

Space

Copernicus for GI professionals and users

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Urban housing density analysis Sentinel-2 for land cover classification

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Introduction

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- This presentation is part of a wider Copernicus User Uptake strategy of the European Commission. One of the aims of the strategy is to stimulate the development and use of innovative downstream applications that incorporate Copernicus data and services.
- The presentation is prepared by EUROGI, the European Umbrella Organisation for Geographic Information. Overall aim of EUROGI is to promote the widespread and effective use of Geographic Information.
- EUROGI has members across Europe. EUROGI member in Latvia is Latvian GIS association (Latvijas ĢIS biedrība).
- EUROGI was asked to identify a number of use cases of Copernicus which may be of interest to practitioners in the GI community.
- LATGIS is delegated to present two of them in this training and information session.









Short information about LATGIS

 Registered name: Latvijas ĢIS biedrība. English: Latvian GIS Association – LATGIS.



- Registered: 17.01.2005, last renewal: 26.07.2011.
- Objectives of the association according statutes include:
 - popularize application of the geographic information and technologies in Latvia;
 - promote of national, public and private sector cooperation in the use and exchange of geographic information;
 - represent and defend the geographic information systems sector interests at the Latvian and international level;
 - identify needs of users of geographic information; etc.
- Collective members:
 - SIA «Envirotech» member from 2005.
 - SIA «MikroKods» member from 2005.
 - SIA «Karšu izdevniecība Jāņa sēta» member from 2014.
 - AS «Latvijas valsts meži» member from 2015.
- Joined to EUROGI at 2016.
- Website: <u>www.gisbiedriba.lv</u>



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Case studies

- EUROGI identified 5 case studies:
 - urban density identification;
 - land cover identification;
 - identification of chlorophyll and turbidity in near coast waters;
 - wildfire mapping;
 - the application of fertilizer and fungicides on farmers fields.
- 2 of them will be shown in this presentation:
 - Urban housing density analysis;
 - Sentinel-2 for land cover classification.





Urban housing density analysis

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Presentation By: Stella Ofori-Ampofo, CERSGIS – University of Ghana





Introduction of the problem

- With growing cities and changing demographics, rapid population growth of urban areas challenges proper planning.
- To ensure well-being and productivity of inhabitants, there is the need for adequate infrastructure and services e.g. water supply, housing and sanitation facilities, etc.
- It is therefore imperative to understand and monitor changes in urban density over time to help policy makers make informed decisions regarding resource allocation.





Introduction of the use case

• The density of urban development has very significant implications for the upfront capital cost and ongoing operational cost associated with the provision of urban infrastructure.

• It also has very important implications for the provision of public transport services and the use of walking and cycling as means of commuting, with consequences for greenhouse gas emissions.





Outline of methodology

- The steps below outline how we mapped urban density using SENTINEL-2 imagery.
- Download Level-1C SENTINEL-2 MSI from the Sentinel Scientific Data Hub (<u>https://scihub.copernicus.eu/dhus</u>).
- Data preparation(stacking 10m bands i.e. bands 2,3,4 and 8, and image subsetting/clipping, band combination).
- Unsupervised image classification (based on ISODATA algorithm).
- Reclassifying/Recoding spectral classes into 5 information classes. (<u>high, medium, low density, vegetation, water</u>).





Hardware and software

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• Hardware :

- i7 Laptop with 2.4GHz speed
- 1 Terabyte storage space
- 12GB Ram.
- Software : ESRI ArcGIS
- Data :
 - Level-1C SENTINEL-2 satellite imagery obtained from
 - Sentinel Scientific Data Hub in .jp2 format
 - Project area extent in .shp (vector format).





Technical issues and resolutions

• Technical Issues

- Limited internet bandwidth for downloading image;
- Huge amount of storage space required to store & process imagery for regional level analysis;
- Difficulty in interpreting image metadata;
- Cloud cover over areas with high level of precipitation. Cloud mask unable to identify some cloud areas.

Possible Resolution

- Provision of an online service to define and download only an extent of imagery rather than the entire scene;
- Ability to download specific bands from Scientific Data Hub;
- Provision of guidelines to interpreting image metadata.





Video demonstration

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The video demonstrates how we mapped urban density using SENTINEL-2 imagery. By observing similar spectral reflectances exhibited by pixels in the images, we identified three (3) levels of urban density; high, medium and low density built-up areas.





Sentinel-2 for land cover classification

- In next video we will demonstrate the classification of land cover types from Sentinel 2 data.
- The application was developed at the University of Maribor in Slovenia. Since the algorithm developed to identify land cover is still a work in progress the author Associate Professor Domen Mongus could be contacted for further information should you, the viewer, so wish.





Land cover detection using Sentinel-2

Copernicus for Entrepreneurs and Developers









Thank you for attention! Paldies par uzmanību!

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