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

Rural Access Index (Roberts et al., 2006)

- 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

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
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
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

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

<table>
<thead>
<tr>
<th>Availability</th>
<th>Access</th>
<th>Consistency</th>
<th>Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government data</td>
<td>Road agencies, statistical offices</td>
<td>Subject to country policy</td>
<td>Govt responsibility</td>
</tr>
<tr>
<td>Collected by mobile applications</td>
<td>By RoadLab etc.</td>
<td>Free application</td>
<td>Consistent with official data</td>
</tr>
<tr>
<td>Commercial data</td>
<td>e.g., DeLome database</td>
<td>Commercial license</td>
<td>Consistent across countries</td>
</tr>
<tr>
<td>Open data</td>
<td>e.g., OpenStreetMap</td>
<td>Free and open</td>
<td>Vary across countries</td>
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</tbody>
</table>
Road conditions? – Normally, road agencies own Road Asset Management (RAM) systems and update them regularly

• “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

<table>
<thead>
<tr>
<th>HDM-4 Recommended IRI default values</th>
<th>RONET Recommended IRI values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Paved road</td>
</tr>
<tr>
<td>Condition</td>
<td>Primary</td>
</tr>
<tr>
<td>Very good</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>2</td>
</tr>
<tr>
<td>Fair</td>
<td>4</td>
</tr>
<tr>
<td>Poor</td>
<td>6</td>
</tr>
<tr>
<td>Bad</td>
<td>8</td>
</tr>
</tbody>
</table>

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

Traditional pavement profiler

Smartphone app (RoadLab)

Drones

High resolution satellite imagery
An example – Ethiopia

81.3 million people live in rural areas
An example – Ethiopia

85,880 km of roads

31% of roads are in “good” condition
An example – Ethiopia

RAI = 21.6%

Important, RAI varies substantially across districts within the country
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
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)
Resources

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

Rural Access Methodology Report (2016)

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
Questions?

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