



Rural Transport Indicators to Support Sustainable Development Goals: Analysis of Survey and Interviews



Partnership on Sustainable, Low Carbon Transport (SLoCaT)

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Abstract

In February 2016, the SLoCaT Partnership launched a general survey on Proposed Indicators on Rural Transport to Support the Sustainable Development Goals (SDGs). To date, 65 respondents have participated in the survey, and the survey results show that there is a general consensus on strategies for developing specific indicator(s) on rural access to be used in support of the SDGs.

The World Bank-developed Rural Access Index (RAI) remains a strong and appropriate option for experts to use to measure improvements in rural access. Its key concepts are clear and it provides an objective, standardized manner to measure baseline and improvements in rural access at global, national, or local scale. It is considered to be especially suitable to measure rural accessibility in Least Developed Countries (LDCs). Most survey respondents suggest adopting a combined approach to the RAI that is both distance-and-time-based. They also voiced support for developing more nuanced indicators that measure access to essential services, and assess the quality of rural transport services as well as infrastructure.

In April 2016, SLoCaT conducted follow-up interviews with key experts on rural transport to conduct a more nuanced set of discussions than are possible within the confines of an on-line survey. These interviews, which incorporate the perspectives of bi-lateral and multi-lateral aid agencies as well as [rural transport implementing agencies], place the survey results in a broader context with respect to the implementation phase of the SDGs, which have implications for [clarifying] the data collection process for the RAI (solidifying its position within the 'tier system'), identifying opportunities to look beyond infrastructure and incorporate rural transport services into the RAI, and supporting the development of proposed (sub)national indicators to support the established global SDG indicators.

Key Words

Rural transport, Sustainable Development Goals, Rural Access, Indicators

RESEACH FOR COMMUNITY ACCESS PARTNERSHIP (ReCAP) *Safe and sustainable transport for rural communities*

ReCAP is a research programme, funded by UK Aid, with the aim of promoting safe and sustainable transport for rural communities in Africa and Asia. ReCAP comprises the Africa Community Access Partnership (AfCAP) and the Asia Community Access Partnership (AsCAP). These partnerships support knowledge sharing between participating countries in order to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources. The ReCAP programme is managed by Cardno Emerging Markets (UK) Ltd.

See www.research4cap.org

Acronyms, Units and Currencies

ADB	Asian Development Bank
AFCAP/ASCAP	Africa and Asia Community Access Partnership
DFID	UK Department for International Development
IAEG-SDGs	Inter-Agency Expert Group on Sustainable Development Goals
ILO	International Labour Organisation
IRAP	Integrated Rural Accessibility Planning
IRI	International Roughness Index
LDC	Least Developed Countries
MDB	Multilateral Development Bank
RAI	Rural Access Index
ReCAP	Research for Community Access Partnership
RTSi	Rural Transport Service Indicator
SDGs	Sustainable Development Goals
SLoCaT	Partnership on Sustainable, Low Carbon Transport
TRF	Tanzanian Roads Fund
TRL	Transport Research Laboratory
UN	United Nations
WB	World Bank

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1 Introduction

Presently, one billion people worldwide lack easy access to an all-season road and thus live in isolation, which is a major contributor to the poverty and marginalization of rural populations. While 58% of the overall population of developing countries live in rural areas, 78% of the extreme poor are located in rural areas. In *Rural Poverty Unperceived*, Robert Chambers firmly linked rural indigence to isolation. "If a rural area cannot be easily reached, if people living in the rural area cannot easily travel, if the flow of goods and services in and out of that area is physically difficult, unreliable or expensive...these are the characteristics of isolation."¹

The Partnership on Sustainable, Low Carbon Transport (SLoCaT) has [actively contributed](#) to the discussion on the United Nations Sustainable Development Goals (SDGs) and associated indicators. To encourage dialogue surrounding the contribution of rural transport to the SDGs, the SLoCaT Partnership is conducting research on possible indicators for rural transport infrastructure and services in support of the SDGs, with regional and sub-regional indicators currently under discussion².

The SLoCaT Partnership is conducting this research through a combination of survey and expert interview within the framework of its collaboration with the UK Aid-funded Research for Community Access Partnership (ReCAP). ReCAP promotes safe and sustainable transport for rural communities in Africa and Asia by supporting rural road infrastructure and transport services research.

The general purpose of this research is to:

- Gather views and opinions on existing indicators for rural transport and how these could be integrated in the monitoring framework for transport related SDGs;
- Present potential indicators and inquire about the acceptability and feasibility of quantification in practice;
- Collect additional indicators suggested by survey respondents and interviewees;
- Identify possible stakeholders for the further development of indicators.

The following sections provides an analysis of the opinion of survey respondents and interviewees on different types of rural transport-related indicators, including the Rural Access Index (RAI), distance-related indicators, and rural transport services indicators, on their effectiveness, relevance, and usefulness in measuring the impact of improved rural access toward the achievement of the SDGs. The analysis also specifically compares the opinion of respondents who are identified as rural transport experts with respondents who are identified as general transport experts. To illustrate, in response to a set of preliminary questions on rural transport indicators, while 100% of survey respondents agree (or "fully agree") that there is generally a lack of transport related data in rural areas in developing countries, which prevents objective measurement of rural access, rural transport experts show a stronger inclination toward this view than general transport experts (Figure 1):

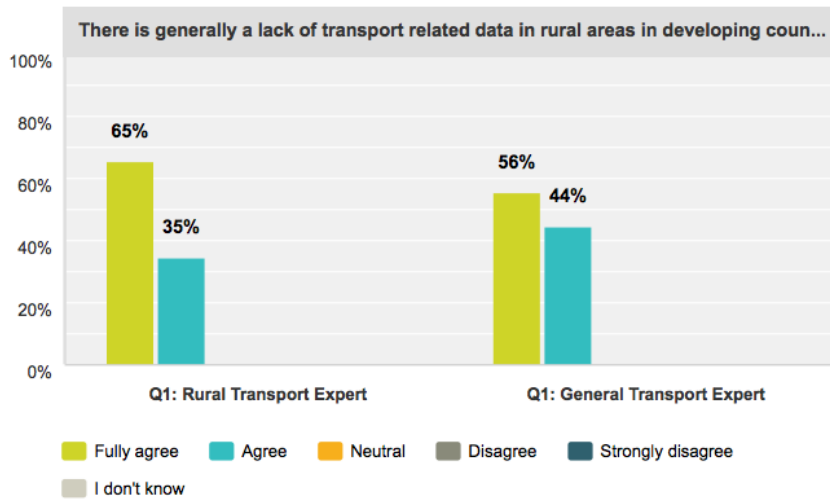
¹ Rural Poverty Unperceived. Robert Chambers. Institute of Development Studies website. <http://bit.ly/259luxf>.

² UN Statistical Commission. 47th Session meeting notes, March 8-11, 2016. <http://bit.ly/1sltEIA>.

Figure 1: Transport-related data availability in rural areas in developing countries

Do you agree with the following statement?

Answered: 42 Skipped: 2



Therefore, the following sections explore potential ways to address the need for rural access indicators within the context of the general lack of available data. This is achieved through an assessment of the current formulation of the RAI, comparing possible alternatives to the RAI, and considering the inclusion of indicators to measure rural transport services in addition to infrastructure. The report concludes with a set of general conclusions and recommendations.

2 The Rural Access Index (RAI)

Background

[The Rural Access Index \(RAI\)](#) is a key headline indicator, which was established by the World Bank (WB) in 2005 to focus on the role of access and mobility in the reduction of poverty in developing countries. Measurement of the RAI has traditionally been based on household survey data in order to estimate the share of population who live within 2 kilometers of (or about 25 minutes walking distance from) the nearest all-season road.³ In the absence of such data, road network models are also applied to calculate the approximate proportion of habitable rural areas that are within 2 kilometers of an all-season road. The current RAI estimates for 178 countries indicate that over one billion people (or 31% of the world's rural population) do not have adequate access to transport, with 98% of these living in developing countries.⁴

The definition of the RAI has changed over time, shifting from the original definition of 'all-weather' roads to the current 'all-season' roads (based on a minimum number of days the road is passable within a month).⁵ Questions remain about the appropriate definition of year-round passability (e.g. the Tanzanian Roads Fund posits that travel during the wet season at an average speed of 50 kph is a better measure of passability than the International Roughness Index (IRI)).⁶ Other definitional questions remain considering the development and application of the RAI. First, it is essential to establish a common reference point to determine levels of motorability, as the prevailing mode of access must be comparable between countries to be meaningful (e.g. if in Tanzania the prevailing transport mode is 4WD, and in Kenya it is *boda boda* (motorcycle taxi), then the RAI will not yield robust global results).

The RAI is included among established global SDG indicators (due in part to DFID and others pushing hard for its inclusion) in the form of Indicator 9.1.1, "Share of the rural population who live within 2km of an all season road".⁷ This is in support of the broader SDG Target 9.1, "Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all."⁸ The RAI is well supported in its own right, since by 2030, around 25% of the global population will be non-urban; however, while it is useful for measuring rural access, the RAI is inadequate for transborder and many inter-urban situations. Although the RAI is included amongst SDG indicators, the wording of the indicator does not specifically refer to 'rural access despite its importance to achieving other SDGs, rural access is not explicitly mentioned in the overall indicator list.

The RAI has been judged as a "quick and dirty" indicator which captures the main aspects of accessibility (as comparable to SDG Indicator 1.1.1, which measures the proportion of the global population below the international poverty line of \$1.25 per day).⁹ Nevertheless, the RAI is broadly accepted worldwide; despite its shortcomings (which are described further in subsequent sections), and given the limited financial means available to monitor rural access on a global scale, it is the

³ Roberts, KC, and Rastogi. World Bank: Transport Results website. <http://bit.ly/200ym32>

⁴ World Bank. Transport Results Measurement website. <http://bit.ly/1xXdWvh>

⁵ Jones, Liz, et al, UK Department for International Development. Phone interview. 28 April 2016.

⁶ Haule, Joseph, Tanzania Roads Fund. Skype interview. 20 April 2016.

⁷ Jones, Liz, et al, UK Department for International Development. Phone interview. 28 April 2016.

⁸ Report on SDG Goal Indicators. UN Statistical Commission. 47th Session, 8-11 March 2016. <http://bit.ly/1N9Ynvg> p. 25.

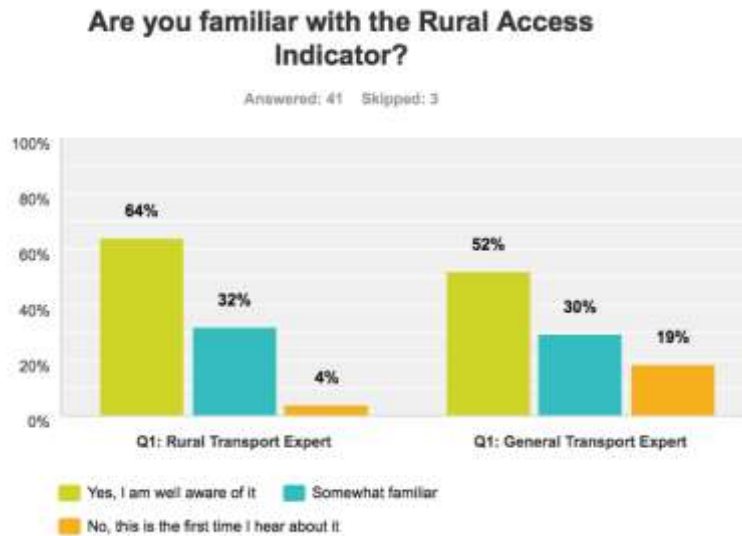
⁹ Salter, David, Asian Development Bank. Skype interview. 27 April 2016.

most efficient indicator to be implemented in practice.¹⁰ However, despite its common currency, the RAI is still more often discussed than applied, and thus the index has lost some credibility because it is not being measured on a regular basis within a wide range of countries.¹¹

Survey Results

The vast majority of respondents are somewhat or well aware of the RAI, including over 80% of general transport experts and nearly all rural transport experts (Figure 2). Thus, there appears to be a reasonably firm foundation of knowledge on which to base judgment on the RAI relative to other rural transport indicators.

Figure 2: Familiarity with RAI

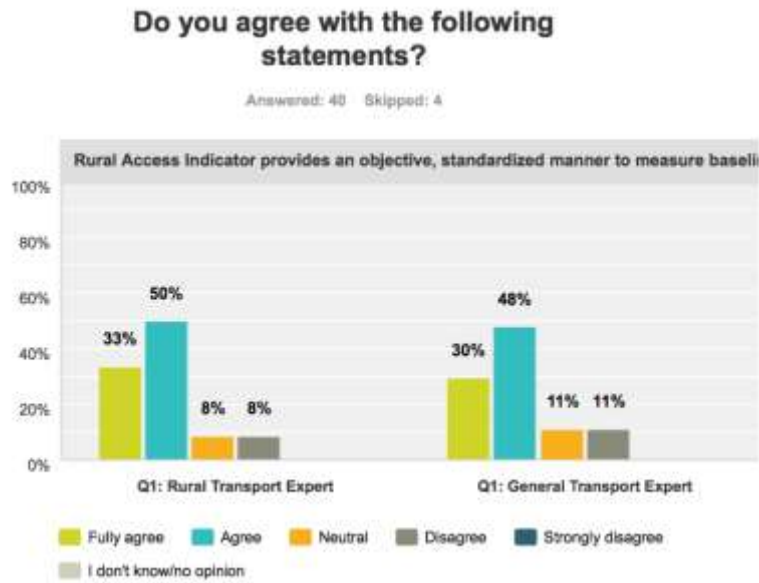


In addition, 81% of all respondents agree or fully agree that RAI provides an objective, standardized manner with which to measure both the initial baseline and subsequent improvements to rural access on a global, national, or local scale, with only a small share of general transport experts disagreeing with this statement (Figure 3).

¹⁰ Salter, David, Asian Development Bank. Skype interview. 27 April 2016.

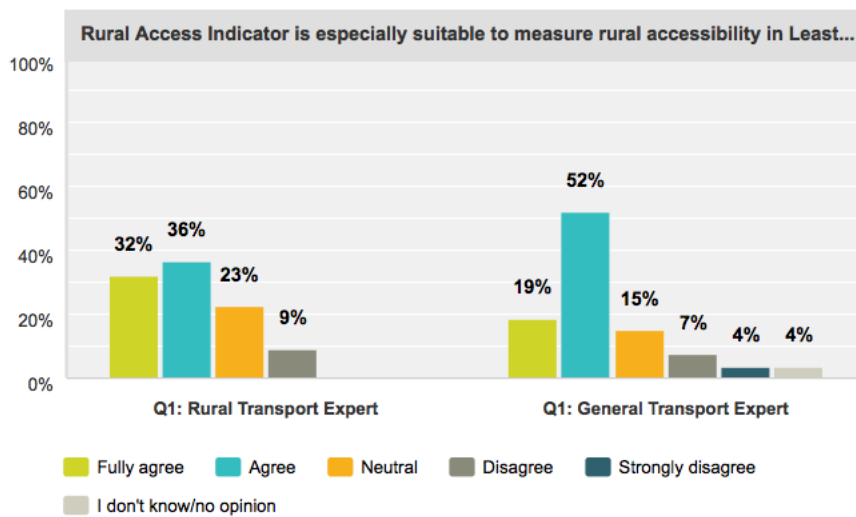
¹¹ Jones, Liz, et al, UK Department for International Development. Phone interview. 28 April 2016.

Figure 3: Do you agree that Rural Access Indicator provides an objective, standardized manner to measure baseline and improvements in Rural Access at global, national or local scales?



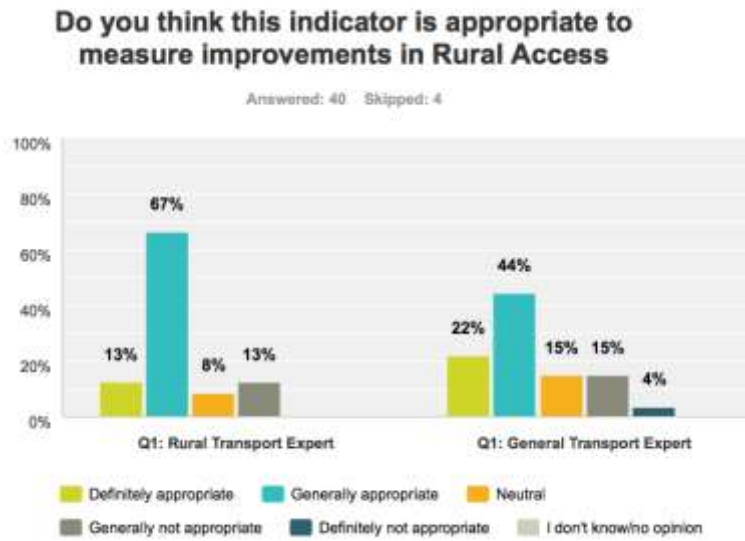
Furthermore, the majority of rural transport experts and general transport experts agree that the RAI is especially suitable to measure rural accessibility in Least Developed Countries (LDCs), where data availability tends to be more limited. Again disagreement is limited to a small minority, although in this case there is some level of strong disagreement among general transport experts (Figure 4).

Figure 4: Do you agree that Rural Access Indicator is especially suitable to measure rural accessibility in Least Developed Countries?



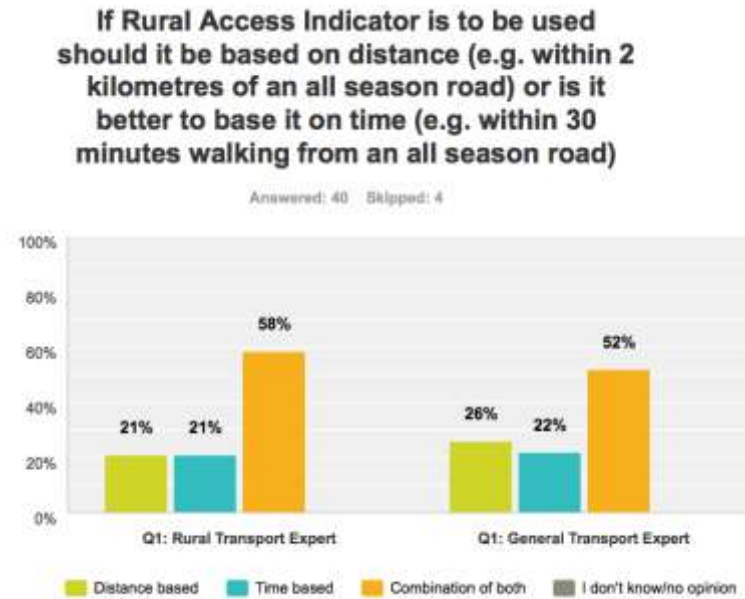
However, while two-thirds to four-fifths of general and rural transport experts respectively think that the RAI in its current form is appropriate to measure improvements to rural access, a significant number of respondents from both groups (19% and 13%, respectively) agree it is generally or definitely not appropriate for this purpose (Figure 5), thus indicating that further assessment and development of the RAI is desirable.

Figure 5: RAI appropriateness in measuring improvement in rural access



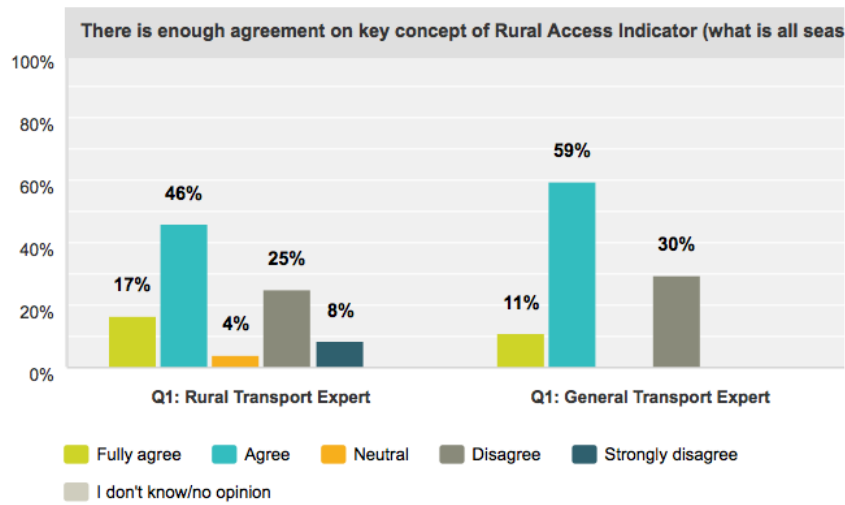
While the RAI in its current form is based on distance, a significant majority of respondents hold that it would be preferable for the RAI to be combination of both a distance-based indicator (e.g. 2 kilometres from an all season road) and a time-based indicator (e.g. within 30 minutes walking distance from an all season road), in order to achieve greater utility in measuring rural access. (Figure 6).

Figure 6: Approaches of RAI



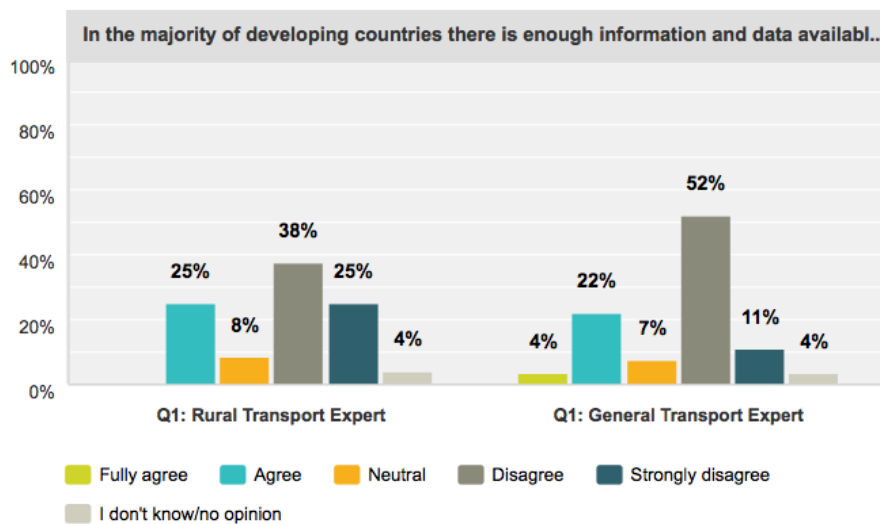
Regarding definitional issues, nearly 70% of all respondents agree that there is sufficient consensus on the definition of an ‘all-season road’ to justify the use of the RAI, although among rural transport experts, 25% disagree (and 8% strongly disagree) that this is the case, an opinion which is shared by a similar number of general transport experts (Figure 7). This indicates the need for further clarification on the definition and application of the RAI, as is currently in process through a joint collaboration between DFID and the WB.

Figure 7: Do you agree that there is enough agreement on key concept of Rural Access Indicator (what is all season road) to justify the use of Rural Access Indicator?



Furthermore, 63% of all respondents disagree or strongly disagree with the idea that in the majority of developing countries, there is enough information and data available to apply the RAI on a large scale (Figure 8). This response is consistent with the preliminary observation that there is generally a lack of transport related data regarding rural areas in developing countries, which poses challenges to an objective assessment of rural access on a global scale.

Figure 8: Do you agree that in the majority of developing countries there is enough information and data available to use the Rural Access Indicator on a large scale?



Finally, in general comments concerning the advantages and disadvantages of the RAI, some transport experts stated that RAI is “simple to understand” and is useful to “measure the extent of available transport infrastructure.” While some general transport experts commented that the RAI is “relatively easy to use [to] compare results from various sources,” some rural transport experts contended that RAI is “not easily assessed on comparative basis,” an assertion which is further explored in the following sections.

Analysis

In sum, as reflected in the responses above, the RAI is not only the most widely known rural access indicator, it is also well accepted by a large share of the transport community as appropriate to measure rural accessibility in developing countries. This is reinforced by three facts:

- i. The indicator is relatively easy to assess compared to other alternatives (see discussion in following sections) and its data requirements are fairly moderate;
- ii. The inter-country comparison can be achieved by setting simple standards (e.g. for all weather roads, or number of resident population);
- iii. Considerable research has been done or is ongoing in order to improve the RAI assessment methodology.

Data availability is frequently cited as an obstacle to using RAI. An improved collection of accurate and meaningful data is therefore crucial to measure rural communities' social needs and participation in economic opportunities, in order to thereby increase the utility of the RAI. To address these concerns, DFID has urged the WB to do additional research on the RAI, to be directly linked to SDG monitoring.¹² As a result, the WB is engaged in DFID-funded research on potential improvements to the RAI, through research in approximately 10 countries in Africa and Asia, with a preliminary report under review at the time of writing.¹³ A WB proposal to expand this research to 30 countries representing each UN region is currently under development, and forthcoming work by the Transport Research Laboratory (TRL) is also to be linked to SDG monitoring.¹⁴

The first round of WB research revealed some challenges to consistent comparison of the RAI over time. For instance, in the reclassification of roads considered 'all-season', the RAI in Tanzania shifted from 36% in 2005 to 24% in 2014. In addition, the research pointed to the need to confirm accuracy of data; for instance, in Zambia only 17% of the population is assessed to have reliable all-season access, a figure which appears low in comparison to peer countries.¹⁵ This ongoing research points to at least two key points: the need to agree on consistent methodology over place and time, and the optimal use of remote sensing techniques (e.g. aerial and satellite images to identify and assess road infrastructures and population distributions).

When the RAI was first measured there were no country-specific condition surveys, only living standards surveys, and now there is in-country condition data for local roads, with population maps and other GIS-based information generally available for most countries.¹⁶ This push toward using emerging technologies aims to make RAI methodology more robust, while at the same time maintaining (and ideally increasing) its affordability in regards to measurement and monitoring.¹⁷ Although this research is still in its infancy, ReCAP is presently initiating a project entitled *The use of appropriate high-tech solutions for road network and conditions analysis, with a focus on satellite imagery*.¹⁸

However, remote sensing information is not always sufficient in itself, and can be strengthened by cross-checking with existing data from the rural branches of the relevant country's road agency. This may be a win-win situation, as rural access indicators are improved at the same time as enhancing the road information of administrative bodies. For example, in Tanzania, the registered rural road

¹² Jones, Liz, et al, UK Department for International Development. Phone interview. 28 April 2016.

¹³ Ellis, Simon, World Bank. Skype interview. 13 April 2016.

¹⁴ Jones, Liz, et al, UK Department for International Development. Phone interview. 28 April 2016.

¹⁵ Ellis, Simon, World Bank. Skype interview. 13 April 2016.

¹⁶ Ellis, Simon, World Bank. Skype interview. 13 April 2016.

¹⁷ Jones, Liz, et al, UK Department for International Development. Phone interview. 28 April 2016.

¹⁸ ReCAP Tenders List. <http://tinyurl.com/zpqow6w>. Accessed 17 May 2016.

network amounts to 42,000 kilometres, while roughly an additional 50,000 kilometres of rural roads are unregistered, and thus receive no maintenance through government agencies. Providing more information to road agencies regarding their own network would reveal the need for increased public spending on rural road maintenance, and thus would improve rural accessibility. Current digital resources thus have the potential to improve upon more traditional measures of road roughness and delays; although these methods are not perfect, they have the advantage of being much less expensive, which is a valuable consideration when attempting to apply the RAI more broadly to monitor progress toward the SDGs.

To the question of whether the RAI is a sufficient indicator of rural access, DFID indices that we currently do not have sufficient evidence. Ongoing WB work suggests that the 'one billion' figure is likely inaccurate, and that it is necessary to apply the RAI in a more robust manner, so that it can simultaneously function as a supportive indicator to help generate preliminary estimates of poverty levels (i.e. based on access to economic opportunities).¹⁹ Other proposed alternatives to the RAI (e.g. access to markets and services, rural transport costs, and rural transport services) offer distinct advantages but may be more costly to evaluate; additionally, the quality of data provided by local government is often low.²⁰ Such indicators are explored further in the following sections.

¹⁹ Jones, Liz, et al, UK Department for International Development. Phone interview. 28 April 2016.

²⁰ Salter, David, Asian Development Bank. Skype interview. 27 April 2016.

3 Alternative Indicators to the Rural Access Index

Background

The following alternative distance-related indicators could also be used to measure rural access, but have not yet been widely implemented on a global scale:

1. *Distance from village to next all-season road (km)*
An alternative approach is to measure rural access by the distance from each village (rather than the share of total population) to the next all-season road.²¹
2. *Distance from village to markets and services (km)*
This proposed indicator measures the distance from the village to the next 'central location', which usually hosts essential services, such as schools, health care facilities and public administration facilities.²²

Speed-related indicators (e.g. from village to all-season road/markets and services) are another alternative to the RAI, but such indicators are only relevant when based on common modes (as noted in the discussion of motorability in the previous section).²³ Thus, for simplicity, speed-related indicators were not considered as an alternate to RAI in the survey, which focuses instead on distance-related indicators.

Since the proposed indicators measure the distance from a village to all-season road/markets and services, it should be noted that a key challenge is to define from which point the measurements should start. For instance, in the case of compact settlement structures with a clearly visible village center, this is not a major problem. However, often villages that stretch along roads, with farmsteads are distributed equally over a vast area which allows houses to be close to the fields. In the latter case, an arithmetic centroid would have to be calculated, which would require intensive data collection to ascertain GIS coordinates for each household.

Survey Results

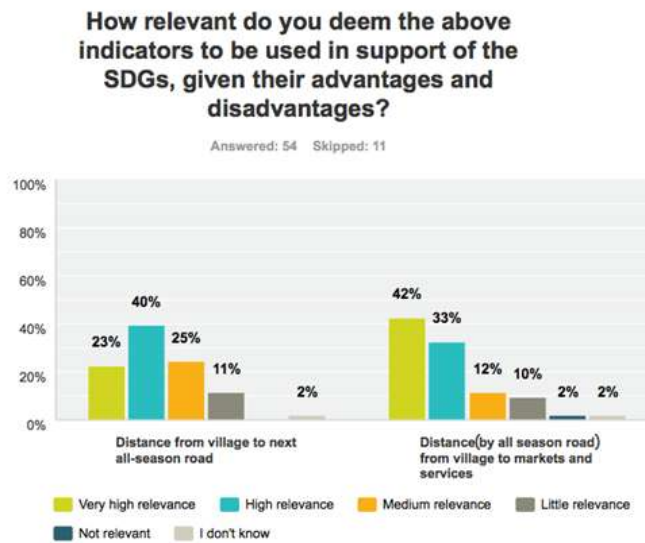
The overall majority of respondents showed a preference towards an indicator which measures 'distance from village to markets and services (km)' in comparison to an indicator to measure 'distance from village to next all-season road (km)', with the former skewed heavily towards 'very high relevance' or 'high relevance' in support of the SDGs (Figure 9). Rural transport experts and general transport experts shared similar views on this question.

²¹ India has applied this indicator in its Prime Minister's Rural Roads Program (<http://tinyurl.com/jpww6lc>).

²² Germany has used this indicator in its Federal Road Planning Scheme (Bundesverkehrswegeplan), (<http://tinyurl.com/jrm6e29>). p.2.

²³ Haule, Joseph, Tanzania Roads Fund. Skype interview. 20 April 2016.

Figure 9: Relevance of distance-related indicators to be used in support of SDGs

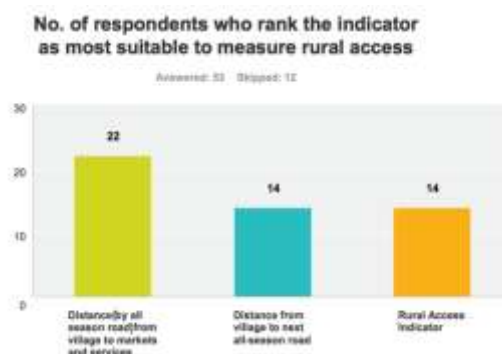


Regarding the distance-related indicators, some rural transport experts stated that the indicator to measure distance from village to next all-season road (km) is ‘attractive,’ ‘practical’ and ‘meaningful’, while some think that it is ‘too general’ and does not contain enough village-specific information. On the other hand, the indicator to measure distance from village to markets and services (km) is thought to better describe the purpose of travel, better reflect actual utility to the rural population, and gives ‘a better indication of possible impact on improvements to quality of life.’ One rural transport expert also indicates that these two indicators should be used as an Integrated Rural Accessibility Planning (IRAP) tool of the International Labour Organization (ILO).

Responding general transport experts generally favour the second indicator on distance from village to market and services, though one warns that this indicator is grounded on common assumptions about village settlement patterns that do not always hold true. It also assumes that there is a central location where basic services are located, which also may not hold true in some cases. Respondents noted that these indicators do not take into account safety, reliability, and accessibility issues in hilly terrain, and do not address gender inequality issues.

A direct comparison of the proposed distance-based alternative versus the RAI in the survey reveals close competition in terms of judgment of their suitability to measure rural access. The ‘distance from village to markets and services’ indicator is ranked as the preferred option by 22 respondents, followed by the RAI and the ‘distance from village to all-season road’ indicator, which were preferred by 14 respondents respectively (Figure 10).

Figure 10: Ranking of the three indicators: RAI, distance (by all season road) from village to market and services, and distance from village to next all season road (all respondents)



Among rural transport experts, ‘distance from village to markets and services’ is ranked as the most preferable option by 10 respondents, followed in turn by the distance indicator regarding an all-season road (7 respondents) and the RAI (6 respondents) (Figure 11).

Figure 11: Ranking of distance indicators and RAI

No. of rural transport experts who rank the indicator as most suitable to measure rural access



Analysis

In this chapter, distance-related indicators from a village (rather than share of population) to the next all weather road or central location with markets and services are discussed as alternatives to the RAI. The main outcomes reinforce the fact that it is necessary to further assess data needs and availability of these indicators as compared to the RAI in order to establish the overall utility and practicality of applying these indicators.

Once again, definitional issues are of utmost importance, as it necessary to apply a common definition of an ‘all-season road.’ The Tanzania Roads Fund suggests that speed can be used as a proxy for road condition as it can be quickly assessed through open data sources, such as road users with the usage of apps, and that a maximum year-round road closure of 48 hours is an important measure of accessibility. In addition, it is necessary to further elaborate the issue of settlement patterns (e.g. what are the parameters that designate a ‘village’); similarly, it is essential to establish a common set of services that are regarded as essential to define a ‘central location.’²⁴

²⁴ Haule, Joseph, Tanzania Roads Fund. Skype interview. 20 April 2016.

On the question of whether it is useful and practical to refine the RAI to measure distance from village centers to markets and services at a global scale, DFID notes that while it is crucial to measure productivity and the ability to access markets, it is also essential to first ensure the methodology is correct first. In this context it is acknowledged that it is more complicated and costly to overlay production and access to markets (i.e. to avoid ‘building a road for the sake of a road’), but that there are exciting possibilities in the ongoing collaborative research with the WB to reflect health perspectives into access questions.²⁵ This therefore opens the possibility of using rural transport indicators to measure progress toward a broader set of SDG targets.

Similarly, the Tanzanian Roads Fund notes a preference for measuring the distance from a village center to markets and services, which is better than simply measuring distance to a road through the RAI, as this does not account for the full benefits of rural access. It was also noted that measuring distance from village centers to services is more practical than measuring the share of population with access to said services, as in Tanzania, villages are ‘registered’ as an official unit of administrative measurement, which is not the case for village inhabitants.²⁶

The Asian Development Bank (ADB) has not been directly involved with rural access indicators, but is presently conducting projects with a focus on agricultural production and rural access.²⁷ Through these projects, the ADB is improving rural accessibility from places of production rather than from village centers (e.g. transport from farmstead to irrigation schemes and from there to storage facilities and to the road network). While this added dimension is more difficult to measure, the ADB asserts that production has a more direct impact on income generation, and thus on poverty reduction. Though the potential impact of these multi-sectoral programs on poverty alleviation is great, an appropriate indicator is difficult to formulate (i.e. an indicator assessing access to local markets is not sufficient, since this relates only to local consumption while demands in large towns are gaining greater importance).²⁸ A rural economic transport model based on RAI developed in Cambodia demands further assessment.²⁹

²⁵ Jones, Liz, et al, UK Department for International Development. Phone interview. 28 April 2016.

²⁶ Haule, Joseph, Tanzania Roads Fund. Skype interview. 20 April 2016.

²⁷ Vietnam is presently preparing multi-sectoral programs with a combination of agriculture and transport as described.

²⁸ Salter, David, Asian Development Bank. Skype interview. 27 April 2016.

²⁹ Rural Transporters. John Tracy White. International Labour Organization website. <http://bit.ly/1WCdIld>

4 Rural Transport Service Indicators

Background

A complementary approach with which to measure rural access is a focus on *rural transport services*, rather than just on the availability and condition of rural road infrastructure. Potential arguments in favour of measuring transport services rather than transport infrastructure is that due to low rates of car ownership in rural areas in developing countries, the provision of roads is in itself not sufficient for key developmental benefits (e.g. access to trade, health care, education) to materialize.

According to Starkey, et al (2013), “Rural transport services indicators (RTSis) should be relevant, valid, reliable, sensitive, measurable, ethical, appropriate, transparent, interpretable, actionable and be based on cost-effective data. They should allow comparisons over time and space, and should respond to appropriate changes to road conditions, operating systems, regulatory environments and to strategic incentives.”³⁰ While these requirements are ambitious, they also establish necessary conditions for constructing RTSis that are robust and comparable within a global context (e.g. to measure progress toward SDG Indicator 9.1.2 (‘Passenger and freight volumes, by mode of transport’).

Starkey’s ground-breaking research proposes the following six headline indicators, which it is suggested should be measured for each vehicle ‘class,’ and are expected to be obtainable for most rural roads globally:

- *Fare price per passenger kilometre*
- *Transport frequency on normal days*
- *The costs per tonne-kilometre of accompanied small freight (50 kg loads)*
- *The costs per tonne-kilometre of consigned medium freight (200 kg loads)*
- *RTSi reliability and predictability index for return trips to the market/services hub*
- *RTSi transport services disruption index.*

The SLoCaT survey adapts the above measures somewhat in eliciting responses on the importance of four key indicators of rural transport services: cost³¹, speed, frequency and safety (e.g. though not all are deemed ‘headline’ indicators, they are judged to be of relevance from a passenger perspective).

Survey Results

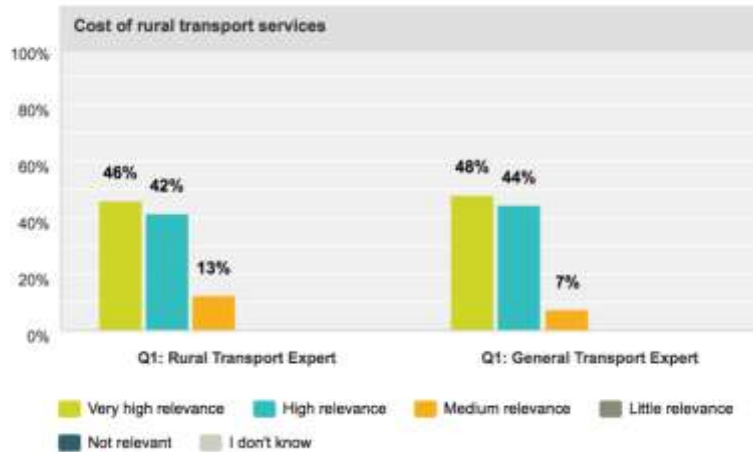
The survey asked respondents to rate the relevance of four rural transport service indicators in terms of measuring the impact of improved rural access to support the realization of the SDGs, including direct support of Target 9.1 and indirect support of related targets.

Roughly 90% of rural and general transport experts feel that the ***cost of rural transport services*** is a (very) highly relevant indicator, with no respondents asserting that cost has little or no relevance (Figure 12):

³⁰ Starkey, Paul; Peter Njenga, Guy Kemtsop, Shedrack Willilo, Romanus Opiyo and John Hine. Rural Transport Service Indicators: Final Report. IFRTD. September 2013

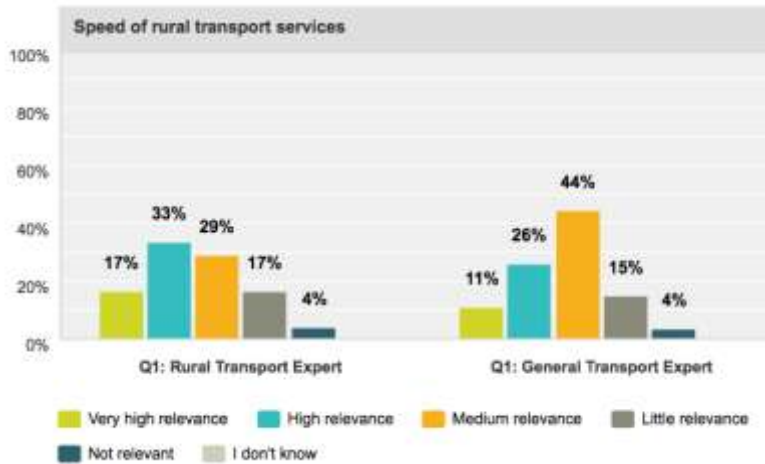
³¹ It is important here to distinguish between costs for the service provider (vehicle operating costs per km) and fares charged to the passengers (\$/km). The first is a good indicator for the road quality, and while the latter incorporates the first, large profit margins may also be incorporated due to monopoly situations (which are not uncommon in rural areas where road conditions are bad and/or travel demand is low).

Figure 12: Relevance of indicator on cost of rural transport services



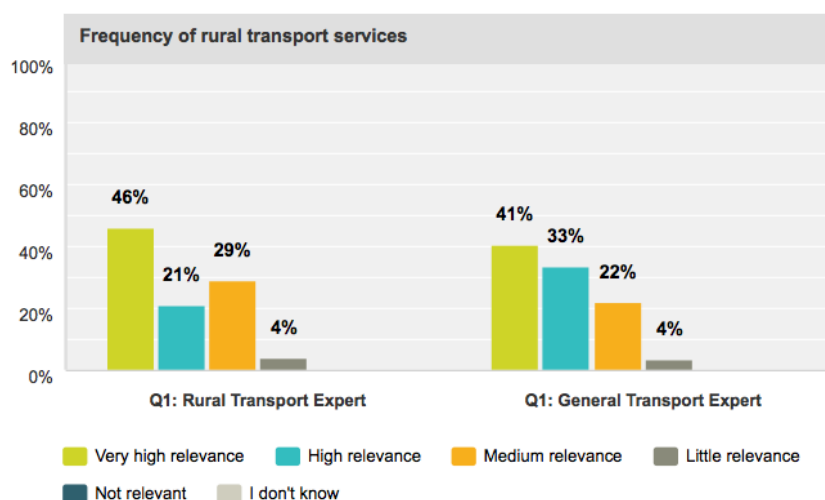
Relative to cost, *speed of rural transport services* receives a much more mixed response with respect to relevance to supporting sustainable development, showing a more balanced distribution from both rural and general transport experts, and with responses at either end of the spectrum (though certainly skewed toward greater relevance). (Figure 13). This suggests that speed is of significantly lower relevance than costs or frequencies, which makes sense, since for users it is much more important how often a bus is available (e.g. twice per day vs. once per week) than the speed of travel. However, speed remains an important indicator for road quality.

Figure 13: Relevance of indicator on speed of rural transport services



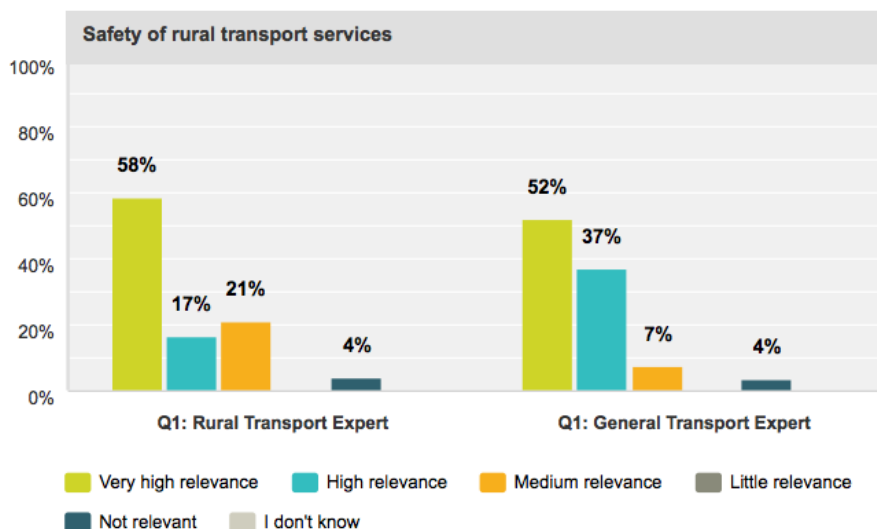
In investigating the *frequency of rural transport services*, the results are once again skewed towards higher relevance (i.e. results show greater similarity to those regarding cost than speed), though a minority of respondents also hold that frequency has little relevance, thus suggesting that rural residents have a higher tolerance for infrequent transport services, likely based on unwillingness or inability to pay for expensive transport (Figure 14).

Figure 14: Relevance of indicator on frequency of rural transport services



Turning finally to the **safety of rural transport services**, this is the indicator which the highest share of rural and general transport experts chose as highly relevant; on the other hand, a small minority at the opposite end of the spectrum holds that it has no relevance at all (Figure 15). These data are certainly more challenging to parse, and suggests that user preferences for safety are more varied (e.g. there may be a higher tolerance for unsafe motorcycle transport among some segments of the rural population but not others).

Figure 15: Relevance of indicator on safety of rural transport services



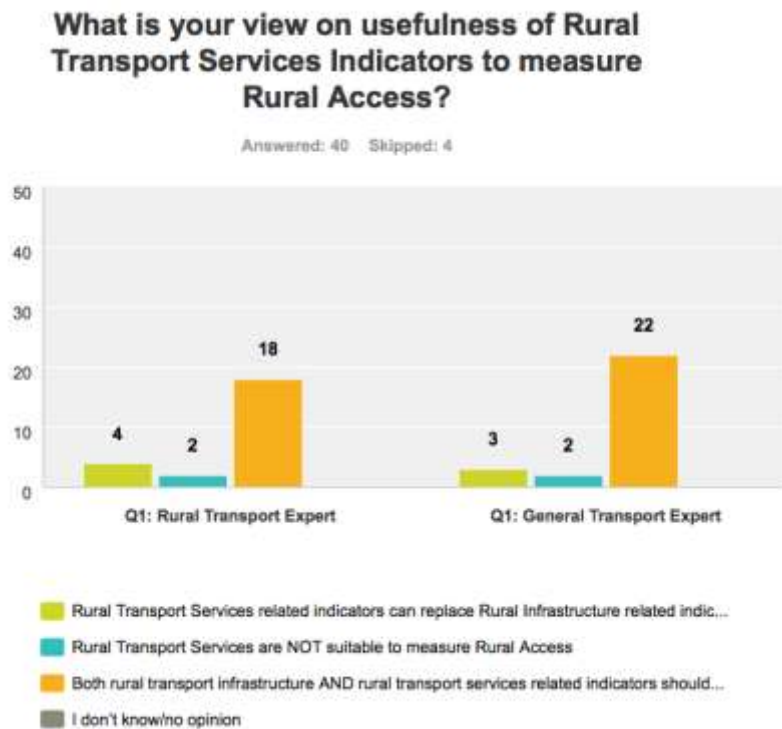
It should be noted that road safety is an important issue not only for rural transport, and urgent action is needed to achieve the ambitious goal for road safety reflected in the 2030 Agenda for Sustainable Development under Target 3.6 ('By 2020, halve the number of global deaths and injuries from road traffic accidents').³²

In terms of the usefulness of rural transport services indicators in measuring rural access, the majority of all respondents (80%) hold that both rural transport infrastructure and rural transport

³² UN Statistical Commission. Report on SDG Goal Indicators. 47th Session, 8-11 March 2016. Available at: <http://bit.ly/1N9Ynvg> p. 18.

services related indicators should be used to present an accurate measure of rural access. 13% feel that rural transport service indicators can replace infrastructure indicators, with only small minority (6%) indicating that rural transport services are not suitable to measure rural access at all. The distribution of these responses mirrored by the responses of both rural and general transport experts (Figure 16):

Figure 16: Usefulness of rural transport services indicators to measure rural access



Concerning general advantages and disadvantages of rural transport service indicators, rural transport experts think that these indicators help to better evaluate economic opportunities for the rural population, although some show concern that the definitions for cost and speed of services are not consistent between different types and conditions of vehicles (e.g. a lorry may be faster but have higher operating costs than an animal-drawn cart). Some also note that the frequency of rural transport services is likely to be more relevant in comparison to the speed and/or safety of these services, thus reinforcing the broader survey results above.

Analysis

In summary, the potential usefulness of RTSis as complements to indicators on access to rural roadway infrastructure is widely accepted. In addition, in assessing the relevance of RTSis to supporting SDGs, indicators of cost (fare) and frequency are prioritized above indicators of travel speed, with road safety indicators receiving a more mixed response.

Consistent with the final survey question described above, the Tanzania Roads Fund posits that it would be ideal to have a combined indicator measuring both transport infrastructure and transport services, though acknowledging that this would require more data, and thus would incur higher monitoring costs.³³ Frequency is cited as fundamental among RTSis, though it is noted that competition often hinders access to the rural transport services market. Decisive factors determining competition within the rural transport service market include density of demand for transport services, rural road conditions, and legislation (if enforced, which is often not the case).

³³ Haule, Joseph, Tanzania Roads Fund. Skype interview. 20 April 2016.

DFID asserts that the proposed 'headline' RTSis could be successfully applied at a global scale (following an appropriate ramp-up period) to help support monitoring of the SDGs, but that this is of secondary importance to monitoring the SDGs in their current form (and would require further investment).³⁴ Starkey, et al assert that "Work is needed to develop and test the methodology for rapidly producing the headline indicators. Follow-up research should be undertaken in collaboration with district-level transport authorities to develop valid, reliable, meaningful and actionable district-level indicators for rural transport services."³⁵ Similarly, the application of such RTSis, even on (sub-) regional scales, could support medium-term monitoring of global SDG Indicator 9.1.2 ('Passenger and freight volumes, by mode of transport'), and thus complement monitoring of the RAI as specified in global SDG Indicator 9.1.1.

³⁴ Jones, Liz, et al, UK Department for International Development. Phone interview. 28 April 2016.

³⁵ Starkey, Paul; Peter Njenga, Guy Kemtsop, Shedrack Willilo, Romanus Opiyo and John Hine. Rural Transport Service Indicators: Final Report. IFRTD. September 2013

General Conclusions and Recommendations

Conclusions

In sum, as previously noted, the Rural Access Index (RAI) is not only the most widely known rural access indicator, it is also well accepted by a large share of the transport community as appropriate to measure rural accessibility in developing countries. This is reinforced by three facts:

- i. The indicator is relatively easy to assess compared to other alternatives (see discussion in following sections) and its data requirements are fairly moderate;
- ii. The inter-country comparison can be achieved by setting simple standards (e.g. for all weather roads, or number of resident population);
- iii. Considerable research has been done or is ongoing in order to improve the RAI assessment methodology.

The survey results show that there is general consensus on the importance of ongoing development and application of specific indicator(s) on rural access to be used in support of the SDGs. The WB-developed RAI remains a reasonable current option for experts to use to measure improvements to rural access, as it provides a standard approach to measure the baseline and subsequent improvements to rural access on a global, national, and local scales. Furthermore, the RAI is considered to be suitable to measure rural accessibility in LDCs with limited monitoring capacity.

However, data availability remains a major issue for the RAI. All respondents 'agree' or 'fully agree' that there is generally a lack of transport related data in rural areas in developing countries, which prevents objective measurement of rural access. Experts also flag that there is not enough information and data available to reliably compare and update the RAI on a global scale.³⁶ Finally, with shifting definitions of the RAI over time (and among various research initiatives), outputs from the RAI require quality control to ensure apples-to-apples comparability across countries.

In addition, distance-related indicators from a village (rather than share of population) to the next all weather road or central location with markets and services are discussed as alternatives to the RAI. In this context, two types of indicators have been presented: 1) indicator to measure distance from village to next all-season road (km); and 2) indicator to measure distance from village to markets and services (km). The majority of all respondents believe these two indicators are highly relevant if used in support of the SDGs. Slightly more respondents favour the second indicator over the first indicator, noting that the second indicator on market and services describes the purpose of travel better, reflect the actual facility for the rural population, and gives "a better indication of possible impact on improvements to quality of life."

The main outcomes reinforce the fact that it is necessary to further assess data needs and availability of these indicators as compared to the RAI in order to establish the overall utility and practicality of applying these indicators (e.g. in addressing challenges of determining a village center point in cases where settlements are more sparse and cover a vast area, as discussed previously). It is also noted that incorporating alternatives to the RAI will require additional resources that are not currently allocated at a global level, and thus are likely to remain an aspirational approach to monitoring rural access at present.³⁷

Furthermore, the potential usefulness of RTSis as complements to indicators on access to rural roadway infrastructure is widely accepted. Four RTSis, including cost, speed, frequency, and safety of rural transport services, have been presented. In assessing the relevance of RTSis to supporting

³⁶ Ellis, Simon, World Bank. Skype interview. 13 April 2016.

³⁷ Jones, Liz, et al, UK Department for International Development. Phone interview. 28 April 2016.

SDGs, indicators of cost (fare) and frequency are prioritized above indicators of travel speed, with road safety indicators receiving a more mixed response. In addition, a majority of all respondents hold that both rural transport infrastructure and rural transport services related indicators should be used in measuring rural access.

In practical terms, RTSis are likely to be ramped up over time, but should be included in ongoing discussion of the IAEG-SDGs (Inter-agency Expert Group on SDGs) as an important (sub-)regional indicator, and particularly as a contributing methodology to monitor global SDG Indicator 9.1.2 ('Passenger and freight volumes, by mode of transport').

In summary, while the RAI may be 'quick and dirty,' it is also simple and cheap; by comparison, while other distance-related indicators (and complementary RTSis) may be preferable in theory, they may also prove more difficult or more expensive to apply in practice on a global scale.

Recommendations

The analysis in this report yields a number of initial recommendations for advancing rural transport indicators:

1. Further explore the potential of emerging data sources monitoring rural transport indicators (i.e. SDG Indicator 9.1.1)

As previously noted, technological advances (e.g. satellite images, mobile apps) provide potentially game-changing avenues for monitoring rural access, which are likely to originate with road agencies, but also offer the potential to expand to individual users and thereby increase the availability of 'big data' for rural transport (e.g. Google Maps and other open data sources³⁸ provide detailed data for some geographies which makes it possible to count culverts on rural roads from remote locations anywhere in the world.)³⁹

While it is noted that the poorest segments of the population do not have widespread access to mobile phones (with smart phones even more limited in parts of East Africa, and elsewhere⁴⁰), regional examples are emerging which show the promise of greater coverage (e.g. Vodacom in Côte d'Ivoire), and thus there is a precedence for more responsive rural transport services based on collective preferences (e.g. digital *matutu* in Nairobi). These more urban-oriented examples can lend themselves to monitoring rural access in the future, with increased mobile and smart phone penetration rates (e.g. road agencies could provide smart phones to taxi, bus and lorry drivers with the aim to relay/report information on road condition, travel speeds, traffic volume major obstacles). Alternative data-collection technologies are of particular interest in conflict-affected states, many of which likely have detailed satellite data although this is not readily accessible.⁴¹

The sustainable transport community should thus continue to seek opportunities for engagement in advancing SDG data collection and analysis through participation in regional statistical workshops, and through close collaboration with development banks and private sector partners, to help achieve the goal of the transformative agenda within the rural transport sector. Alongside acknowledging that the next-generation RAI is quite early in its developmental cycle, it is important to bear in mind the importance of developing a broad framework, which may incorporate data in different ways (e.g. to support distance-based indicators).⁴² Thus, the rural transport community

³⁸ Other key data sources to monitor rural roads include www.openstreetmap.org and opendata.arcgis.com/.

³⁹ Ellis, Simon, World Bank. Skype interview. 13 April 2016.

⁴⁰ Haule, Joseph, Tanzania Roads Fund. Skype interview. 20 April 2016.

⁴¹ Jones, Liz, et al, UK Department for International Development. Phone interview. 28 April 2016.

⁴² Ellis, Simon, World Bank. Skype interview. 13 April 2016.

should develop common monitoring frameworks to be expanded in future with additional data sources and funding.

2. Leverage other transport-related SDG indicators to increase focus on rural transport.

In addition to the current focus on the RAI-focused Indicator 9.1.1 ('Proportion of the rural population who live within 2 kilometres of an all-season road'), the SDG indicator framework provides other opportunities to measure rural access. For instance, Indicator 3.6.1 ('Death rate due to road traffic injuries') can help to focus on safety of rural (vs. urban) roads, and Indicator 9.1.2 ('Passenger and freight volumes, by mode of transport') can assist with focus on relative demands for national vs. rural roads in order to rationalize investment levels for the latter. Additionally, resiliency-focused indicators can be used to support SDG Target 13.2 (e.g. 13.2.1* 'Number of countries that have formally communicated the establishment of integrated low- carbon, climate-resilient, disaster risk reduction development strategies').

Thus, the rural transport community should seek opportunities to expand treatment of rural transport through these 'indirect' indicators via the IAEG-SDGs data disaggregation and interlinkages working groups.⁴³

3. Increase engagement of the private sector in rural access monitoring efforts

According to the United States Council for International Business, "The business community is crucial to the data revolution to implement the SDG Indicator Framework. Given its ambition and scope, the multi-level indicator framework will continue to evolve towards 2030, as knowledge and data availability improve."⁴⁴ In addition, as noted by the Secretary-General's recent Report on Big Data, "Any statistical work involving big data, will almost necessarily entail engagement with the private sector," and thus it is necessary to explore long-term partnerships that benefit both the private sector and the UN.⁴⁵

While arguably more challenging, it is even more important to apply these principles in rural areas, where data needs are greater than in urban areas. Therefore, the rural transport community should explore the opportunity to engage multinationals with vested interests in rural access (e.g. agricultural and food service and industries) to support longitudinal monitoring of rural access, and thus to provide sustainable development co-benefits. A key challenge is to incorporate the rural access of small scale farmers, which have not historically been a point of interest, into this fold.

4. Create regional data- and knowledge-sharing platforms for rural transport indicators

Increased South-South collaboration is required to increase capacity and ensure comparability of rural access data across national borders. Thus it is recommended to create platforms to collect and store data among various countries, both to share knowledge of data collection methodologies and to confirm data accuracy based on common assumptions. This will allow for the development of (sub-) regional indicators to support the established global SDG indicators, which are currently under discussion through the IAEG-SDGs to reflect different levels of development and data availability across UN Member States.⁴⁶

5. Incorporate rural access indicator discussion into national rural access policies.

⁴³ SLoCaT has requested participation in the latter, with status still pending.

⁴⁴ Meyerstein, Ariel, United States Council for International Business e-mail, March 7, 2016.

⁴⁵ Report of the Global Working Group on Big Data. UN Statistical Commission. 47th Session, 8-11 March 2016. <http://bit.ly/259PF8F>.

⁴⁶ UN Statistical Commission. Update on the Work of the IAEG-SDGs. Informal Briefing on the Global Indicator Framework for the SDGs. January 2016. <http://tinyurl.com/jzzun4j>.

Improved rural access indicators have the potential to help maintain/increase commitments by multilateral development banks (MDBs) and national governments to rural transport investments in the context of a prevailing bias toward urban transport. Thus, it is recommended to assess the most successful national rural access policies (e.g. in India, under the Prime Minister's Rural Roads Program, every habitation of more than 500 people is to be connected by an all-weather road).⁴⁷ Furthermore it may be useful to incorporate discussion of optimal use of modern data collection techniques (as previously discussed) into funders' policy dialogues with national governments, to allow for a bi-directional information flow to refine national monitoring of rural access indicators.

6. Increase provision of technical assistance and tools to road agencies in monitoring key indicators

Implementing agencies in many cases have sufficient budgets for assessment at the administrative district level, but lack access to modern technologies and techniques (e.g. satellite phones, digital imagery, training modules) to carry out measurements in the most efficient and consistent manner.⁴⁸ Therefore, it is recommended to more closely align target multilateral/bilateral assistance with local needs in this area.

Related topics for further investigation include the following:

- Application of remote sensing data for road condition assessment (including DFID/WB and other research) and potentially as a quality check for existing road data
- Support for registering the whole rural transport network within the road agencies (e.g. in Tanzania only 45% of the rural road network is currently registered)
- Inclusion of the transport service industry in SDG data collection (e.g. SME service providers, trucking industry, public transport enterprises, transport associations)
- Research on feasibility of options for open data collection (e.g. from road users), and in using automated methods to transform remote sensing data into other forms of useful data

⁴⁷ Accelerated Action on Rural Transport in Asia-Pacific Region. SLoCaT Partnership, UN Economic and Social Commission for Asia and the Pacific, [United Nations Centre for Regional Development](http://bit.ly/1stZaOO). <http://bit.ly/1stZaOO>. p.9

⁴⁸ Haule, Joseph, Tanzania Roads Fund. Skype interview. 20 April 2016.

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Annex A: Background on Survey Respondents

Survey respondents

Total number of respondents: 65

Field of expertise* (respondents can choose more than one answer):

- Number of respondents identified as Rural Transport Experts: 26
- Number of respondents identified as General Transport Experts: 29
- Number of respondents identified to be from the construction industry: 13
- Number of respondents identified to be from the transport industry: 20
- Number of respondents identified to be from professional transport body: 10
- Number of respondents identified as regional development planners: 10
- Number of respondents identified as administrator/ policy maker: 4
- Number of respondents identified as to be from financial institution/ donor: 2
- Number of respondents identified as students: 0
- Others: 15

The survey has successfully received responses from professionals in relevant fields. The majority of survey respondents have identified themselves as either general transport experts (45%) or rural transport experts (41%) with nearly 50% of them being “very familiar” with rural transport (Figure 17 and Figure 18).

Figure 17: Expertise of respondents

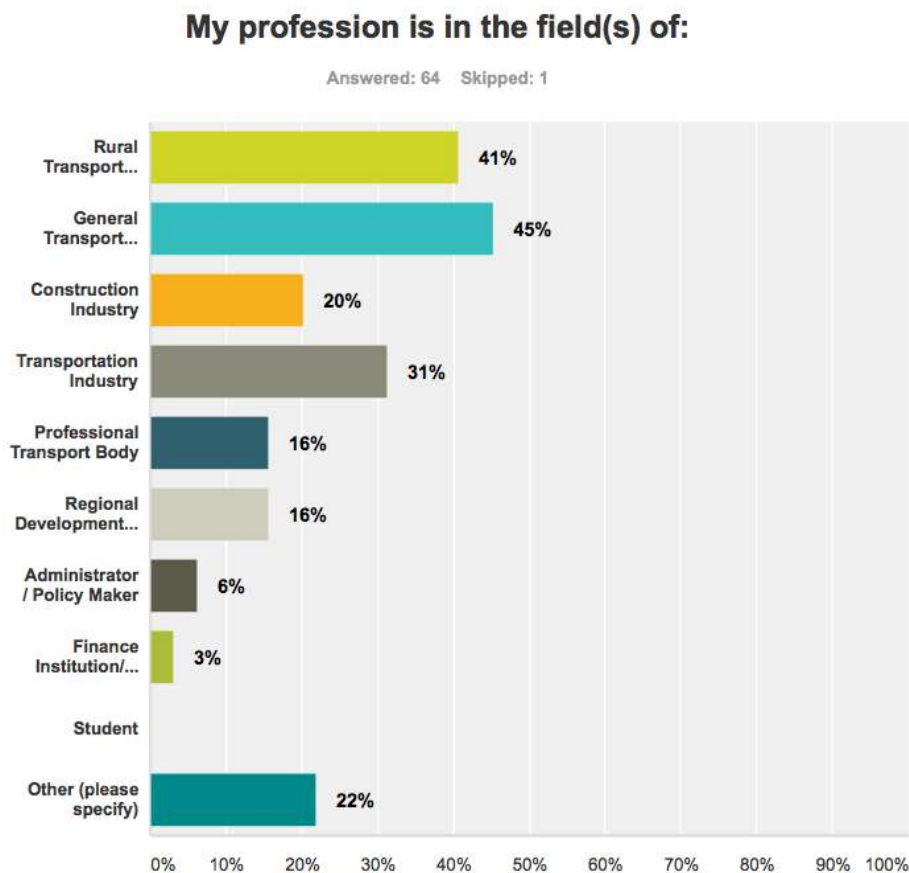
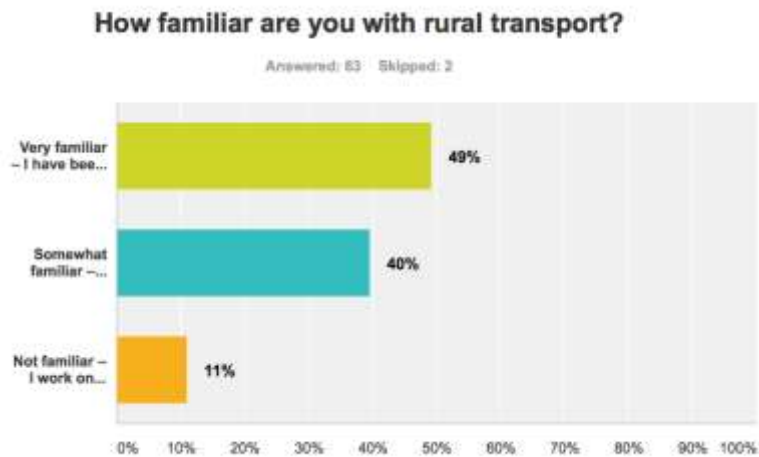


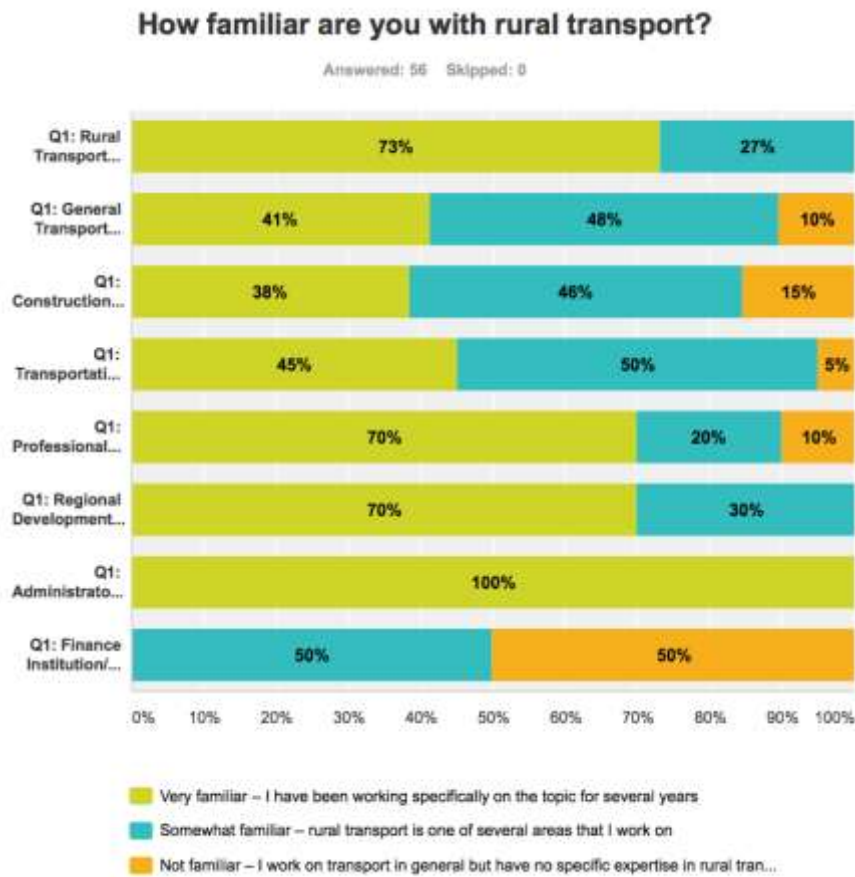
Figure 18: Familiarity with rural transport (all respondents)



Among the rural transport experts, 73% are ‘very familiar’ with the topic and have been working specifically in this field for several years, and 27% are ‘somewhat familiar’ as rural transport is only one of the several areas that they work on. Among the general transport experts, 48% of them are ‘somewhat familiar’ and 41% of them are ‘very familiar’ with the topic. 10% of them are not familiar at all.

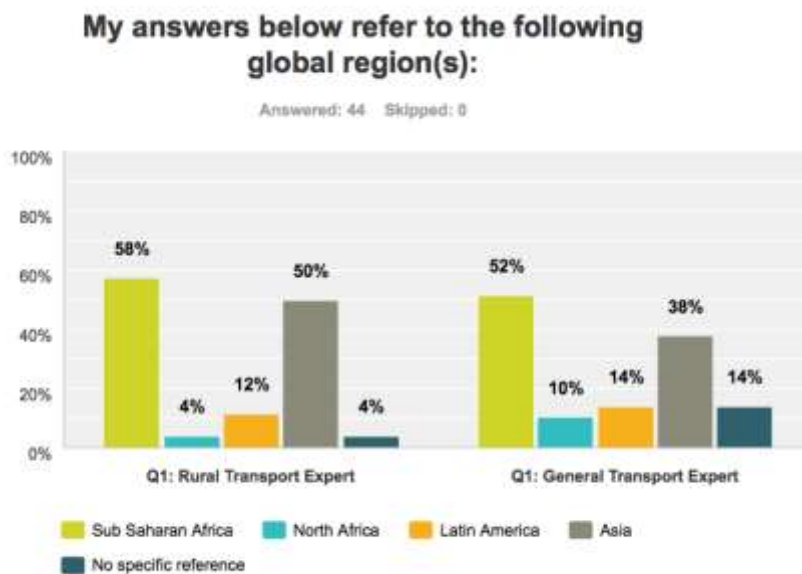
Most of experts from the construction industry, professional transport bodies, and regional development planning industry also consider themselves as ‘very familiar’ with the topic. 2 experts from the finance institution/ donor sector acknowledge that they work on transport but are only ‘somewhat familiar’ or ‘not familiar’ with rural transport (Figure 19).

Figure 19: Familiarity with rural transport (by types of experts)



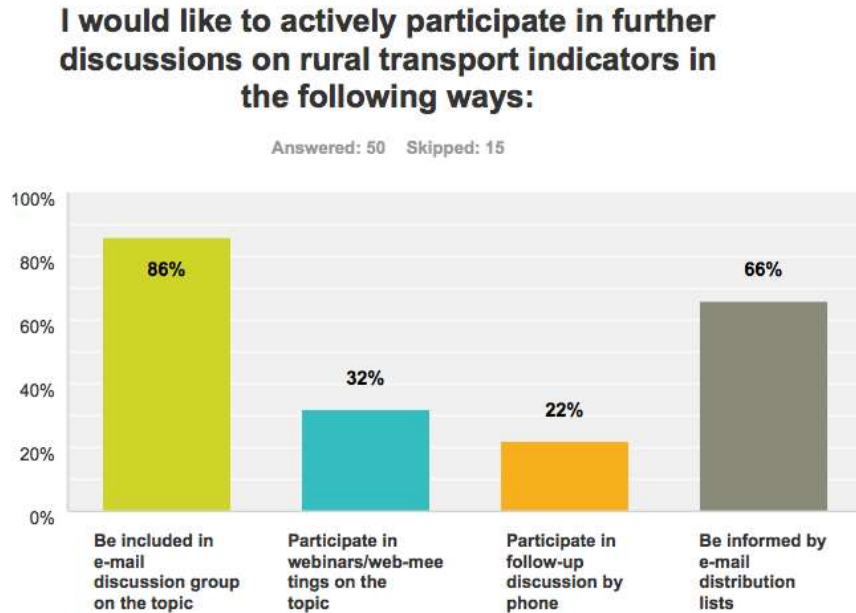
In addition, the majority of both rural transport experts and general transport experts have a strong geographic focus on Africa and Asia (Figure 20):

Figure 20: Geographical Scope of Interest of Rural Transport Experts and General Transport Experts



46 survey respondents answered positively and provided email addresses when asked if they are interested in rural transport and SDGs process. 86% would like to be included in an email discussion group on the topic and 66% of them want to be informed by e-mail distribution lists. 32% of them are interested in participating in webinars and web-meetings and 22% are willing to participate in follow-up discussion by phone (Figure 21). One rural transport expert specifically indicates interest to be invited to the launching occasion, if any, for our rural transport indicators project.

Figure 21: Follow-up participation in further discussions on rural transport indicators (all respondents)



Annex B: List of Experts Interviewed

- David Salter, Asian Development Bank
- Caroline Visser, Research for Community Access Partnership
- Joseph Haule, Tanzanian Road Fund
- Colin Gourley, UK Department for International Development
- Elizabeth Jones, UK Department for International Development
- Noor Mohammed, UK Department for International Development
- Simon Ellis, World Bank