight, and urban passenger transport. Such technologies are now demonstrating the potential to transform rural transport and logistics services. Examples of ride hailing, freight hailing and rural supply chain management are briefly summarized below.

Safe Boda, Uganda. *Boda boda* drivers in Uganda have had a reputation for reckless driving–driving on pedestrian sidewalks and ignoring traffic lights. They also don't apply a standard fare: for each trip, a passenger has to bargain until a fare is agreed upon.

Safe Boda is a new hailing app for *boda boda* in Kam-

pala. It was conceived in 2014 as a social enterprise to develop a platform that would help to provide affordable, convenient, and safe *boda boda service*s. It came up with a simple yet effective solution by creating a community of *Boda Boda* drivers, training them on road safety standards, equipping them with safety gear such as helmets, and then connecting them with roaming passengers around the city via a mobile app with similarities to Uber, Grab, and other ride hailing apps.

The result is a community of professional, trained, motorcycle taxi drivers that offers a safer experience to passengers. Safe Boda's base fare is UGX 500 ($0.13) or UGX 500 per kilometer or UGX 50 ($0.01) per minute. Currently the app only allows payment in cash, but payment by debit or credit cards or mobile money is soon to be introduced. The app is also popular with Boda Boda drivers and has an 85 percent year-on-year retention rate among drivers.

With support from the Shell foundation (71 percent), the Global Innovation Fund, and USAID, Safe Boda has raised $1.8m in investment financing for further development. In future it hopes to scale up its operations to cover a larger share of Africa's five million motorcycle taxis.

Uber Freight app, USA. Uber Technologies Inc. has launched Uber Freight, a mobile app designed to streamline freight booking, particularly for small carriers and shippers that still rely heavily on manual processes. It provides one-touch booking for drivers, making it easier to find freight consignments, simplifying transactions, and providing upfront pricing and quick payment for their work. It can also handle dry van, refrigerated truckload, short-haul, and long-haul freight. The app can be downloaded from Google Play.

The primary market for Uber Freight is the owners and operators of small fleets that lack the freight booking technology used by larger operations. The service is currently available across the United States. Initially, the company focused much of its early efforts on signing up drivers and shippers in Texas to create a launch market in an area with dense freight movements.

Uber Freight is a tool for drivers to find and book loads, but it is not a dispatching service. Carriers open the app to check prices and select the loads they want. The service is designed to ensure that drivers receive payment as quickly as possible. Uber makes a margin on the difference between the prices for shipper customers and carriers. Similar to Uber's ride-hailing app, the prices on Uber Freight change in accordance with market conditions. From the shipper perspective, the platform provides a "more efficient, lower-cost model," especially for smaller shippers that have been underserved by technology. Shippers will also be able to track their loads from start to finish through the app's built-in tracking capabilities.

Logistimo, India. Low-resource supply chains, such as rural supply chains, pose significant challenges in collecting digital data from remote locations, including poor network connectivity and the capacity of staff to use technology or manage inventory.

Logistimo is an open-source platform for managing low- resource supply chains using mobile phones, based in India[42]. It offers a robust technology platform with mobile and web applications that simplify data collection across the supply chain network, including the last mile, and deliver actionable analytics to users at every level in the supply chain. The platform enables reliable data collection over unreliable networks, through a novel utilization of mobile Internet and SMS communication channels, while also working in a fully offline mode. It supports all the major supply chain capabilities including inventory management, order management, inventory optimization, workforce management, real-time dashboards, and big data analytics.

Along with optimizing inventory, Logistimo enables monitoring of storage conditions (such as temperature or moisture) by integrating data from telemetric sensors with an Internet-of-Things-based infrastructure and an ability to handle billions of data points.

Logistimo is currently deployed in five countries—Democratic Republic of Congo, India, Myanmar, South Sudan, and Zambia. It works across different types of rural supply chains including health commodities, agricultural inputs, and energy products. There are more than 12,000 shops in its network, over 95 percent of them being below district level, with more than 15,000 users accessing its services through mobile phones. It

is currently supporting one of the largest immunization cold-chains in the world (in India), ensuring availability and potency of more than 430 million doses of vaccines annually.

The emergence of Logistimo and similar platforms shows that internet platforms geared toward rural needs in developing countries are rapidly emerging. In the future, such platforms have the potential to streamline rural transport and logistics services, including through the coordination and consolidation of loads, arranging storage, obtaining transport services on a more competitive basis, and potentially also for transacting produce sales by mobile phone.

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ANNEX C.
LIST OF POLICY MEASURES

The list of policy measures identified in this paper to achieve universal rural access has been consoli¬dated and harmonized with the policy measures to achieve all other policy goals toward sustainable mobility. The Global Roadmap of Action toward Sus¬tainable Mobility provides the consolidated list of measures.

The consolidated policy measures that have an impact on universal rural access in mobility are shown in the tables I.1.

Table I.1: Policy Measures with Description (by toolbox and thematic area, with an impact on universal rural access)

Policy Measure	Policy Measure Description
Toolbox: Regulatory and Institutional	
Thematic Area: Plans and Strategies	
Develop an Integrated National Transport Plan	Develop and implement an integrated national transport plan to cover the four policy goals, all modes of transport, and passenger and freight traffic.
Set Targets across Policy Goals	Set clear targets to be achieved in the long term and in the interim for the four policy goals, aligned with an integrated sustainable mobility plan.
Develop Mobility Plans at the Sub-National Level	Develop a sustainable urban mobility plan and implement strategies at the sub-national level that are consistent with the integrated national sustainable transport plan.
Plan for a Multi-Tiered Rural Access Approach	Use a multi-tiered and multimodal approach to universal rural access in the integrated national transport plan, supporting both early attainment of universal rural access and further upgrading to higher-access tiers based on affordability and feasibility.
Embed the Safe System Approach into Transport Planning	Embed the safe system approach to road safety in all aspects of national and sub-national transport planning
Provide Policy Certainty to Businesses and Investors	Ensure a stable regulatory and policy framework, setting a timeline sustainable mobility targets, to increase the confidence for businesses and financial investors to make long-term decisions.
Thematic Area: Institutional Design, Cooperation, and Coordination	
Coordinate Planning across Government Agencies	Coordinate across agencies to ensure integrated planning and shared responsibility for results across levels of government, jurisdictions, and agencies, including but not limited to the coordination of road safety responsibilities and the coordination of response to extreme weather events.

Policy Measure	Policy Measure Description
Define Roles and Accountabilities across Agencies	Define government roles, responsibilities and accountabilities in the transport sector across the four policy goals, modes of transport, national and sub-national government levels, and passenger and freight transport.
Establish Joint Gender Programs Across Agencies	Establish joint programs with ministries and agencies responsible for gender to include transport in their work program.
Thematic Area: International agreements and regulations	
Remove Non-Tariff Barriers for International Trade	Remove non-tariff barriers for cross-border traffic, including barriers for rail and waterborne transport.
Thematic Area: Regulations for Transport Services	
Adopt a Coherent Competition Policy	Adopt a coherent competition policy for passenger and freight transport based on the principles that competitive markets are central to efficiency, and acknowledge that market failures in the transport sector require regulation.
Review Legal Framework for Women's Security in Transport	Review the national framework for security and safety in public spaces used to access transport, and for in-vehicle protection from harassment.
Review transport regulations periodically	Promote the periodic review of the regulations to allow the fast-moving mobility solutions to evolve towards a sustainable and inclusive transport system
Thematic Area: Regulations for Vehicles and Vehicle Use	
Ensure Legal Certainty Regarding Driver Permits	Adopt standards and compliance regimes for the provision and withholding of driver licenses and permits, including compliance regimes designed to prevent and reduce fatal and serious injury risk.
Define and Enforce Speed Limits	Define and enforce speed limits according to modal mix, road function, and protective qualities of roads.
Establish More Stringent Fuel Economy Standards	Establish stricter fuel economy standards and CO2 emission standards for new motor vehicles, as well as stricter fuel specifications, for example, the use of low-sulphur petroleum products.
Thematic Area: Regulations for Data Collection, Share and Use	
Establish Data Protection Regulations	Establish personal and travel data protection regulations, with processes that handle personal data with the appropriate safeguards and ensure that data are not made available to the public without explicit informed consent.
Require Service Providers to Report Standardized Data	Establish standardized data reporting requirements for all transport service providers, including transportation network companies (TNC), public transport operators, and bike- or car-share companies.
Develop Data Repositories and Data Collection Guidelines	Develop centralized data repositories and establish data collection guidelines at the national and metropolitan levels, and facilitate data access to different stakeholders (academics, private sector, etc.) while stablishing a legislative framework defining the context and purpose of its use.
Require Use of Data to Support Decision Making	Require using operational data to support decision making and regulatory oversight.
Thematic Area: Procurement and Contracts	

Policy Measure	Policy Measure Description
Prepare Public Procurement Rules and Procedures	Prepare procurement rules and procedures, standard contract documents for infrastructure construction and maintenance, supported by an e-procurement platform, and harmonize those at a regional or international level to foster economies of scale.
Procure Contractors on a Competitive Basis	Procure contractors on a competitive basis, using packaging of batches of projects to attract multiple capable contractors.
Integrate Gender in Public Procurement and PPPs	Integrate gender in bidding documents for standard public procurement and public-private partnerships (PPPs) by requesting bidders to demonstrate gender experience, by setting gender-specific targets for women's employment and entrepreneurship, for example, quotas for contracts to be awarded to women-owned and managed businesses.
Establish a Pool of Technical and Financial Experts	Establish a pool of independent experts capable to undertake technical and financial audits of projects.
Thematic Area: Capacity Building and Human Resource Development	
Identify and Empower Sustainable Mobility Champions	Identify and Empower Country Champions to Help Move Forward the Sustainable Mobility Agenda, for example, ministers and mayors.
Build Capacity Across Levels of Government	Build national and local capacity across levels of government, jurisdictions, organization, and modes, including providing training and information resources.
Provide Training for Workforce in Leadership Positions	Provide training for the current and future transport workforce in leadership positions, enabling well-trained staff to drive change toward sustainable mobility.
Facilitate Capacity Building at the International Level	Facilitate sector specific capacity building at the international level.
Build Capacity for Local Path and Road Maintenance	Provide capacity building to assist stakeholders to perform their roles in the maintenance of local paths and roads.
Train more Women on Skills Needed in Transport	Create incentives for training more women with the skills needed in transport, for example, operating heavy duty vehicles.
Build Capacity on Gender-Inclusive Accessibility Planning	Build capacity on accessibility planning that includes gender impacts, for example, consider access to centers of interest for women and gendered information on access to jobs and education.
Train Security and Transport Staff in Gender Aspects	Train security and transport stakeholders in gendered aspects of transport, especially security.
Create Mentoring Programs and Professional Networks	Create programs to promote role models, mentoring and networks of transport professionals, including programs targeted to women.
Toolbox: Engineering and Technology	
Thematic Area: Technical Standards	
Establish Technical Standards for Transport Infrastructure	Establish high technical standards for transport infrastructure design, for example, performing climate vulnerability screening, protecting roads against water penetration, and using local materials and resources when feasible.

Policy Measure	Policy Measure Description
Harmonize Construction Standards along Corridors	Adopt construction standards so that assets are created using accepted, up-to-date, harmonized standards and regulations, across borders, within regions and along transport corridors.
Harmonize Construction Standards along Corridors	Adopt construction standards so that assets are created using accepted, up-to-date, harmonized standards and regulations, across borders, within regions and along transport corridors.
Recruit Qualified Firms for Project Design and Feasibility	Recruit qualified consulting firms for preparing feasibility reports and engineering designs, and supervising civil works.
Ensure Safe Roads Design with Lower Design Speeds	Plan and design safe roads and roadsides for lower speeds, including features that calm traffic, and considering the increasing use of bicycles and pedestrian flows in urban areas.
Improve Intermodal Connections in Transport Hubs	Improve local access to transport hubs including bus and train stations, ports and airports.
Ensure Transport Project Design Includes Gender Aspects	Include considerations for women and for people with disabilities in transport infrastructure project design and planning.
Set and Implement Climate Change Adaptation Standards	Set climate change adaptation and resilience standards and practices, and integrate them into project design across transport infrastructure, including roads, airports, and seaports.
Set Low-Noise Engineering and Traffic Management Practices	Set traffic management practices to reduce noise pollution, for example, speed limitations, speed humps, traffic lights coordination and roundabouts, and low-noise road engineering and maintenance practices, for example low-noise pavement and noise barriers.
Thematic Area: Asset Construction	
Build Rail and Maritime Transport Infrastructure	Build infrastructure for energy- and space-efficient modes such as rail and waterborne transport, including high-speed rail for corridors with sufficient demand.
Expand Public Transport Infrastructure	Expand the public transport network adjusted to demand requirements, with an emphasis on equitable access and considering the most appropriate modes in each context, including bus, rail, demand-responsive service, cable-propelled transport and ferry transport.
Build Roadside Produce Storage for Farmers	Create simple roadside produce storage facilities to allow farmers to consolidate produce before collection and to reduce losses due to perishability.
Expand the All-Season Road Network	Expand the density of the all-season road network in rural areas.
Improve First and Last Mile Access Infrastructure	Evaluate and improve first and last mile access to major transport services in urban and rural areas.
Thematic Area: Design and Deployment of Transport Services	

Policy Measure	Policy Measure Description
Improve the Quality and Safety of Public Transport	Improve the quality and safety standards of public and private as well as formal and informal public transport operations, such as service frequency, reliability, cleanliness, and safe driving practices, and implement bus lanes and other bus priority measures.
Ensure Access to Transport Services in Underserved Areas	Ensure complete transport services by extending services to underserved areas and populations.
Develop Online Platforms for Rural Transport Services	Introduce online platforms to create marketplaces linking rural transport service users with service providers for freight and passenger services.
Implement ITS Solutions for Providing Transport Information	Implement online platforms and other ITS solutions for providing information on traffic, routes, and transport mode options for both passengers and freight transport
Conduct Accessibility Evaluation and Mapping	Develop tools for measuring the accessibility of different locations and evaluation how various transport and land use changes will affect accessibility for various groups and activities, with a special attention to access for disadvantaged groups.
Integrate New Mobility Solutions to Existing Transport	Support the complementarity of new shared solutions such as car-sharing, electric vehicles rentals and autonomous vehicles with existing public transport networks, for instance by supporting new solutions to direct traffic to public transport stations or as a replacement after operating hours.
Thematic Area: Design and Deployment of Programs	
Map the Full Extension of the Road Network	Map the full extension of the road network and maintain the data updated, including road quality attributes.
Identify Risks and Vulnerabilities to Extreme Weather Events	Conduct risk appraisal and impact quantification of failures and disruptions due to extreme weather events, identifying the most vulnerable transport links.
Monitor Weather Events and Develop Warning Systems	Conduct real-time monitoring of extreme weather events, developing plans to take immediate actions to mitigate damage with early warnings.
Ensure Adequate Post-Crash Intervention	Ensure adequate post-crash intervention through efficient emergency notification, fast transport of qualified medical personnel, correct diagnosis at the scene, stabilization of the patient, prompt transport to point of treatment, quality emergency room and trauma care, and extensive rehabilitation services.
Support Data Sharing Programs and Platforms	Establish a framework and promote data sharing programs and platforms across different sectors to exchange data relevant for transport policy, such as data collaboratives models including the public and private sector.
Thematic Area: Asset Management	
Develop Asset Management Standards and Plans	Develop asset management standards and plans to preserve, maintain, and manage transport infrastructure and their systems over their life cycle.
Establish Approaches to Feeder Road Asset Management	Establish reliable approaches to asset management of feeder roads, with communities performing routine maintenance in rural paths and roads, where feasible, and contractors performing periodic maintenance, based on reliability, availability, maintainability, and safety (RAMS) approach
Set Up Audits for Construction Design and Safety	Set up independent audits of asset management industries and of construction design and safety to ensure the quality of assets.

Policy Measure	Policy Measure Description
Thematic Area: Safeguards	
Ensure Project-Induced Resettlement is Conducted Fairly	Ensure that project-induced displacements are economically justified and handled with fair and dignified treatment of those affected, ensuring that safeguards are in place.
Comply with Gender-Based Violence Prevention Practices	Require contractors to commit to an agreed code of conduct that should be applied to employees and sub-contractors, ensuring compliance with gender-based-violence prevention and response practices.
Toolbox: Economics and Finance	
Thematic Area: Project or Program Cycle	
Use a Robust Framework for Project Prioritization	Use a robust investment evaluation framework to prioritize the allocation of public infrastructure funding to infrastructure projects and associated services.
Establish Selection Criteria for Feeder Roads Projects	Establish a set of selection criteria for feeder road projects and disseminate these widely among rural communities with a view to attracting their participation in the process.
Establish Performance Monitoring and Evaluation Schemes	Establish performance and result monitoring and evaluation schemes to inform the regular adjustment for projects, policies and programs, for example, the evaluation of road safety interventions and their institutional delivery.
Conduct Impact Evaluation Studies	Conduct impact evaluation studies to improve the evidence base available to policymakers, considering the impact of transport infrastructure projects on economic growth and employment, and considering differentiated impacts on women.
Thematic Area: Allocation of Public Funds	
Require Projects to Meet Cost-Effectiveness Thresholds	Require transport projects to meet an economic viability threshold based on a cost-benefit analysis and estimate the economic internal rate of return (EIRR), reflecting least-cost planning principles
Thematic Area: Fiscal and Financial Measures	
Apply Innovative Solutions Financing for Asset Creation	Apply sustainable and innovative financing schemes for asset creation, including new financing mechanisms, new fund management techniques, and new institutional arrangements.
Set User Fees to Support Transport Infrastructure Funding	Adopt transport user fees to help fund transport infrastructure and allow for return on investment, for example, toll roads.
Mobilize Public and Private Capital for Transport Finance	Mobilize public and private capital for transport finance, using PPPs to improve sector efficiency when appropriate, and help bridge the transport infrastructure gap.
Thematic Area: Pricing for Efficiency and Inclusion	
Make Public Transport Fares Affordable for the Poor	Make public transport fares affordable for the poor using means testes approaches to ensure cost-recovering mechanisms.
Ensure Integrated Fare Payment across All Modes	Develop integrated fare payment systems across all modes of public transport, parking and road charges.
Thematic Area: Innovation Policy and Enhancement	
Support R&D to optimize the life cycle of vehicle batteries	Support the research to optimize the life cycle of batteries by improving their lifespan and developing optimal cost-efficient sustainable recycling solutions

Policy Measure	Policy Measure Description
Toolbox: Communication	
Thematic Area: Consultation and Public Engagement	
Consult with Stakeholders during the Full Project Cycle	Consult extensively with stakeholders during project formulation and establish a framework for continuous consultation during project implementation.
Use Participatory Planning Methods	Use participatory planning methods, including creation of a website, to help communities propose interventions.
Ensure Women's Participation in Consultation Processes	Ensure that voices of women are upheld during pre- and post-project consultation.
Promote Public Discussion on New Mobility Solutions	Promote public discussion with civil society about new mobility solutions to generate new ideas, innovations and tools.
Ensure Neutrality on Technology related communication	Ensure neutrality and transparency on technology related communication, taking into account the whole life-cycle of technologies when making technology decisions, using for instance LCA (Life Cycle Analysis) methodologies.
Thematic Area: Promotion Campaigns and Public Awareness	
Implement Awareness and Behavior Change Strategies	Implement awareness and behavior change (ABC) strategies to help shift attitudes towards sustainable modes, for example, public transport, walking and cycling, complementing other engineering, legal or economic measures.
Implement Anti-Harassment Campaigns in Public Transport	Implement anti-harassment awareness campaigns in public transport spaces.
Raise Road Safety Awareness	Ensure sustained communication of road safety as a core business for government and society, emphasize the shared responsibility for the delivery of road safety interventions, and raise awareness about the dangers of speeding.
Make Information Publicly Available on Projects and Policies	Make information accessible to increase the public support to transport policies and projects.
Thematic Area: Knowledge Management and Dissemination of Best Practices	
Share Knowledge on Successes and Best Practices	Share successes and best practices with other agencies at the local, national and international level, based on a well-designed knowledge transfer framework.
Inform Users about New Sustainable Solutions	Promote physical and online information centers aiming to reinforce the demand for sustainable mobility products, and facilitate the understanding of new technologies.