Forest cover

Indicator name — **Forest Cover 2000 and Forest Cover Change statistics**

Indicator unit — Forest change statistics are expressed as the trend in the percent of the land covered by forests, as well as the total forest area (km^2) gained or lost when compared to the reference year 2000.

Area of interest — The forest cover for the year 2000 and the forest change statistics are computed for each protected area, each country and each ecoregion and are provided for each terrestrial and coastal protected area of size ≥ 1 km^2 ,each country and each terrestrial ecoregion.

Related targets

Sustainable Development Goal 15 on life on land

Aichi Biodiversity Target 5 on natural habitats

Aichi Biodiversity Target 11 on protected areas

Aichi Biodiversity Target 12 on species

Policy question — How well are forests preserved in a given area? Forests are one of the most important terrestrial habitats and a carbon sink that needs to be conserved to fulfil biodiversity conservation and climate change mitigation targets. By informing of forest cover trends, and their spatial distribution, it is possible to highlight countries, ecoregions or specific protected areas with worrying forest loss trends, as well as others where forest cover is well maintained or even increases through time either naturally or through forestation.

Use and interpretation — Forests concentrate a large portion of terrestrial biological diversity and are one of the main storages of carbon, which is accumulated in the forest biomass, in the dead organic matter and in the forest soils. Halting or reducing forest loss is required to ensure the conservation of many species that depend on forest habitats and ecosystems. On the other hand, a sustainable use and management of forests, which obtains wood and non-wood products for human use while ensuring forest persistence, is crucial to support, in many areas, the livelihoods of rural communities, which would otherwise get impoverished by a depleted forest cover. Avoiding forest loss, or increasing the area covered by forests where necessary, is also needed to preserve or restore many other important ecosystem services like water regulation, erosion control, pollution control or recreation. Forests are in risk in many areas due to a variety of pressures, most notably agricultural expansion but also extractive activities (such as mining), urbanization, infrastructure development or wildfires, among others.

Key caveats

The forest change statistics included in DOPA Explorer are based on global products derived from earth observation, which may have varying classification accuracies and unavoidable uncertainties in the classification of forests in different areas (see e.g. Gross *et al.*, 2017; and section on methodology).

The period considered for assessing the forest trends computed for the period 2001–2022 and defines forest based on tree cover. This means that this product considers as forest loss the temporarily unstocked areas, and that trees in agricultural lands may be classified as forests.

In DOPA Explorer, maps of forest gain and losses can be displayed at country, ecoregion and site level and the changes are quantified in charts (Figure 1).

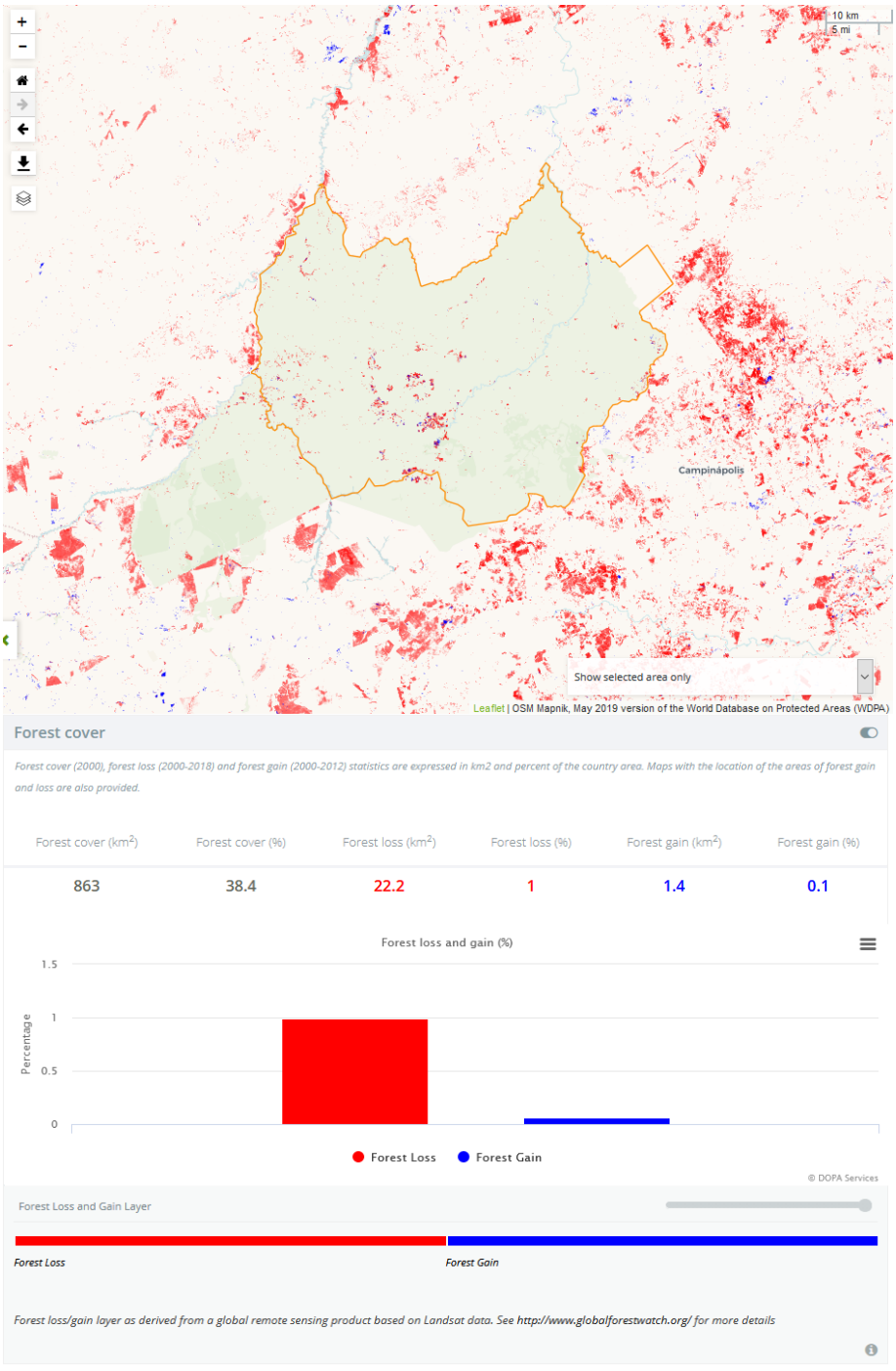

Figure 1. Forest cover for the reference year 2000, forest gain and losses maps and statistics for the Parabubure protected area in Brazil, as displayed in DOPA Explorer.

The forest data sources and classifications do not differentiate natural forest from plantations, nor natural regeneration or expansion from that due to planting or deliberate seeding. Forest habitat quality, for particular taxa or for forest biodiversity in general, is not discriminated in these sources, which would need to be considered in more detailed assessment that may focus on individual species or groups of species of particular conservation interest.

Indicator status Operational indicator published by Hansen *et al.* (2013) derived here from GIS analyses applied at country, ecoregion and protected area level.

Available data and resources

Data available Maps with forest gains and losses compared to the reference year 2000 are obtained from a global remote sensing product indicating loss for the period 2000-2022 and gain for the period 2000-2012. Trends in forest loss and gain are available at the country and ecoregion level as well as for each protected area at least as large as 1 km^2.

Data updates Planned with each update of DOPA.

Codes Standard GIS operations applied to vector and raster data

Methodology

Methodology The forest cover for the reference year 2000 and change statistics (gain 2000-2012, and loss 2000-2022) were produced at a spatial resolution of 30 m by the analyses of remote sensing images acquired by Landsat satellites, as described in Hansen et al. (2013). These analyses have been updated, including improvements to the methodology, to assess forest trends up to 2022. In these analyses, forest refers to tree cover, defined as all vegetation taller than 5 m in height, which may include some tree crops under agricultural land use. Although these maps allow differentiating forests, and their trends, for different percentages of tree canopy cover, the gains and losses are reported here for 30% or more of canopy cover. Forest loss is defined as a stand-replacement disturbance or the complete removal of tree cover canopy at the 30 m Landsat pixel scale. Forest gain is defined as the inverse of loss, or the establishment of tree canopy from a non-forest state. The authors evaluated the accuracy of the forest change maps and reported the classification errors to be of about 12% of for the forest losses and of about 25% for the forest gains. These error rates are global averages, and may vary significantly in particular biomes or focal areas. Some additional information on the accuracy of these maps is provided at http://blog.globalforestwatch.org/data/how-accurate-is-accurate-enough-examining-the-glad-global-tree-cover-change-data-part-1.html

For the forest trends at the protected area level included in DOPA Explorer, the forest change maps by Hansen et al. (2013), updated for the period 2001–2022, are overlaid with country and ecoregion boundaries as well as with all protected areas provided by the UNEP-WCMC and IUCN (2023). This analysis excludes UNESCO Biosphere Reserves as well as protected areas recorded only as points.

Input datasets

The forest change statistics and maps in DOPA Explorer are based on the following data sources and spatial layers:

Forest cover 2000 and change for the period 2001–202219 (country, ecoregion, and protected area levels)

- Hansen *et al.* (2013)
    - Available from: https://glad.earthengine.app/view/global-forest-change
    - Further details on the version of this dataset used in DOPA Explorer are available from: https://storage.googleapis.com/earthenginepartners-hansen/GFC-2022-v1.10/download.html

Protected Areas

- WDPA of February 2023 (UNEP-WCMC & IUCN, 2023).
    - Latest version available from: www.protectedplanet.net

Country boundaries

Country boundaries are built from a combination of GAUL country boundaries and EEZ exclusive economic zones (see Bastin *et al.*, 2017).

- Global Administrative Unit Layers (GAUL), revision 2015.
    - Latest version available online: http://www.fao.org/geonetwork/srv/en/metadata.show?id=12691
- Exclusive Economic Zones (EEZ) v9 (2016-10-21)
    - Latest version available from: http://www.marineregions.org/downloads.php

Terrestrial Ecoregions of the World

- TEOW (Olson *et al.*, 2001)
    - Latest version available from: https://www.worldwildlife.org/publications/terrestrial-ecoregions-of-the-world

References

Bastin, L., *et al.* (2017). Processing conservation indicators with Open Source tools: Lessons learned from the Digital Observatory for Protected Areas. In: *Free and Open Source Software for Geospatial (FOSS4G)* Conference Proceedings: Vol 17, Article 14. August 14-19, 2017, Boston, MA, USA. http://scholarworks.umass.edu/foss4g/vol17/iss1/14

Gross, D., *et al.* (2017) Uncertainties in tree cover maps of Sub-Saharan Africa and their implications for measuring progress towards CBD Aichi Targets. *Remote Sensing in Ecology and Conservation*. http://dx.doi.org/10.1002/rse2.52

Hansen, M. C., *et al.* (2013). High-resolution global maps of 21st-century forest cover change. *Science*, 342: 850–853. http://dx.doi.org/10.1126/science.1244693

Olson, D. M., *et al.* (2001). Terrestrial ecoregions of the world: A new map of life on Earth. *Bioscience*, 51: 933–938. https://doi.org/10.1641/0006-3568(2001)051[0933:TEOTWA]2.0.CO;2

UNEP-WCMC & IUCN (2023). Protected Planet: The World Database on Protected Areas (WDPA) [On-line], [February/2023], Cambridge, UK: UNEP-WCMC and IUCN. www.protectedplanet.net

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