

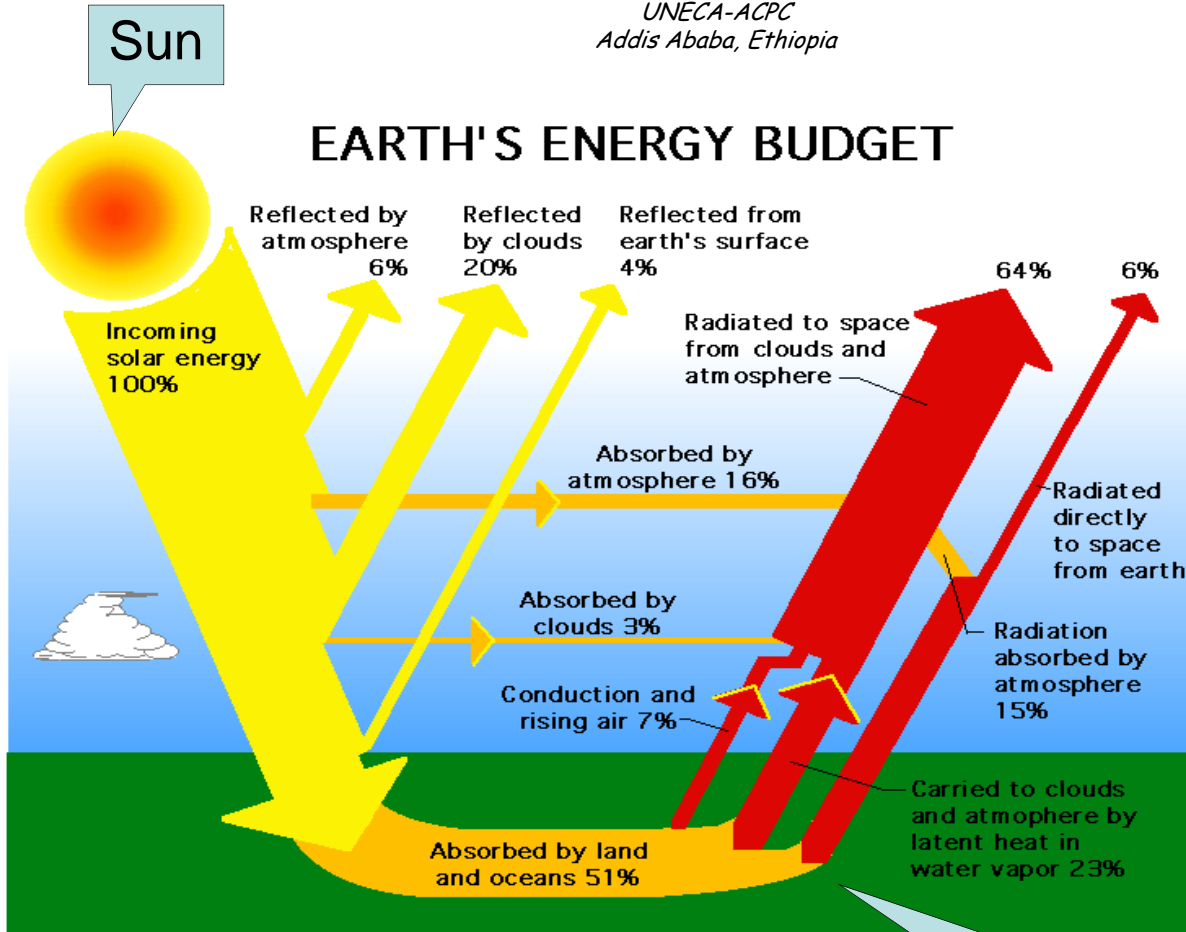
# First Annual Conference on Climate Change and Development in Africa (CCDA-I)

United Nations Conference Centre, Addis Ababa, Ethiopia, 17-19 October 2011

## The influence of Greenhouse Gases in the Radiation Budget of the Earth: Causes of Climate Change

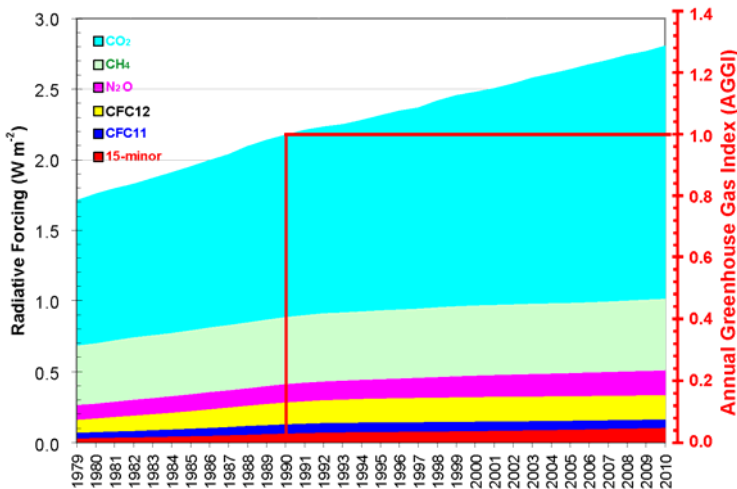
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### EARTH'S ENERGY BUDGET



Without anthropogenic emission of greenhouse gases the incoming radiation from the sun and the outgoing radiation from the earth and its atmosphere remains balanced annually like in the figure in the left.

### Earth's Surface



The emission of greenhouse gases (long lived gases like CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, CFCs) starting from the industrial revolution made the earth's surface warmer than normal (unbalance the radiation budget of the earth) due to the absorption of the outgoing radiation from the earth and re-radiate back to the earth's surface.

The greenhouse gases are recently warming the earth's surface by about 2.8 W/m<sup>2</sup>

Radiative forcing, relative to 1750, of all long lived greenhouse gases. The NOAA annual greenhouse gas index, which is indexed to 1 for the year 1990, is shown in the right axis (source NOAA website).