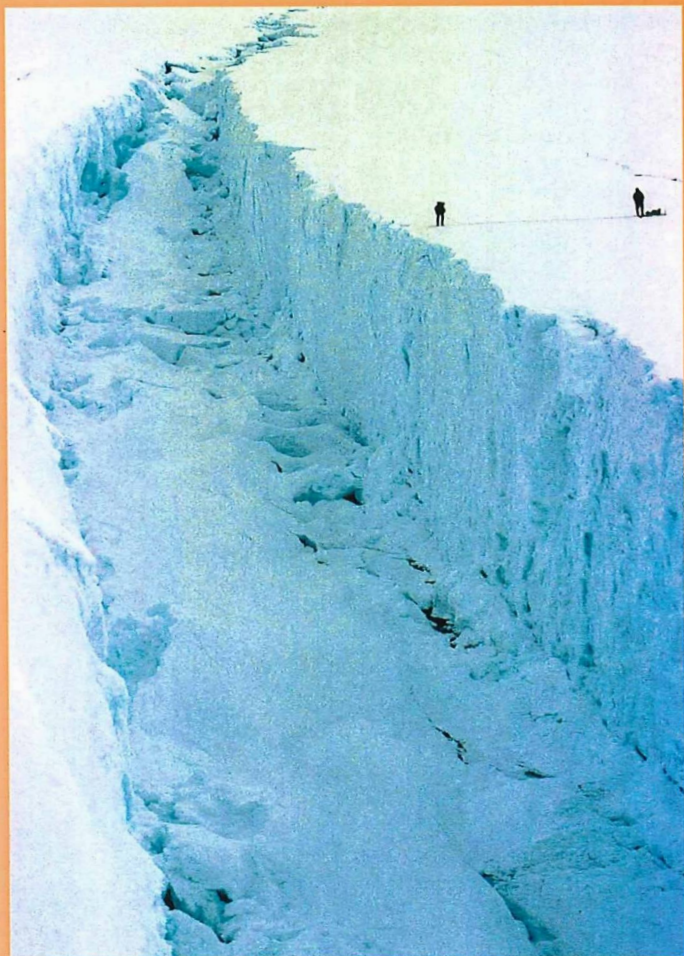


GLOBAL WARMING AND FORESTS



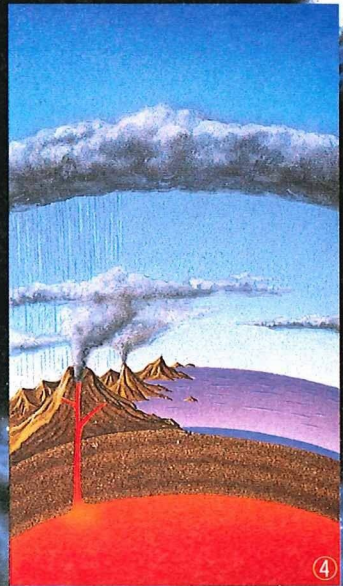
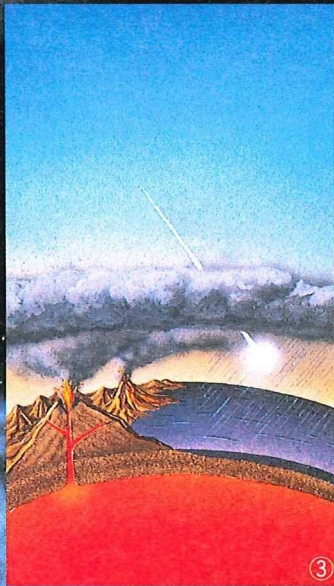
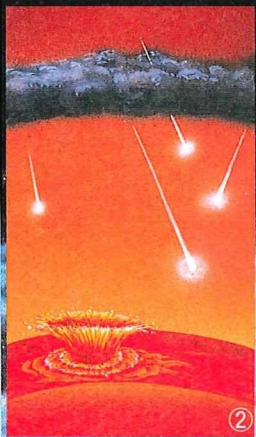
The Creation of the Earth

According to a current thinking, the earth was created about 4.6 billion years ago. At that time innumerable planetesimals were rotating around the sun, and through repeated crashes with each other, some gradually became larger, pulling others into them due to their gravitational force. The earth is one such planet.



- ①The energy from the ocean.
- ②These crashes also c
instantaneously evap
- ③When the earth beca
rain continued for ae
where it combined v
nitrogen became the
- ④On this earth with mo
and/or volcanic activ
air it cooled down an
exist on earth.

The Miraculous Planet which Made the Existence of Life Possible



ashes caused the surface of the earth to fuse and it was covered with a red-hot magmatic

and the components of the planetesimals such as water, carbon dioxide (CO_2), and nitrogen to
e, and form a primitive atmosphere and clouds over the earth.

cooler, the clouds gradually descended and brought the first drops of rain to the surface. The
and in course of time the sea was formed. CO_2 in the atmosphere dissolved in the sea water
calcium, and turned into limestone. As the amount of CO_2 decreased in the atmosphere,
ipal component, and accordingly the earth cooled to a degree where life could exist.

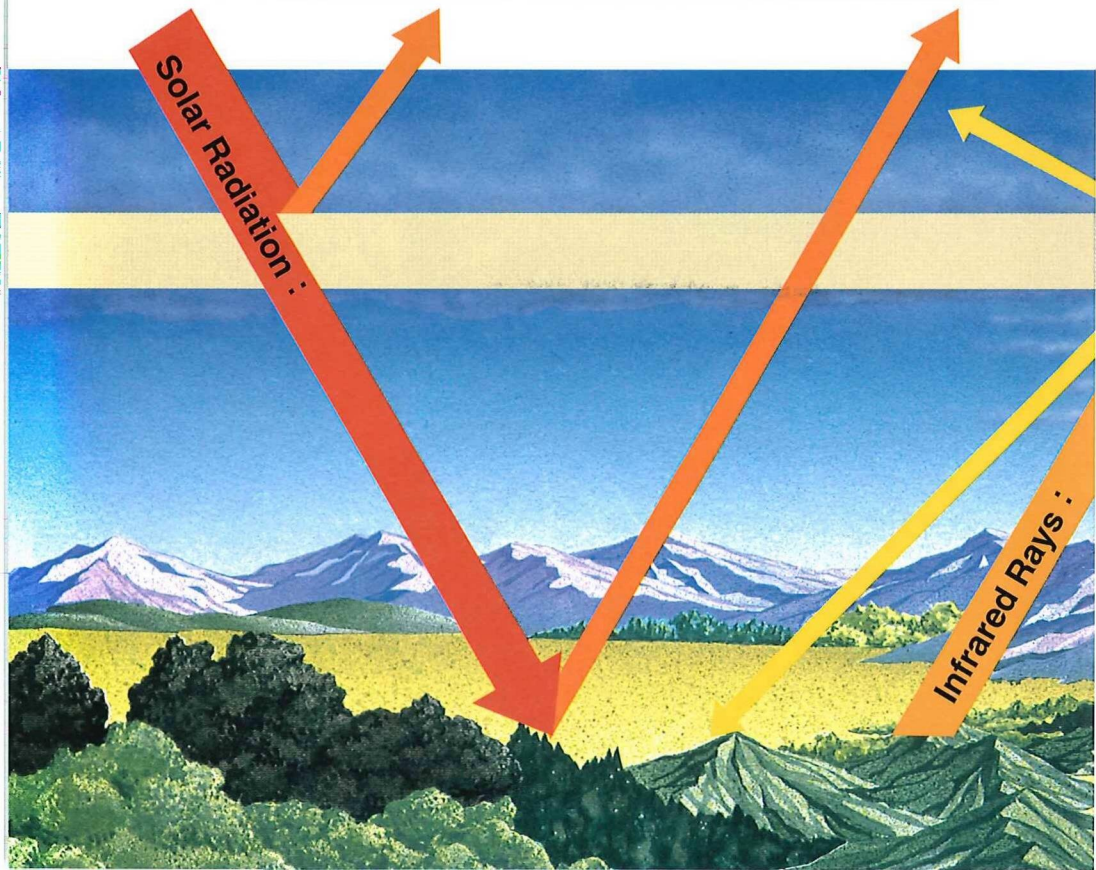
able temperatures, the water cycle was born; When the earth became hot from the sun's heat
e water evaporated, removing the heat from its surface, and turned into clouds. In the upper
n returned to the earth in the form of the rain. It is this system that made it possible for life to

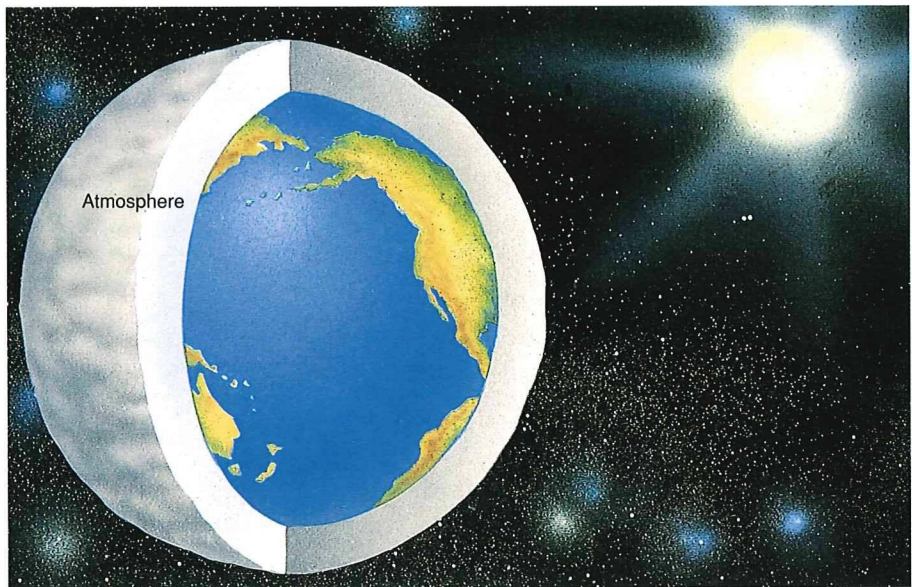
The Earth Has Lost Its Balance

The atmosphere contains greenhouse gases which play a role similar to the glass of a greenhouse, allowing solar radiation to pass through but not letting heat escape. With similar effect, the global mean temperature has been kept to about 15°C. However, as human activities expanded and emissions of greenhouse gases such as CO₂, methane and CFCs increased, the degree of enclosed heat from the surface of the earth has increased, and as a result, the global mean temperature is rising. This is what is called global warming.

Greenhouse Effect on the Earth's Atmosphere (Radiation Balance)

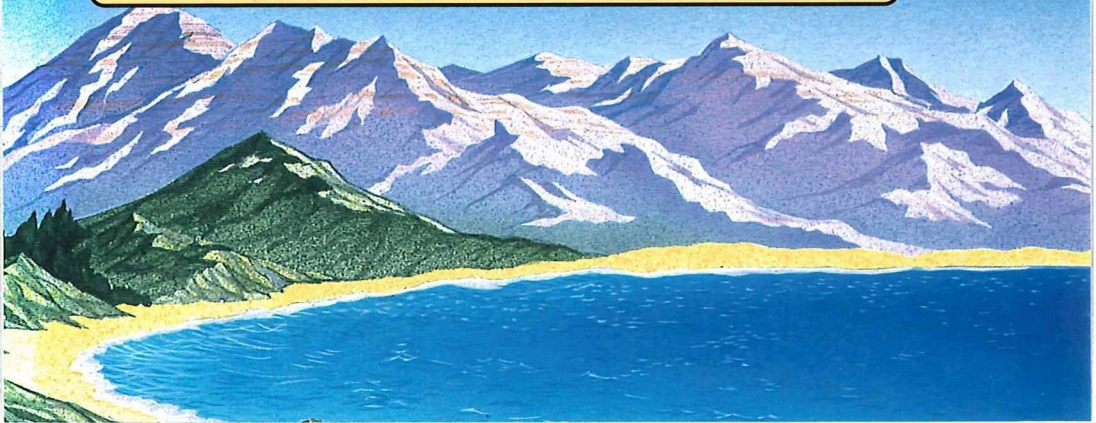
Energy from the sun, for the most part, is absorbed by the earth's surface, while a part is reflected by the earth's surface and the atmosphere.





Greenhouse Gases (water vapor, CO₂, methane, etc.)

A considerable portion of the heat radiated from the earth's surface (infrared rays) is absorbed and reradiated by greenhouse gases, and thus heats the earth's surface and lower atmosphere, while a part escapes into space.

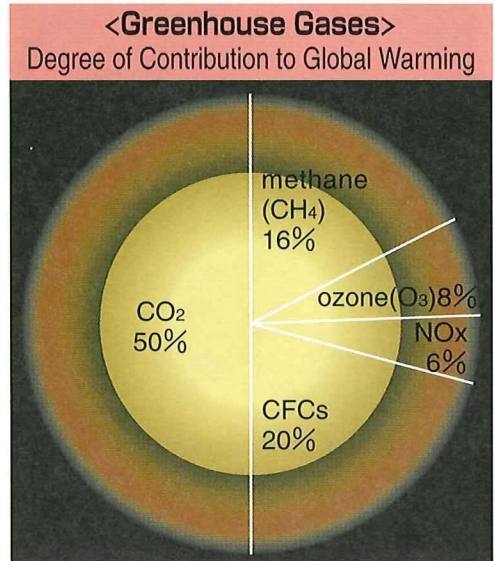


Acceleration of Global Warming

Emissions of greenhouse gases are increasing as a result of various human activities. Gas emissions through the production, conversion and consumption of energy (chiefly CO₂) contribute most to global warming, followed by industries (chiefly CFCs), deforestation (CO₂ & methane) and agriculture (chiefly methane) in that order.



High energy consumption in modern society

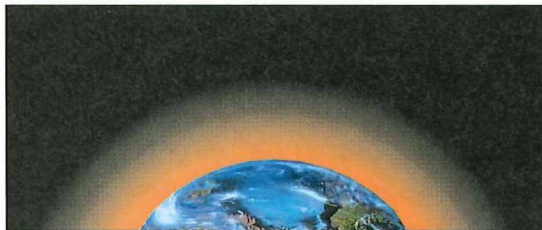


Source : World Resources Institute Data, 1990

Due to the increase of CO₂ emissions attributed to combustion of fossil fuels such as petroleum, coal and natural gas, as well as deforestation, current CO₂ concentrations in the atmosphere have increased 1.25 times compared to those prior to the Industrial Revolution in the mid-18th century. This rapid increase has upset the natural balance in the atmosphere all the more because CO₂ is an extremely small component of the atmosphere. The CO₂ increase is regarded as the biggest cause of global warming.



Increase of Atmospheric CO₂ Concentrations



Mass Consumption of Fossil Fuels

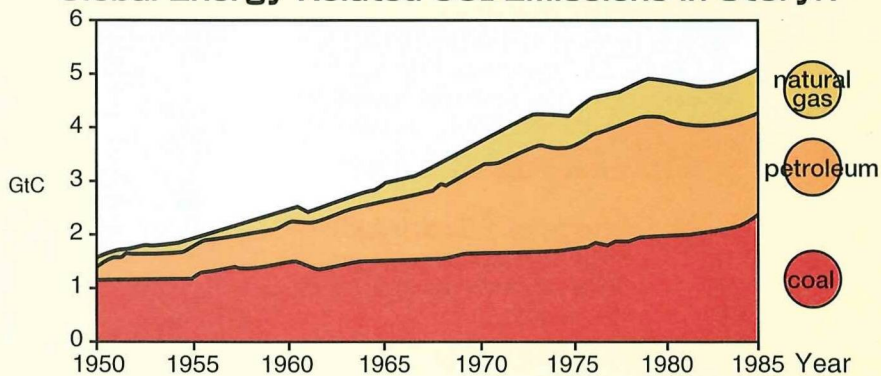
Consumption of coal, petroleum and natural gas has increased radically since the Industrial Revolution.

Deforestation

Tropical forests have been decreasing at an alarming rate since the 2nd World War.

It is estimated that by the end of the 21st century, CO₂ concentrations will be double those prior to the Industrial Revolution, even though emissions are to be maintained at current levels.

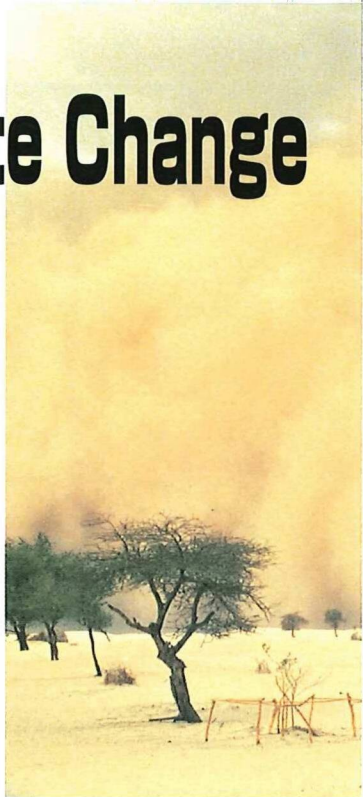
Global Energy-Related CO₂ Emissions in GtC/yr.



Source: Marland, 1988

Projection of Climate Change

The global mean temperature has increased by 0.3 - 0.5°C over the past 100 years. The United Nations, in cooperation with experts world-wide, has prepared projections of future climate change and proposals for action. According to the report (IPCC Report, 1990), if emissions of CO₂ and other greenhouse gases continue to grow at the current rate without any adequate measures being taken to reduce them, the temperature will increase by 3°C in the next 100 years. There is great concern that weather extremes and rising sea levels, etc. resulting from the increase would affect various aspects of human life.



Rise of Global Sea Levels

The average sea level is expected to rise as a result of thermal expansion of the oceans and melting of mountain glaciers and polar ice-sheets. The sea level has risen by 10 - 25cm over the past 100 years. An additional 1m maximum increase in the sea level may occur by 2100.



Submergence of Small Islands, etc.

Some islands would disappear.
Some countries would be partially submerged.

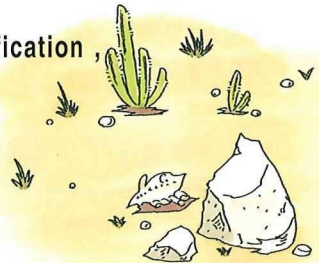
Retreat of Coastlines

A crack indicating melting of the polar ice shelf
(Larsen B Ice Shelf, Weddell Sea, Antarctica,

Weather Extremes

A general warming may lead to intensification of the usual climatic patterns with more rainfall in some places and less in others; a more intense cold climate in cold areas, and a more intense hot climate in hot areas; more frequent and more severe storms in certain regions.

- Occurrence of more frequent & more severe droughts and /or floods
- Expansion of desertification, degradation of farmland
- Serious famine



Extensive loss of inhabitable land

Creation of massive numbers of refugees

Prevention of Future Warming

In order to prevent further progress of global warming, it is most urgent that CO₂ emissions in developed countries be drastically reduced through adjustments in their life styles and social structures based on mass production & mass consumption. Since global warming is a cross-border issue, every nation and every individual in the world, must take action and cooperate with each other.



Application of wind power
(Tachikawa, Yamagata)

Reducing the use of fossil fuels

Alternative energy

- <Renewable energy sources>
Solar, solar hydrogen, wind, hydroelectric, biomass, ocean, geothermal, etc.

Higher energy-efficiency

- Improvement of generators, etc.
- Efficient use of heat generated from incinerators, subways, etc.



Application of heat from garbage incinerators
(Tropical Greenhouse Dome, Tokyo)

Energy-saving buildings

- Airtight & insulated
- Application of solar energy, etc.
- Re-use of building materials

Efficient transportation system

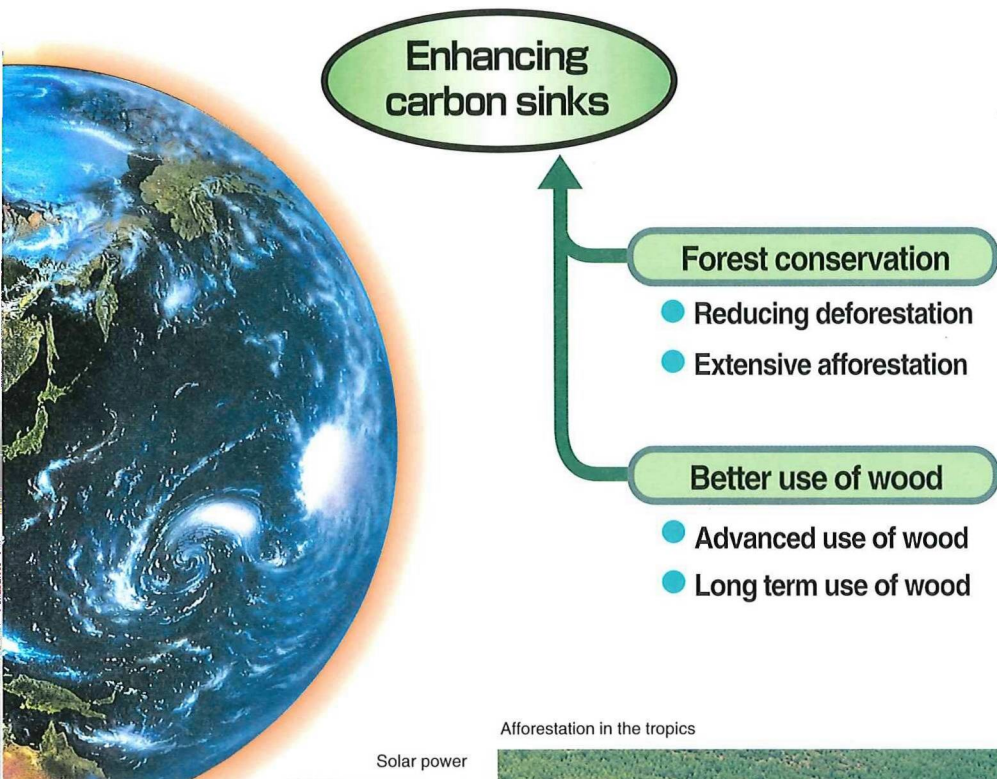
- Improvement of mass transportation system
- Popularization of low-pollution vehicles such as electric cars

Reducing waste

- Recycling resources



—International Cooperation Is Indispensable—



Solar power



Afforestation in the tropics



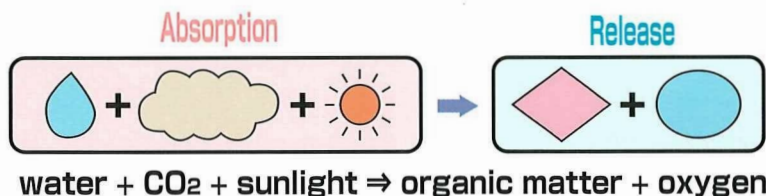
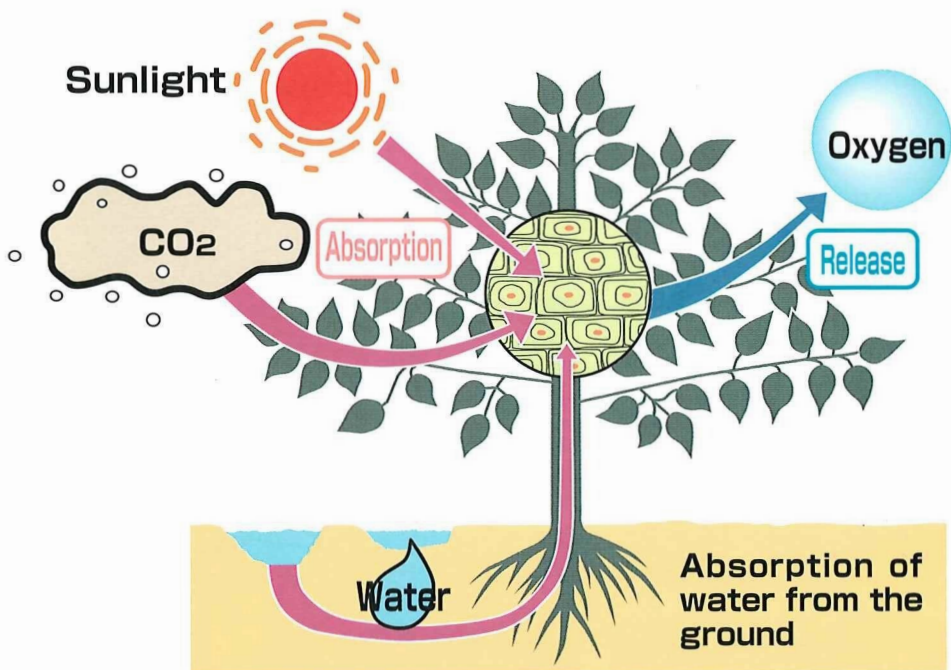
Electric car (no exhaust)

Forests—the Most Cost Effective CO₂ Fixation System

Through photosynthesis, plants absorb CO₂ and fix the carbon by turning it into organic matter and liberating oxygen. About 90% of the total amount of carbon fixation by plants on earth is attributed to trees.

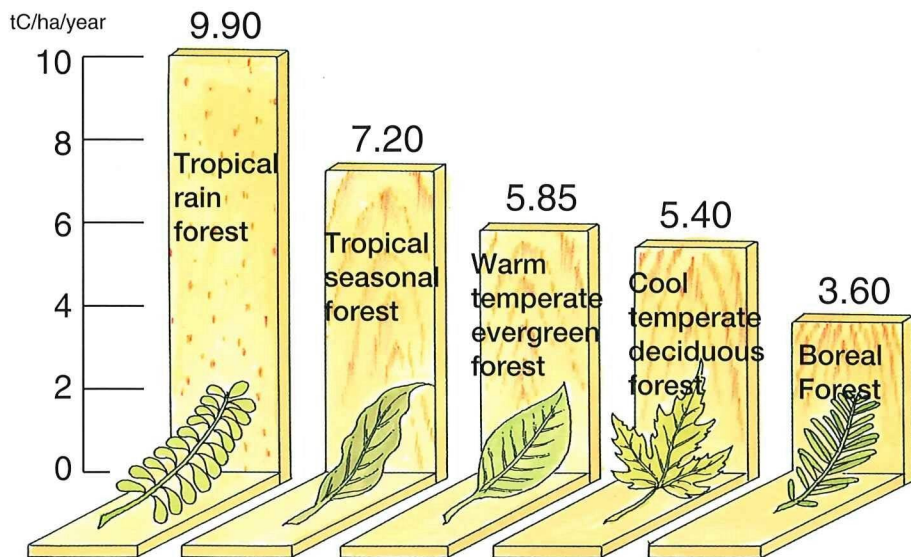
Photosynthesis by Trees

Fixing carbon in the form of growing leaves, branches, roots and trunks



CO₂ Absorption in Various Forest Ecosystems

— Annual amount of carbon fixation per hectare —



Source: Yoshitaka Nitta, 1989: *Estimates of the reduction of CO₂ emissions at the global level by energy conservation and absorption of CO₂ through reforestation*. Estimates are based on Whittaker and Likens Data, 1975.



Tropical rain forest



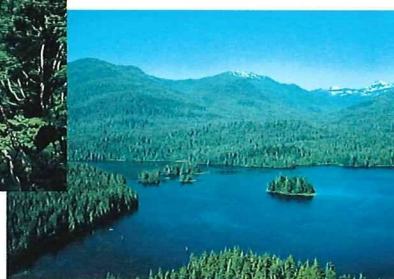
Tropical seasonal forest



Warm temperate evergreen forest



Cool temperate deciduous forest



Boreal forest

Reducing Deforestation

Tropical forests are decreasing by 15.4 million hectares a year due to excessive practice of slash-and-burn shifting cultivation, over-grazing, over-cutting, land development for other purposes such as agriculture, and so forth. Deforestation results in not only the reduction of carbon sinks, but also the release of CO₂ into the air as the cut wood decays or is burnt.



About one third of the total area of the earth is land.



About one third of the land area is forest (4 billion ha).



About Half of the forest area is tropical forests.



Forests effectively fix CO₂ as they grow. It is therefore important that we practice appropriate care, harvesting and regeneration at right stages of their growth as well as to prevent their degradations.



**Sustainable Forest Management
Is Essential.**

Enhancement of Forest Carbon Sinks ②

Expanding Forest Areas

CO₂ emissions in the air currently amount to 3.2 GtC per year. Since forests fix 6 tons of carbon per hectare a year, if an area of 540 million hectares (13.5% of the existing forest area) is afforested, the amount of carbon sequestration could offset the increased amount.

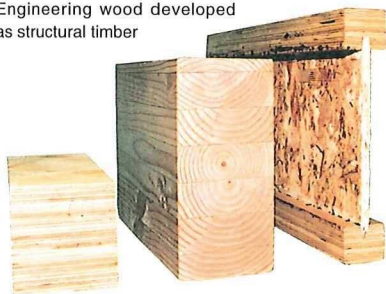


"Forest for the Green Earth" by JIFPRO
(Sabah, Malaysia)

Enhancement of Forest Carbon Sinks ③

Advanced & Longer Term Use of Wood

Engineering wood developed
as structural timber



Another effective measure to counter global warming is the use of wood instead of materials such as steel, aluminium, and concrete, which, in their manufacturing process, consume large quantities of fossil fuels, thus increasing CO₂ emissions. Technologies for advanced use of wood are being developed.

Long term use of wood means that the carbon is conserved in wood as long as it is used. Wooden houses and structures can thus be regarded as an "urban forest".



Modern large-scale timber construction (Karakuri Kinenkan, Kanazawa, Ishikawa)

Your Support for Global Forestry Promotion



The global environment is now in danger. To save our earth, conservation and rehabilitation of forests on a global scale is most urgently required. Individual citizen's action is needed.

This brochure was produced with the aid of the Ministry of Posts and Telecommunications through donations collected from the 1996 sales of post cards additionally priced for that purpose.



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