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UKaid
from the British people

How to use GIS to measure Rural Access for SDG 9.1.1

TRL

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20th November, 2019

Cardno

Establishment of the RAI in 2006

Definition

Rural Access Index = 'the proportion of the rural population living within 2 km of an all-season road'.

All-season = *"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), with some predictable interruptions of short duration during inclement weather (e.g., heavy rainfall) allowed*."

2016 - SDG Indicator 9.1.1

SDG Target 9.1

Develop quality, reliable, sustainable and resilient infrastructure

SDG Indicator 9.1.1

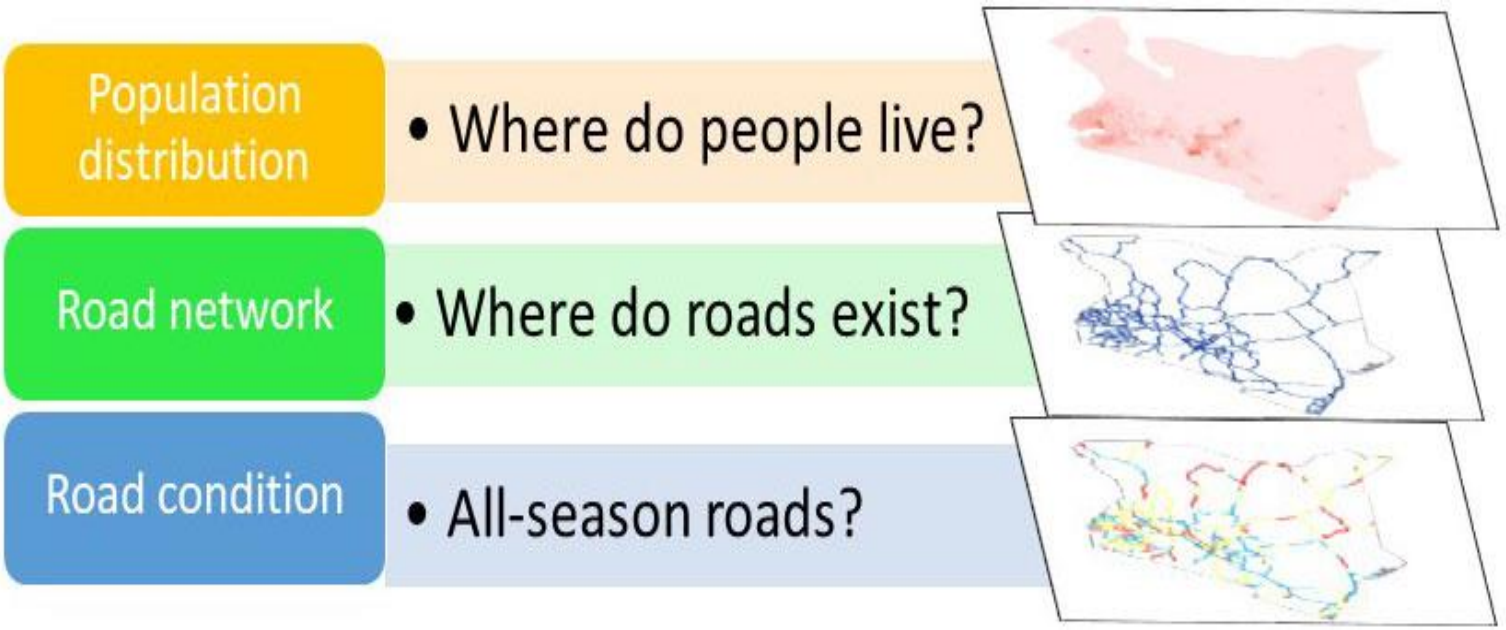
Proportion of the rural population who live within 2 km of an all-season road.

World Bank is the "custodian" of SDG Indicator 9.1.1

2015/2016

UKAid funding, through ReCAP, to update method of measuring the RAI. Pilot measurements in 8 ReCAP countries. Support moving SDG Indicator 9.1.1 to Tier II

Geospatial Approach to the RAI



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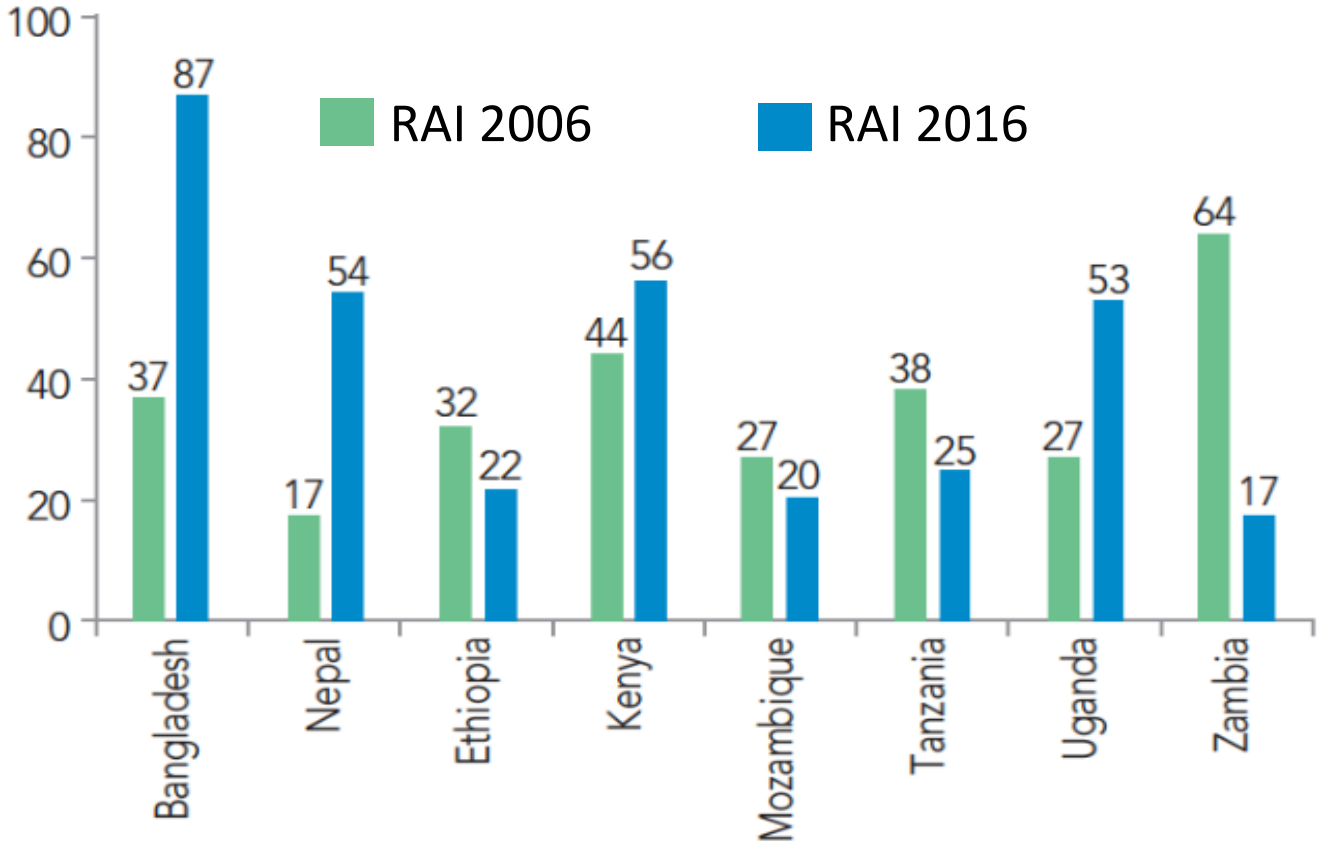
Comparison of 2006 and 2016 results



2019 – RAI Consolidation & Revision

- Scale-up RAI and **advance SDG 9.1.1 from Tier III to Tier II**
- Refine, propose, and agree on **harmonised approach** to data collection and measurement of RAI
- **Refine the measurement framework** to:
  - Meet international standards
  - Provide a clear framework for data validation
  - Ensure consistent and rigorous data collection
- **Trial proposed measurement framework** in 4 ReCAP countries

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SDG Indicator "Tier" system (*Note: Abbreviated*)

Tier I: Regularly produced for at least 50% of countries.

Tier II: Conceptually clear, established methodology, but not regularly produced.

Tier III: No internationally established methodology or standards, but they are being developed.

Current rating of SDG Indicator 9.1.1, the RAI

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- Conducted country trials in:
  - Ghana, Malawi, Myanmar, Nepal
- Engaged with NSO and roads organisations
- Reviewed data for completeness and quality
- Analysed data in GIS format
- Supported local partners to measure RAI

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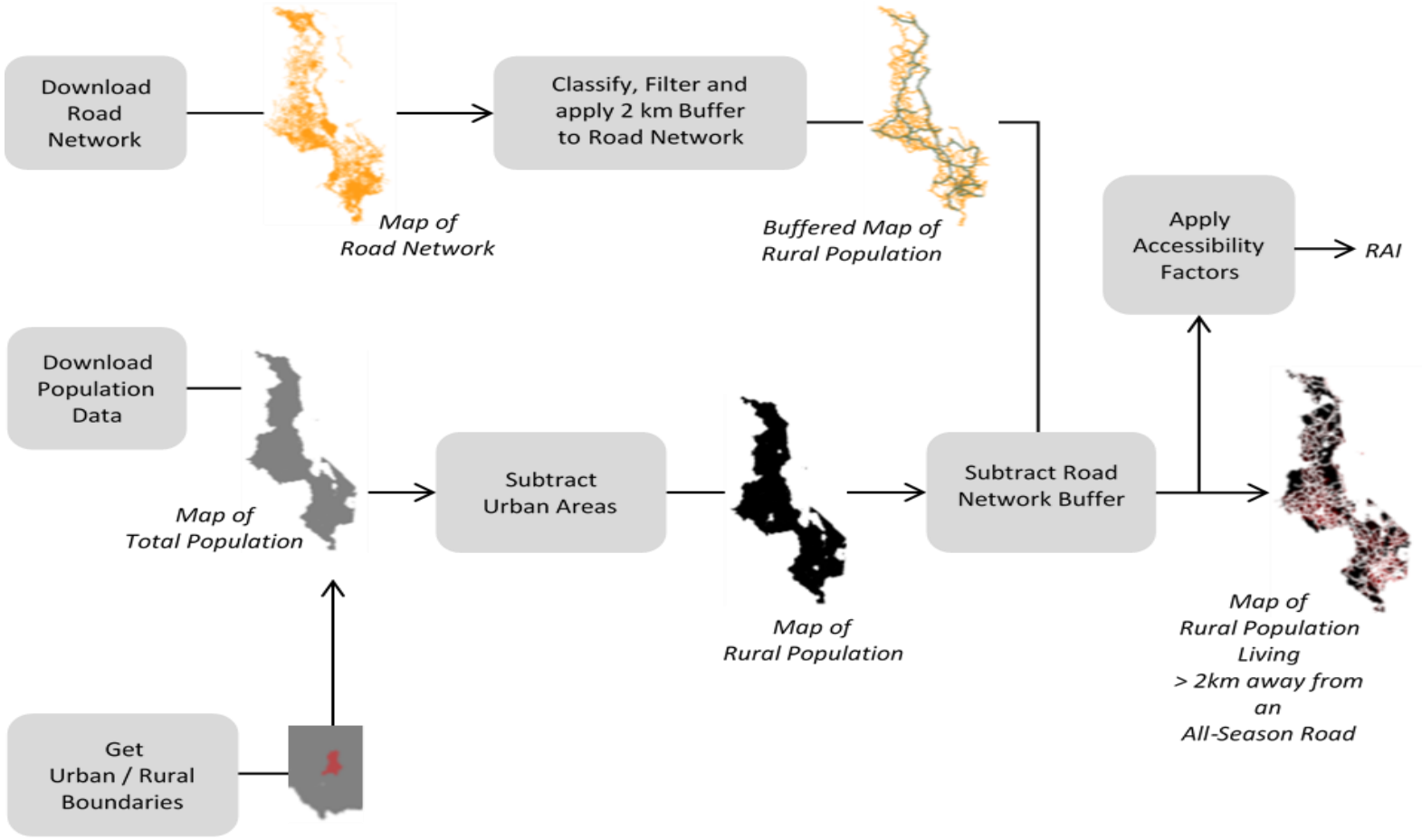
GIS process



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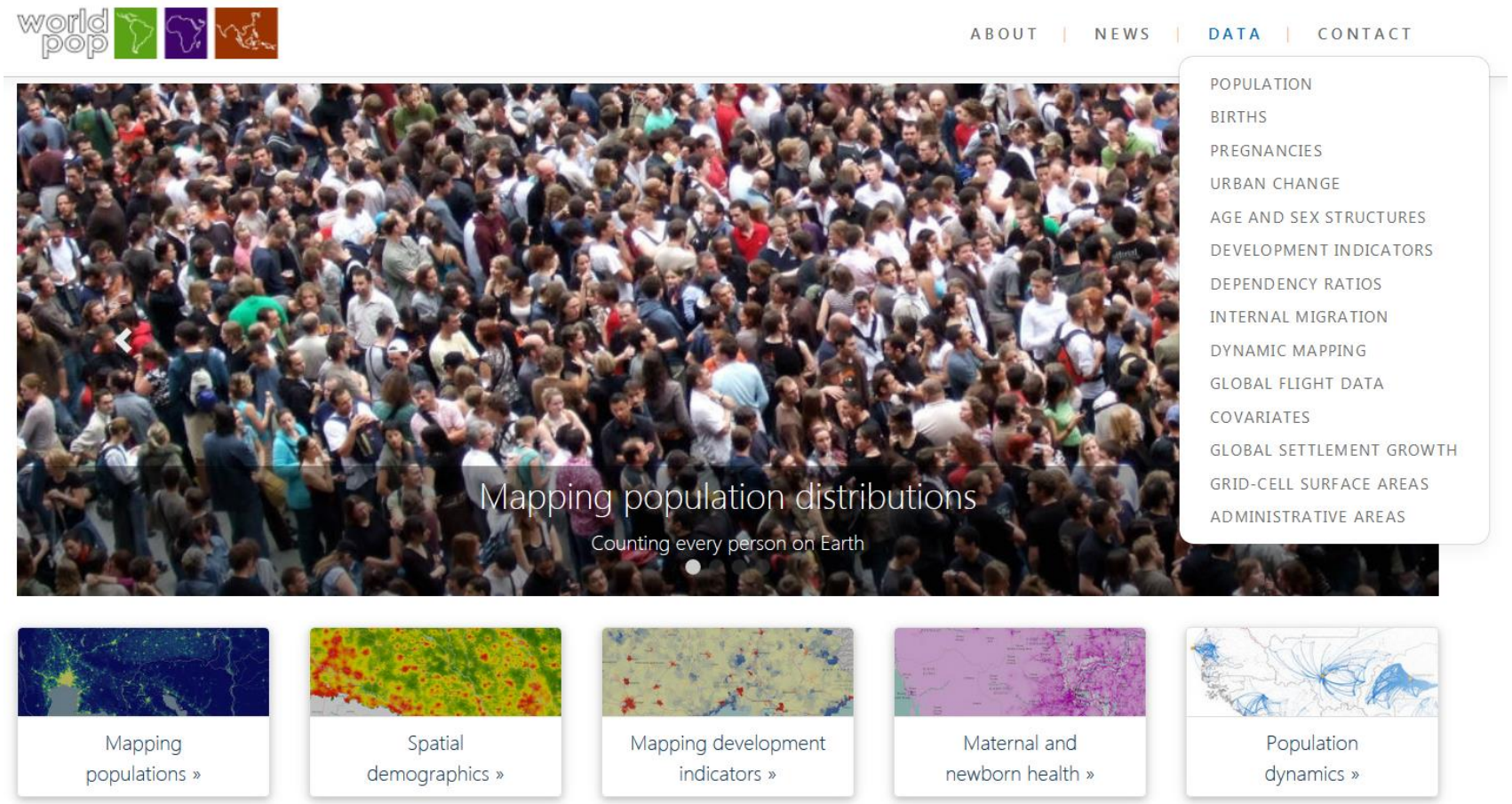
Population Data

WorldPop, Rural / Urban boundaries



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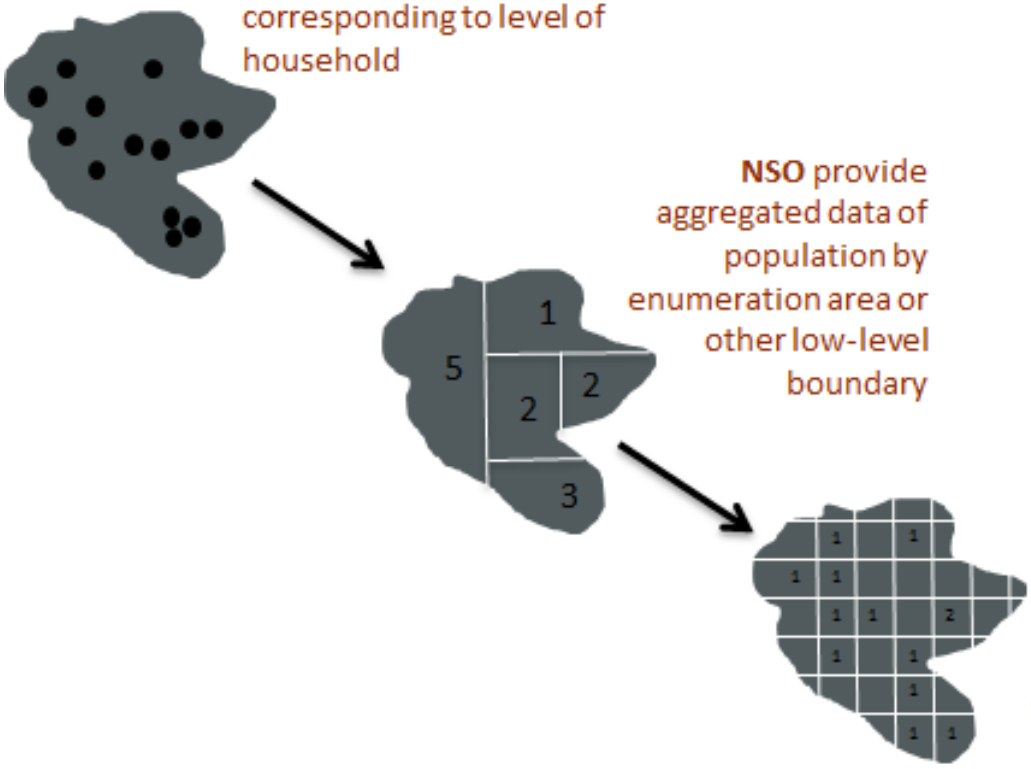
WorldPop data



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Road Network Data

Open Street Map – almost the *de facto* standard for mapping of road network, buildings, health centres, schools etc.

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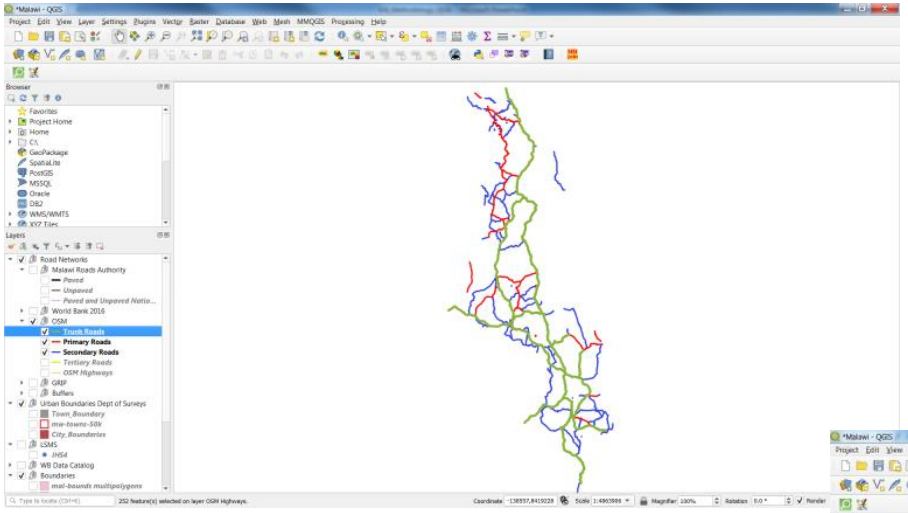
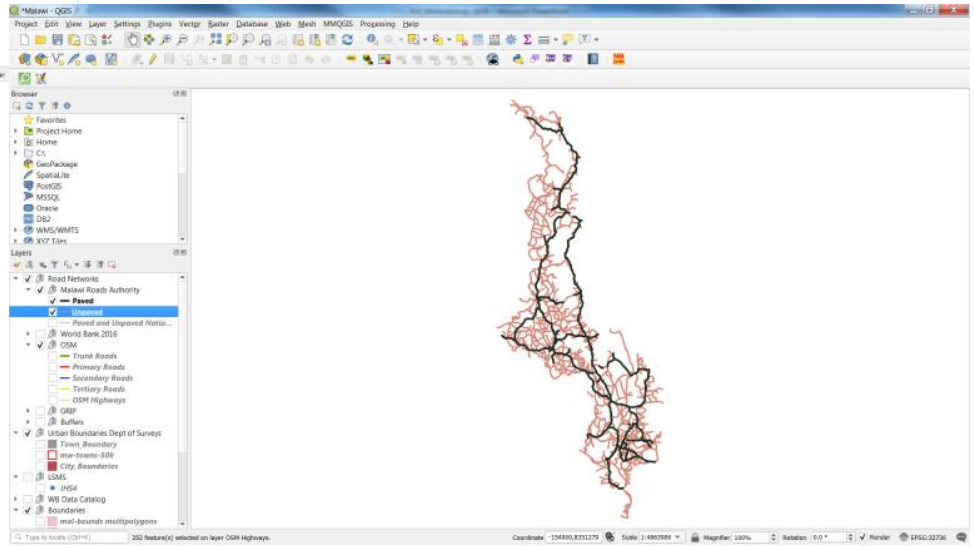
Network processing



Save road networks as separate layers (example from Malawi)

Separate out paved and unpaved roads (treated separately in terms of all-season status)



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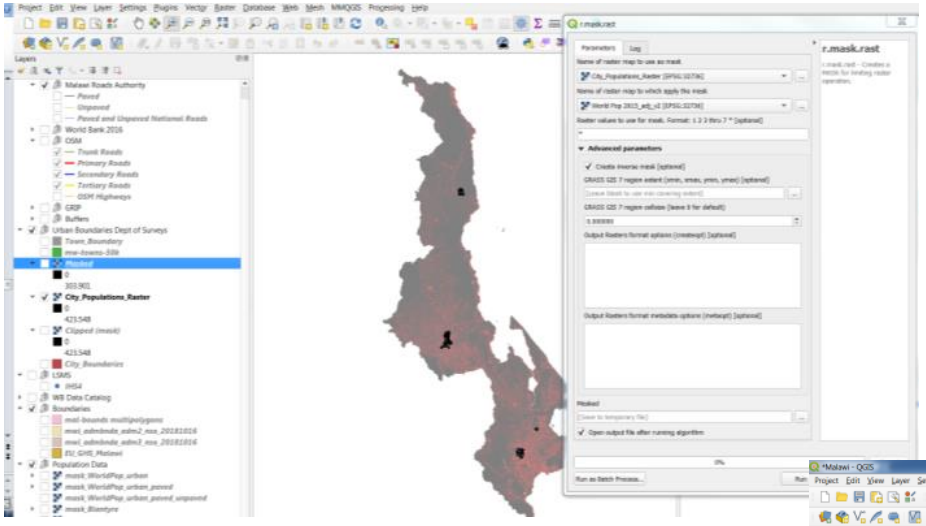
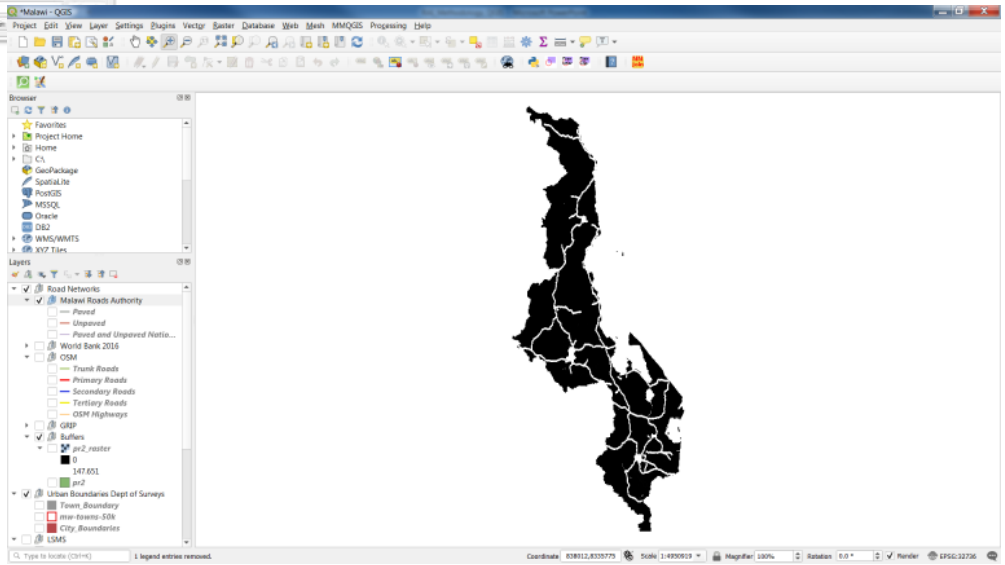
Combine population and roads



Clip urban rasters out to create a raster of rural population

Buffer roads, produce a raster of rural population outside 2km of a paved/unpaved road



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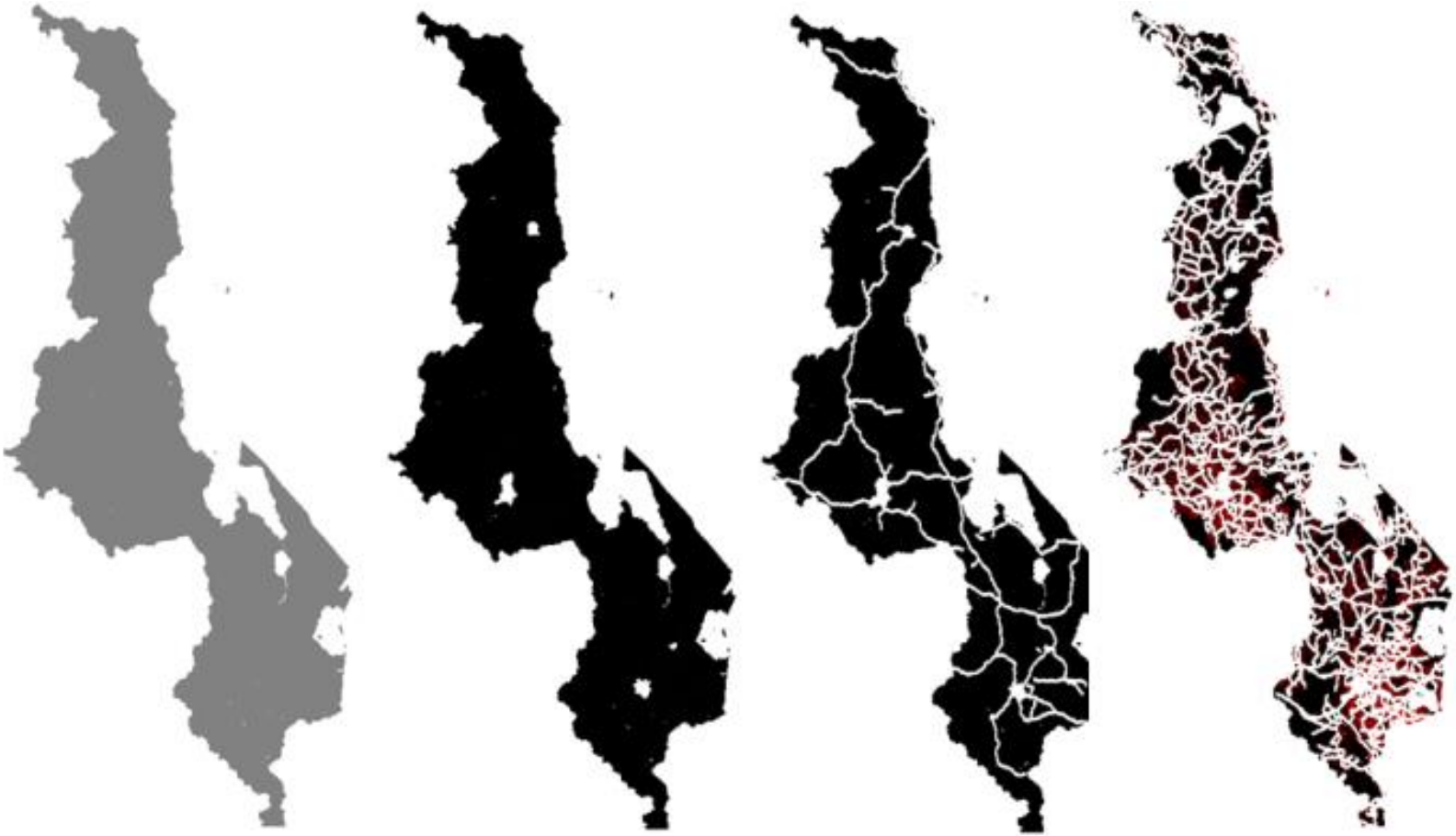
Summary



Total Population | Rural Population | Rural pop. >2km paved | Rural pop. >2km tot.

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Apply all-season road status

Ambiguity surrounding the definition and measurement of an '**all-season'** road:

- Countries do not typically collect data on which roads were impassable and for how long
- Any attempt to collect it retrospectively per road would be subjective and very time-consuming
- Even if a given road flooded once in, say, 2015, does that mean that it is still "not all-season" in 2019?

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Accessibility factor as a proxy for ‘all-season’

Alternative approach based on “accessibility factors” defined by each country, to be used where road condition is unavailable or unreliable. Ground truth the accessibility factors.

		Terrain	
		Low Risk (e.g. Flat, Rolling)	High Risk (e.g. Mountainous)
Climate	Low Risk (e.g. Dry Season)	1	1
	High Risk (e.g. Wet Season)	1	0.9

		Terrain	
		Low Risk (e.g. Flat, Rolling)	High Risk (e.g. Mountainous)
Climate	Low Risk (e.g. Dry Season)	1	0.9
	High Risk (e.g. Wet Season)	0.9	0.8

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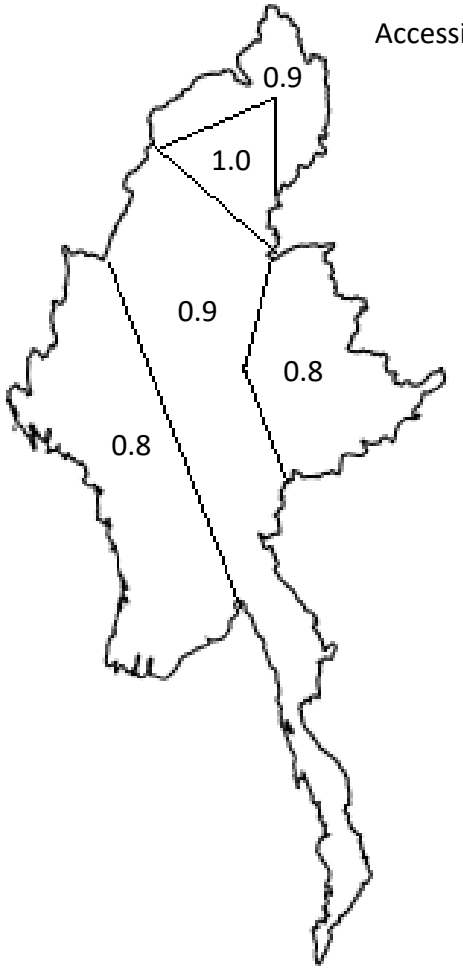
Accessibility Factor applied

(example Myanmar)



Accessibility factor map: Unpaved roads

Accessibility factor table for unpaved roads (from Figure 1)

		Terrain	
		Low Risk (e.g. Flat, Rolling)	High Risk (e.g. Mountainous)
Climate	Low Risk (e.g. Dry Season)	1	0.9
	High Risk (e.g. Wet Season)	0.9	0.8

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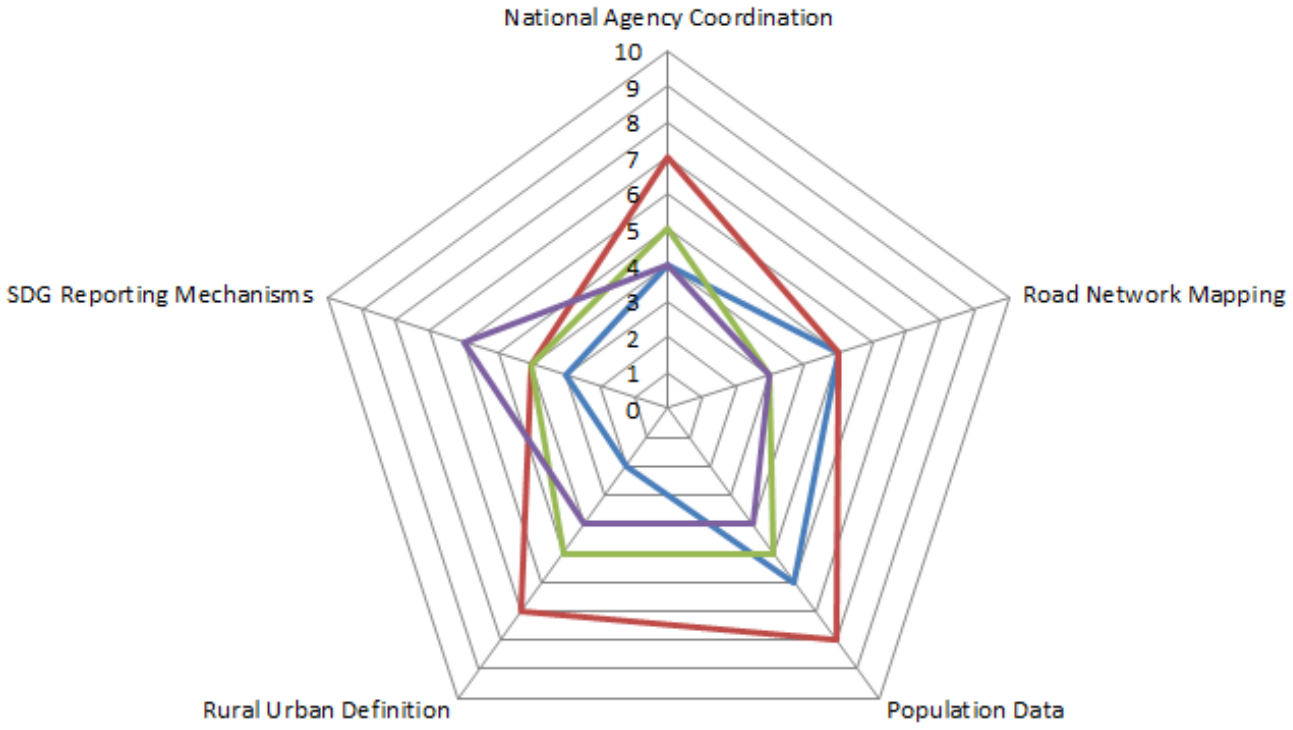
Assessment Framework for countries' readiness and capacity to calculate and publish RAI:



2020 – Next Steps for RAI

RAI Calculation Tool (by Azavea)

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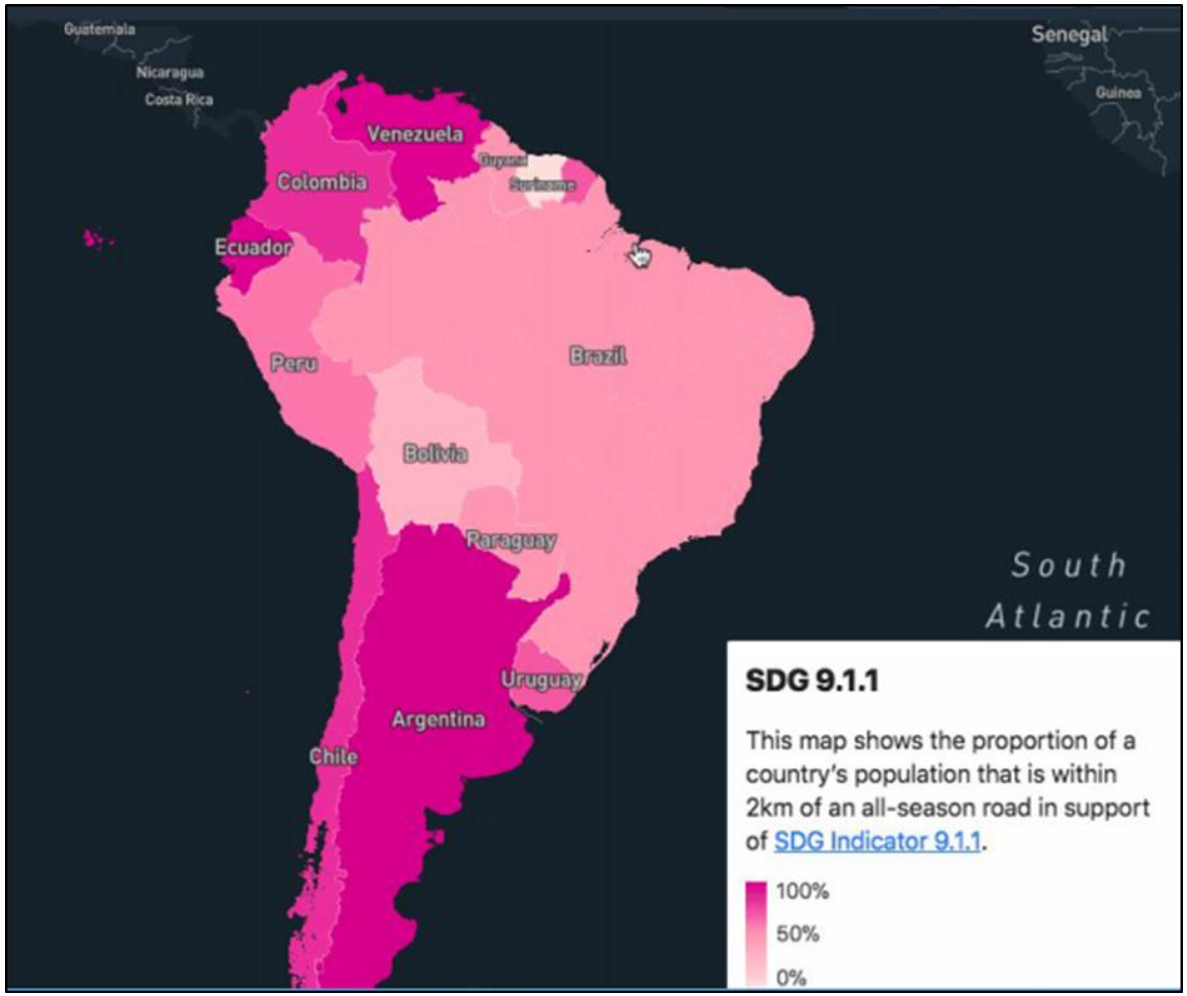
RAI Calculation Tool



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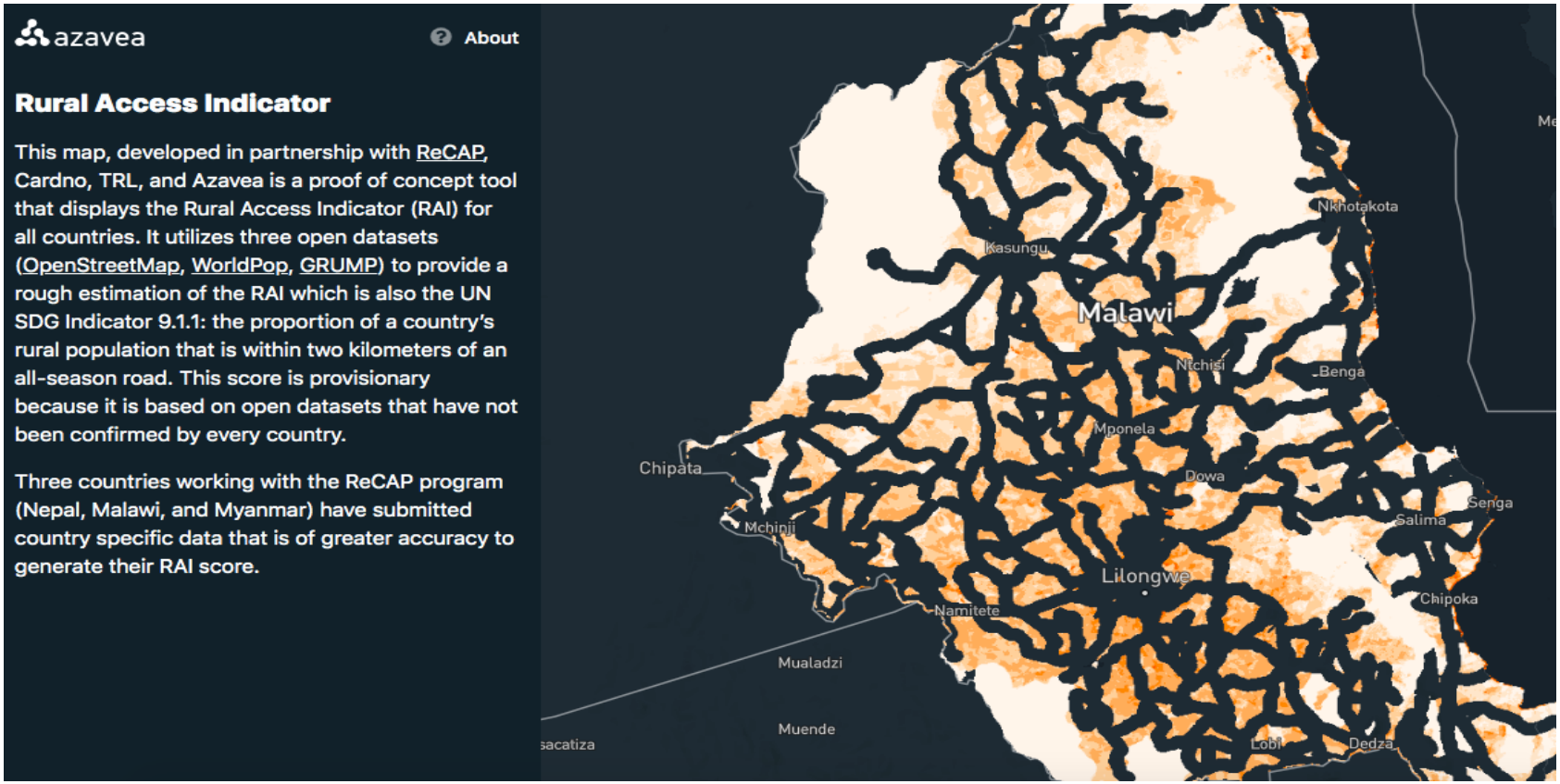
RAI Calculation Tool



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RAI with Absolute Numbers

	Population (millions)			
Region	**Total**	**Rural**	**Living >2 km away from an all-season road**	**RAI**
Africa	*1,317.7*	*908.4*	*421.1*	*53.6*
Americas	*1,057.3*	*222.7*	*71.0*	*68.1*
Asia	*4,632.8*	*2,590.6*	*658.9*	*74.6*
Europe	*757.1*	*190.6*	*19.8*	*89.6*
Oceania	*37.4*	*12.8*	*7.4*	*42.2*
World	***7,802.3***	***3,925.0***	***1,178.2***	***70.0***

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Conclusions

- Accurate, replicable and sustainable method of measuring SDG 9.1.1 in the future, to ensure its continued use
- Sustainability depends on the data collection being kept simple and undemanding on local resources
- Maximise the use of GIS software and tools
- Define the all-season status of the road without putting extra burden on countries to collect additional data
- Specialist expertise and extensive experience in GIS should not be necessary
- The calculation tool being developed on the UN Global Platform will make measurement simple and quick
- More funding necessary for Phase 3

Thank you for your attention

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