International Cartographic Association
Association Cartographique Internationale

Land cover data provided by the Copernicus Land Monitoring Service as important sources for thematic cartography

Daniel Szatmári [a,*], Ján Feranec [a], Monika Kopecká [a], Róbert Fencík [b], Tomáš Soukup [c]

[a] *Institute of Geography – Slovak Academy of Sciences, Bratislava, Slovakia, daniel.szatmari@savba.sk, feranec@savba.sk, monika.kopecka@savba.sk*
[b] *Department of Theoretical Geodesy and Geoinformatics – Faculty of Civil Engineering, Slovak University of Technology in Bratislava, Slovakia, robert.fencik@stuba.sk*
[c] *GISAT s.r.o., Praha, Czech Republic, tomas.soukup@gisat.cz*

* Corresponding author

Keywords: Copernicus, land cover, thematic cartography, Bratislava, urban growth

Abstract:

Land cover data applicable to the process of making thematic maps with other than topographic or general geographical content are obtained by various approaches. As Kraak and Ormeling (2021) report, they include: terrestrial surveys, photogrammetrical surveys, LiDAR or laser altimetry, satellite data, global navigation satellite system data, digitising or scanning analogue maps, using existing boundary files, socio-economic statistical files, (geo)physical or environmental data files, volunteered geographical information as well as data of various environmental monitoring systems (approaches generally used for acquisition of spatial data). Monitoring is defined as a procedure that involves the systematic measurement of a targeted object in time (at least two times) to assess changes and trends in the quantity and/or quality of these objects and finally understand the processes behind these changes (Mücher 2009).

Environmental monitoring, first of all, leverages recent achievements in capabilities and the methods of satellite imaging. Current satellite constellations (amplified by the European Copernicus programme) provide a rich pool of image data ready for land cover information extraction from the global to national, regional or local levels. Presented data are characterised by the parameters important for thematic cartography: source of image data, temporal coverage (reference years available), spatial and thematic resolution, geometric and thematic accuracy, coordinate reference system, and data accessibility/availability.

The existence of global land cover data is necessary for the United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol, governments and scientific communities, especially for the identification of global landscape changes and coordination of measures aiming at mitigation of their consequences (Mora et al. 2014). Global land cover data are essential inputs into the Global Circulation Models, Earth Systems Models and Integrated Assessment Models used in global and regional climatic simulations, dynamic vegetation modelling, and carbon (stock) modelling (Hibbard et al. 2010, Herold et al. 2011). This is also reflected in UN Sustainable Development Goals implementation activities, where Earth Observation and geospatial data are mentioned in the context of transparent and accountable information. Currently, an international collaboration to scale up Earth Observation innovation for the full achievements of the UN 2030 Agenda on Sustainable Development is coordinated by the Group on Earth Observation (GEO) and the Committee on Earth Observation Satellites (CEOS). Characteristics and history of monitoring the European landscape are part of the Harmonised European Land Monitoring – HELM Project results (Ben-Asher et al. 2013).

In the case of thematic map compilation based on Copernicus Land Monitoring Service (CLMS) products (CORINE Land Cover – CLC, Urban Atlas – UA, Imperviousness – IMP and others), it is necessary to define what types of topographic layers can be used at a regional, national or local level to comply with general and specific cartographic principles. At the national and local levels, these can be selected physical-geographical objects of topographic databases or boundaries of administrative and technical units of the territory. Specific characteristics of Copernicus data (e.g. coordinate reference, spatial resolution, temporal extent, quality, and validation), important in terms of their use in thematic cartography, are part of the metadata. Within the cartographic compilation of the content of thematic maps, it is important to align the Copernicus layers with topographic layers from the point of view of scale, degree of generalisation, clarity, the emphasis on dominants and comprehensibility.

The aim of this presentation is to provide: i) brief information about the CLMS products concerning their use in thematic cartography, ii) examples of the Bratislava Region urban growth maps for the years 2007-2016 and 2015-2018 using

https://doi.org/10.5194/ica-abs-5-132-2022

Copernicus UA and IMP data, respectively, iii) quality assessment. The presented Bratislava Region urban growth maps are the result of compilation process: selection of topographic layers, geometric transformation of Copernicus data, computer assisted photointerpretation, detailed manual editing, and computer assembly of thematic urban land cover/use change maps.

Acknowledgements

This work was supported by the Slovak Scientific Grant Agency VEGA under Grants 2/0023/19 "Land cover dynamics as indicator of changes in landscape" and 1/0468/20 "Application of innovative mathematical methods in optimization of geomodeling processes based on data from laser scanning".

References

Ben-Asher, Z., Gilbert, H., Haubold, H., Smith, G. and Strand, G.-H., 2013. *HELM – Harmonised European Land Monitoring: Findings and recommendations of the HELM Project*. Tel-Aviv: The HELM Project.

Herold, M., van Groenestijn, A., Kooistra, L., Kalogirou, V. and Arino, O., 2011. *Land cover CCI user requirements document*. Louvai-la-Neuve: UCL – Geomatics.

Hibbard, K., Janetos, A., van Vuuren, D. P., Pongratz, J., Rose, S. K., Betts, R., Herold, M. and Feddema, J. J., 2010. Research priorities in land use and land-cover change for the Earth system and integrated assessment modelling. *International Journal of Climatology*, vol. 30, no. 13, 2118–2128, doi: 10.1002/joc.2150.

Kraak, M. J. and Ormeling, F., 2021. *Cartography: Visualization of Geospatial Data*. *Fourth Edition*. Boca Raton: CRC Press. ISBN 978-1-138-61395-9.

Mora, B., Tsendbazar, N.-E., Herold, M. and Arino, O., 2014. Global land cover mapping: Current status and future trends. In Manakos, I. and Braun, M. (eds.) *Land use and land cover mapping in Europe: practices & trends*, p. 11–30. Dordrecht: Springer.

Mücher, C. A., 2009. Geo-spatial modelling and monitoring of European landscapes and habitats using remote sensing and field surveys. *Altera Scientific Contributions*, 31. Wageningen: Altera.

https://doi.org/10.5194/ica-abs-5-132-2022