World Health Organization

# Geographic accessibility for geo-enabled microplanning for health campaigns + tech demonstration

## WHO GIS Centre for Health

# Outline

- What is geo-enabled microplanning?
- Geographic accessibility modelling for malaria campaigns
- Tool demonstration: AccessMod NextGen
- Geo-enabled microplanning handbook
- Question and answer session (10 minutes)

# WHO GIS Centre for Health

**"Timely and reliable decisions save lives"**

Geospatial technology in the form of Geographic Information System (GIS) enables spatial representation of data to support better public health planning and decision-making.

Geospatial data and techniques are also an effective tool to monitor progress and provide a strong basis for policy making to achieve the SDGs and deliver the GPW13 Triple Billion targets.

The medical applications of GIS are numerous, but many countries currently lack the benefits of GIS to strengthen their health information system.

By connecting maps, apps, data and people, WHO GIS Centre for Health (GISC) is dedicated to supporting countries and partners to make informed public health decisions faster and to extend the reach of geospatial information across the Organization.

By continuing to expand its collaboration with partners WHO GIS Centre for Health aims at bridging inequalities within and across countries.

Since August 2020, WHO GIS Centre for Health - a unit of WHO Division of Data, Analytics and Delivery for Impact (DDI), has been focusing on high-impact delivery and supporting relevant topics in the health sector by being part of the COVAX GIS Working Group, initiating an international database 'WHO Snakebite Information & Data Platform' for better snakebite management, rolling out a system for surveying excess mortality effectively, and engaging in transfer of knowledge as well as capacity building and advocacy to reach all Member States.

The overarching goal of WHO GIS Centre for Health is to support Member States in the efficient and effective delivery of health care to the entire world population.


**The overarching aim will be met through the following goals:**

**Goal 1:** Enable WHO, through its Regional and country offices, to operationalize and scale geospatial data and technologies

**Goal 2:** Foster meaningful partnerships that allow WHO and Member States to use fit-for-purpose GIS supported solutions

**Goal 3:** Establish and maintain a consolidated repository of geospatial data, tools and best practices for effective deployment to priority WHO missions

World Health Organization

SCAN ME TO LEARN MORE


WHO GIS Centre for Health
Division of Data, Analytics and Delivery for Impact
www.who.int/data/gis gissupport@who.int

# Meet the GISC team

**Today this team is 42 geospatial experts and allied resources working across 10 time zones from Fiji to Seattle**

**Adam**
Coder, geodatabase specialist

**Ali**
Monitoring and Evaluation

**Ana**
GIS specialist, project facilitator

**Anare**
GIS Specialist

**Anna**
Spatial biologist

**Annette**
GIS specialist

**Asela**
GIS specialist and data expert

**Bodour**
Project facilitator

**Cam**
GIS Specialist

**Carlos**
Geospatial Health Analyst

**Catherine**
Project facilitator

**Chris**
Emergency specialist, project facilitator

**Cici**
Geospatial data scientist

**Daniel**
GIS server expert

**Deen**
Statistician

**Denise**
Monitoring and evaluation

**Gopi**
GIS Specialist

**Ian**
GIS specialist

**Inge**
Training and capacity development specialist

**Jaouad**
GIS specialist, project facilitator

**Jessie**
Project facilitator

**Jing**
Product evangelist

**Jo**
GIS specialist

**Jon**
Partnerships

**Julia**
Geospatial data assistant

**Kshitij**
Web and IT specialist

**Kt**
Cartographer

**Lucy**
Geospatial data assistant

**Marc**
Project facilitator

**Marissa**
Administrative support

**Michael**
Business analyst

**Mojdeh**
Program support

**Nadika**
Geospatial Health Analyst

**Nick**
GIS data and research specialist

**Nim**
Project facilitator

**Nomsa**
Business analyst

**Oluwaseun**
GIS specialist

**Paul**
GIS Specialist

**Prashant**
GIS specialist, project facilitator



**Ravi Shankar**
GIS team lead



**Samuel A.**
GIS specialist, project facilitator



**Samuel O.**
GIS Specialist, Project facilitator



**Tamer**
GIS specialist, project facilitator

# Microplanning team at the GIS Centre for Health

**Ravi Shankar**
*Head*
*GIS Centre for Health*

**Chris Jung**
*Emergency Specialist*
*Project Facilitator*

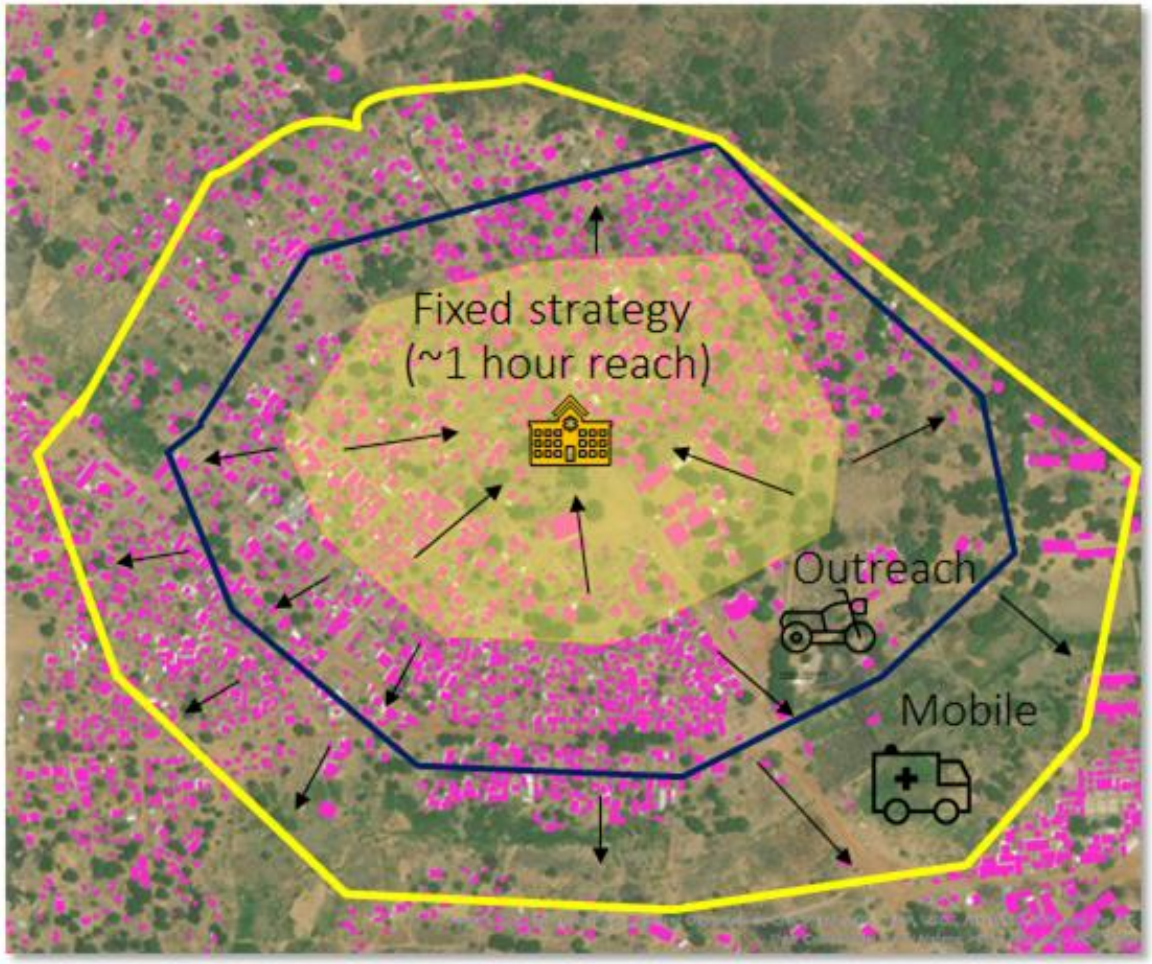
**Jo Belanger**
*GIS Specialist*

**Ana Lourenco**
*GIS Specialist*
*Project Facilitator*

**Denise Ferris**
*Monitoring & Evaluation*

**Samuel Omara**
*GIS Specialist, Project Facilitator*

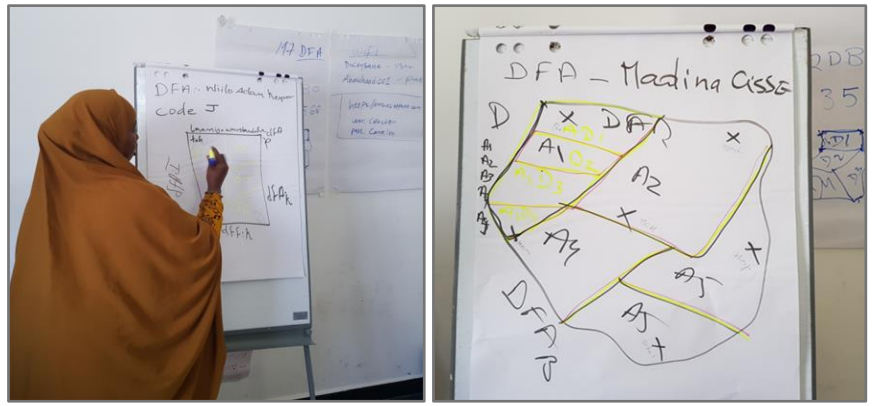
# What is Geo-enabled Microplanning?




Geo-enabled microplanning involves the use of geospatial data and technologies, including geographic information systems (GIS), to support the planning and monitoring of service delivery at the local level of health facility and health district.

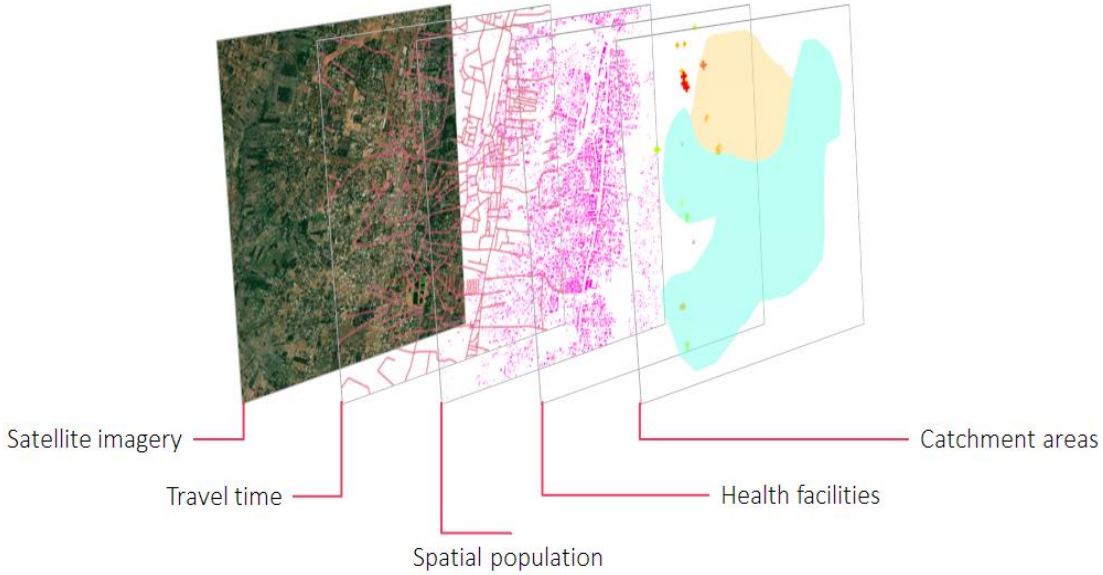
Using spatial data on the location of populations, health resources and the surrounding environment in a GIS environment, digital microplanning can ensure all populations are accounted for, identify gaps in population equitable access to care, and optimize planning for outreach activities to ensure equitability and reach of services.

# Geo-enabled Microplanning



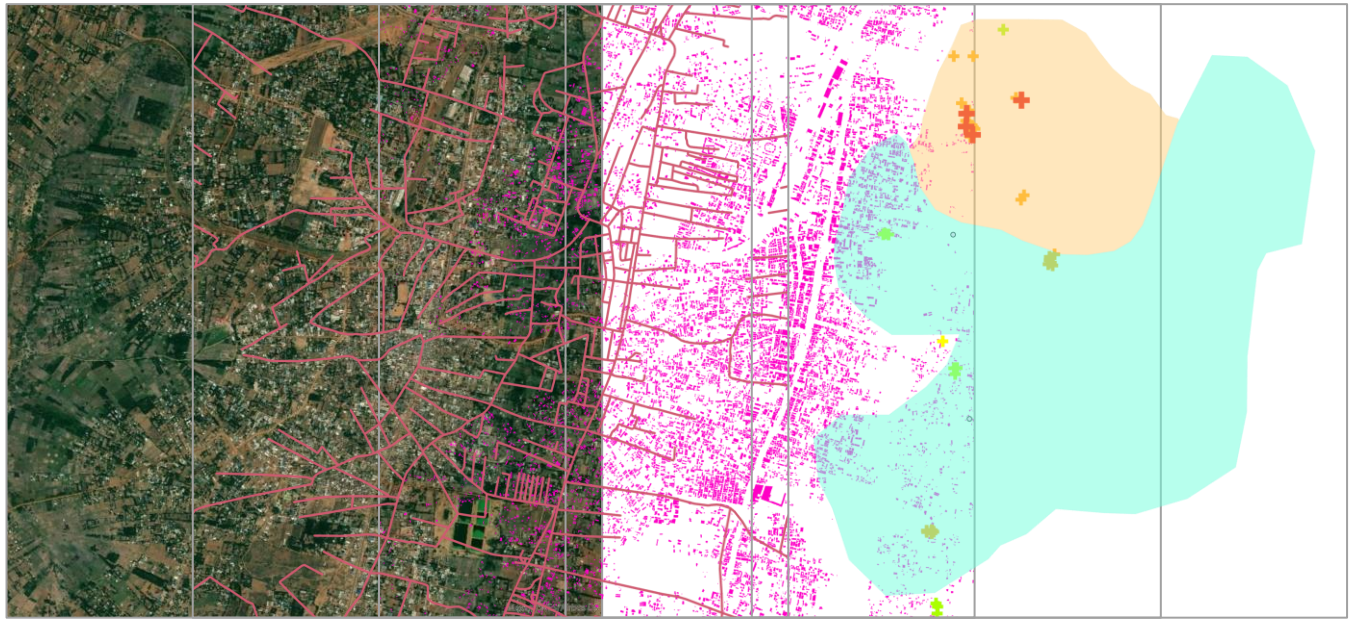

Microplanning using sketch maps and non digital tools

Geospatial data components




A data-driven and digitally enabled microplan using geospatial data and technologies

# Geospatial data components



Satellite imagery

Travel time

Spatial population

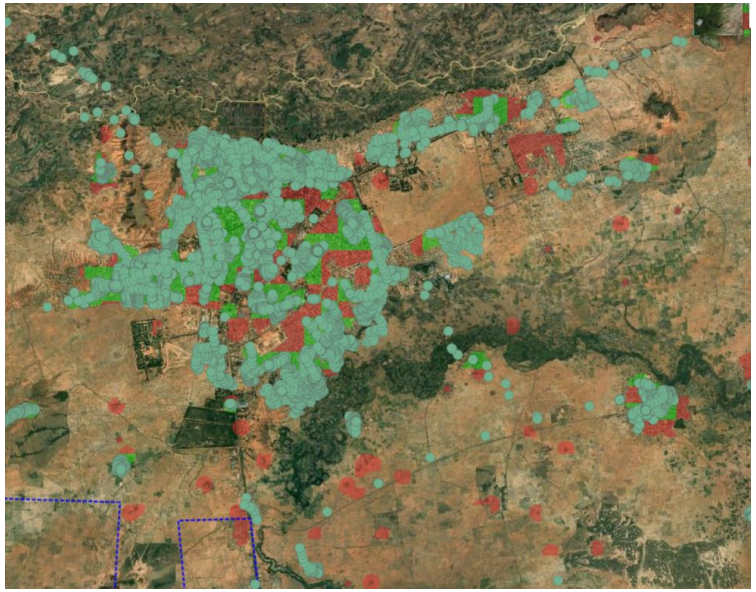
Health facilities

Catchment areas

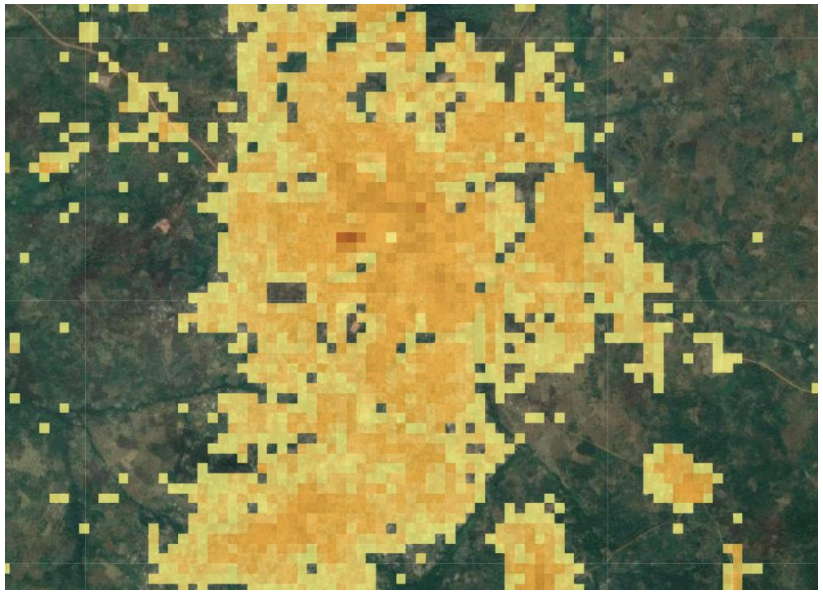
# Population estimation and spatial distribution

In geo-enabled microplanning, population estimation is the use of statistical models, remote sensing datasets and sampled census information to create spatially accurate and precise estimates of population density and distribution.

Population estimates are used to create population denominators for the community to be served.



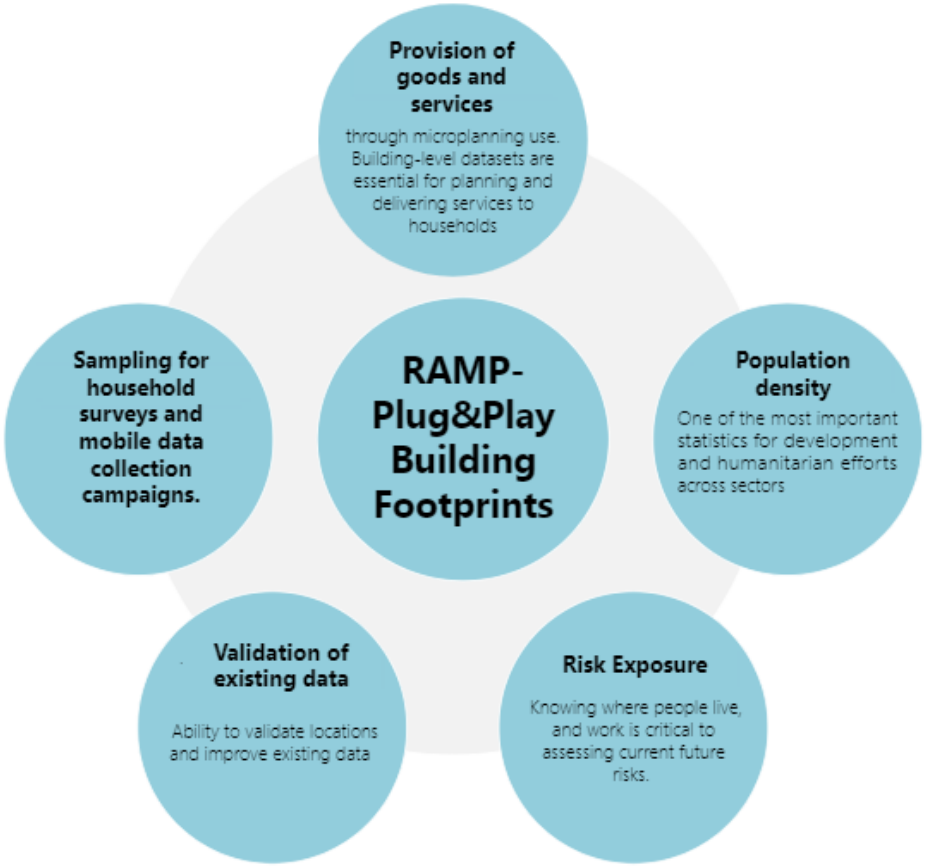
Settlement and Remote sensing data



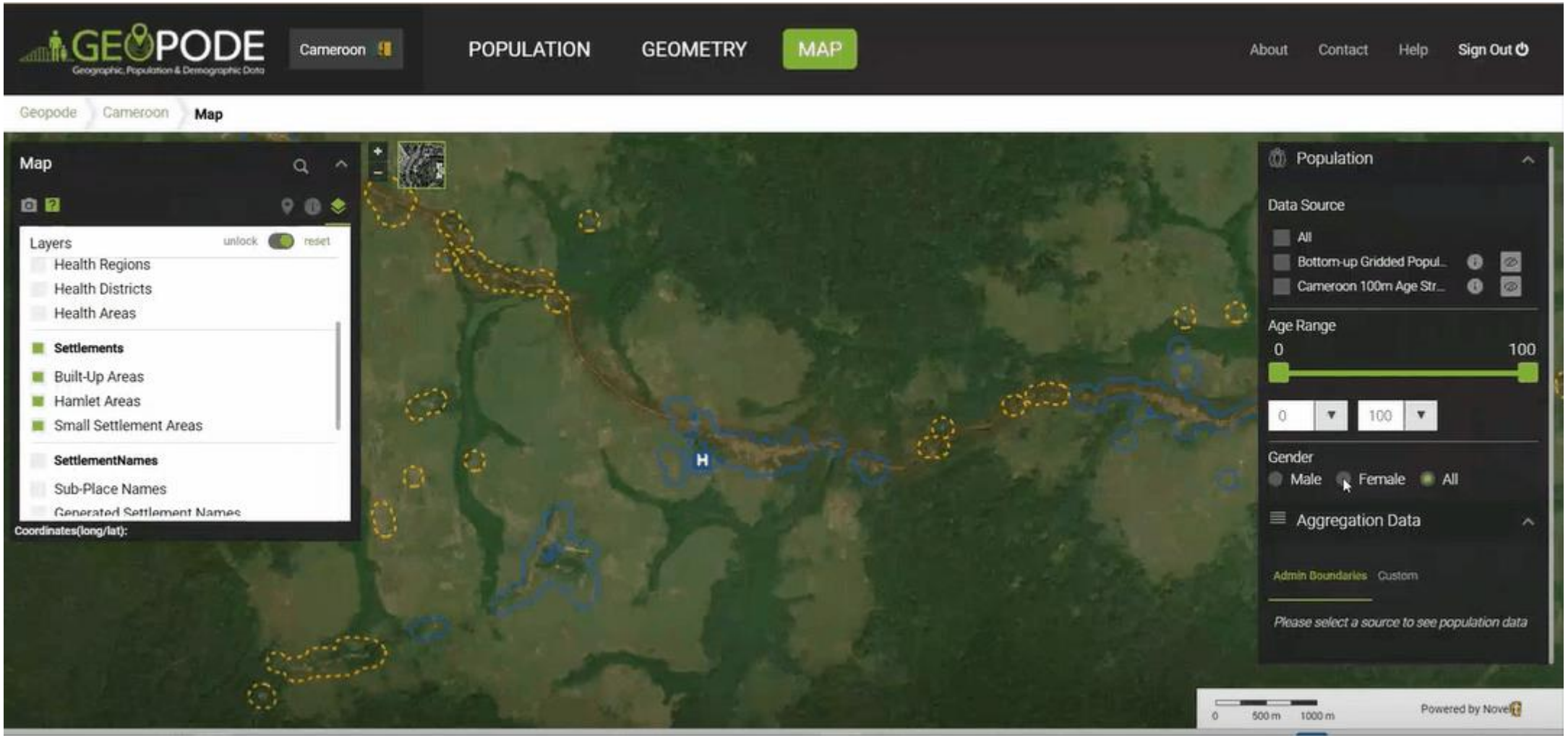
Statistical models

# ABLE – Automated/AI-Assisted Building Layer Extraction

*Provides essential capacity to identify buildings, one pivotal layer to supporting humanitarian response.*

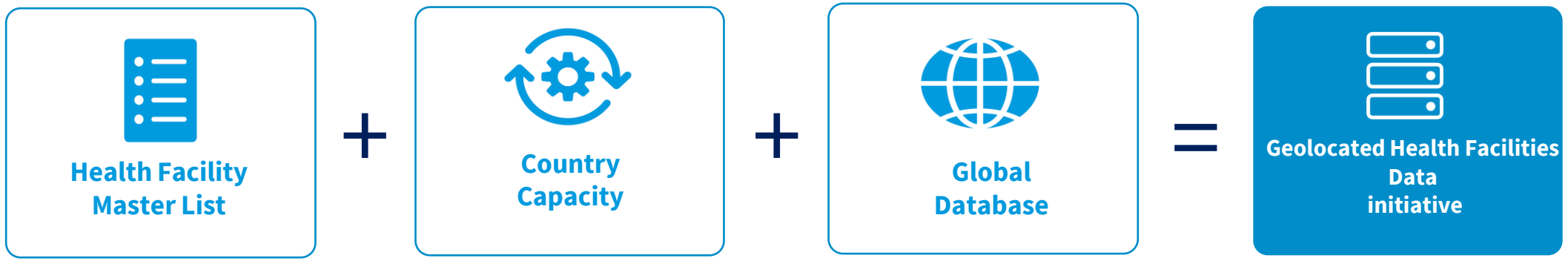



# GeoPoDe


GEOPODE
Geographic Population & Demographic Data
Cameroon
POPULATION
GEOMETRY
MAP
About
Contact
Help
Sign Out
Geopode
Cameroon
Map
Map
Layers
unlock
reset
Health Regions
Health Districts
Health Areas
Settlements
Built-Up Areas
Hamlet Areas
Small Settlement Areas
SettlementNames
Sub-Place Names
Generated Settlement Names
Coordinates(long/lat):
Population
Data Source
All
Bottom-up Gridded Popul...
Cameroon 100m Age Str...
Age Range
0
100
0
100
Gender
Male
Female
All
Aggregation Data
Admin Boundaries
Custom
Please select a source to see population data
0
500 m
1000 m
Powered by Nove

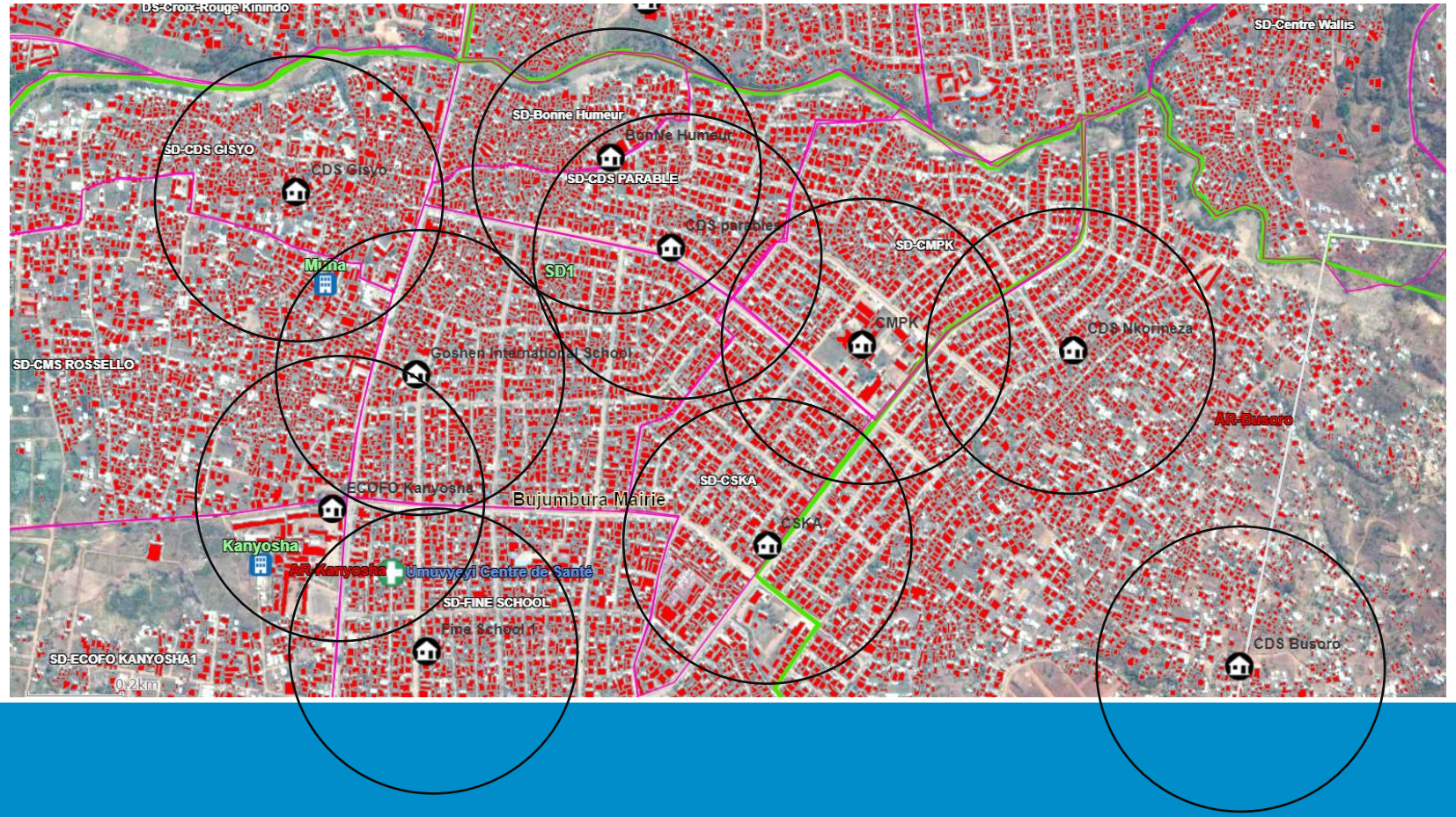
# The Geo-located Health Facility Data (GHFD) Initiative

*Offering a georeferenced Health Facility Master List (HFML) per country that is actively maintained, shared by the MoH, and used for health advancement.*



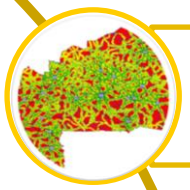
# What is Geographic Accessibility Modelling?

Geographic accessibility, service location and route optimization modelling are advanced modelling approaches used to identify possible gaps or overlaps in service coverage. Models analyze whether the target populations fall within an agreed-upon travel time or distance threshold for reaching such services or identify the most optimal routes to deliver essential commodities (e.g., insecticide treated nets).



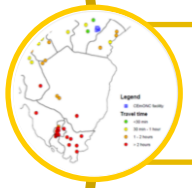
# What is AccessMod?

A free, multi-OS, and open-source software combining a set of GIS tools designed to analyze and optimize access to health services and support Universal Health Coverage (UHC)

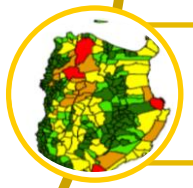


**Accessibility analysis**: Assess how physically accessible existing health services are to the target population

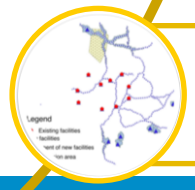
**Geographic coverage analysis:** Assess the target population that would not receive care due to a shortage of capacity



**Referral analysis** Measure travel time and distances between health facilities or supplier/ HF



**Zonal statistics:** values of the population covered for any subnational division of interest



**Scale up analysis** Design and simulate different scenarios to optimize services and coverage

# AccessMod - History

2002: Start of the activity in the context of cost-effectiveness analysis (WHO)

2003: Need to develop an automated module. First results obtained through the application of the extension developed for ArcView

2004: Decision on the name for the extension: AccessMod. First publication based on the use of AccessMod (ESRI health user conference)

2005: Release of version 2.1 (isotropic version, ArcView 3.2)

2008: Release of version 3.0 (anisotropic version, ArcView 3.2)

2012: Release of version 4.0 (extension to ArcGIS)

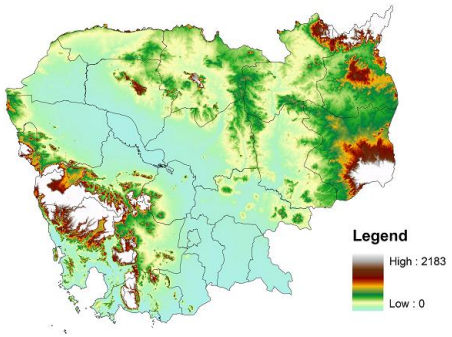
**2017: Release of version 5.0 (stand alone version)**

**2022: Release of version 5.8 (current version)**

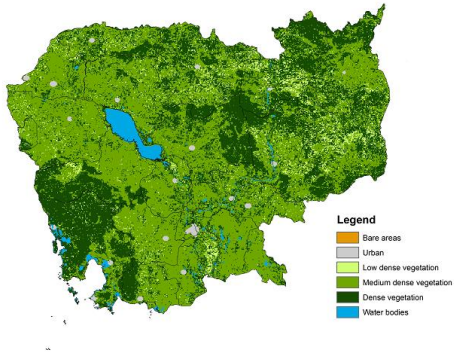
**2022: Next Generation AccessMod online version**

# AccessMod - Input geospatial data

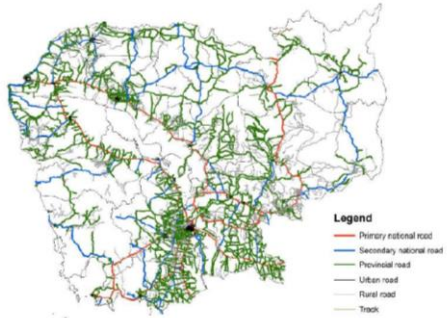
## Data used depends on the analysis being conducted



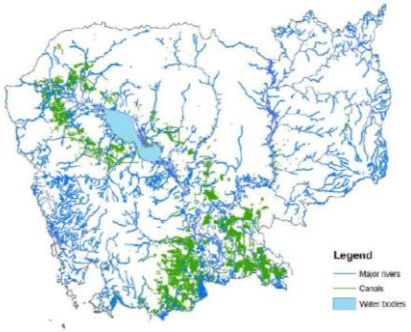

Digital Elevation Model (DEM)



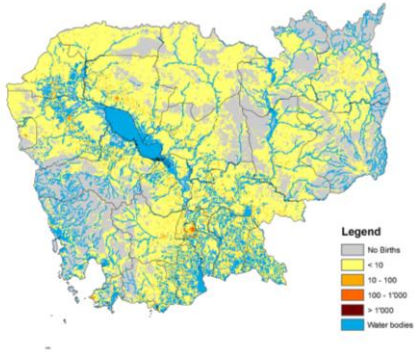

Land cover



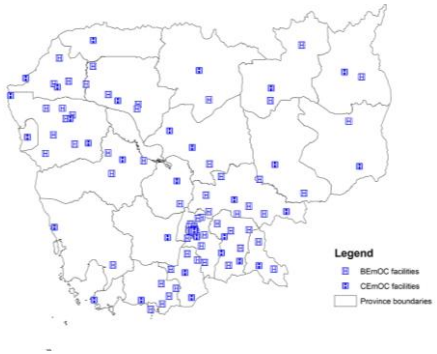

Transport network




Barriers to movement - hydric network, special areas




Population

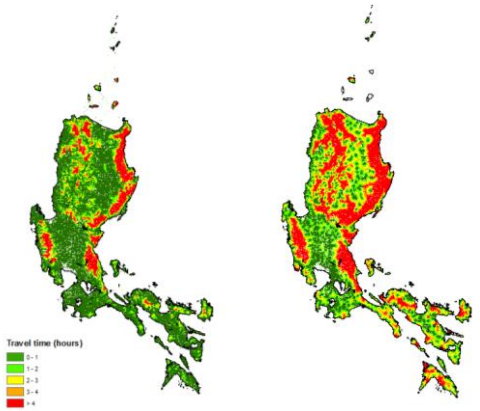



Health facility location

Zones - admin divisions, health areas

# AccessMod - Outputs

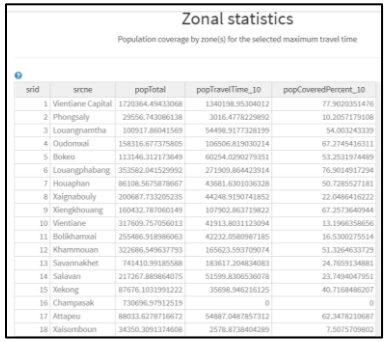
## 1. Travel time distribution grid for different scenarios




Walking + motorized vehicle

Walking

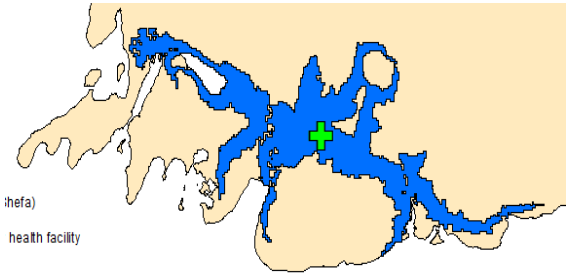
## 2. Tables

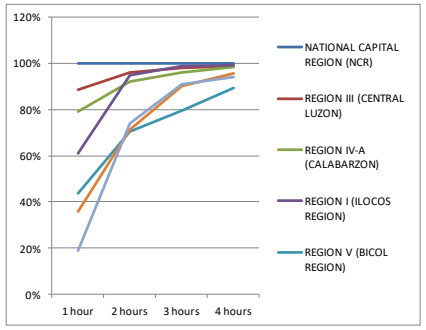



Download

| srid | srcne | popTotal | popTravelTime_10 | popCoveredPercent_10 |
|---|---|---|---|---|
| 1 | Vientiane Capital | 1720364.494 | 1340198.953 | 77.90203515 |
| 2 | Phongsaly | 29556.74309 | 3016.477823 | 10.20571791 |
| 3 | Louangnamtha | 100917.8604 | 54498.91773 | 54.00324334 |
| 4 | Oudomxai | 158316.6774 | 106506.819 | 67.27454163 |
| 5 | Bokeo | 113146.3122 | 60254.02903 | 53.25319745 |
| 6 | Louangphabang | 353582.0415 | 271909.8644 | 76.90149173 |
| 7 | Houaphan | 86108.56759 | 43681.6301 | 50.72855272 |
| 8 | Xaignabouly | 200687.7332 | 44248.91907 | 22.04864162 |
| 9 | Xiengkhouang | 160432.7871 | 107902.8637 | 67.25736409 |
| 10 | Vientiane | 317609.7571 | 41913.80311 | 13.19663587 |
| 11 | Bolikhamxai | 255486.919 | 42232.0581 | 16.53002755 |
| 12 | Khammouan | 322686.5496 | 165623.5937 | 51.32646337 |
| 13 | Savannakhet | 741410.9919 | 183617.2048 | 24.76591349 |
| 14 | Salavan | 217267.8899 | 51599.83065 | 23.7494048 |
| 15 | Xekong | 87676.1032 | 35698.94622 | 40.71684862 |
| 16 | Champasak | 730696.9791 | 0 | 0 |
| 17 | Attapeu | 88033.62787 | 54887.04879 | 62.34782107 |
| 18 | Xaisomboun | 34350.30914 | 2578.87384 | 7.507570988 |

## 3. Extent of catchment areas based on travel time with facilities location

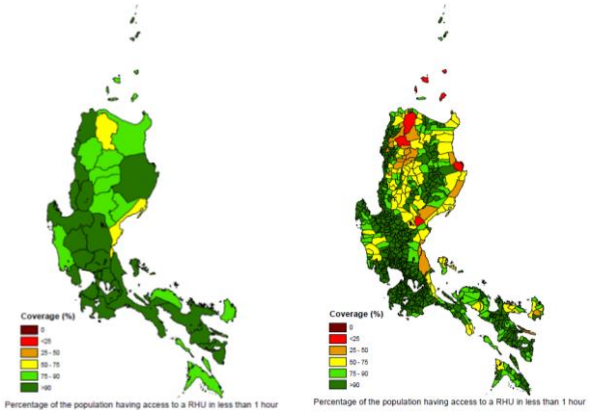



Graphs

| Region Name | 1 hour | 2 hours | 3 hours | 4 hours |
|---|---|---|---|---|
| NATIONAL CAPITAL REGION (NCR) | 100% | 100% | 100% | 100% |
| REGION III (CENTRAL LUZON) | 89% | 96% | 98% | 99% |
| REGION IV-A (CALABARZON) | 79% | 92% | 96% | 99% |
| REGION I (ILOCOS REGION) | 61% | 95% | 99% | 99% |
| REGION V (BICOL REGION) | 44% | 71% | 80% | 89% |
| CORDILLERA ADMINISTRATIVE REGION (CAR) | 36% | 71% | 90% | 96% |
| REGION II (CAGAYAN VALLEY) | 19% | 74% | 91% | 94% |

Tables




Maps

# AccessMod NextGen - Advantages

**User Experience**

- ➔ Simplified & advanced UI
- ➔ Collaborative features
- ➔ Data visualization
- ➔ **Automated data acquisition**

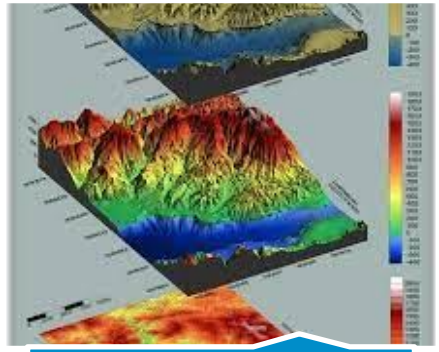
**Cloud Computing**

- ➔ Automation
- ➔ Concurrency
- ➔ Scalability

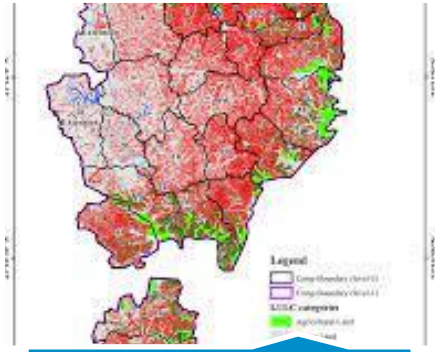
The project is funded and led by the **WHO GIS Centre for Health**.

https://www.who.int/data/GIS

# AccessMod NextGen - Data Resources

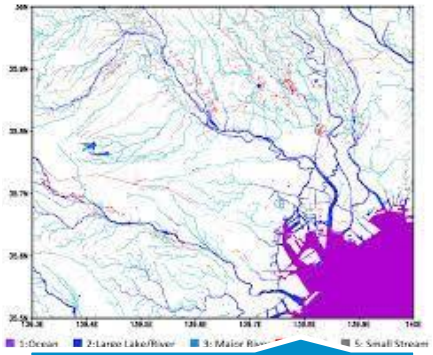


DEM - Shuttle Radar Topographic Mission



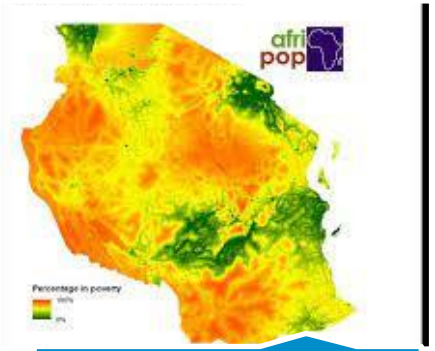
Land Use and Land Cover (LULC) maps - Copernicus Global Land Service

Surface Water - Global Surface Water (GSW) 7



Surface Water - OpenStreetMap (OSM)

Transport Network - OpenStreetMap (OSM)



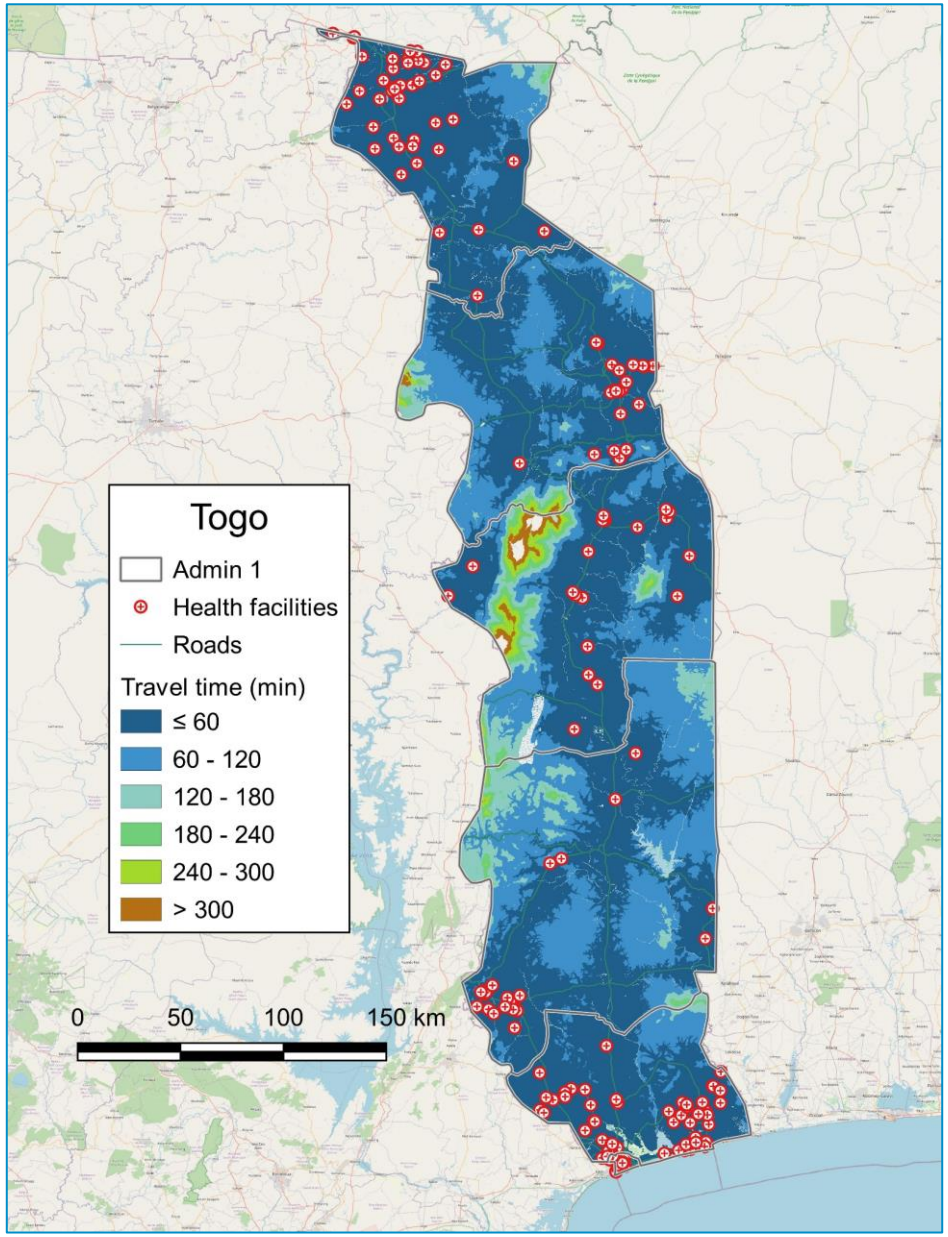

Population Distribution- WorldPop

dhis

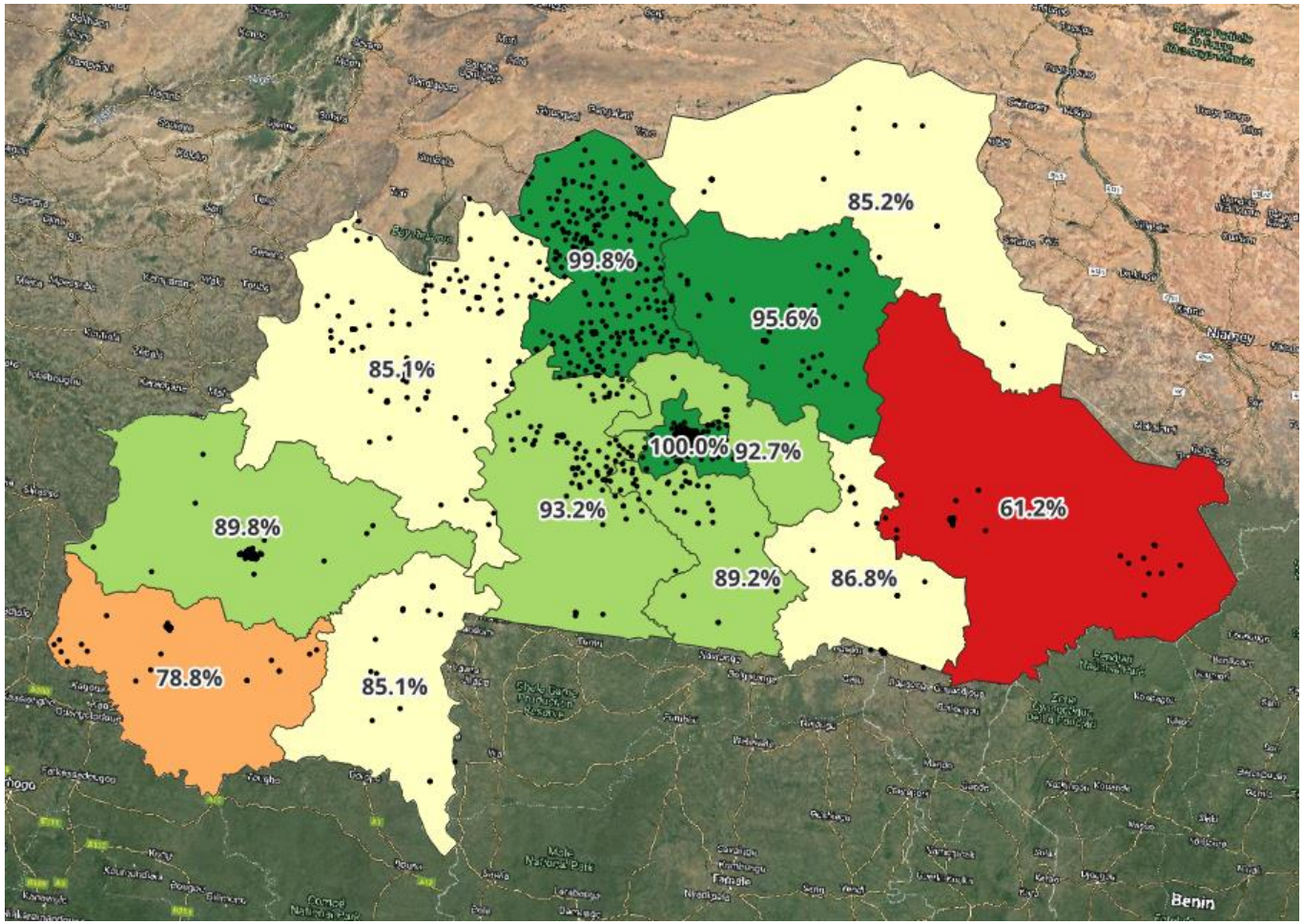
Health Facilities and Services - DHIS2

# AccessMod NextGen - Outcomes (Travel Time)

Walking and motorized scenario



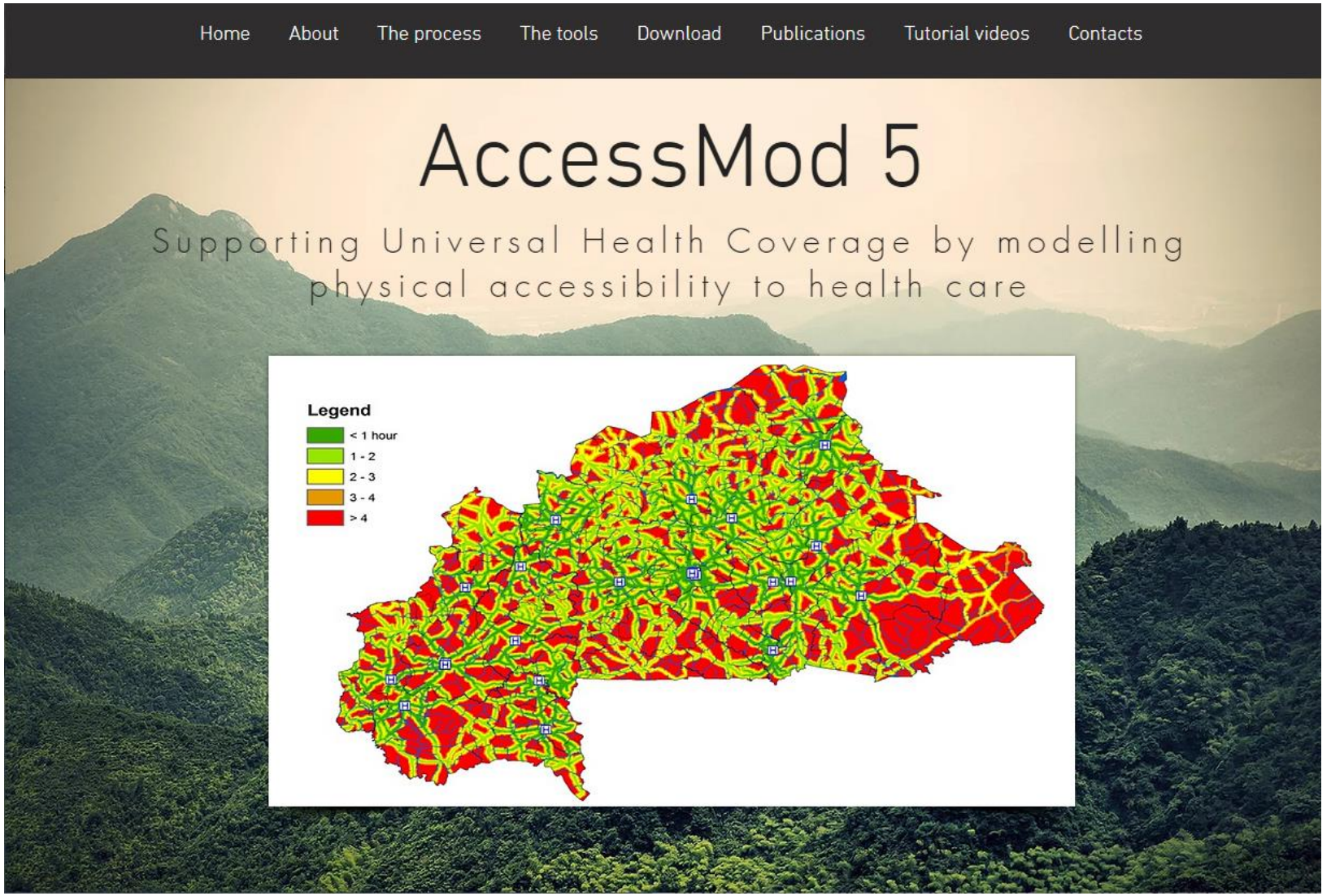
# AccessMod NextGen - Outcomes (zonal statistics)



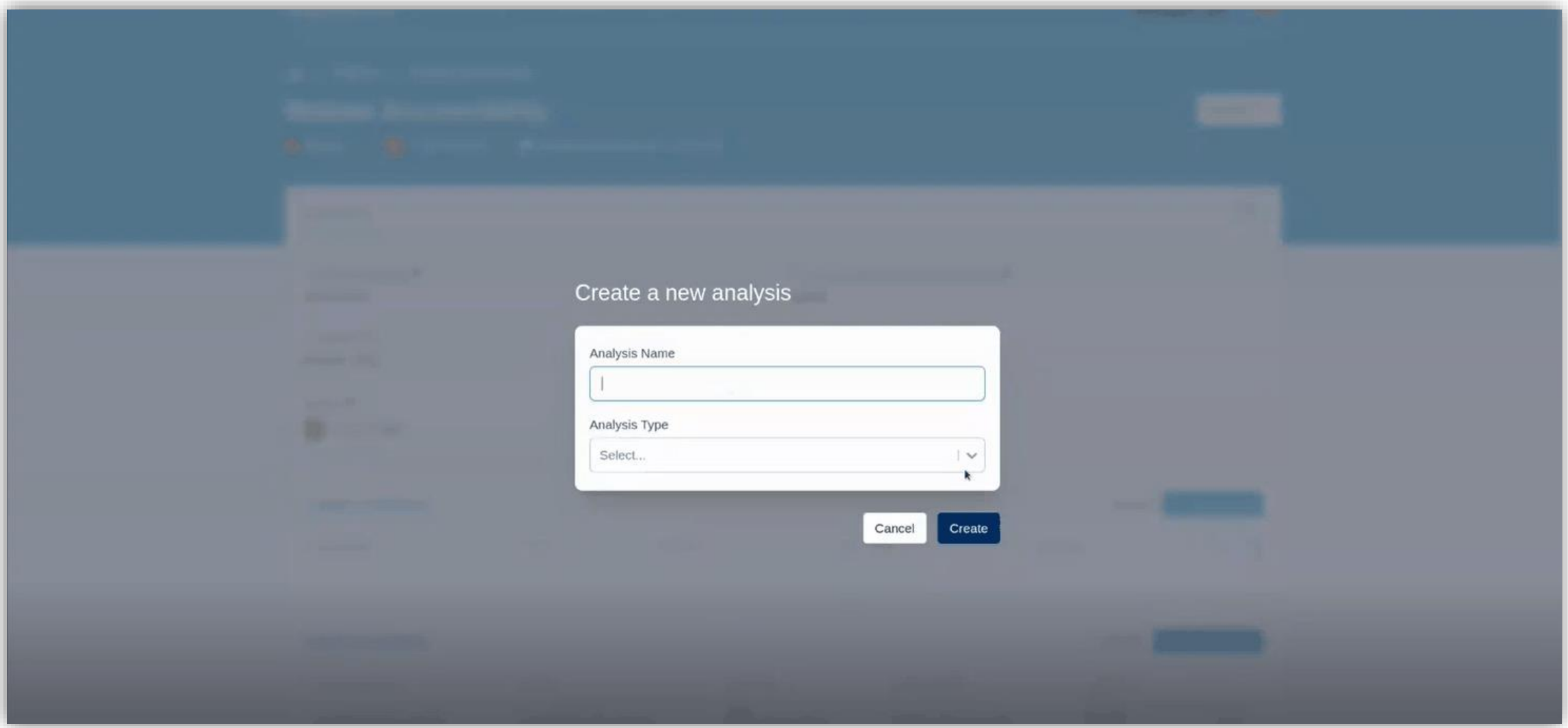

AccessMod Next-Generation Map - thumbnail percentage population access less than 120 min, Burkina Faso

# AccessMod - Website

https://www.accessmod.org



# AccessMod NextGeneration - demonstration



# The Geo-enabled Microplanning Handbook

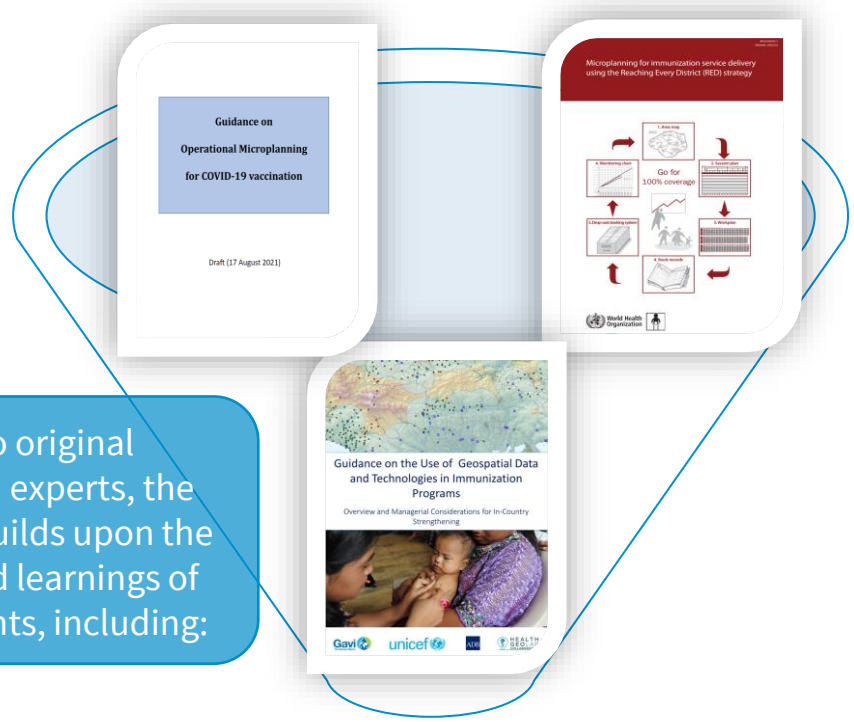
The WHO-UNICEF COVAX GIS Working Group, with support from the Bill & Melinda Gates Foundation, have coordinated the writing of this handbook as a practical guide to help readers develop and implement geo-enabled microplans.

**115 co-authors and reviewers** have contributed their knowledge and expertise to the document since the first workshops began in August 2021.

Coordinating organizations:

- WHO GIS Centre for Health
- UNICEF
- CDC
- Gavi
- The Global Fund
- World Bank
- DevGlobal Partners
- Health GeoLab Collaborative

…and many participating organizations




In addition to original content from experts, the Handbook builds upon the guidance and learnings of key documents, including:

Geo-enabled Microplanning Handbook

https://www.covid19giswg.net/geo-enabled-microplanning

# Handbook Highlights

## Modulated approach for a wide audience

Target audience ranges from programme managers to GIS technical staff.

The Handbook is designed so readers can approach it as a "cookbook" and look for specific applications that suit the needs of their microplan.

## 4 "applications" of geospatial data and technology

1. Geo-referenced health facility master lists
2. Population estimation and distribution
3. **Geographic accessibility, service location and route optimization modelling**
4. Thematic Mapping

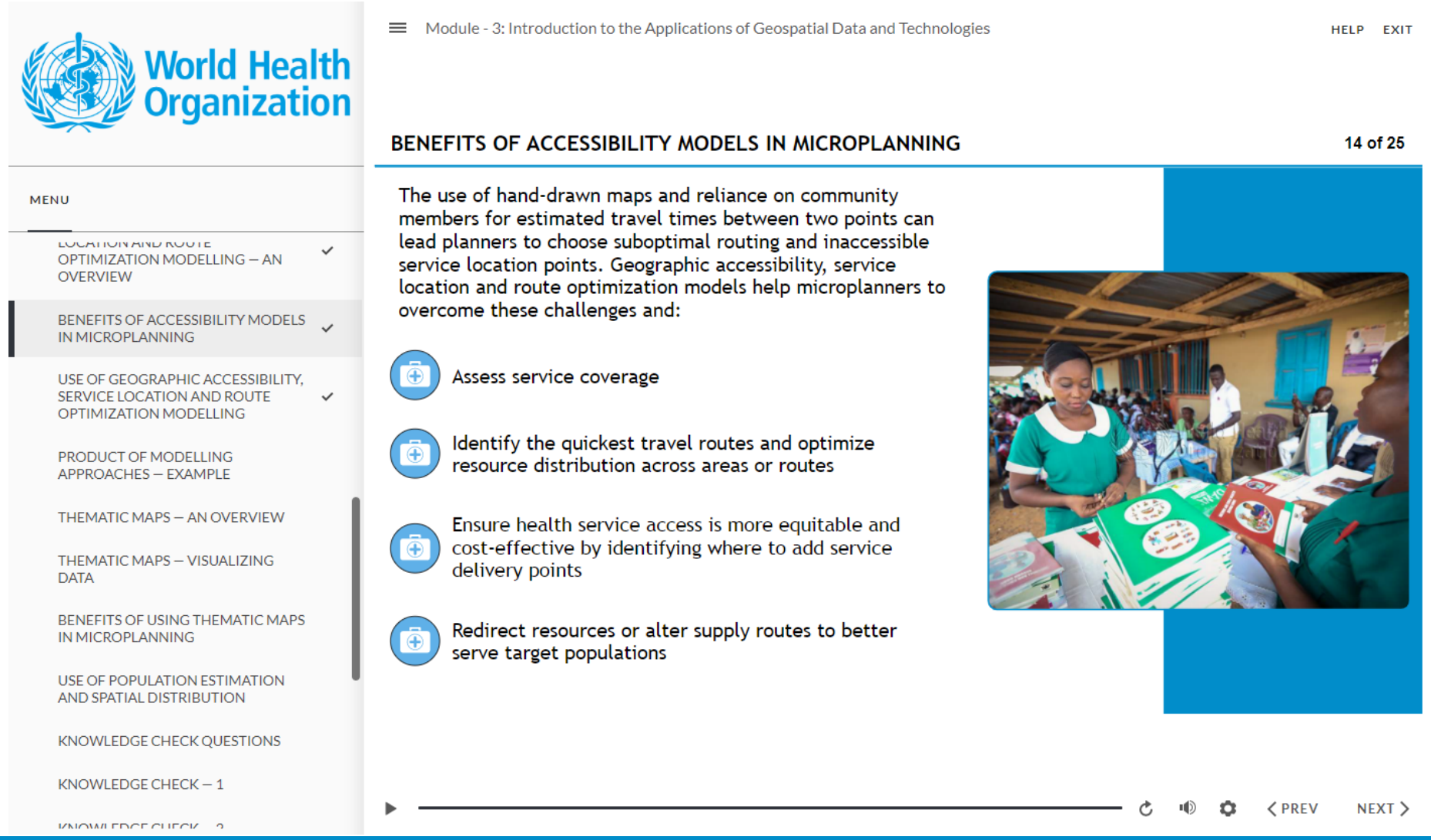
## 6 use cases

1. COVAX (Nigeria)
2. Malaria elimination campaign (Cambodia)
3. Routine immunization (India)
4. Polio supplemental immunization (Nigeria)
5. Emergency measles outbreaks (Nigeria)
6. Co-deployment of Malaria interventions ITN + IRS (Zambia)

## Monitoring, evaluation and learning

Call-out boxes and dedicated sections on how to incorporate monitoring, evaluation, and learning (MEL) across a microplan

# E-Learning Course for Geo-enabled microplanning




9 self-paced modules + 6.5 hours of content

Will be available in English, French, and a third language (TBD)

Content is tagged for specific audiences

Ready in 2-Months - Handbook

# Thank you!