MEASURING RURAL ACCESS INDEX

Big Data and SDGs

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Road to EXPO2020 Webinar Series
December 14, 2021

Content

- Background
- “Old” and “new” methodologies
- Some examples
- Challenges and opportunities
- References
- Q&A

Rural accessibility has long been an important challenge particularly in developing countries…

- Urbanization has been accelerating even in developing countries
- Still, about 3 billion people or 50% of total population live in rural areas
- Most of the rural population is poor
  - In Africa, 40% live under the poverty line ($1.90 a day)
- A wide variety of implications of poor road accessibility
  - Limited agricultural productivity
  - Limited access to markets
  - Limited access to quality healthcare services
  - Limited access to school

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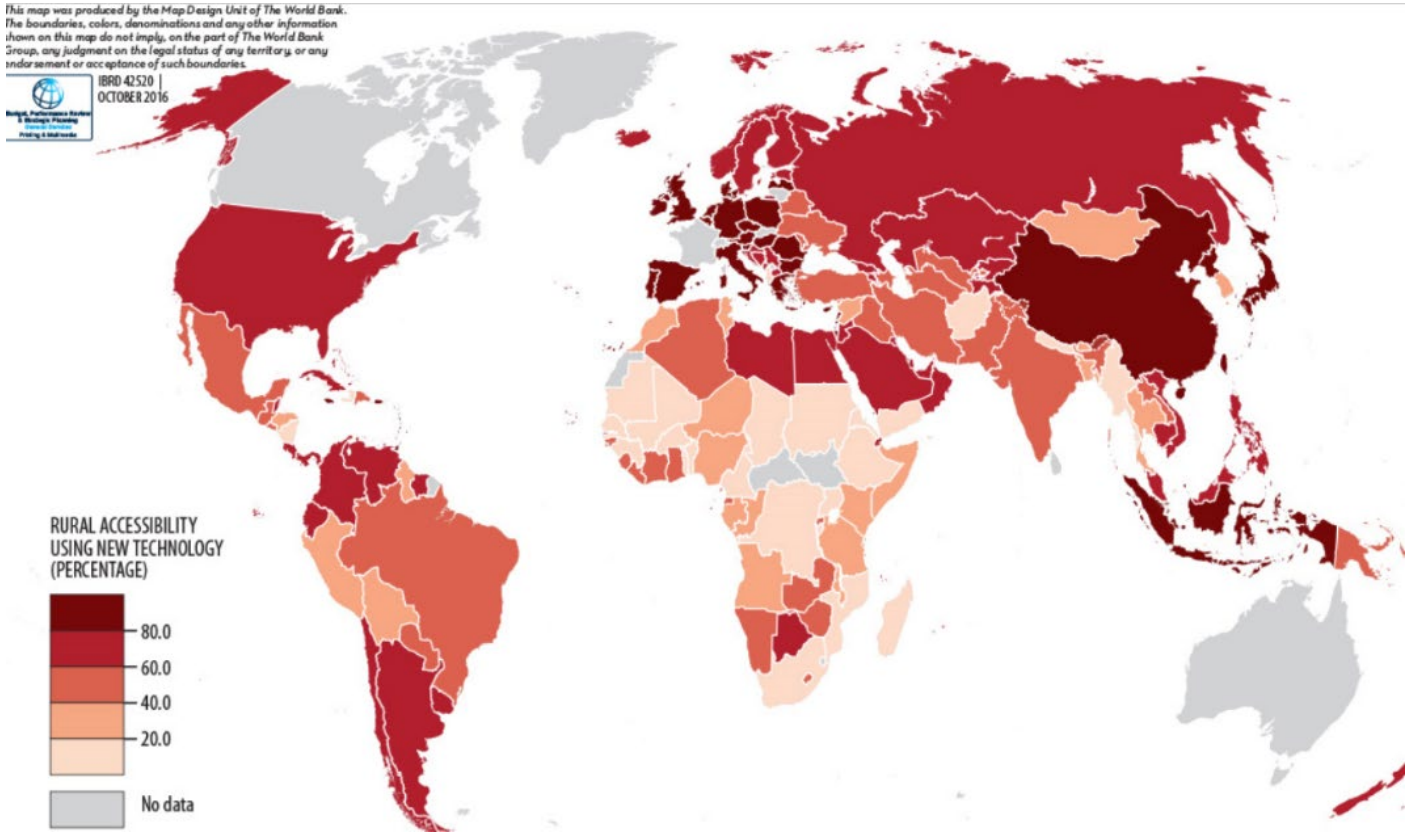
Globally, about 1 billion people or 68% of total rural population remain unconnected to the road network

Rural Access Index (Roberts et al., 2006)



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

- A few global indicators in the transport sector
- Rural Access Index developed by Roberts et al. (2006)
- Unfortunately, no systematic update of the index since then

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RAI is conceptually well defined, but methodological challenges remain

- Rural Access Index
  - Share of rural population who has access to an "all-season road" within 2 km (approximately, 25-minute walk)
- Methodological challenges:
  - Data availability – No regular update of "all-season" accessibility of roads
  - Household surveys – Costly and/or unavailable
  - Limited sample areas (200-400 villages)
  - Inconsistency across countries – Asking *"Do you have all-season access?"*
  - Sampling at national level – Little operational relevance

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Renewed interest in the SDG context – Indicator 9.1.1. RAI

SDG Target 9.1

"Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all"

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

- **Indicator 9.1.2**: Passenger and freight volumes, by mode of transport
  - Aviation
  - Road, rail, inland water, pipeline
  - Led by ICAO; International Transport Forum; UNECE; UNCTAD

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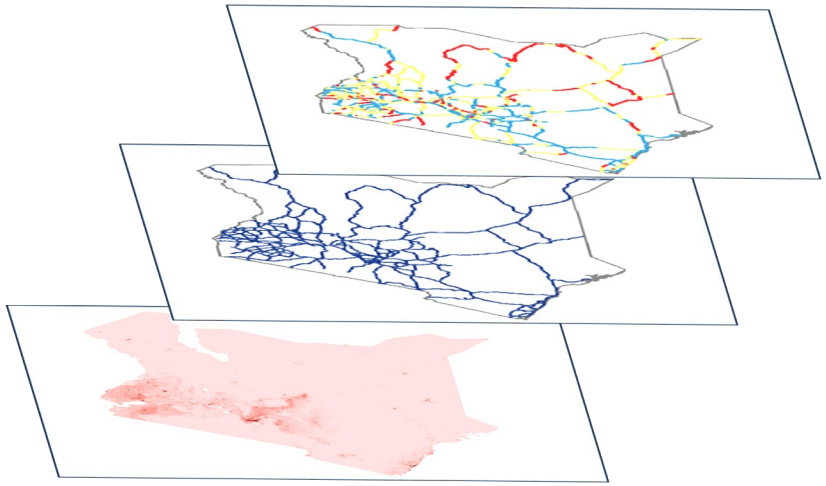
New methodology – Conceptually the same, but measured differently using new spatial data and technologies for sustainability and operational relevance

Main principles of the new methodology

- Sustainability
- Consistency
- Simplicity
- Operational relevance

To calculate RAI, use and overlap 3 spatial data

- Road condition
- Road network
- Population



See World Bank (2016) for more details
http://documents.worldbank.org/curated/en/367391472117815229/Measuring-rural-access-using-new-technologies

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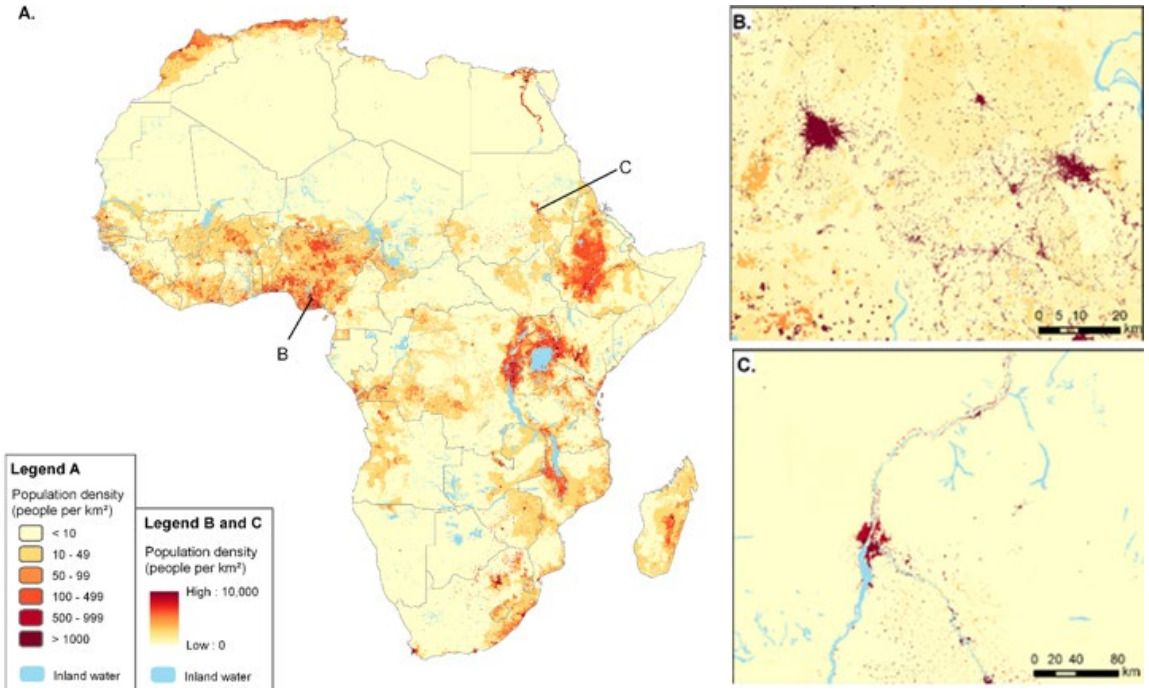
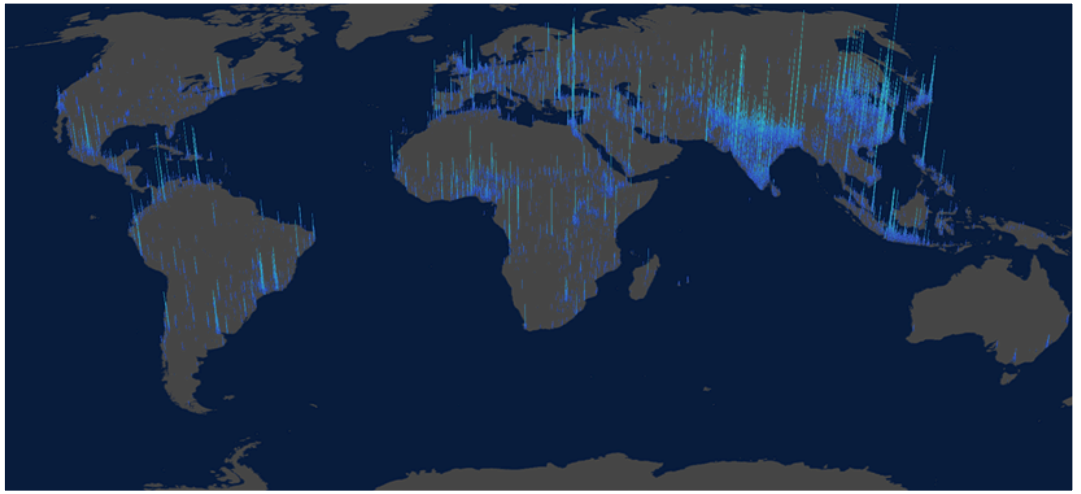
Where do people live? – Detailed global population data, e.g., WorldPop, GPW, etc. or national census data

WorldPop



Global Human Settlement Data



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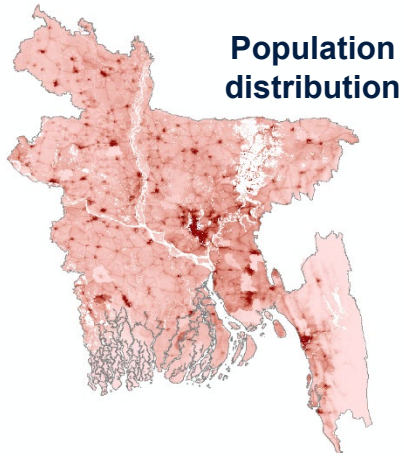
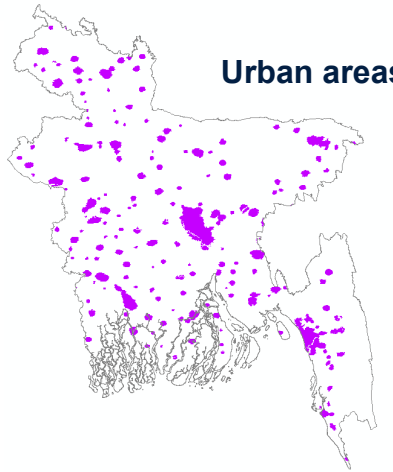
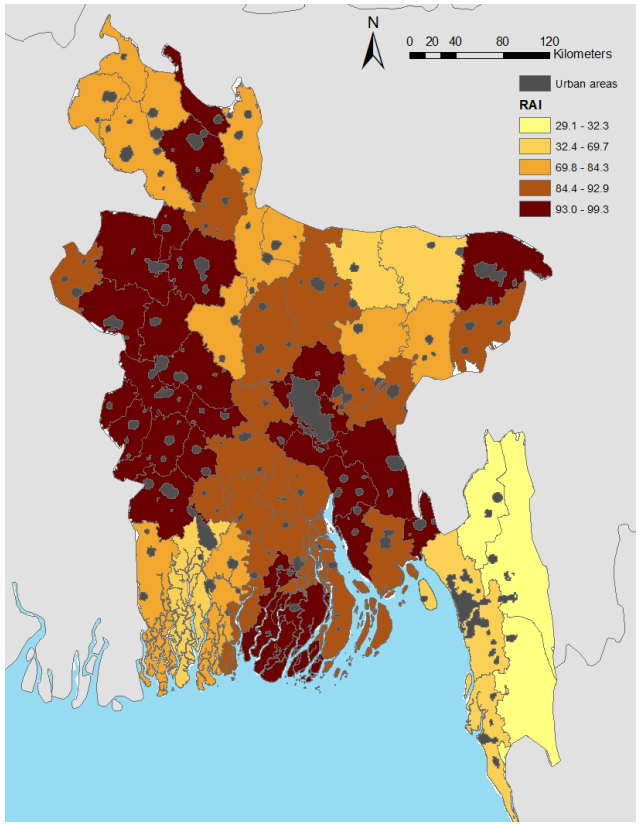
RAI is sometimes sensitive to urban-rural delineation

In RAI calculation, urban areas need to be excluded using GRUMP data







- Different urban-rural classifications are available
  - Global databases – Global Rural Urban Mapping Project (GRUMP) in 1990
  - National administrative definition
  - New method to delineate cities, urban and rural areas endorsed by the UN Statistical Commission
    - UN. (2020). “A recommendation on the method to delineate cities, urban and rural areas for international statistical comparisons”
    - https://unstats.un.org/unsd/statcom/51st-session/documents/BG-Item3j-Recommendation-E.pdf

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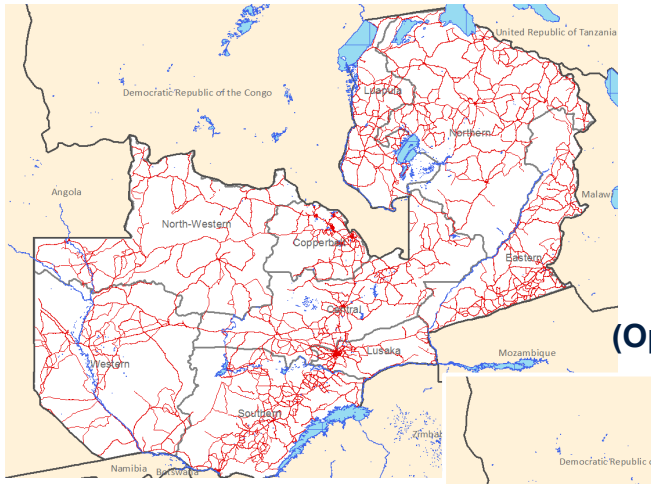
Where do roads exist? – National road network data owned by road agencies, or commercial database, or open data

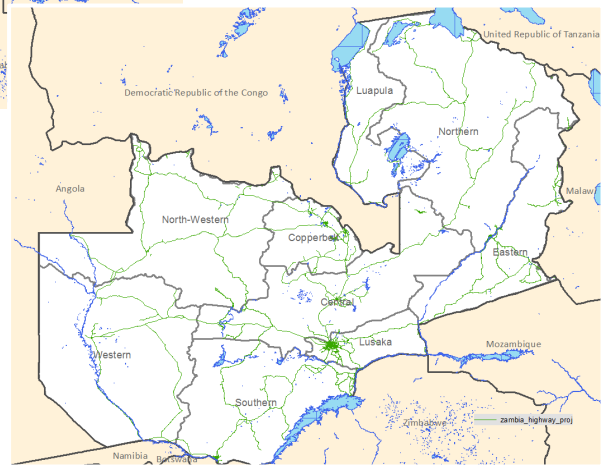
- Government data – Consistent with official network, classification and responsibility
- Open data may be more comprehensive particularly in urban areas, but not systematically updated, and with no road condition data attached

	Availability	Access	Consistency	Update
Government data	Road agencies, statistical offices	Subject to country policy	Consistent with official network	Govt responsibility
Collected by mobile applications	By RoadLab etc.	Free application	Consistent with official data	Every time when a survey is carried out
Commercial data	e.g., DeLome database	Commercial license	Consistent across countries	Regularly updated
Open data	e.g., OpenStreetMap	Free and open	Vary across countries	On an ad hoc, voluntary basis

(Government data)



(OpenStreetMap)



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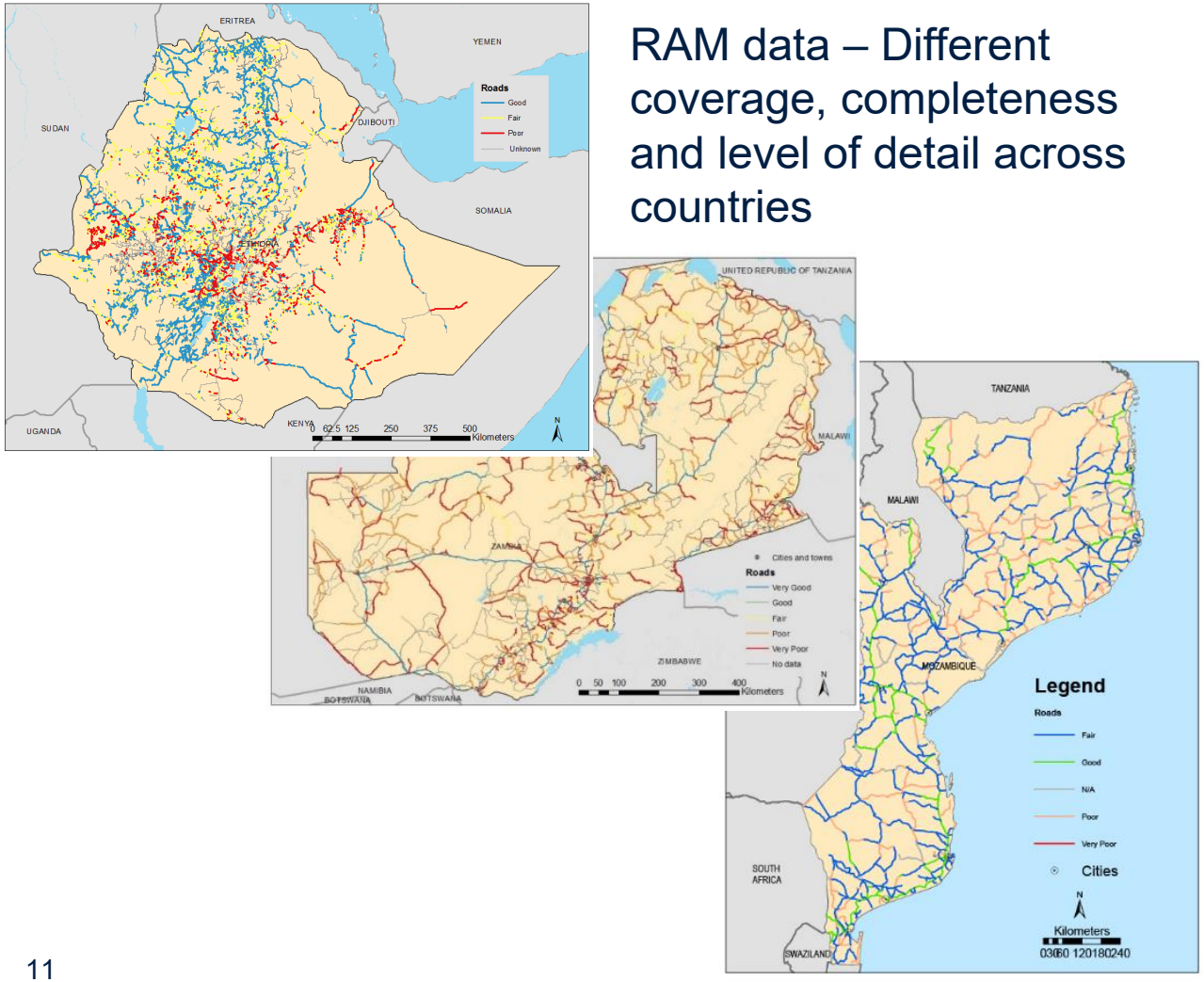
Road conditions? – Normally, road agencies own Road Asset Management (RAM) systems and update them regularly



RAM data – Different coverage, completeness and level of detail across countries

- "All-season road"?
  - If a road is impassable to the prevailing means of rural transport for more than 7 days a year, it is not regarded as all-season (Roberts et al., 2006)
- Conversion needed based on individual country context (weather, road specification, etc.)

Example of "all-season" roads based measured IRI

HDM-4 Recommended IRI default values				RONET Recommended IRI values		
	Paved road				Unpaved	
Condition	Primary	Secondary	Tertiary	Condition	Gravel	Earth
				Very good	7	10
Good	2	3	4	Good	10	13
Fair	4	5	6	Fair	13	16
Poor	6	7	8	Poor	17	20
Bad	8	9	10	Very poor	22	24

Source: World Bank (2016)

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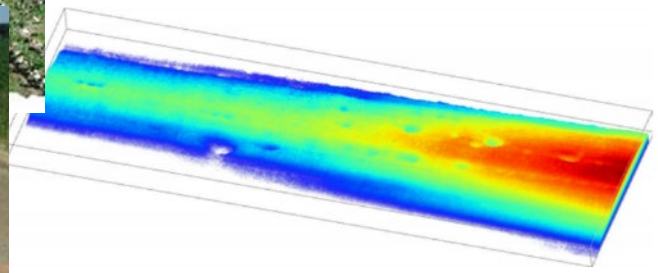
Where does the road condition data come from?
A wide variety of technologies are emerging and now available

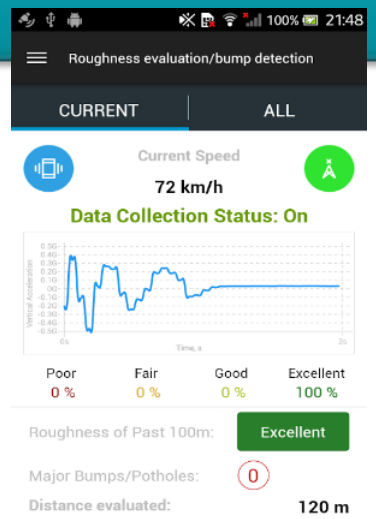
Traditional pavement profiler

Drones



Traditional

Innovative

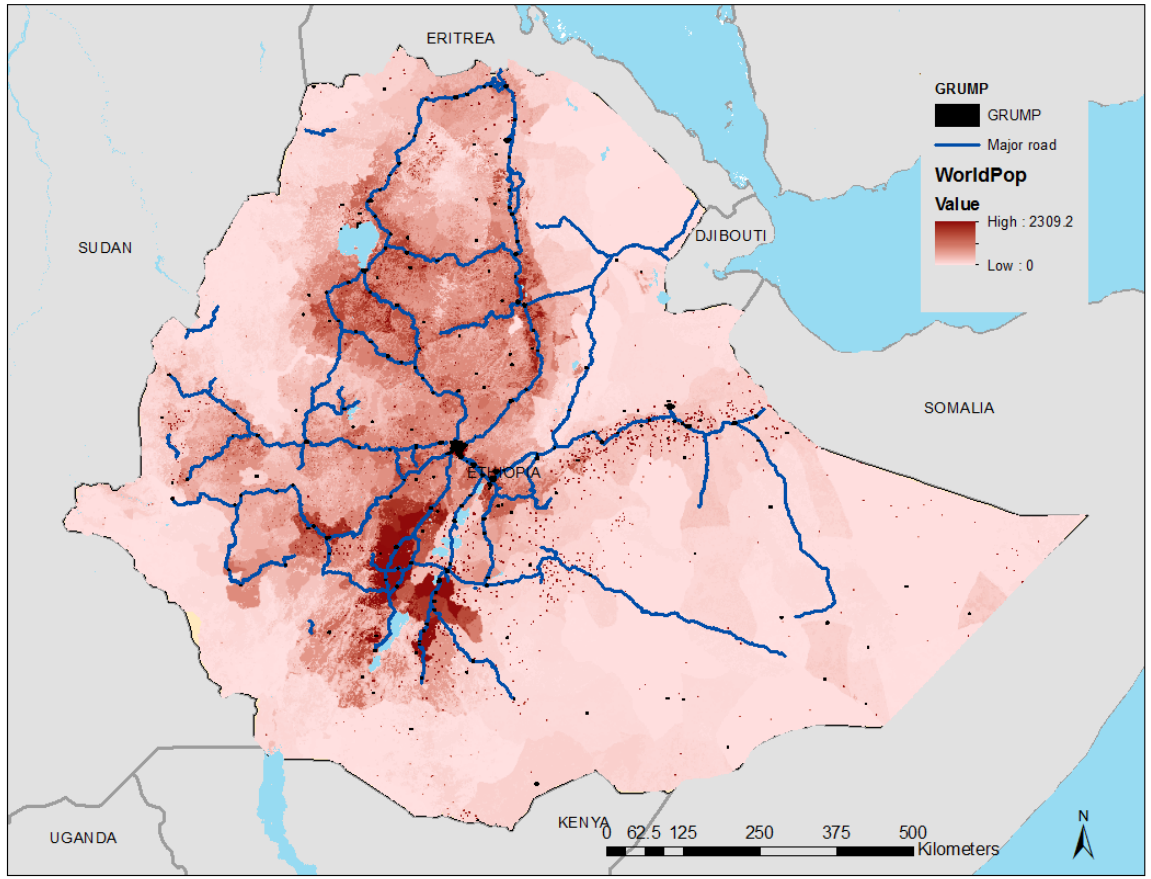


Smartphone app (RoadLab)

High resolution satellite imagery

An example – Ethiopia

81.3 million people live in rural areas



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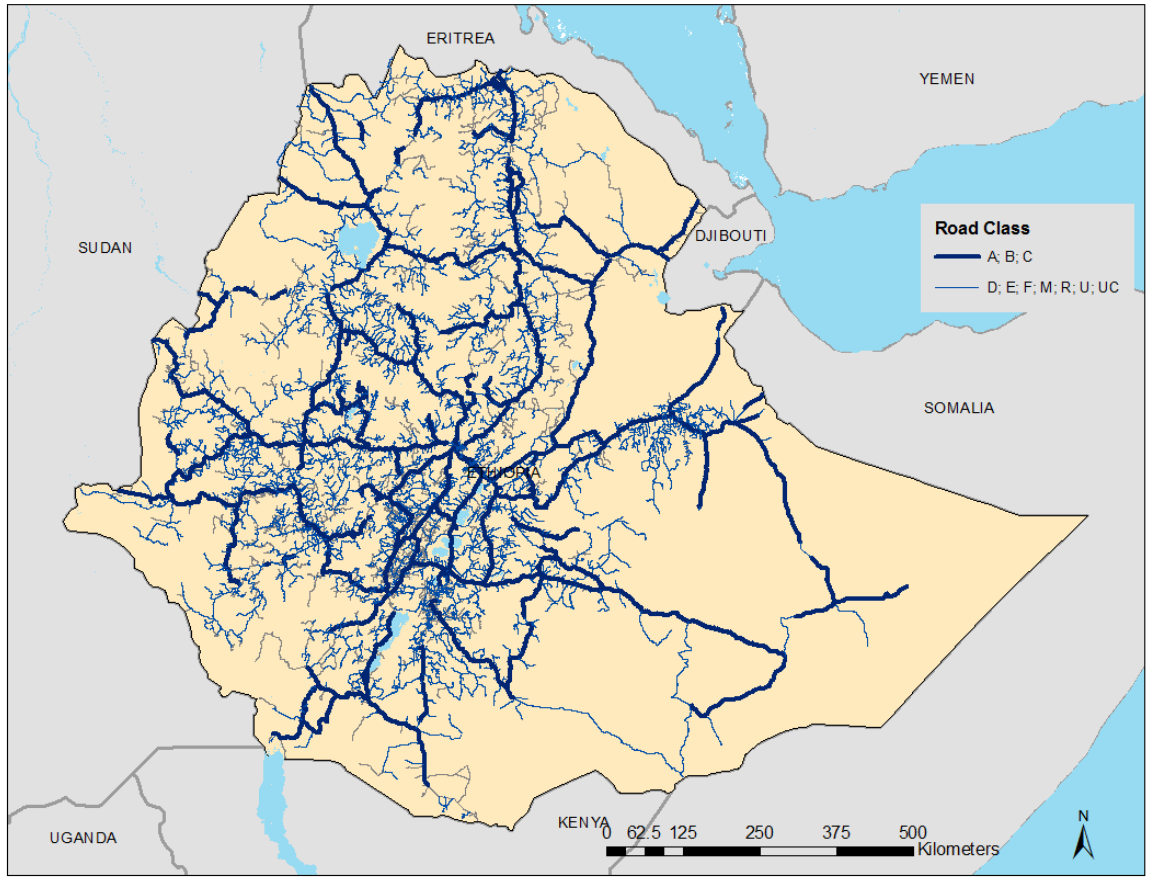
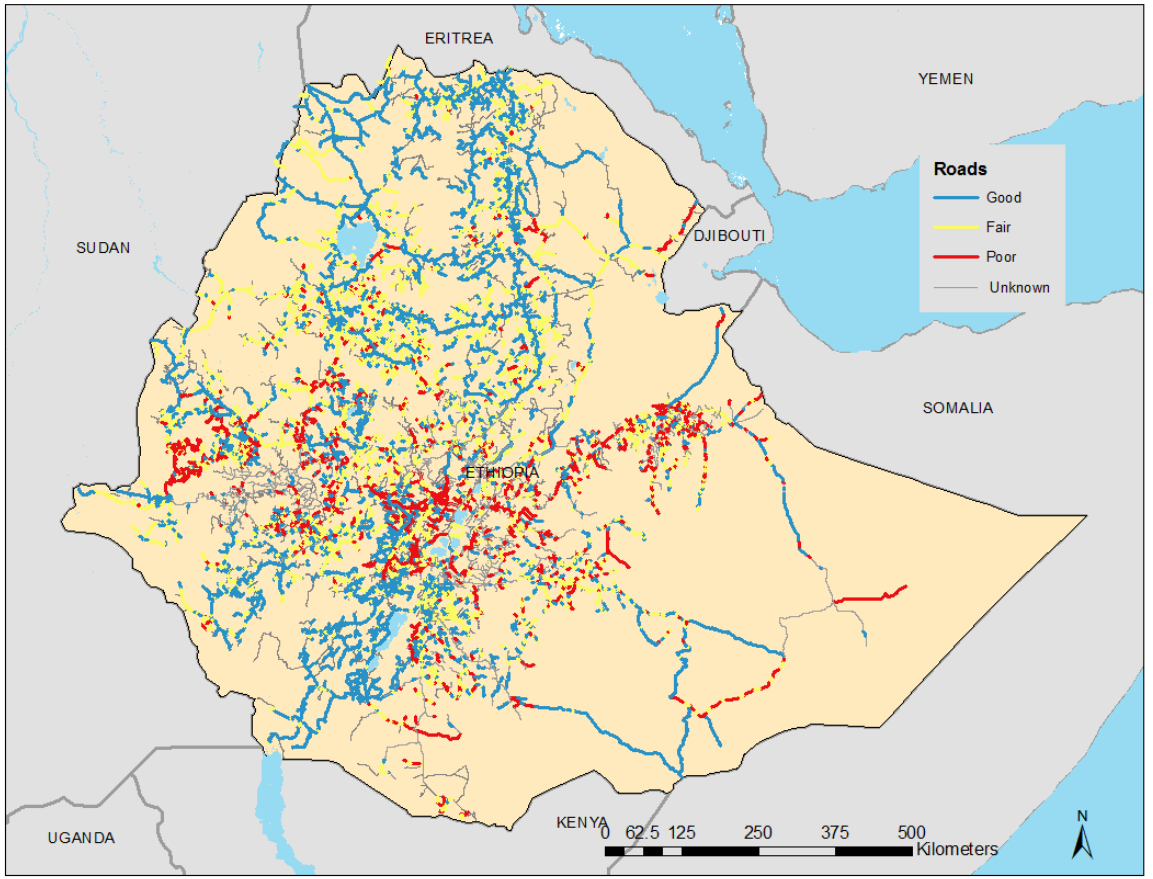
An example – Ethiopia

85,880 km of roads



31% of roads are in "good" condition



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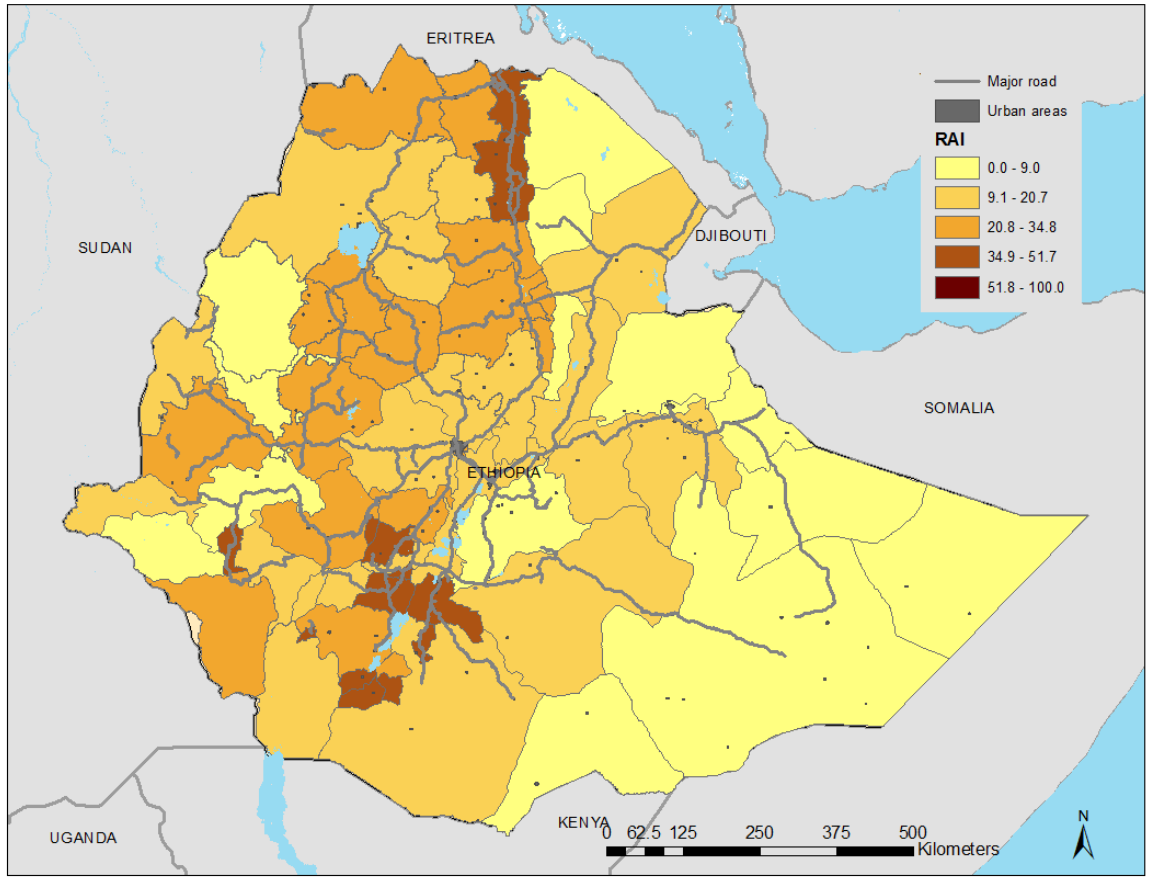
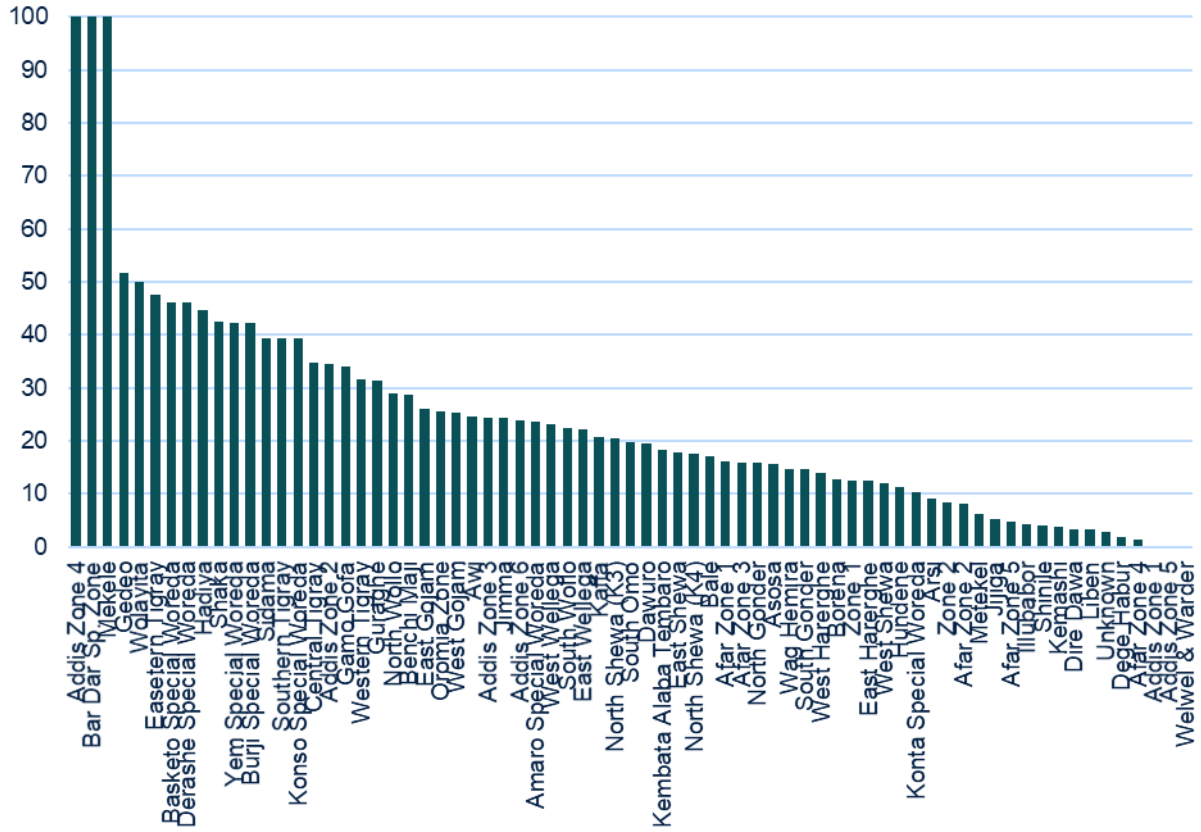
An example – Ethiopia

RAI = 21.6%



Important, RAI varies substantially across districts within the country



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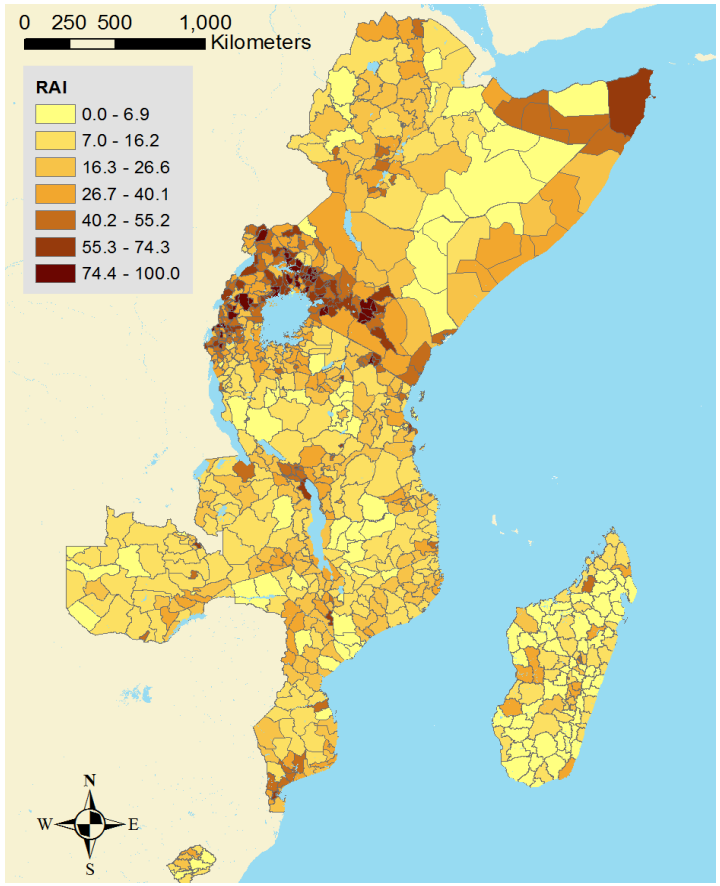
Operational relevance – Subnational RAI indicates potential needs for rural access in a country, guiding rural road programs

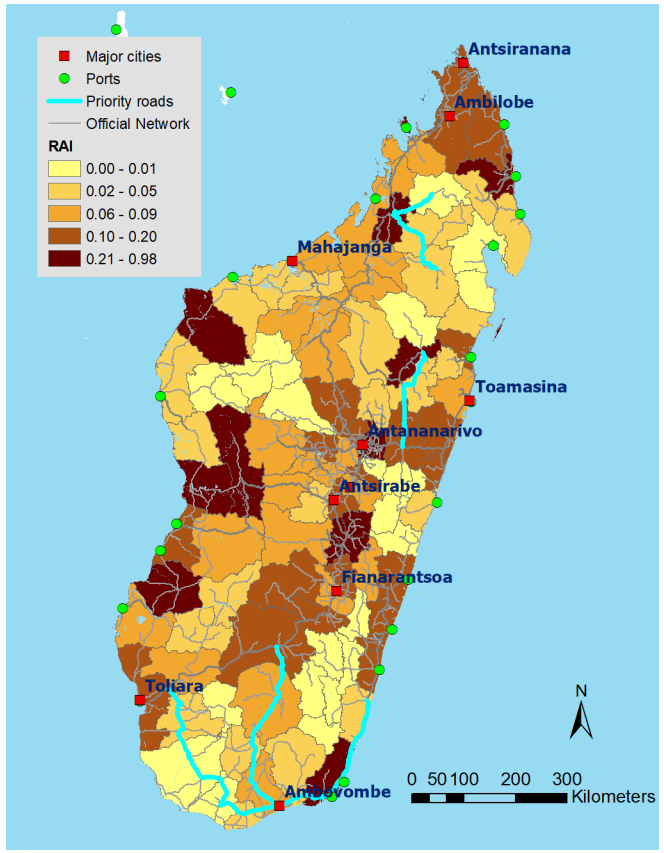
Consistency

Regional connectivity based on RAI in Eastern and Southern Africa

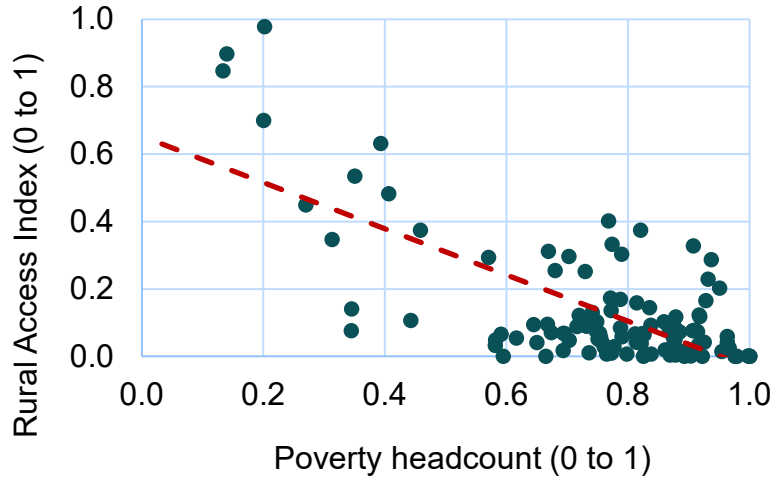


Granularity (subnational data)

In Madagascar, prioritizing rural road programs, based on RAI, agricultural production, poverty, …



Normally, poverty is higher where rural access is limited



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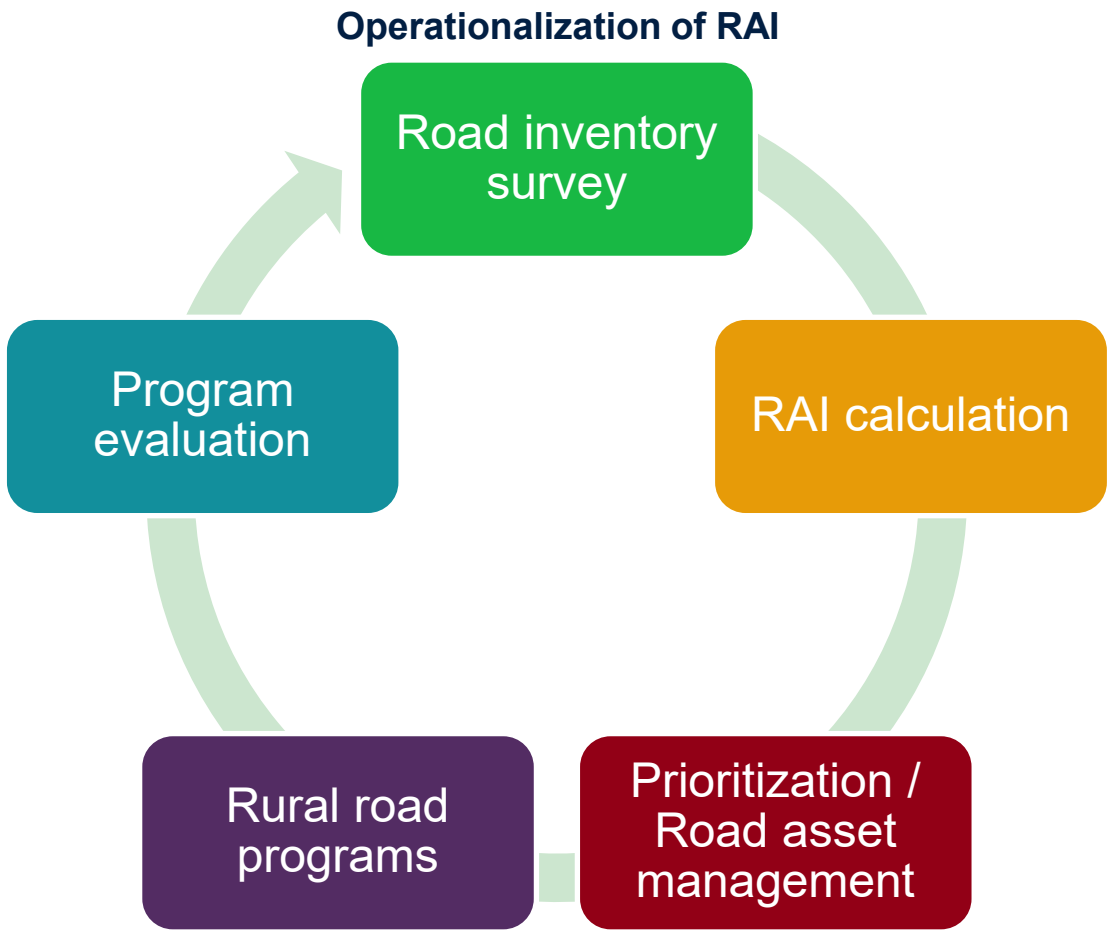
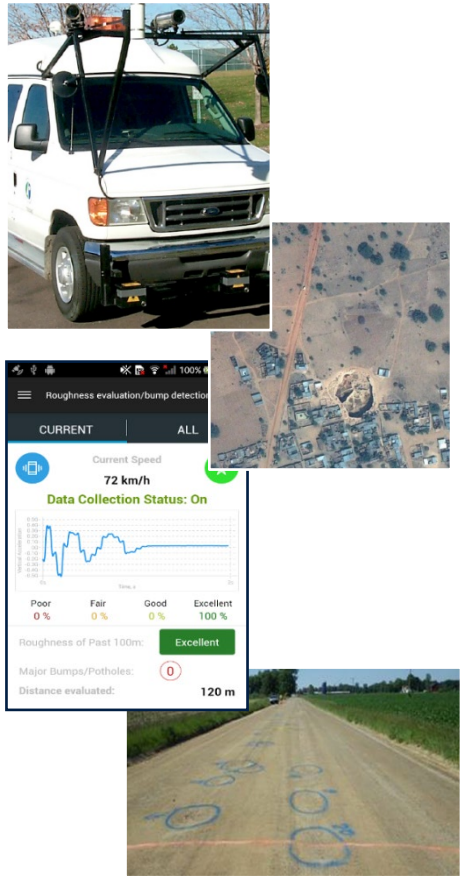
As of now, RAI were updated in 25+ countries… Big data and open data have potential to improve accuracy and sustainability of RAI



1. Regular data collection
   - Collaboration between governments and international community
   - A wide variety of new technologies to collect data

2. Interface between RAMs and RAI calculation tool
   - Traditional RAM data are not georeferenced
   - Govt data may not be comprehensive
   - Multiple datasets (national/local)



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Resources

World Bank Rural Access Index Website
https://datacatalog.worldbank.org/dataset/rural-access-index-rai

Rural Access Methodology Report (2016)
https://documents.worldbank.org/en/publication/documents-reports/documentdetail/367391472117815229/measuring-rural-access-using-new-technologies

Rural Access Update (2017/18)
https://documents.worldbank.org/en/publication/documents-reports/documentdetail/543621569435525309/world-measuring-rural-access-update-2017-18

World Bank. 2020. The Fallout of War : The Regional Consequences of the Conflict in Syria
https://openknowledge.worldbank.org/handle/10986/33936

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Questions?

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