



TOPIC: FORESTS & FORESTRY RESEARCH

FORESTS OF THE EARTH

Worldwide, there are roughly **50 000** different types of trees. Three basic types of forests can be distinguished.



The global forest area is **4 GIGAHECTARE**. 30% of the land surface are covered by forests. This equals more than 4 times the size of Europe.

i 1 gigahectare are 1 billion hectares or 10 million square kilometers



Tropical Forests

Evergreen forests in warm and humid vegetation



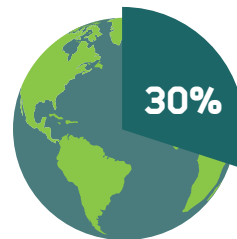
Boreal Forests

Conifer forests in the northernmost vegetation zones



Temperate Forests

Deciduous and mixed deciduous forests in temperate latitudes



Germany's forest area covers 11 million hectares.

FORESTS IN THE GLOBAL CARBON CYCLE

CARBON STORAGE IN FORESTS

- Forests are important carbon reservoirs.
- Forests are important carbon sinks.

SINGLE TREE (35 METERS TALL)

One tall tree absorbs 1 tonne (t) of carbon. By this, it reduces carbon in the atmosphere by 10 kg per year.



FOREST (100 TREES PER HECTARE)

One hectare forest absorbs 100 t of carbon. By this, it reduces carbon in the atmosphere by 1 t per year.



FORESTS WORLDWIDE

All forests of the Earth absorb about 400 gt carbon. By this, they reduce carbon in the atmosphere by 2.4 gt per year.
(estimate, exact value 2.4 gt, Pan et al. 2011 PNAS)



CARBON EMISSIONS

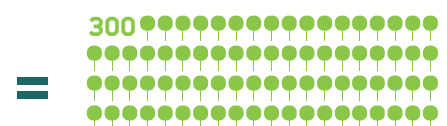
GLOBAL

i 1 gigatone (gt) is 1 billion tonnes. Carbon = C



Every year, humans release **11 GIGATONNES** of carbon to the atmosphere. Forests reduce the entrance of carbon into the atmosphere by 2.4 gt, oceans by 2.5 gt.
(Friedlingstein et al. 2019 Earth System Science Data)

PER PERSON



Each person in Germany emits 3 t C per year. This equals the productivity of 300 trees (3 ha of forest). Effectively, however, there are only 15 trees per person (0.15 ha of forest)

i All information are in carbon, 1 t of C amounts to 3.67 t of CO₂.



IMPACTS OF CLIMATE CHANGES

Extreme events like droughts, storms and insect infestations change forests.



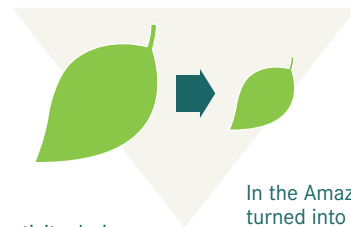
DECREASE OF FOREST AREAS



245.000 HA

of forest area in Germany were damaged by storms, draughts and insects in 2018 / 2019. This equals the size of Saarland.

REDUCTION OF PRODUCTIVITY



30%

reduction of productivity during the drought of 2003 in Europe. Vegetation changed from a carbon sink to a carbon source.

(Reduktion der GPP, Ciais et al. 2005 Nature)

In the Amazon, forests turned into a carbon source during draughts in 2005 / 2015.

(Liu et al. 2017, Science, Phillips et al. 2009, Science)

HELMHOLTZ' RESEARCH: FOREST MODEL FORMIND

WILL VEGETATION REMAIN A CARBON SINK IN FUTURE?

The FORMIND forest model simulates the growth of forests and trees based on climate and soil data.



The FORMIND team combines forest models with current satellite data and is thereby able to analyze the dynamics of large forest areas, such as the Amazon with 410 billion trees. The model can estimate the biomass in forests of the earth as well as determine the impacts of climate change for different areas. The simulations help to understand what types of forest are able to better cope with extreme events. In Germany, for example, this would be mixed forests with heterogeneous structures.

(Fisher et al. 2016 Ecological Modelling; Rödiger et al. 2019 Nature communications ; Bohn et al. 2017 Royal Society Open Science)

INFO

The forest model is developed at the Helmholtz-Centre for Environmental Research (UFZ).

The research team of Prof. Dr. Huth analyzed more than 700.000 laser data for the Amazon-area. They simulated every tree in the Amazon (410 billions of trees) and blended these data with information on climate and soil. As a result, the researches generated maps over the current biomass stocks and the productivity of trees in the Amazon.

Would you like to know more?

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www.formind.org

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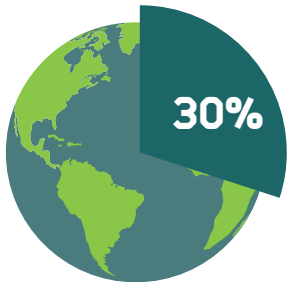
an initiative of the Hermann Helmholtz Association of German Research Centres

www.helmholtz-klima.de

Die globale Waldfläche beträgt

4 GIGAHEKTAR.

30% der Landoberfläche sind von Wäldern bedeckt. Das ist mehr als die 4-fache Fläche Europas.





Jährlich gelangen durch den Menschen

11 GIGATONNEN

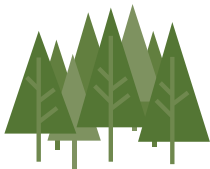
Kohlenstoff in die Atmosphäre.
Wälder verringern den Eintritt von
Kohlenstoff in die Atmosphäre um
2.4 Gt, Ozeane um 2.5 Gt.

(Friedlingstein et al. 2019 Earth System Science Data)



Tropische Wälder

Immergrüne Wälder
in feuchtwarmen
Vegetationen



Boreale Wälder

Nadelwälder sind in den
nördlichst gelegenen
Vegetationszonen



Temperierte Wälder

Laub- und Laubmisch-
wälder in gemäßigten
Breiten