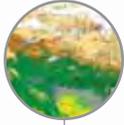


LAND COVER

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Land cover is defined as the observed physical cover including the vegetation (natural or planted) and human constructions that cover the earth's surface. Reliable land cover and land cover change observations and assessment are essential for the sustainable management of natural resources, understanding and mitigating climate change, modelling of ecosystems and biogeochemical cycling and for addressing other important issues such as food security.

Land cover characteristics reveal ongoing processes of deforestation, desertification, urbanization, loss of biodiversity and ecosystem functions, and water and energy management. *In situ* and satellite-based land observation efforts, as well as different disciplines (i.e. geography, ecology, geology, forestry, etc.), use and refer to land cover as one of the most obvious and detectable indicator of land surface characteristics.

LAND COVER MONITORING

The land surface of the World has been mapped and characterized several times and many countries have some kind of monitoring systems in place (i.e. forest, agriculture and cartographic information systems and inventories). There are multiple examples of countries using satellite data for national land cover and change assessments, i.e. in the context of their UNFCCC reporting. Examples include:

- Australia: National Carbon Accounting System
- Canada: Earth Observation for Sustainable Development of Forests (EOSD)
- Different countries worldwide: United Nations Global Land Cover Network (GLCN)
- European Union: Coordination of Information on the Environment (CORINE)
- Land Cover Map of Great Britain
- New Zealand Land Cover Database
- South African National Land Cover Database
- United States National Land Cover Dataset (NLCD)

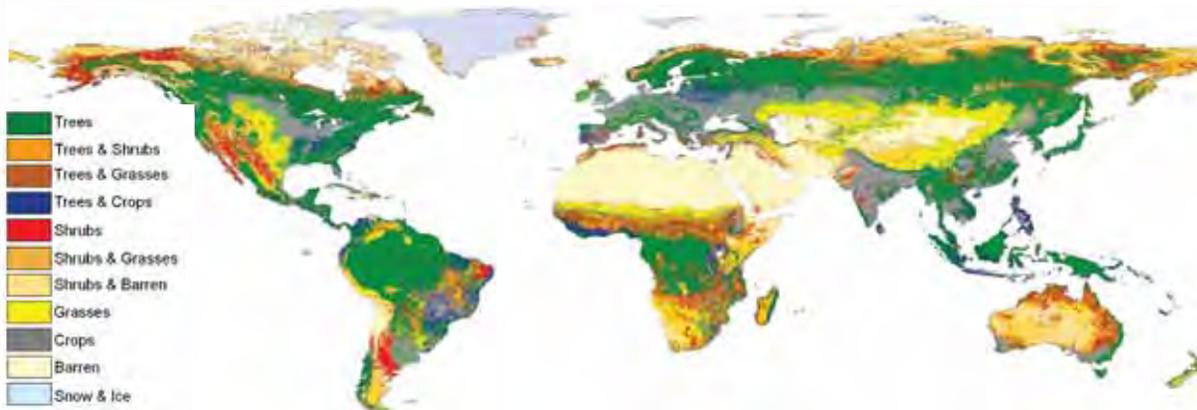
In addition there are a number of global land cover mapping activities. They have evolved with the availability of continuous global moderate resolution

satellite observations since the early 1990s and resulted in number of available 300m to 1km resolution products. While most mapping projects are developed for specific applications and purposes, the resulting inconsistency between the different land cover map products or change accounting systems undermines the ability to successfully synthesize land assessments on regional and global scales. However, the FAO/UNEP Land Cover Classification System (LCCS) is now being adopted by many countries and international initiatives and is being widely used to provide thematic land cover standardization at a variety of scales of implementation.

AVAILABLE OBSERVATIONS

Multispectral and multitemporal global and regional land cover data sets are currently produced by a range of space agencies and research institutes at medium resolutions (250 m to 1 km) for determining land cover type, and at fine resolutions (10–50 m) for determining type and detecting land cover change. Additionally, *in situ* data are acquired for monitoring of land cover, vegetation migration and related phenomena, and are also used as ground truth for validation of land cover and land cover change measurements by satellites. Land cover observations have historically been developed according to specific project needs. The land theme of IGOS (IGOL) defines detailed observations requirements. It advocates sustained and integrated observations on all three major scales (moderate and fine resolution satellite data, and *in situ*). Data gaps exist, especially for the more detailed scales. Near-operational annual global data products are provided for moderate resolutions,

Operational land cover monitoring requires increasing international commitment for long-term continuity and consistency of satellite and *in situ* observations



SYNMAP – a global synthesis product of existing global land cover maps for carbon cycle modelling [Source: M. Jung, Remote Sensing of Environment]

and global mosaics of Landsat-type satellite data exist from 1990 and 2000 (2005 in progress). Thus, some basic datasets exist and detailed global land cover monitoring is possible and should be pursued. Coordinated *in situ* observations are limited to date. Nevertheless, essential challenges for building a sustained global land cover observing system remain, including international cooperation on the continuity of observations; ensuring consistency in land monitoring approaches; community engagement and country participation in mapping activities; robust product validation; suitable data access and regional networking; and capacity building.

RECENT ACTIVITIES

- Advocating existing internationally-agreed approaches to systematic land cover characterization (LCCS) and validation (CEOS protocols).
- Release of GLOBCOVER (ESA) product to provide the highest resolution (300 m), consistent, global land cover map to date.
- Development of the Mid-decadal Global Land Survey (USGS & NASA) for consistent, preprocessed, global, free-of charge Landsat data for 2005, which extends the existing 1990 and 2000 Geocover global datasets.
- Global Remote Sensing Survey as part of FAO's Forest Resources Assessment 2010.
- Utilizing and validating moderate-resolution time-series data and land cover data sets.
- Technical inputs on available methodologies and observations for the UNCCC initiative on Reducing Emissions from Deforestation and Degradation (REDD).

- Formulating specifications and implementing production of a global high-resolution land cover and land change data set and report (GEO task).
- Strengthening national-level capacities to produce and use these products, especially in developing countries, through national and regional networks (like GOF-C-GOLD) and capacity building initiatives such as GLCN.

INTERNATIONAL FUTURE IMPLEMENTATION NEEDS

Substantial resources are required to maintain and extend space-based observation assets (fine and moderate resolution) and *in situ* observation capabilities to provide baseline data of worldwide consistency and availability. GEO, the Partners of IGOS, including the Space and UN agencies, GTOS, and other entities such as the Global Monitoring for Environment and Security (GMES) are committed to improve land observations globally, an effort that needs further international engagement and support. GTOS, through GOF-C-GOLD and its partners have provided a platform for international cooperation and communication on land cover monitoring (including standardization and validation). The Global Land Cover Network (GLCN) has furthered the implementation of national, regional and international approaches to land cover standardization and capacity development amongst its member states. However, a minimum of US\$250 000 per year is required to maintain the international networks and to ensure long-term continuity and consistency in land cover monitoring.

RELATED LINKS:

GOF-C-GOLD: www.fao.org/gtos/gofc-gold | GLCN: www.glcen.org | Integrated Global Observations of the Land (IGOL): www.fao.org/gtos/igol
CEOS Calibration and Validation Working Group: <http://wgcv.ceos.org> | UN Land Cover Classification System: www.glcen-lccs.org