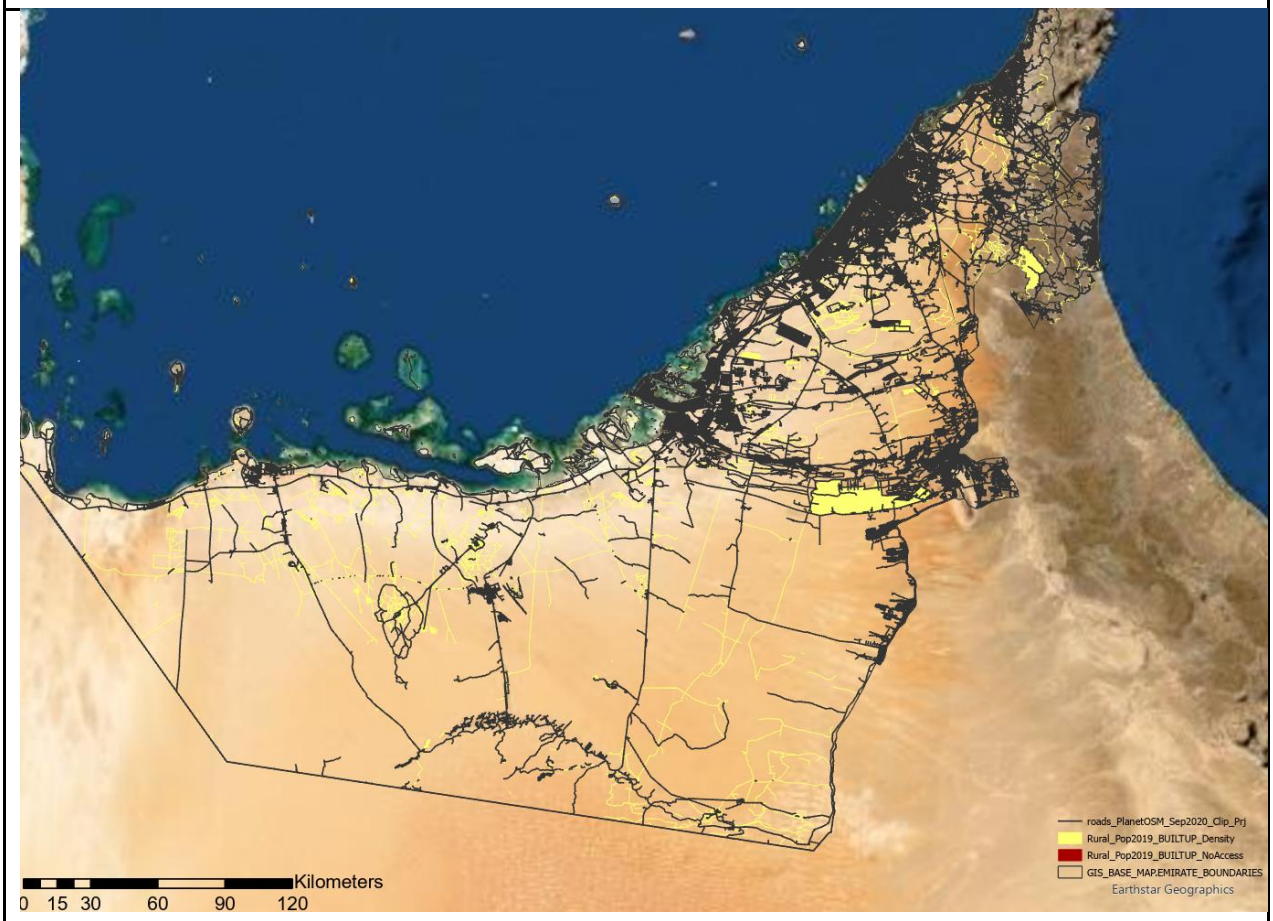
EARTH OBSERVATIONS FOR THE SUSTAINABLE DEVELOPMENT GOALS

United Arab Emirates' Practice in Calculating Rural Access Index (RAI) using Earth Observations



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

To track and report SDG indicators, the United Arab Emirates (UAE) Federal Competitiveness and Statistics Centre (FCSC) is continuously trying to utilize the latest techniques and tools available such as Earth observations, geospatial information, and big data in calculating SDG indicators. An example of this effort is the approach used in calculating SDG indicator 9.1.1: "Proportion of the rural population who live within 2 km of an all-season road" on 2019 datasets.

Relevant Indicators

9.1: Sustainable and resilient infrastructure to support economic development and human well-being

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

To calculate the indicator, FCSC followed the following steps:

Data Inputs:

1. OpenStreetMap (OSM) 2020 - Planet OSM data
2. Built-up Area from Landsat imagery:
   - European Commission GHS built up epoc 2015 – 250 meters resolution
   - European Commission GHS built up sentinel 2016 - 30m resolution - method of 2019
   - FCSA Built-up areas extracted from Landsat imagery
   - Residential areas from Ministry of Energy and Infrastructure
3. UAE 2019 population estimate per sub district
4. Global Rural-Urban Mapping Project (GRUMP), v1 the dataset consists of polygons representing urban extents with population figures for 1990, 1995, and 2000.

Data Preparation Steps

1. Road Dataset from OSM - Data Preparation:
   - Download OpenStreetMap 2020 and Project it WGS UTM 40 N.
   - Clip by UAE boundary
   - Review all roads layer types to exclude 17 types of roads like pedestrian, footway, bridleway, construction (TBC under construction can be partially seen on Google), corridor, cycle way, disused, elevator, footway, path (TBC), proposed, secondary (TBC), secondary link, steps, track, traffic island, razed, virtual rail (later to consider excluding if needed: unclassified (mix of existing and non-existing roads, residential)
   - Definition Query on roads_PlanetOSM_Sep2020_Clip_Prj
     type <> 'construction' And type <> 'bridleway' And type <> 'pedestrian' And type <> 'footway ' And type <> 'corridor' And type <> 'cycleway' And type <> 'disused' And type <> 'elevator' And type <> 'path ' And type <> 'proposed' And type <> 'secondary' And type <> 'secondary_link' And type <> 'steps' And type <> 'track' And type <> 'traffic_island' And type <> 'razed' And type <> 'virtual_rail'

Additional Resources

Link of the published indicator on the SDG Hub

UAE Calculation Methodology for Rural Accessibility Index (RAI) and SDG 9.1.1

Point of Contact
UAE Federal Competitiveness and Statistics Centre (FCSC)

GIS Section
Marwa Elkabbany
Marwa.Elkabbany@fcsc.gov.ae

SDG Section
Reem Alhammadi
Reem.alhammadi@fcsc.gov.ae

- Buffer Roads by 2 km
- Dissolve the buffer for faster performance

2. Built-up Area - Data Preparation:
   - Merge built up areas datasets from European commission, Landsat that were extracted from satellite imageries with resolutions varying from 250 to 30 meters.
   - Combine with the residential areas maps received from ministry of energy and infrastructure

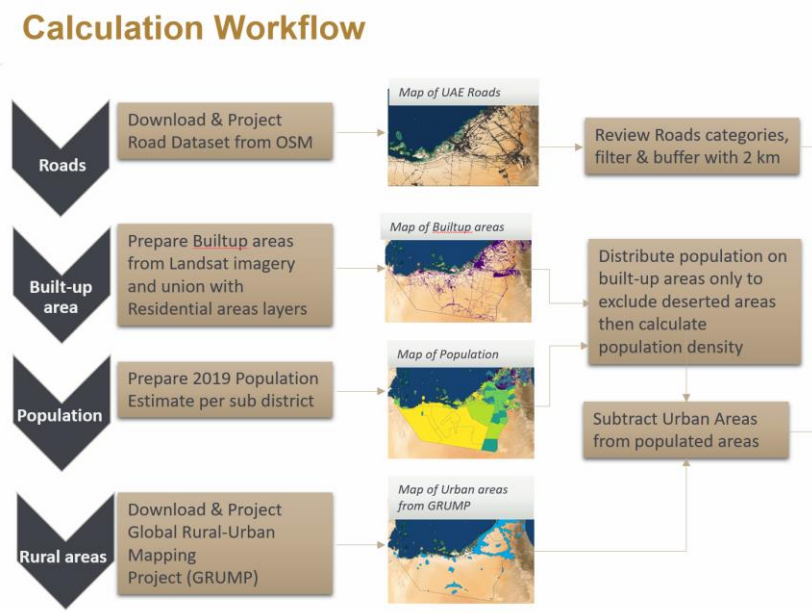
3. Population Dataset – Data Preparations:
   - Distribute population on built-up areas only to exclude deserted areas then calculate population density- which will be used to assume population in rural areas later.

Calculation Steps

Note: for the time being, the Global Rural-Urban Mapping Project (GRUMP) – based on the World Bank Rural accessibility index methodology - was used. GRUMP dataset represents urban extents and areas out of GRUMP are considered rural.

- Subtract Urban Areas (GRUMP Dataset) from built up population dataset with density, using the erase tool to extract Rural population area with population densities.
- Calculate total rural population from population density field: !DensityinBuiltup! *! Rural_Area_SQKM!
- Extract the Rural Population with no road access: Subtract Rural Population from Roads Buffer. The result is a map of Rural Population within a distance of more than 2km from all season access road.
- Then calculate total rural population with no road access from density and sq km area. The results show that.

Workflow Summary Diagram



Results & Impact

Rural populations that are more than 2 km from an all-season road represent 4.91% of the total rural population, while rural populations within 2 km from an all-season road – the RAI index - equals 95.09%.

The calculation was based on rural areas delineation by GRUMP dataset, which will be enhanced after applying the national definition and mapping rural areas according to ground truth data.

Enabling Factors

- Availability of Streets Open Data like OSM
- Availability of global definition for urban areas

Constraints

- Accuracy limitation of streets open data in the region
- Global Urban definitions might not fit all countries, for example the urban-rural classification by GRUMP may not be consistent with the national definition and perhaps be outdated given the country's high and rapid urbanization.

Conclusions and Recommendations While countries are working on developing national geo-datasets, like population, urban/rural areas, streets network, which may take a lot of time and resources to complete, national agencies shall consider leveraging publicly available open datasets and global definitions to start measuring and tracking sustainable development indicators.	