



Food and Agriculture  
Organization of the  
United Nations

# FAO assessment of forests and carbon stocks, 1990–2015

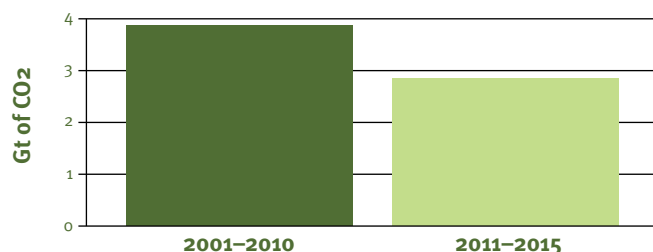
Reduced overall emissions, but increased degradation



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**GLOBAL ESTIMATES OF FOREST EMISSION TRENDS** show that total emissions have decreased by over 25 percent between the period 2001–2010 and the period 2011–2015. FAO data show that the decrease is due to a decline in deforestation rates globally. They also reveal that emissions from forest degradation, estimated for the first time, are increasing over time and represent one-quarter of total emissions.

FAO’s most recent global estimations of carbon emissions from deforestation and forest degradation for the period 2011–2015 point to a reduction of over 25 percent in emissions from deforestation over this period, i.e. from an average of 3.9 to an average of 2.9 Gt (or billion tonnes) of CO<sub>2</sub> per year.



According to the FAO estimates, while deforestation still contributes to net emissions into the atmosphere, the remaining forests continue to be a net carbon sink globally, having stored on average some 2.1 Gt of CO<sub>2</sub> annually, during the period 2011–2015. Half of the FAO estimated sink was due to net growth in planted forests.

If the contributions of deforestation and forest sinks are considered together, forests are a net source of emissions, at an average of 0.8 Gt of CO<sub>2</sub> per year during the period 2011–2015, although this represents a reduction of over 50 percent with respect to the decade 2001–2010, which saw average net forest emissions of 1.7 Gt of CO<sub>2</sub>.

The FAO figures are based on the FAOSTAT Emissions database methodology, which uses national data reported by countries to FAO via the Global Forest Resources Assessment (FRA) as input, and applies the Intergovernmental Panel on Climate Change (IPCC) guidelines for estimating national greenhouse gas emissions from agriculture, forestry and land use. Previous FAO data published in the IPCC Fifth

Assessment Report (IPCC, 2014a) were based on FRA 2010 figures. The estimates released in this document thus update and extend for the first time the IPCC analysis to 2015.<sup>1</sup>

The input data used for these estimates, including area extent and biomass information, are produced by each country according to FRA guidelines, using ground-based and aerial measurements. They are not directly comparable to measurements using satellite imagery, which, although useful, do not capture certain types of forests or stages in the growth cycle or discern critical trends in land-use change. For example, dry forests in Africa or central Brazil have great spaces between trees and often have few leaves for large parts of the year, making them difficult to capture by remote sensing. At the same time, areas of managed forest (where trees are harvested and regrown) are typically considered as forest land by countries reporting under the FRA, but may be classified as deforestation by satellite-based surveys.

## WHAT IS A FOREST?

FAO defines forests as land with trees higher than 5 m height and a minimum canopy cover of 10 percent, excluding land that is mainly used for agriculture or urban use. Trees may be temporarily absent in managed forests and still be classified as forest land. These parameters are used for international reporting through the FRA, although countries also use national definitions for their own purposes.

For the purpose of this document, forest area is further subdivided into: **Natural forest** (which includes the two FRA subdivisions **Primary forest** and **Other naturally regenerated forest**) and **Planted forest**.

For the purpose of this analysis, **deforestation** is considered to occur when forest land changes to non-forest use.

<sup>1</sup> More details on methods and additional data analysis will be made available on the FRA website in September 2015.

## DIFFERENCES BETWEEN COUNTRIES AND REGIONS

Countries with developed economies<sup>2</sup> continued to represent the bulk of the overall estimated carbon sink, or 60 percent of the total during 2011–2015, but down from 65 percent of the total during 2001–2010. The decrease was largely due to decreases in new forest area plantations.

At the regional level, Africa, Asia and Latin America and the Caribbean all continued to be net sources of emissions from forests, although emissions from Africa and Latin America and the Caribbean decreased over the period 1990–2015. Brazil alone represented more than 50 percent of the overall estimated reduction in emissions over the period 2011–2015, with a decrease of almost one-third in net deforestation between 2005 and 2006, and a halving of net deforestation between 2010 and 2011.

The forests of Europe and North America continued to be carbon sinks over the period 1990–2015. Oceania did not show a clear trend in forest emissions over the same period.

### WHAT IS FOREST DEGRADATION?

Forest degradation is defined here as a net annual decrease of carbon stock density in land remaining forest.

## FOREST DEGRADATION AND THE IMPORTANCE OF RESTORATION IN STRENGTHENING THE MITIGATION POTENTIAL OF FOREST LAND

FAO's data include, for the first time ever, a separate assessment of emissions from forest degradation and removals from forest regrowth. According to the findings, emissions from forest degradation are significant: as large as 1.0 Gt CO<sub>2</sub> yr<sup>-1</sup> on average over the period 2011–2015. This represented **one-quarter** of net emissions from forests, the remaining three-quarters being due to deforestation.



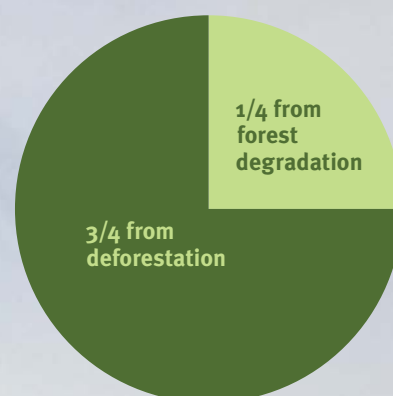
### WHAT IS A CARBON SINK AND HOW DOES IT WORK?

A carbon sink is anything that absorbs more carbon than it releases, while a carbon source is anything that releases more carbon than it absorbs. Forests, soils, oceans and the atmosphere all store carbon and this carbon moves between these reservoirs in a continuous cycle. Forests can act as either a source or a sink at different times.

A net carbon sink exists where total carbon absorption is higher than total emissions.

Overall, emissions from forest degradation have more than doubled, from an average of 0.4 Gt CO<sub>2</sub> yr<sup>-1</sup> in the period 1991–2000 to an average of 1.0 Gt CO<sub>2</sub> yr<sup>-1</sup> for 2011–2015.

The predominant role of forest degradation that has been brought to light underscores the importance of restoration and conservation in addressing climate change mitigation.



Net emissions, 2011–2015

<sup>2</sup> References in this document to countries with developed economies refer to those countries listed in Annex I of the United Nations Framework Convention on Climate Change, which can be consulted here: [http://unfccc.int/parties\\_and\\_observers/parties/annex\\_i/items/2774.php](http://unfccc.int/parties_and_observers/parties/annex_i/items/2774.php). Countries referred to as having developing economies are those not listed in this Annex.



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## DATA SOURCES AND AVAILABILITY

The FRA data have been drawn directly from each country's Country Report, which will be made available as of 8 September 2015 at <http://www.fao.org/forestry/fra/67090/en/>

FRA data, available over the period 1990–2015, include, among others, estimates of forest area and of carbon stocks in both aboveground and belowground biomass carbon pools.

For each UN Member State an updated time series, 1990–2015, of annual net CO<sub>2</sub> emission/removal from forest land will also be made available on the FAOSTAT website (<http://faostat3.fao.org/faostat-gateway/go/to/download/G2/GF/E>).

This document is the result of a collaborative effort between the Forestry Department, the Natural Resources Department and the Statistics Division of the FAO.



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