



MONITORING URBANIZATION IN LATIN AMERICAN METROPOLITAN AREAS (BOGOTA, QUITO AND LIMA)

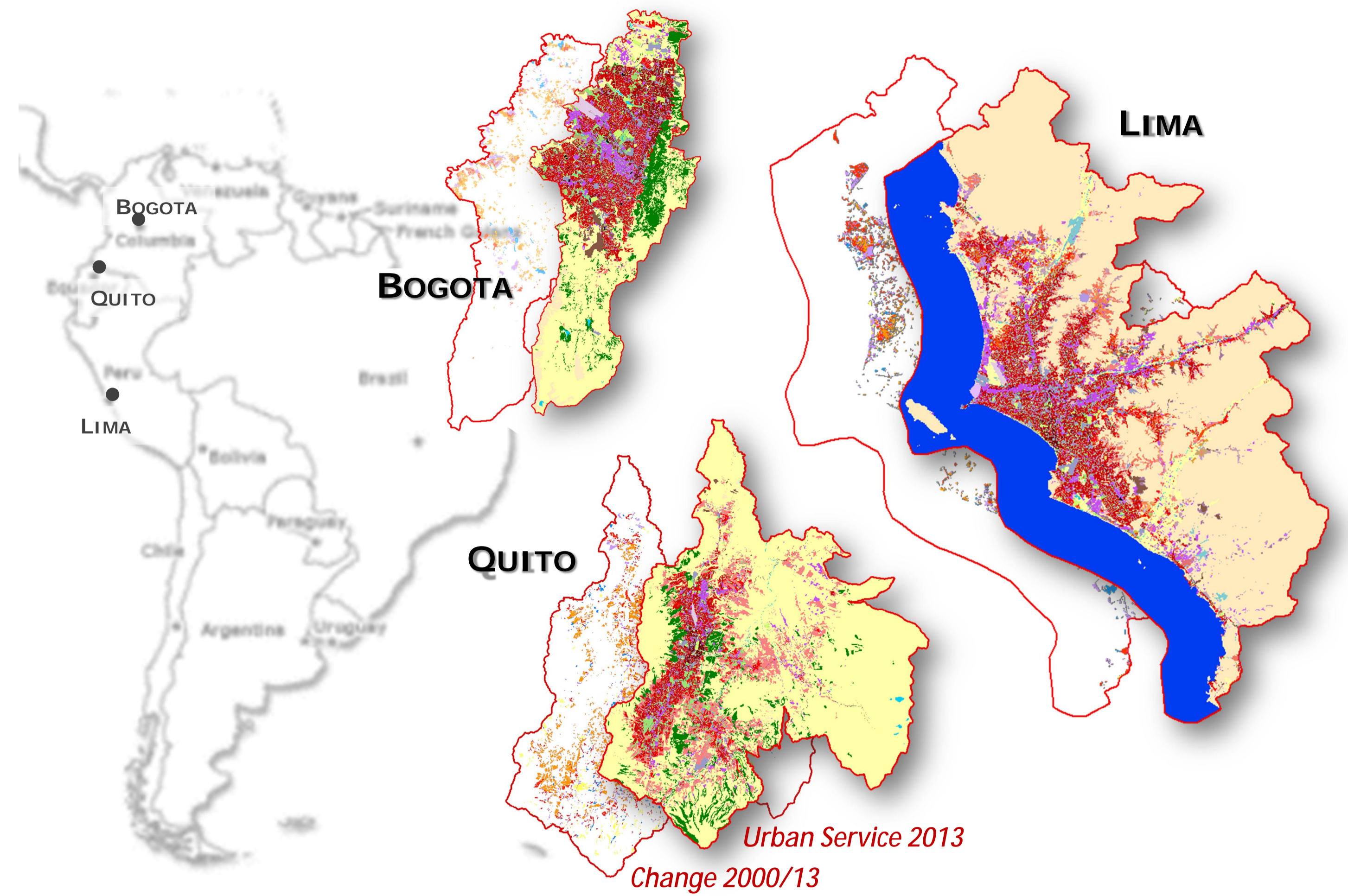


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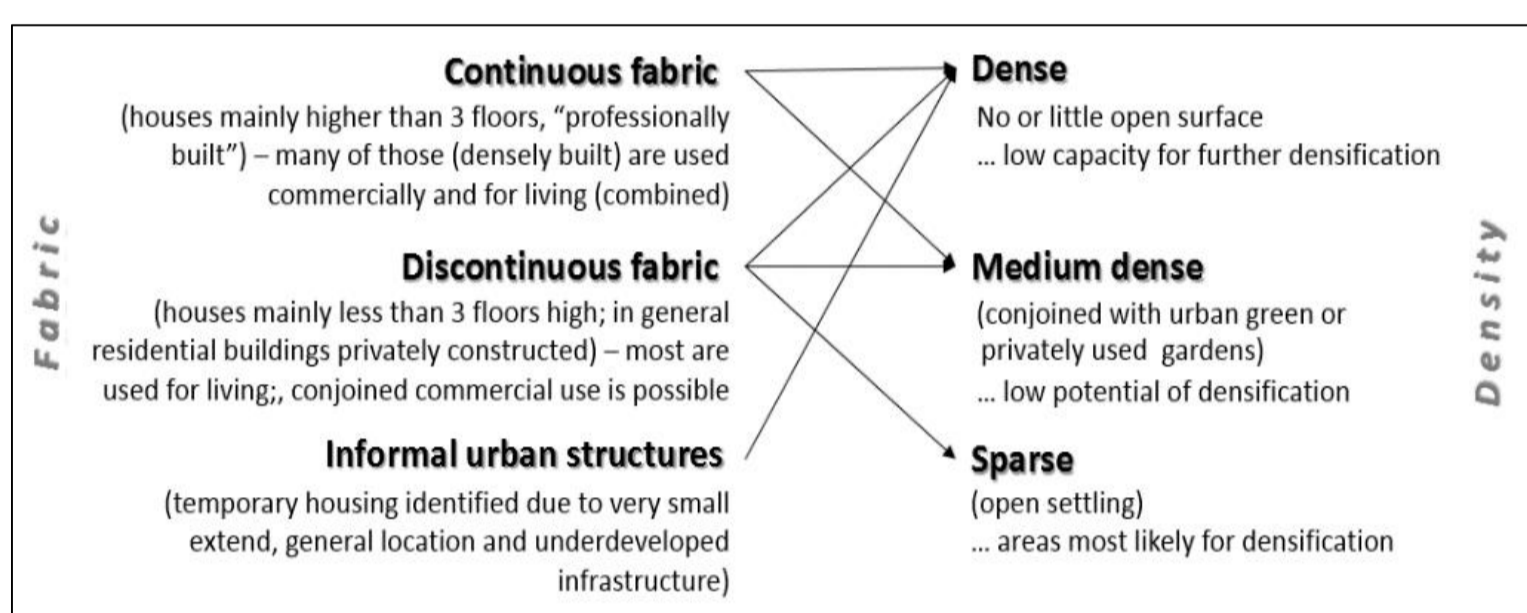
BACKGROUND

The use of EO services is on the rise, but not yet appropriately applied to the planning and industrial sectors. ESA took the opportunity to finance pilot projects following key aspects of World Bank topics within the Value Adding Element/ EOworld2. The project was designed to set-up services following thematic requirements of World Bank staff. Planning activities, construction, appropriate management of investments services combined with broader modelling of potential future development requires detailed spatial information – up-to-date and historic. Depending on the thematic scope users require large area covered or information with high thematic depth. The pilot project was set up to find a tailored solution to support these essential needs by generating up-to-date, detailed urban land use maps and land use change analysis.



BASELINE URBAN SERVICES

Within the EOworld2 PilotProject services were prepared to support World Bank activities. The Urban Mapping Service distinguishes between up to 23 different classes, 18 directly related to urban. It corresponds to Urban Atlas (GMES/Copernicus) which is in line with CORINE, focusing on urban and simplifying natural and semi-natural areas. The mapping is comparable to a scale of 1:25,000 and better. Urban structures are preliminary differentiated due to density and building height. This principle is an essential component for a globally transferable nomenclature suitable for large scale downstream analysis of various sites with different history of development due to geographical, natural and/or political circumstances.

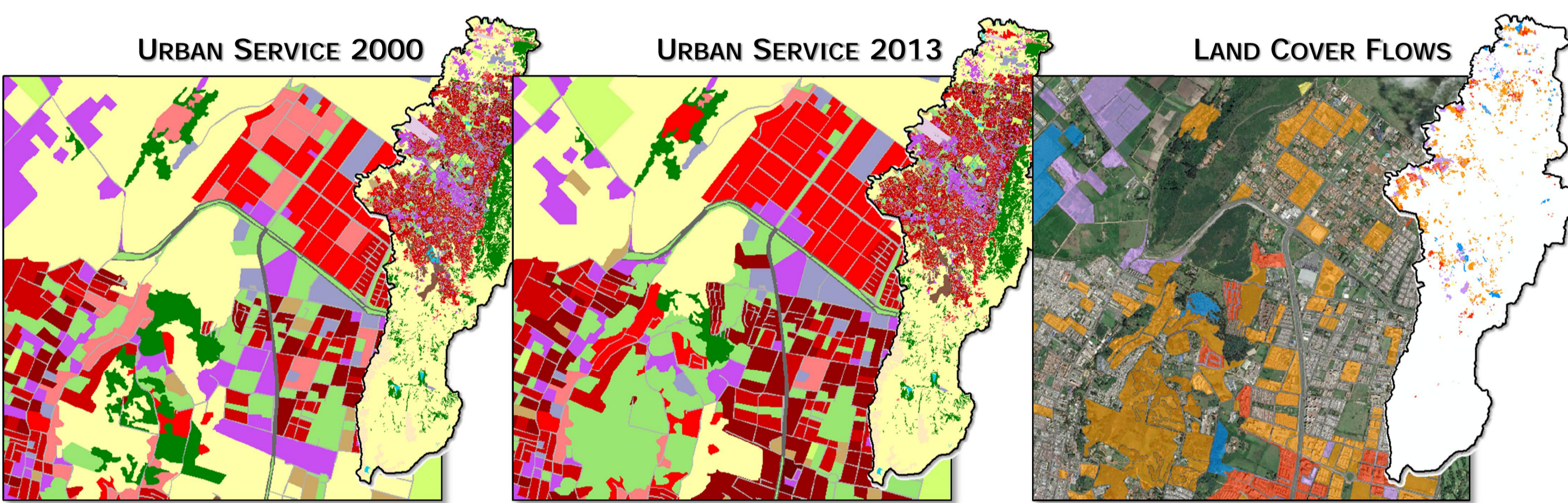


Dense
No or little open surface
... low capacity for further densification

Medium dense
(conjoined with urban green or privately used gardens)
... low potential of densification

Sparse
(open settling)
... areas most likely for densification

Urban mapping Service, example Bogota; Land Cover Flow (LEAC)



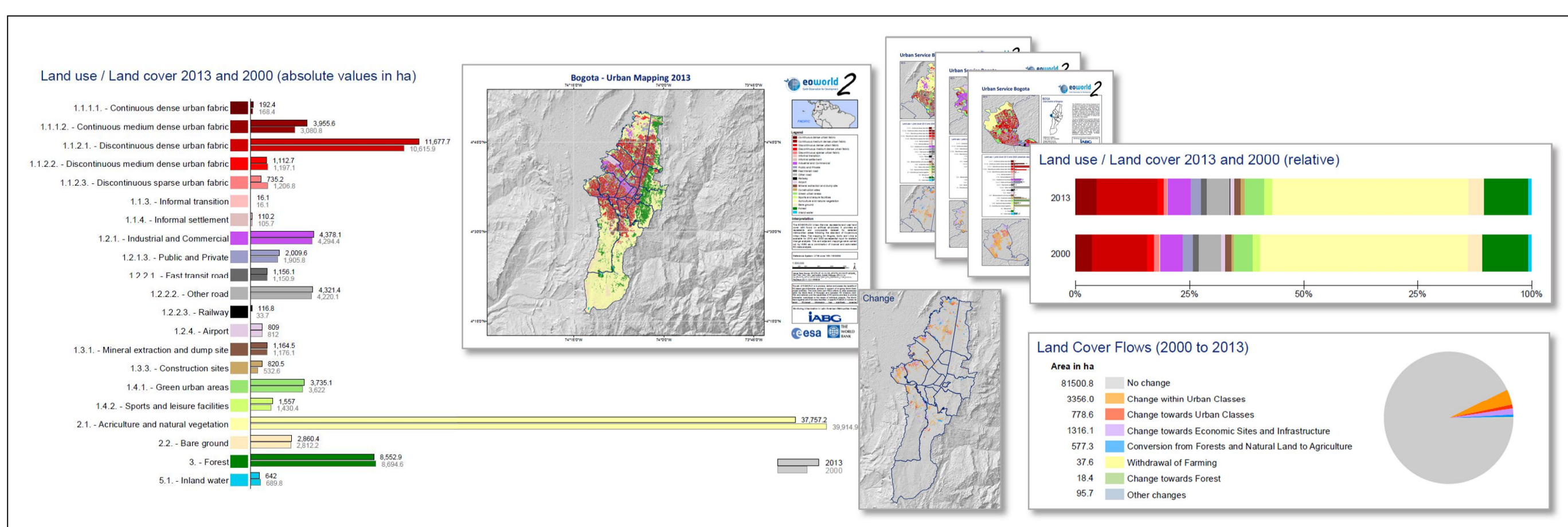
Urban mapping Service, example Bogota; Land Cover Flow (LEAC)

The Urban Service was prepared for 2013 (SPOT6 data/ 1.5m) and transferred towards 2000 (SPOT4/5, Landsat/ 2.5-15m) following a backdating approach combining manual and automated image analysis (OBIA) reaching thematic quality of 96% and better. The Urban Services of 2013 and 2000 were combined with each other, changes identified, summarized and presented in GIS and statistical context. With respect to World Bank needs, reference to administrative units is essential due to correlation to other in-house statistical appraisal. Transferability is merely limited by availability of very-high resolution historic EO data. However, with reference to the VHR analysis of 2013, historic data of significantly lower resolution did not have substantial effect on historic data interpretation.

Change analysis had been performed following the LEAC standard [1]. It aggregates Land Cover Changes according to thematic groups of broader Land Use/ Cover categories.

BASIC CHANGE ANALYSIS AND PRESENTATION

With respect to the users' needs, analysis was prepared for the entire regions under focus as well as the opportunity given to derive geo-statistical summaries for administrative units or other secondary GIS-related units.



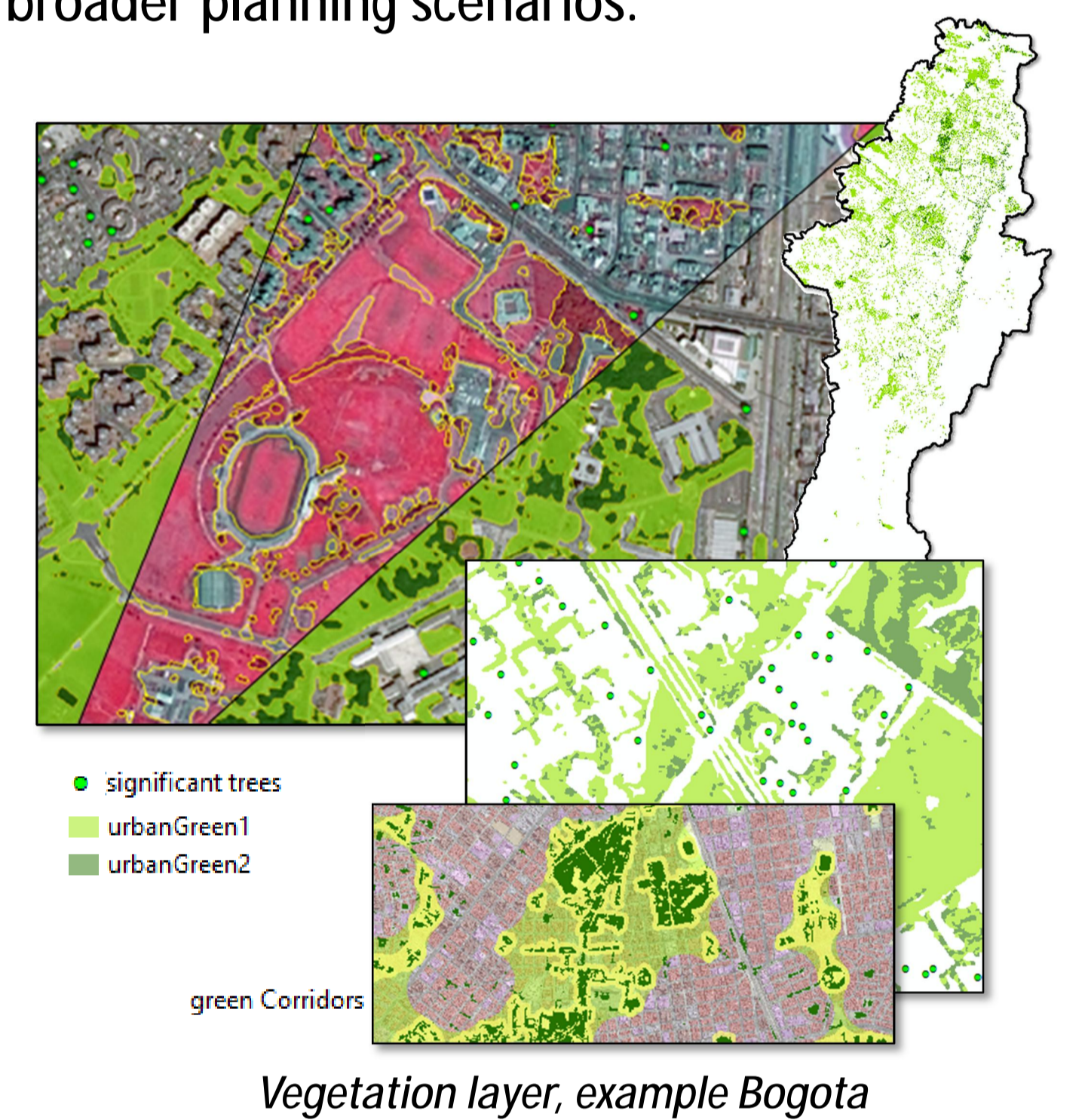
Selected presentation material, example Bogota

Often local authorities and the decision making sector are not familiar with applying geo-spatial data as supportive measure. Information, simple to access and simple to handle is a key element for implementation and acceptance in the appropriate environment. Within EOworld2 different ways of presentation were selected, containing Google-ready GIS data, video, on-screen presentation and analysis, statistical presentation, or conventional map series and products.

Adjacent to the project in progress, new requirements did arise and were expressed by World Bank staff that could increase potential usage of the Urban Baseline Service significantly. They can be derived highly automated and enable the user to carry out complex analysis to comparable low costs: analysis on distribution, connectivity and change of urban vegetation, further investigation in selected classes (e.g. informal), conditional terrain analysis, as well as setting up broader planning scenarios.

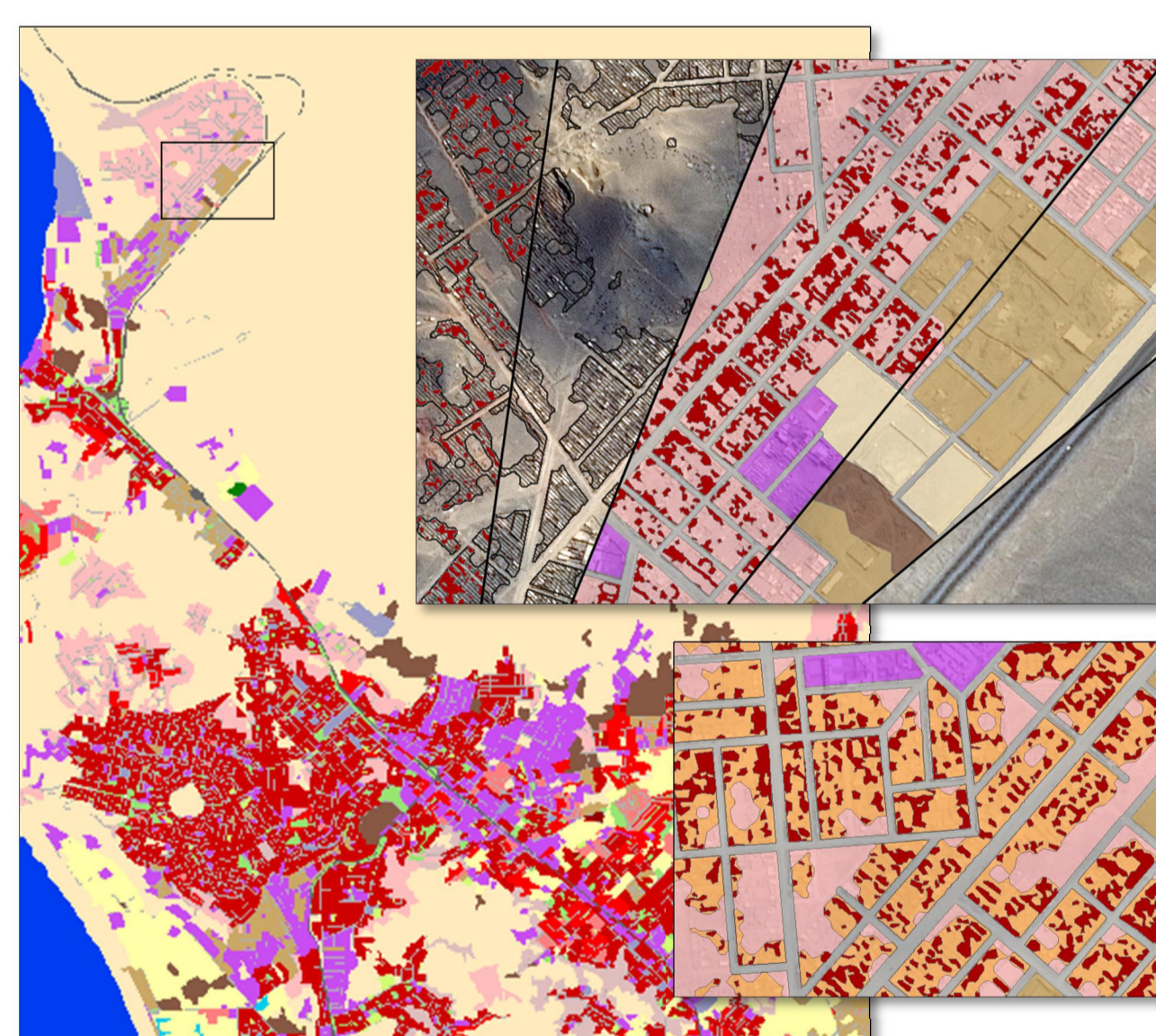
URBAN VEGETATION LAYER

In most fast growing cities cadaster information related to vegetation is rare, inhomogeneous, of coarser scale or outdated. Sensibility related to environmental analysis (e.g. urban climate, water economy) arises. Urban green acts as substantial indicator for climatic aspects or for quality of living. Protecting those is an important issue for urban planning as well as identifying areas with fast reduction of green space as sign for socio-economic conversion or commercial activities. By using advanced technologies, a vegetation layer was derived, separating low and elevated vegetation ready for downstream GIS analysis or direct usage (identification of vegetation corridors, green spots important for urban climate, ...). In combination with the Urban Baseline Service or large scale cadastral data the layers identify areas of open space suitable for protection/ further development.



INFORMAL URBAN STRUCTURES

Different thematic aims require tailored solutions, such as further separation of distinct classes. The Urban Service is then applied as masking element to support the specific mapping approach. The figure shows housing structures within the urban class "informal transition". Distributed all over the urban fringe informal housing transforms into proper building structures over time. These areas are mapped separately, of large extent and various stage of development. Automatic approaches can easily identify density and complexity of such structures as well as their transformation over time. As this example shows a multi-temporal analysis of single features significantly supports the process of coordination of planning.



Informal transition, example Lima

SUMMARY AND FUTURE ACTIONS

EOworld2 provides EOdata services exemplarily on selected metropolitan regions. According to customers feedback it significantly supports the work of development initiatives by providing an independent sight onto the regions under focus. The Urban Baseline Service, its geo-statistical data as well as the fact of having an identical approach applied on different regions provides the Bank with a reliable and comparable reference data set for downstream analysis.

The Sentinel mission strategically supports the value adding sector with a wide range of suitable EOdata for mapping and monitoring environmental situation and changes with comparable techniques. With respect to analysis of historic EOdata, it is suitable and envisaged to set-up classification updates of 2015 or later using Sentinel-2 and -1 as well as transfer the services onto other sites.

Reference

[1] Land and Ecosystem Accounting (LEAC) based on CORINE land cover changes database (1990-2000) <http://www.eea.europa.eu/themes/data-and-maps/data/land-cover-accounts-leac-based-on-corine-land-cover-changes-database-1990-2000/>