



ReCAP
Research for Community Access Partnership



Status Review of the Updated Rural Access Index (RAI)

Interim Progress Statement



Author: Stephen Vincent

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Cover Photo: Children at a rural school in Ghana

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ReCAP Project Management Unit
 Cardno Emerging Market (UK) Ltd
 Oxford House, Oxford Road
 Thame
 OX9 2AH
 United Kingdom



Abstract

The Rural Access Index (RAI) was defined in 2005 as the proportion of the rural population living within 2 km of an all-season road. Initial measurements of the RAI for 64 countries were published in 2006, but further systematic updates of the RAI did not take place. In 2016, SDG Indicator 9.1.1 was agreed with the same definition as the RAI, requiring regular update of RAI data for the majority of UN countries. With support from ReCAP, the World Bank developed updated spatial analysis techniques to measure RAI, and trials were carried out in eight ReCAP countries. However, concerns were raised about inconsistencies across countries, possible weak operational relevance, weak client ownership by pilot countries, and potential high future update costs. This status review is intended to address these concerns with a view to accelerating progress with the updated measurement of the RAI. Preliminary findings from a literature review and from consultations with World Bank staff during a visit to Washington DC are presented, including information about the UN processes associated with the SDG Indicators. Preliminary recommendations are also presented for ReCAP RAI Task Group 2 (TG2), Consolidation and Revision, to take place after this status review.

Key words

RAI, Rural access, SDG Indicator, status review

RESEARCH 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

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Abbreviations, Acronyms and Initialisms

| | |
|-----------|---|
| \$ | United States Dollar (US\$ 1.00 ≈ provide conversion to local currencies) |
| ADB | Asian Development Bank |
| AfCAP | Africa Community Access Partnership |
| AfDB | African Development Bank |
| AsCAP | Asia Community Access Partnership |
| CDS | Civil Design Solutions |
| DEC | World Bank Development Economics Vice Presidency |
| GPS | Global positioning system |
| IAEG-SDGs | UN Inter-agency and Expert Group on SDG Indicators |
| IDB | Inter-American Development Bank |
| LSMS | Living Standards Measurement Study |
| NSO | National Statistical Office |
| PI | CDS Principal Investigator |
| PMU | Programme Management Unit |
| RAI | Rural Access Index |
| ReCAP | Research for Community Access Partnership |
| SDGs | Sustainable Development Goals |
| SRAI | The RAI calculated by the 2016 "Spatial Rural Access Index" method |
| UK | United Kingdom (of Great Britain and Northern Ireland) |
| UKAid | United Kingdom Aid (Department for International Development, UK) |
| UN | United Nations |

Contents

| | |
|--|------------------------------|
| Abstract | Error! Bookmark not defined. |
| Key words | iii |
| Acknowledgements | iv |
| Acronyms, Units and Currencies | iv |
| 1 Introduction | 1 |
| 2 Status Review Activities to date | 1 |
| 3 Preliminary Findings | 1 |
| 3.1 Establishment of the Rural Access Index (RAI) in 2005/2006 | 1 |
| 3.2 Update, application and use of RAI | 2 |
| 3.3 UN SDG Indicator 9.1.1 | 3 |
| 3.4 Updated RAI measurement method using new technologies 2016 | 6 |
| 3.5 Other measurements of the RAI | 6 |
| 3.6 New technologies and alternative methods of measurement of the RAI | 7 |
| 4 Preliminary Recommendations | 7 |
| 4.1 Actions that can be initiated immediately | 7 |
| 4.2 Actions requiring further consultation and definition | 8 |
| 5 Next steps | 9 |
| 6 References | 9 |

List of Figures

| | |
|---|---|
| <i>Figure 1 – Definition of the Rural Access Index</i> | 1 |
| <i>Figure 2 – Measurement of the Rural Access Index (RAI)</i> | 1 |
| <i>Figure 3 – Length of network needed to reach different levels of Rural Access Index</i> | 2 |
| <i>Figure 4 – Definition of SDG Indicator 9.1.1</i> | 4 |
| <i>Figure 5 – Definition of SDG Indicator Tier Classification</i> | 4 |
| <i>Figure 6 – IAEG-SDGs reviews of SDG Indicators in 2020 and 2025</i> | 5 |
| <i>Figure 7 – Comparing the accuracy of RAI datasets calculated using different methods</i> | 8 |

1 Introduction

The Research for Community Access Partnership (ReCAP) is a programme of research and knowledge dissemination funded by the UK government through the Department for International Development (DFID).

ReCAP has initiated a status review of progress with the measurement of the Rural Access Index (RAI). This review is being carried out by Civil Design Solutions (CDS). Project work started in January 2018, and the Final Report is expected to be delivered by May 2018.

2 Status Review Activities to date

Activities carried out so far as part of this status review include:

- an Inception Meeting, meetings with specialists, and preparation of Inception Report;
- a Literature Review of relevant documents (ongoing); and
- meetings at the World Bank and Inter-American Development Bank in Washington DC.

3 Preliminary Findings

3.1 Establishment of the Rural Access Index (RAI) in 2005/2006

The Rural Access Index (RAI) is widely referred to as having first been defined in the World Bank Transport Paper 10 “*Rural Access Index: A Key Development Indicator*”⁽¹⁾, published in March 2006, and written by Peter Roberts, Shyam KC and Cordula Rastogi. A more concise original document is included in Annex I of the report, “*Rural Access Index: Summary Sheet*”, updated by Peter Roberts in September 2005. This starts with the definition presented as Figure 1.

‘*Rural Access Index*’ is the percentage of rural people who live within 2 km (typically equivalent to a walk of 20 minutes) of an all-season road as a proportion of the total rural population. An “*all-season road*” is a road that is motorable all year round by the prevailing means of rural transport (often a pick-up or a truck which does not have four-wheel-drive). Predictable interruptions of short duration during inclement weather (e.g. heavy rainfall) are accepted, particularly on low volume roads.

Figure 1 – Definition of the Rural Access Index

The 2006 Transport Paper referred to a walk of 20-25 minutes. Some specialists have extended this to 30 minutes. However, the distance of 2 km as a proxy for this walk has been widely accepted and used. Hence, all data collection for the RAI is guided as illustrated in Figure 2. Within rural areas, the population of households within the 2 km boundary (regarded as having access to transport), is compared with the total population of all households.

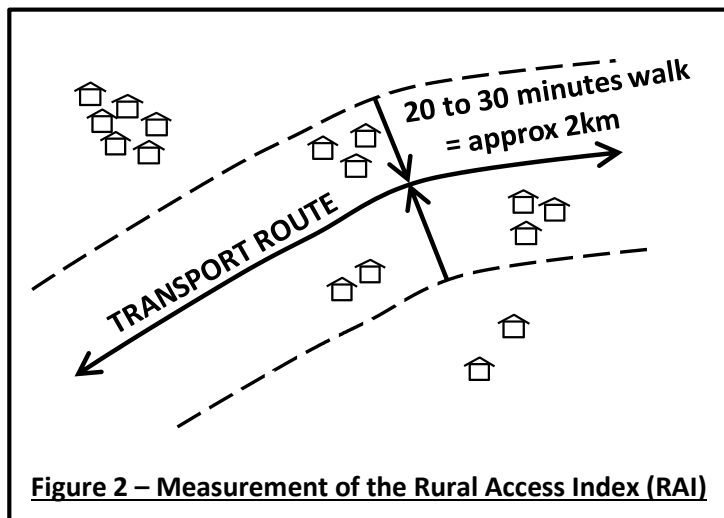


Figure 2 – Measurement of the Rural Access Index (RAI)

Two approaches to the measurement of RAI were explained in 2005,

- (a) household surveys that include information about access to transport, or
- (b) map data to determine how many people live within the specified catchments of the road network.

The RAI was adopted as a development indicator for the Results Measurement System for IDA-14, the 14th replenishment of International Development Association resources in 2005. In 2006, Transport Paper 10 (1) included initial measurement of the RAI for 64 countries, 32 IDA countries and 32 non-IDA countries. Amongst these 64 countries, the RAI measurements for 26 countries were based on the results from five different types of household survey data, and the measurements for 10 countries were based on mapping/GIS analysis. The measurements for a further 22 countries were estimated using approximate modelling techniques. Measurement methods used for ReCAP partner countries were:

| | |
|--------------------------------|---|
| Household surveys: | Ghana, Kenya, Malawi, Tanzania, Bangladesh, Nepal, Pakistan |
| Mapping/GIS: | (none) |
| SSATP (method unclear): | DR Congo, Ethiopia, |
| Approximate models: | Sierra Leone, Uganda, Zambia |

In 2006, it was intended that a suitable question about “the distance or time taken to walk to an all-season road” should be included in household surveys carried out every few years, and estimated that an update of the RAI would then only require one day of statistical analysis for each household survey. There was also a suggestion that: “If at all possible, a second question should be included to ask about access to a reliable, all-season ‘transport service’. In the medium-term it is likely that the focus will shift to assessing the level of access to transport services rather than access to the road network, since not all sections of the network necessarily carry satisfactory services”.

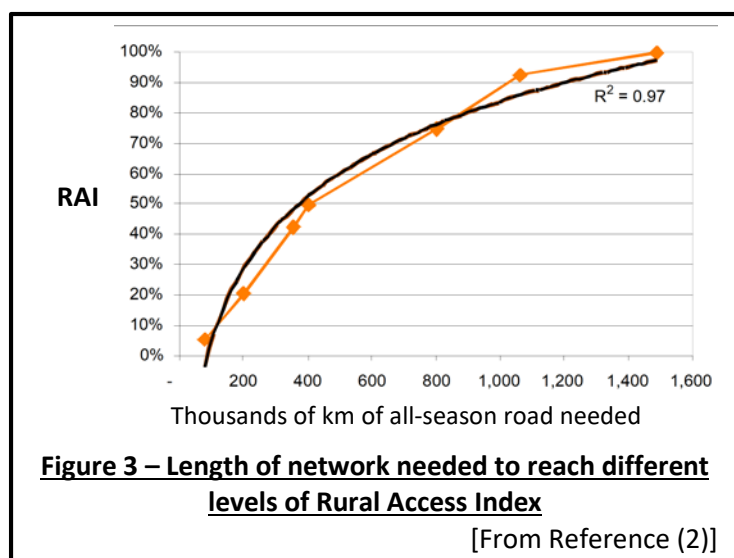
Although the method by which the RAI data for each country was measured is shown in Annex III of the 2006 report, there is no information about the anticipated accuracy of the input data, and no attempt appears to have been made to measure the likely accuracy of each measurement.

3.2 Update, application and use of RAI

The regular update of the RAI as an IDA-14 indicator does not appear to have taken place. Nevertheless, the RAI is widely known and understood, and has been used by development partners for regional studies and national rural development planning.

The Africa Infrastructure Country Diagnostic (AICD) updated RAI data for 24 countries in Africa, and published findings in 2008. However, because this RAI data was generated using GIS based methods it was not regarded by AICD analysts as suitable for direct comparison with the 2006 RAI data because of significant differences in the measurement method.

One of the applications of the AICD RAI data was to consider the rural road infrastructure investment needed to achieve different levels of RAI ⁽²⁾, as illustrated in Figure 3. An important



conclusion was that, pragmatically, it might not be financially possible to achieve an RAI of over 50% in some African countries. Very importantly, short term improvements in RAI would not be sustainable unless appropriate action was taken to ensure that improved roads would be maintained.

Over the past decade, various concerns have been expressed by transport and rural development specialists about the accuracy and usefulness of the RAI. Issues raised include:

- Even as the RAI was first defined in 2005, Peter Roberts used the 2 km distance only as an approximation for walking time, and he noted that what was really important was the **distance to an appropriate transport service**, the existence of a road does not guarantee access to such a service.
- The actual distance walked in the same time through **different types of terrain** will also vary.
- The boundary between rural areas and urban areas may not be well defined, and **information about the rural population distribution and the location of roads may be inaccurate**.
- The concept of a road being **“all-season” is not well defined or widely understood**, and records of roads kept by road administrations or local government are not normally classified as such.
- The single, national, value of the RAI originally measured in 2006 can be used for making comparisons between countries; and could potentially be useful for monitoring long term changes; but is **not useful for local planning purposes**.
- The extensive and **rapid growth in the use of motorcycles** in many developing countries has made very significant changes in the transport services available in some rural areas. A recent study in Liberia ⁽³⁾ found that in some areas the majority of rural people attending health centres, including women attending maternity centres, used motorcycle transport. Many school children also travelled by motorcycle. Motorcycle taxi services can reach areas beyond the normal road network, and can also provide a more responsive “on demand” service than other transport options, but are more expensive.

3.3 UN SDG Indicator 9.1.1

Following the establishment of the UN Sustainable Development Goals (SDGs) in September 2015, a set of 230 SDG Indicators were defined by the UN Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs) in June 2016. The members of UN IAEG-SDGs, which makes all recommendations regarding SDG Indicators, are from the National Statistical Offices (NSOs) of a representative group of all UN countries, with membership rotating between countries. The IAEG-SDG prepares a report to the UN Statistical Commission in December each year.

SDG Indicator 9.1.1 is the same as the RAI, as shown in the extract from the 2016 IAEG-SDGs Report in Figure 4.

Extract from Report of the Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs), 15 December 2016 ⁽⁴⁾.

From page 25/49:

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

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

Indicators:

9.1.1 Proportion of the rural population who live within 2 km of an all-season road

9.1.2 Passenger and freight volumes, by mode of transport

Figure 4 – Definition of SDG Indicator 9.1.1

A tier classification system for all SDG Indicators was established in 2016, and was updated in 2017 as defined in Figure 5.

Extract from Report of the Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs), 19 December 2017 ⁽⁵⁾

From page 3:

A. Review of Tier classification and methodology development of Tier III indicators

8. The Expert Group clarified the criteria/definitions of Tier classification at its fifth meeting, as follows:

- (a) Tier I: Indicator is conceptually clear, has an internationally established methodology and standards are available, and data are regularly produced by countries for at least 50 per cent of countries and of the population in every region where the indicator is relevant;
- (b) Tier II: Indicator is conceptually clear, has an internationally established methodology and standards are available, but data are not regularly produced by countries;
- (c) Tier III: No internationally established methodology or standards are yet available for the indicator, but methodology/standards are being (or will be) developed or tested;

Figure 5 – Definition of SDG Indicator Tier Classification

The RAI is currently on the lowest tier, Tier III, alongside other indicators which do not yet have an established methodology. To progress to Tier II, an updated methodology must be finalised, and it must be possible to demonstrate that systems are in place to collect and update RAI data in the future for a significant number of countries. To progress to Tier I, RAI data must be measured regularly for at least 50% of UN countries.

The December 2016 report of IAEG-SDGs also explained the mechanism for reviews of all SDG Indicators that will take place in 2020 and 2025. The criteria for these reviews is shown in Figure 6. Further details of the timescale for the 2020 review were included in the December 2017 IAEG-SDGs report, with proposals for changes and possible deletions to be made by mid-2019.

Extract from Report of the Inter-agency and Expert Group on SDG Indicators, (IAEG-SDGs), 16 December 2016 ⁽⁴⁾.

From page 6/49:

22. Two comprehensive reviews of the indicator framework are planned, and their results are to be submitted for consideration and decision by the Statistical Commission at its 2020 and 2025 sessions. They could include the addition, deletion, refinement or adjustment of indicators on the basis of the following:

- (a) Indicator does not map well to the target;
- (b) Additional indicator(s) is needed to cover all aspects of the target;
- (c) New data sources are available;
- (d) Methodological development of tier III indicator has stalled or has not produced expected results;
- (e) Indicator is not measuring progress towards meeting the target.

Figure 6 – IAEG-SDGs reviews of SDG Indicators in 2020 and 2025

Before 2020, the only changes to SDG Indicators that are possible are minor corrections.

The World Bank Development Economics Vice Presidency (DEC) represents the World Bank at IAEG-SDGs meetings, as an observer.

The DEC representative who has attended the IAEG-SDGs meetings provided the following additional information:

- (i) No further discussion of Indicator 9.1.1 have taken place in IAEG-SDGs meetings since this Indicator was initially defined.
- (ii) The World Bank is “custodian” of approximately 20 SDG Indicators, including 9.1.1.
- (iii) The World Bank has successfully requested moving at least three SDG Indicators from Tier III to Tier II, and is familiar with the process for doing this.
- (iv) Moving from Tier III to Tier II is not simply dependent upon the number of countries for which measurements have been made. What is essential is to demonstrate the mechanism by which both initial measurement and then regular updates will take place. A proposal to move to Tier II could be made with as few as 15 or 20 countries, as long as it is quite clear that this will rapidly expand to regular updates by a large number of countries.
- (v) The National Statistical Offices (NSOs) have the deciding role in what happens with SDG Indicators. The NSOs do not have any specialist knowledge related to the RAI.
- (vi) If the definition of Indicator 9.1.1 (the same as the RAI) does not truly represent the reality of contemporary rural access, then rather than modify the definition of Indicator 9.1.1 it would be preferable to recommend an additional new indicator that models current rural access better. Then, in due course, if such a new indicator becomes more widely accepted it could eventually supersede 9.1.1.
- (vii) If both the World Bank as custodian, and a country, independently measure the value of Indicator 9.1.1, it is not yet clear which value would take precedence for official UN statistics.
- (viii) The World Bank can request additional organisations to be added as partner agencies for an Indicator, but it is likely that DFID would not be accepted, as representing only one country.

3.4 Updated RAI measurement method using new technologies 2016

As the "custodian" of SDG Indicator 9.1.1, the World Bank started a research programme to develop a new methodology for measuring the RAI. A more reliable and sustainable method of measurement was needed to address the requirements for an SDG Indicator.

The new methodology makes use of existing spatial datasets. Various international population datasets are available, for example *WorldPop*, and these datasets are progressively becoming more accurate. National road administrations and government departments are progressively developing georeferenced datasets of national road networks, and these datasets could be supplemented by other mapping sources, for example *OpenStreetMap*. There is some difficulty determining which roads are "all-season", and it was decided to use good/fair/poor ratings of roads, determined from road asset management systems or other alternative data sources, to determine which roads should be included in the analysis. These datasets were then combined using a GIS. This method has the advantage of being able to generate regional and local values of RAI for analysis and planning purposes, as well as determining the national average.

ReCAP provided financial resources for pilot measurements of the RAI using this new methodology, which were carried out in eight ReCAP countries in Africa and Asia (Ethiopia, Kenya, Uganda, Tanzania, Mozambique, Zambia, Nepal and Bangladesh). The results of these pilot measurements for the new RAI measurement method were published in the ReCAP/World Bank report "*Measuring Rural Access: Using new technologies*" ⁽⁶⁾ in 2016.

The World Bank prepared a proposal for more widespread use of the new RAI measurement methodology. However, concerns were raised by ReCAP member countries about inconsistencies across countries, possible weak operational relevance, weak client ownership by pilot countries, and potential high future update costs.

As an SDG Indicator, the RAI rapidly needs to be measured for as many UN countries as possible, and a mechanism needs to be established through which regular future updates will take place. In order to accelerate progress, ReCAP has defined three task groups to move development and use of the RAI forward:

Task Group 1 (TG1): A status review and way forward recommendation

Task Group 2 (TG2): Consolidation and Revision

Task Group 3 (TG3): Application in Pilot Countries

This status review is Task Group 1.

3.5 Other measurements of the RAI

During the initial stages of this status review, other more recent measurements of the RAI in specific countries were identified. A study in Timor Leste led to a report in 2017 ⁽⁷⁾ presenting a method in which individual settlements were mapped onto the road network, to calculate the RAI for planning purposes. Bangladesh has used a spreadsheet method, determining whether each village was within 2 km of a road, and then adding up population data for each village to calculate the RAI. The African Development Bank has provided information about RAI calculations in Chad and Togo.

Another group at World Bank has been estimating approximate values of the RAI for well over 100 countries using Open Data sources available online, for example using the *OpenStreetMap* unofficial road network.

There does not appear to be any central database of where RAI measurements have taken place.

3.6 New technologies and alternative methods of measurement of the RAI

Proposals have been made to use various new technologies to assist in the measurement of RAI, for example satellite imagery to estimate road locations and condition, and mobile phone accelerometers to estimate roughness and hence road condition. Some possible sources of data are included in the AfCAP Guideline on the use of high tech solutions for road network inventory and condition analysis in Africa ⁽⁸⁾.

Other possibilities for measuring data might become available in the future. For example, taxis, and motorcycle taxis, use mobile phones for people needing transport to contact them. The technology already in use to provide real time travel speed data on roadmaps on smart phones might be extended to identify travel patterns of taxis, and hence identify the road network regularly used by transport services.

4 Preliminary Recommendations

Preliminary key recommendations for ReCAP RAI Task Group 2 (TG2) are set out below.

The most important requirement is to support the sustainable establishment of SDG Indicator 9.1.1, so that this SDG Indicator can progress from Tier III to Tier II, and in due course to Tier I. Key issues to be addressed are:

- (i) Establish a long term process for the sustainable update of the RAI for each country, as well as measuring the RAI for as many countries as possible, as quickly as possible.
- (ii) Establish methods of assessing the quality of each measurement of the RAI, with a view to including measurements from as many different sources as can be adequately quality assured, to include innovative country led methods as well as updated methods developed by development partners.
- (iii) Engage with countries, and National Statistical Offices, to support the use of the most recent and appropriate data sources, and to establish country led updates wherever possible.

4.1 Actions that can be initiated immediately

Some actions can be initiated immediately:

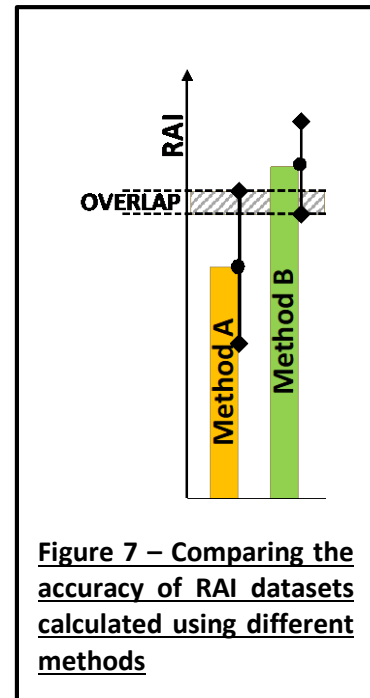
- **International catalogue of RAI data:** There does not currently appear to be a single catalogue of known RAI data for every UN country. As custodian of Indicator 9.1.1, it would be useful for the World Bank to assemble a complete catalogue of all RAI data known to exist. This would, where possible, include a record of the method used to calculate each dataset and any information available about the likely accuracy of each dataset.
- **International catalogue of the quality of data sources:** As preparation for the calculation of the RAI for additional countries, a catalogue can be established of known data sources and datasets that could be used to calculate the RAI.
- **Method statement:** Independent of the various reports about data collection and analysis of RAI data, a concise standalone document can be prepared explaining the principles of measuring the RAI; which methods are considered acceptable for Indicator 9.1.1 measurement; and what information about data sources and accuracy should accompany each dataset. This document would be provisional until accepted by key interested parties (World Bank, DFID, regional development banks).

- **Maintain a schedule of planned future RAI measurements:** Establish a mechanism through which any organisation or project intending to measure new values of RAI will routinely notify the World Bank, so that this information can be integrated into the World Bank planned schedule of future RAI measurements. This schedule should be updated regularly and circulated to key parties including the regional development banks, in order to track progress towards establishing the Indicator 9.1.1 as a Tier II/Tier I SDG Indicator.

4.2 Actions requiring further consultation and definition

All methods of measuring RAI are intended to measure the same thing, the proportion of the rural population living within 2 km of an all-season road, as illustrated in Figure 2. In order to collect reliable data with a sustainable update path for as many countries as possible, as quickly as possible; and hence to support moving Indicator 9.1.1 from Tier III to Tier II; it is likely to be necessary to accept data calculated by different methods. Formal methods of assessing the quality of each dataset must therefore be established so that the likely accuracy can be taken into account whenever making comparisons between different datasets.

- **Accuracy:** There is little evidence of any scientific analysis of the likely accuracy of each existing RAI measurement, or of any quality assurance to verify that mistakes have not been made in calculations. All RAI measurements are nominally measuring exactly the same thing, as illustrated in Figure 2, and it is not acceptable simply to attribute differences in results to using different analysis methods. It should be possible to establish the likely accuracy of each source dataset used in RAI calculations, and then to combine the accuracies for all of the datasets used to calculate an overall likely accuracy for each RAI measurement. If the accuracy range for each method is correct, then the accuracy ranges for different methods should overlap as shown in Figure 7. In future every RAI dataset should include an assessment of accuracy.



- **Method correction factors:** To achieve comparable RAI measurements, some methods or datasets may require correction factors. For example the method of classifying the georeferenced road network in a particular country might be known to underestimate the extent of the actual rural road network, and a correction factor might therefore need to be applied to achieve national RAI results that are comparable with other countries. Another example could be that using good/fair/poor ratings to identify the appropriate rural roads does not match the all-season road network, and a correction factor is then needed to achieve a comparable national RAI value.
- **Alternative RAI values:** In some countries, it might be argued that the realities of rural access are not adequately modelled by the RAI. For example if motorcycles are the predominant means of rural transport, and as a result transport services extend well beyond the conventional all-season road network. In this case, it should be allowable to calculate an additional RAI value, using a method locally deemed more appropriate, as well as calculating the RAI using the original method for Indicator 9.1.1. A more realistic value can then be used for local planning purposes.
- **Consider an additional SDG Indicator for rural access:** In parallel with activities to measure the original RAI, consider whether a second SDG Indicator for rural access is needed to reflect the reality of changes in rural access. For example, a new indicator might be framed in terms of

walking time and the availability of appropriate transport services, and such transport services might include motorcycle taxis.

- **Institutionalisation:** The methods through which future updates will be institutionalised should be planned, documented and monitored.
- **National involvement in the measurement of the RAI:** The interaction between development partners and national contacts needs to be planned and monitored. Contact needs to be maintained with National Statistical Offices, Road Administrations, and potential users of RAI data.
- **Responsibility for quality assurance and submitting RAI data to the UN:** Procedures for quality assuring the RAI data, and for submitting Indicator 9.1.1 data to the UN, need to be formalised.

5 Next steps

The ReCAP RAI status review will continue with the following activities:

- Visits to the African Development Bank and the Asian Development Bank.
- Country visits to Ethiopia, Uganda, Nepal and Bangladesh.
- Consultation with rural development practitioners and other interested parties by e-mail.
- A final report will be prepared with detailed recommendations for the way forward.

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