



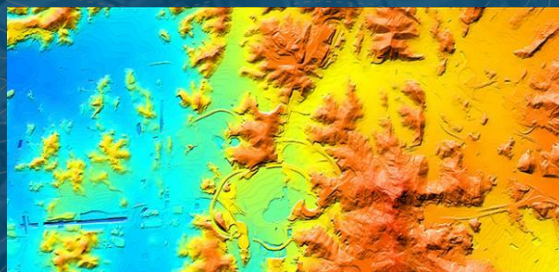
DIGITAL MAPPING PRODUCTS

25 years experience at telecom market

WE OPERATE WORLDWIDE



GEODATA FOR 5G/4G/LTE
NETWORKS PLANNING



ELEVATION PRODUCTS:
DTM, DEM, DSM



GEOSPATIAL DATA FOR
SMART CITIES



LAND USE





FRANKFURT, GERMANY

DIGITAL MAPS FOR TELECOM



Starting with the implementation of the 2G networks and further deployment 3G, 4G and 5G ones, we support our customers by providing them with highly accurate geospatial data.

Tailored for the needs of the telecom market, our geodata products enable you to achieve accurate results along with network planning and optimization. Our long-time relationships with planning tools vendors and the biggest players in the telecom market allow us to meet our customer's requirements whenever they operate.

PRODUCTS OVERVIEW



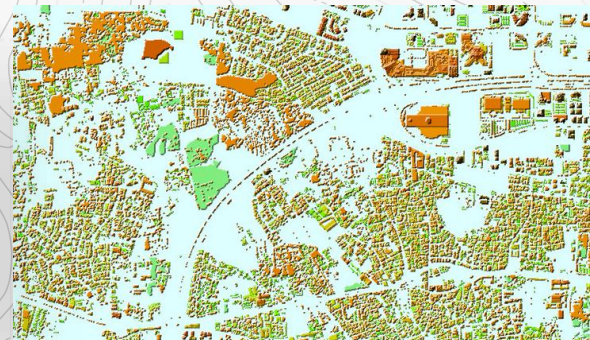
REGIONAL COUNTRYWIDE 2D MODELS



3D MAPS FOR CITIES AND CONTRYWIDE



2.5D MAPS FOR CITY/SUBURBS/COUNTRIES



ADVANCED ACCURACY 3D MAPS FOR 5G NETWORKS



OFF-THE-SHELF DATA CATALOGUE

- 2500+ 3D City Models, over 100 000 km²
- 5000+ 2D Urban Models, over 2 000 000 km²
- 85+ Countrywide Models, over 30 000 000 km²

VISICOM KEY BENEFITS

- Delivery in any RF/GIS tools formats
- Compatibility with any propagation model
- Support any raytracing models
- Fitted to requirements of mmWave frequencies
- Provide extra-accurate 3D features
- Contain the most up-to-date information

PRODUCTS OVERVIEW

DELIVERED DATA LAYERS FOR 2D/2.5D/3D MODELS

2D URBAN 2D REGIONAL MODELS

Digital Terrain Model
Clutter/Land Use Model
Vector Model (Linear Objects)

OPTIONALLY:

Population Distribution Model
Orthorectified imagery
POIs

2.5D CITY | 2.5D URBAN 2.5D SUBURBAN MODELS

Digital Terrain Model
Clutter/Land Use Model
Vector Model (Linear Objects)
Clutter Heights Model

- By buildings
- By buildings blocks

OPTIONALLY:

Population Distribution Model
Orthorectified imagery
POIs

3D MAPS FOR CITY/SUBURBS/COUNTRIES

Digital Terrain Model
Digital Surface Model
Clutter/Land Use Model
Orthorectified imagery
Vector Model (Linear Objects)

- Obstacles Heights Model
- Buildings
- Vegetation/trees
- Engineering constructions

OPTIONALLY:

Population Distribution Model
POIs

ADVANCED ACCURACY IS REQUIRED FOR 5G NETWORK PLANNING

5G radio-planning processes requires more detailed, accurate and up-to-date maps in comparison with previous networks generations

Because of the sensitivity of radio waves, it is necessary to have an adequate level of maps details, which tends to grow – 3D buildings with roofs features; 3D vegetation, which also can affect the signal propagation, with crown and trunk features

1M OR 2M RESOLUTION MAPS

- **3D Buildings** include small roof details
- **3D Trees Model** with separate crowns
- **3D Bridges** displaying precise and detailed engineering constructions

For big areas like regions and whole countries, more precise data are also very important. They ensure detailed clutter classification together with Population Distribution models

2.5D 5M AND 10M RESOLUTION MAPS

- Improved clutter classification
- Clutter Heights for obstacles
- Detailed street/road network

3D PRODUCTS OVERVIEW

Digital Terrain Model

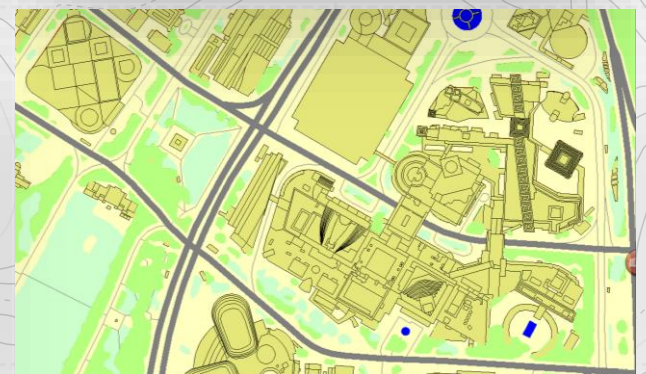
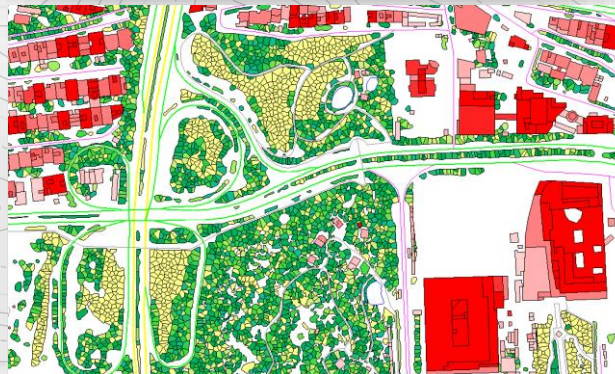
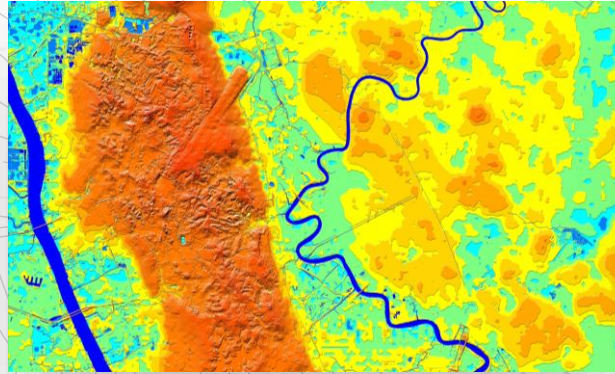
Digital Surface Model

Clutter/Land Use Model

Orthorectified imagery

Vector Model (Linear Objects)

- Obstacles Heights Model
- 3D Buildings
- 3D Vegetation/Trees
- 3D Engineering constructions





3D MODELS

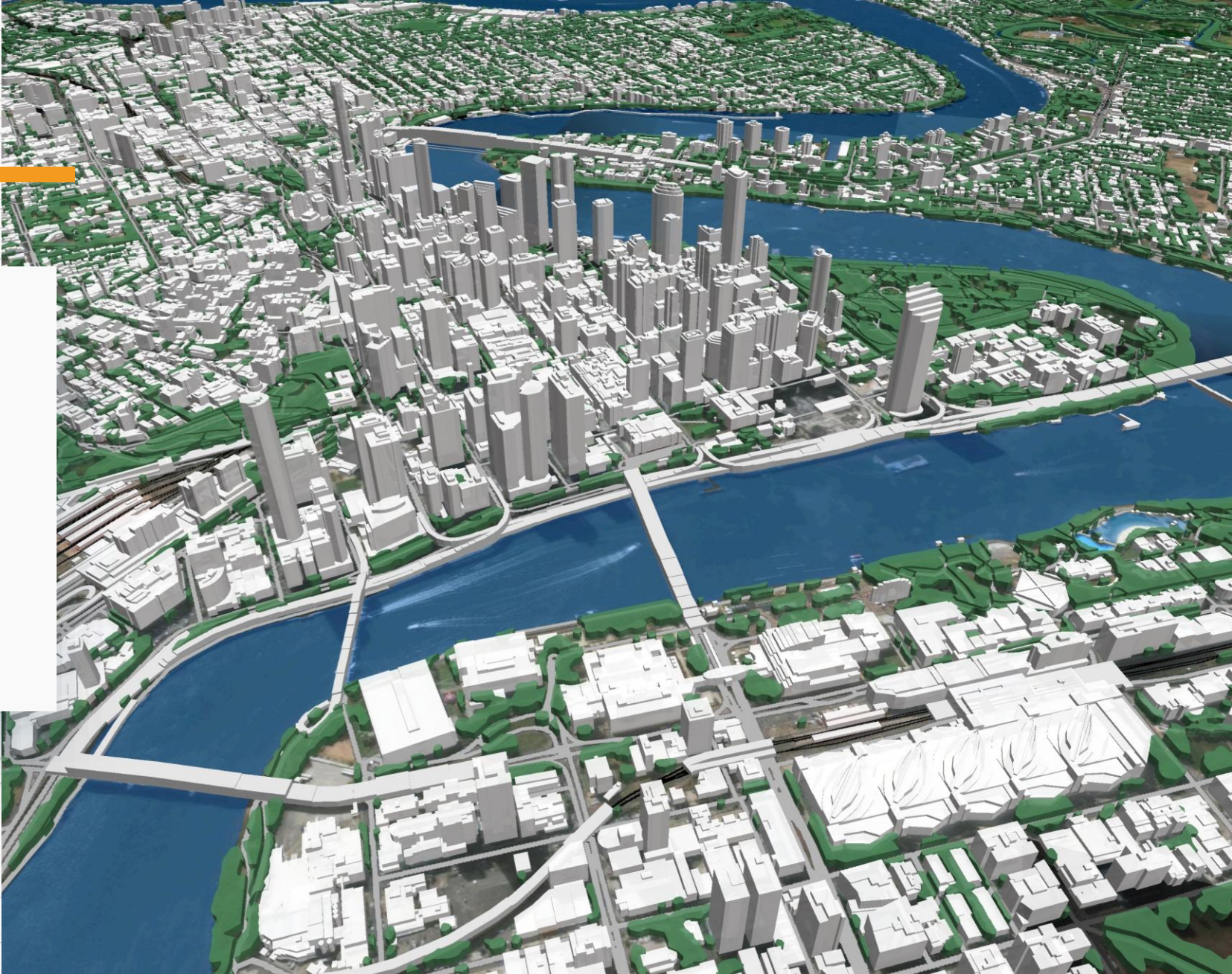


PRODUCT FEATURES DEPENDING ON THE PROJECT DEMANDS

- 1m, 2m or 5m resolution
- MMU 9-16 sq.m
- X,Y, Z accuracy $\pm 2-4$ m
- Building heights accuracy $\pm 1-3$ m
- Represents all buildings structure
- Allows processing complex architectural solutions, irregular quarter's structure with high building density
- Vegetation is provided as detailed foliage, including separate trees with individual heights
- Supports any RF tools format like Atoll Forsk, Planet, Aircom Asset, ICS Telecom, CelPlanner, NetPlan, Ranplan Professional, Pathloss, etc.



3D CITY MAP



VEGETATION MODELING

- Vegetation outline recognition from high-resolution satellite images as Worldview 1,2,3 and Pleiades or aerial photos
- Segmentation of vegetation polygons
- Vegetation height defining by a Convolutional Neural Network (CNN) model



VISICOM REGIONAL MAPS LINE



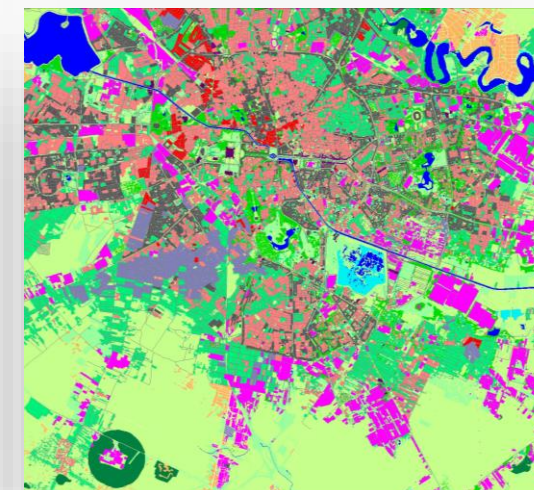
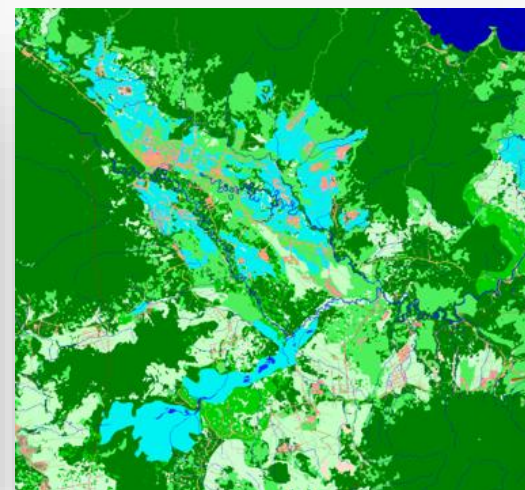
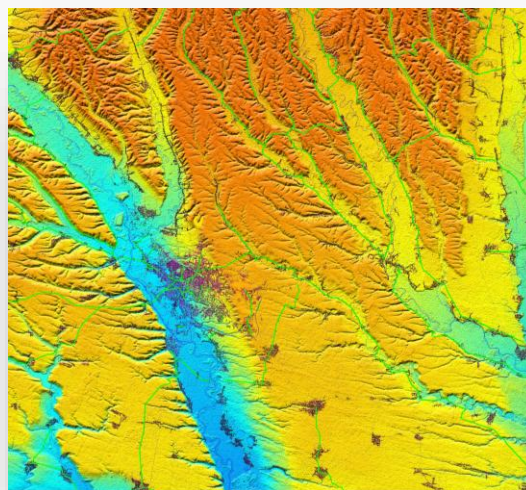
CREATED USING AI TECHNOLOGY OF SATELLITE IMAGES RECOGNITION

PRODUCTS FEATURES

- 10m resolution
- Accurate land use classification
- Last available administrative division
- Imagery source: Sentinel-2, 10m resolution images
- Easy to use due to support of all major RF-tools formats

DATA FORMATS

Atoll Forsk, Mentum Planet, Aircom Asset, ESRI ArcGIS, MapInfo, ICS Telecom, CelPlanner, NetPlan, Ranplan Professional, Pathloss, and any other

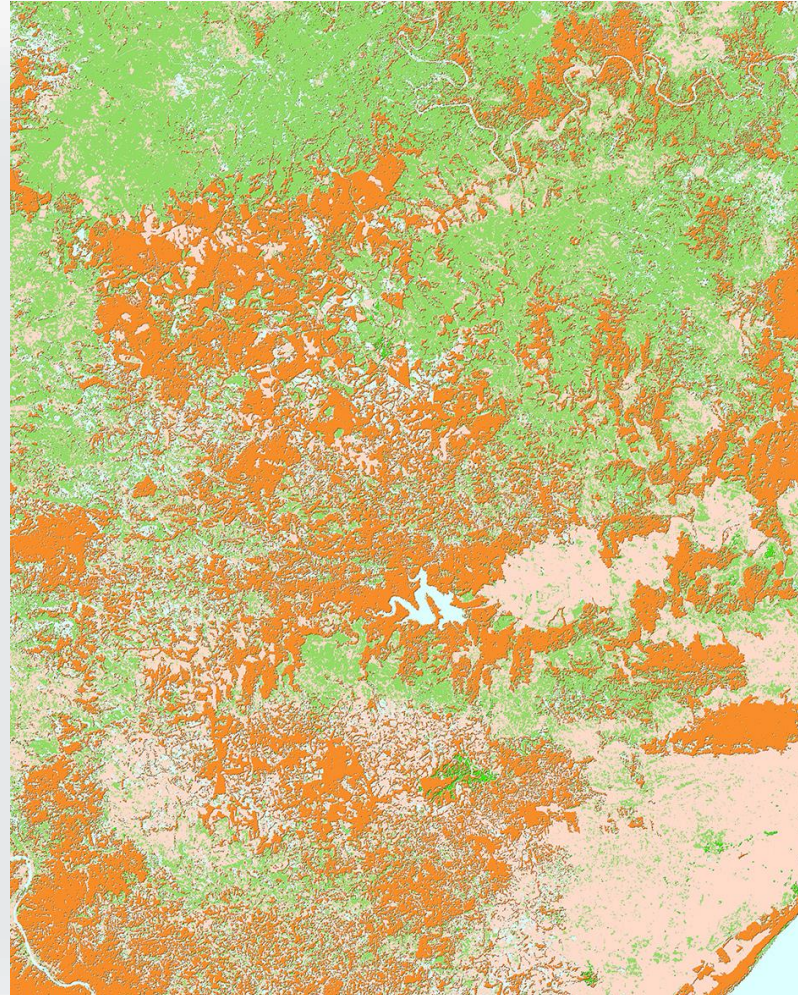




VISICOM REGIONAL MAPS LINE

OUR PROJECTS REALIZED IN 2023 FOR 2.5D AND 2D REGIONAL MODELS

- Poland
- Czech Republic
- United Kingdom
- Belgium
- Georgia
- Romania
- Malaysia
- Philippines
- Cambodia
- Bangladesh
- Sri Lanka
- Vietnam
- Myanmar
- Thailand
- Jordan
- Singapore
- South Korea
- Pakistan



The best choice for 5G rollout in large regions is a 10 m resolution Regional model with an extended set of clutter classes, more detailed building structure classification and type of vegetation layers, and 5m vertical accuracy in DTM

2D map provides valuable information about the surrounding environment, which helps predict radio wave propagation, interference patterns, and signal strength in regions

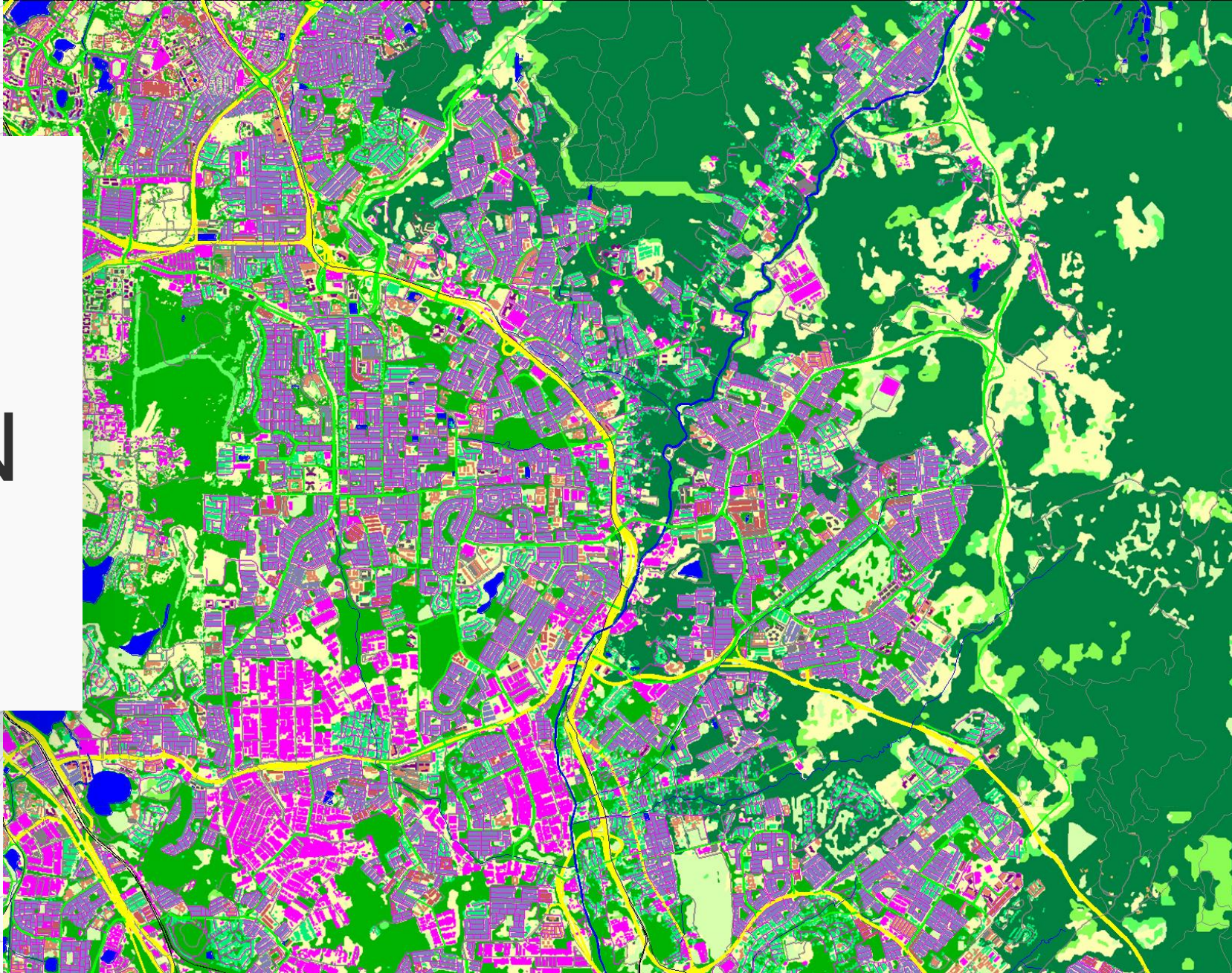
2.5D maps allow wireless planners to improve predictions of signal attenuation and assist in finding the optimal location of network base stations and other wireless system transmitters within a country

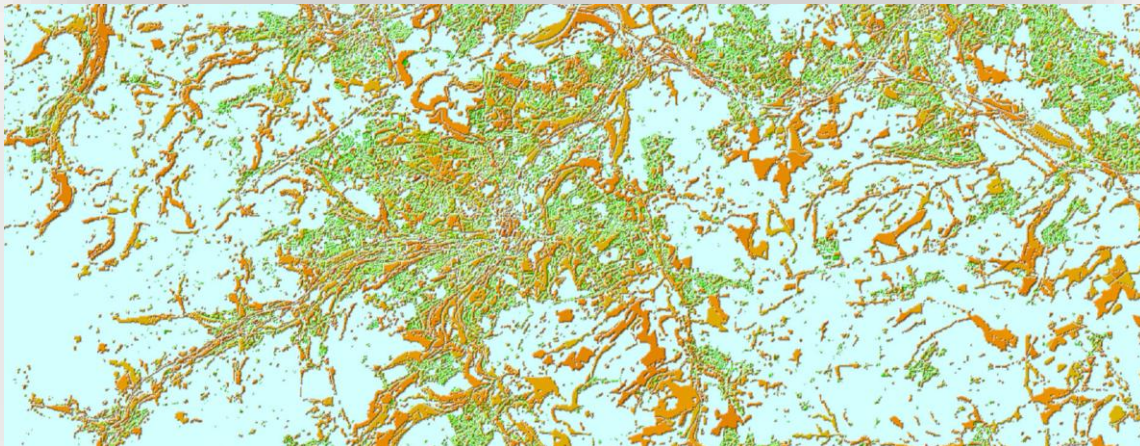
Layers: Digital Terrain Model (DTM), Clutter/Clutter Height Model and Basic Vectors.

Population distribution model delivered together with the usual layers provides a better representation of land use and density ratios of urban classes

CLUTTER MODEL, 10 M RESOLUTION FOR SPAIN

DATA PREVIEW





BALANCE COST AND ACCURACY WITH 2.5D NATIONWIDE COVERAGE

2.5D map provides valuable information about the surrounding environment, which helps predict radio wave propagation, interference patterns, and signal strength in regions

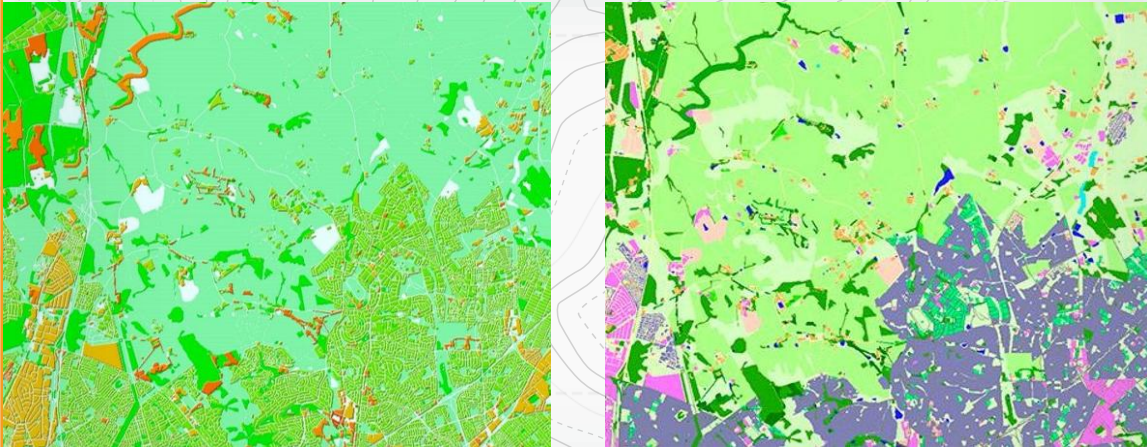
The Clutter Height layer or Digital Heights Model (DHM) is an essential part of 2.5D maps that represents the elevation differences in the terrain, providing detailed data on the height of the surface at specific points. Clutter height data helps to determine the best locations for communication towers and antennas.

2.5D REGIONAL MODEL, 10 M RESOLUTION WITH CLUTTER HEIGHTS



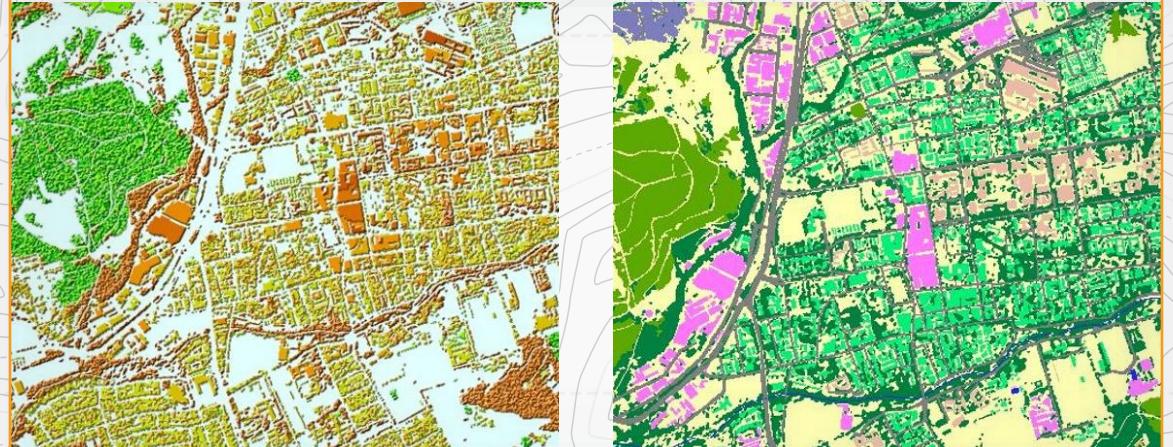
RURAL AREA

CLUTTER MODEL



BUILT-UP AREA

CLUTTER HEIGHTS MODEL





2.5D GEODATA FOR SUBURBS AND RURAL AREAS



5 M RESOLUTION MODEL

Clutter Heights model is a matrix with a height attribute defined for each pixel of clutter matrix separately as an individual value

2.5D Models are usually produced for suburban / rural areas outside big cities as more budget solution in comparison with 3D Models that are strictly required for 5G planning inside big cities

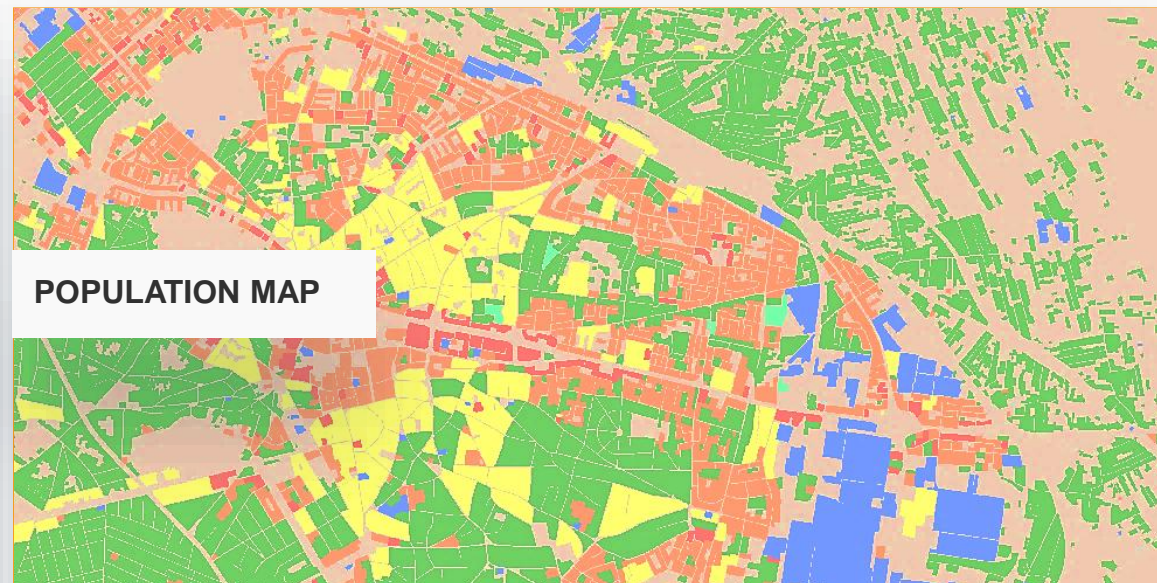
POPULATION MAPS



SOURCES CLUTTER (LAND USE)

POPULATION MAPS BASED ON:

- Clutter Model: 1/2/5 m resolution for cities, 5/10/20 m resolution
- The minimum mapping unit for population maps corresponds to the accuracy of the clutter model used for production
- Detailed administrative boundaries from official national sources (National Centers for Statistics, etc.)
- Boundaries and related population data for built-up areas covering major cities and suburbs
- Utilizing the last available Official Census population figures and official population forecast for the present year.



POPULATION MAP

MAIN ATTRIBUTES PRESENTED IN POPULATION MAP:

In raster representation:

- Population density per each cell of the raster grid
- Population quantity per each cell of the raster grid

In vector representation:

- Population density per each built-up block
- Population quantity per each built-up block

Administrative divisions are delivered together with Population map as vectors

DAY AND NIGHT POPULATION MAP

DAY POPULATION MAP (DYNAMIC MODEL)

provides the density ratios between the urban classes taking into account a mean average of activity in urban, commercial, and industrial areas.

Day Population Map considers people's movement within an average business day. The day population distribution matrix represents the maximum expected overall population density by a cell in the daytime, assuming all people are present in their assigned workplaces or other locations and the rest remains at home.

The socio-economic and demographic factors, classifications of buildings, and built-up areas that are taken into account for Day Population Map production are the following:

- Industrial zones: factories, plants, and ports
- Big office complexes and buildings
- Universities and colleges etc.
- Villages far from towns, cities, and industrial zones
- Suburb zones of large cities
- Roads, weighted by distance from major roads
- Traffic flow

Probability coefficients are assigned to each value of each input factor, and a composite probability coefficient is calculated for each item of the **Day Population Map**.

NIGHT POPULATION MAP (STATIC MODEL)

provides density ratios between the urban classes based on the places people have identified as inhabiting (residential areas) in the census information.

For calculating the matrix **Population Distribution Model**, two input layers are applied: clutter or land use model (only classes related to the populated areas) and experimentally obtained coefficients that assign proportions of population density for different clutter classes.

With the application of these coefficients in conjunction with vector boundaries of administrative units and the populated clusters, the calculation is being conducted individually for each administrative unit.

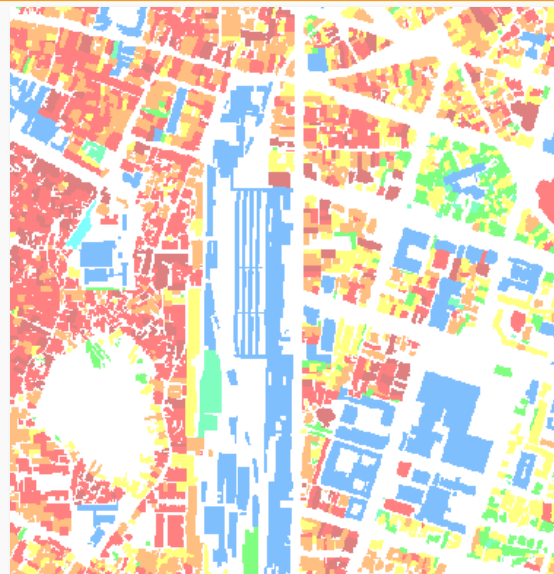
The resulting values are given as a matrix model with preassigned cell size. A **Population density value** is assigned with each cell of the matrix.

For the calculation of the **Regional Population Map** are used clutter class type, percentage of built-up block area within each cell (pixel), and also the population density coefficient that was calculated individually and varied for each administrative unit.

POPULATION MAPS



DAY POPULATION MAP

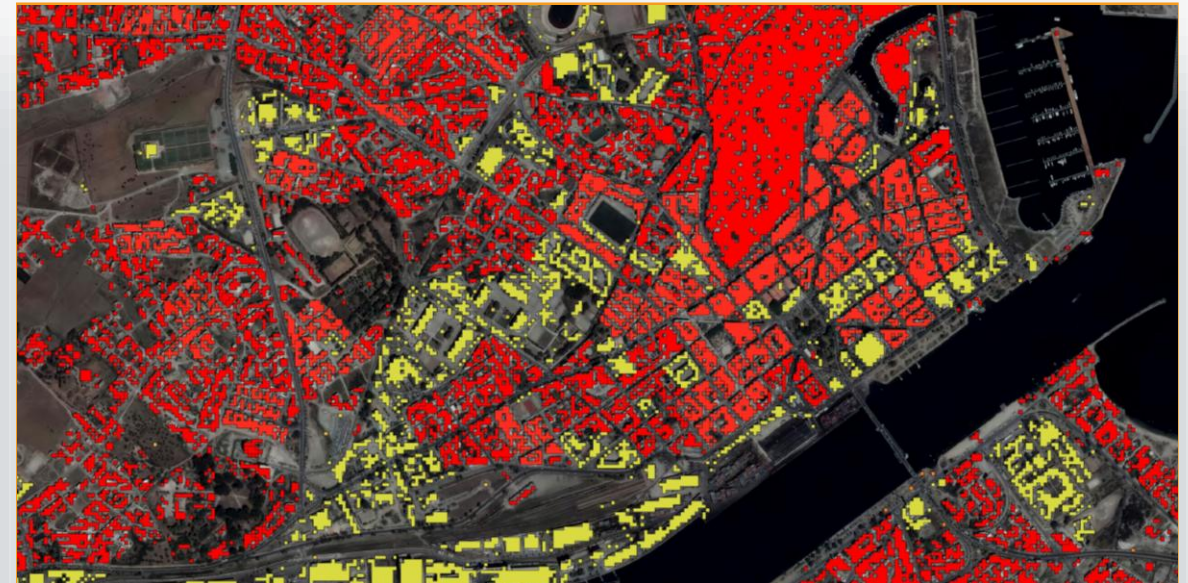


NIGHT POPULATION MAP

MATRIX

Population map in matrix representation provides:

- Population density per each cell of the raster grid
- Population quantity per each cell of the raster grid



VECTOR

Vector Population map provides the attributes of polygons in built-up areas:

- ID – unique identifier of each built-up block
- Population – calculated population for each built-up block
- Density – calculated density per each block of built-up area (inhabitants/sq.km)

OUR RECENT PROJECTS



REGIONAL PLANNING

Country	Area, km ²	Map Type, Resolution
Belgium	30 688	2D 10m + Popmap
United Kingdom	209 331	2D 20m
Hungary	93 030	2D 10m
Kazakhstan	2 725 000	2D 10m + Popmap
Malaysia	330 000	2D 10m + Popmap
Pakistan	881 193	2D 10m + Popmap
Thailand	513 120	2D 10m + Popmap
Algeria	150 000	2D 10m
Bangladesh	148 460	2D 10m + Popmap
Ghana	238 533	2D 10m
Jordan	89 342	2D 10m
Philippines	300 000	2D 10m + Popmap
Poland	322 575	2D 10m
UAE	83 600	2D 10m

3D MODELS

Country	City
Hungary	40 biggest cities
Kazakhstan	55 biggest cities
Malaysia	Johor, Penang and Georgetown
Thailand	3D countrywide coverage
Jordan	5 biggest cities
Turkey	100 biggest cities
Greece	3D countrywide coverage
Czech Republic	3D countrywide coverage
Croatia	3D countrywide coverage
Mexico	3D countrywide coverage
Austria	3D countrywide coverage
Slovakia	3D countrywide coverage
Bahrain	3D countrywide coverage

PROJECTS WORLDWIDE 8500+

2500+

3D City Models

5500+

2D Urban Models

85+

Countrywide models



High quality
and accuracy



Support for all RF
planning tools



Two-year
warranty



Highly competitive
and flexible prices



Worldwide
delivery

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OUR PROFESSIONAL AND CUSTOMER-ORIENTED TEAM WORKS FOR YOU TO FIT YOUR PROJECT GOALS AND BUDGET



VERTICAL MARKETS WE SUPPORT

- SMART CITIES AND IoT
- TRANSPORTATION
- ENVIRONMENTAL MANAGEMENT
- ARCHITECTURE
- SOLAR ENERGY



OUR CLIENTS:

- MOBILE OPERATORS
- RF PLANING TOOLS PROVIDERS
- TELECOM COMPANIES