10 questions and answers about forest, trees and climate

During the year, there will be many discussions on many different levels regarding climate and climate change – and many questions will arise. Here we have summed up 10 common questions regarding forests, trees and climate – and tried giving relatively short answers. These short answers cannot cover every aspect of the problem and give a complete explanation, so we encourage you also to seek more knowledge on your own.

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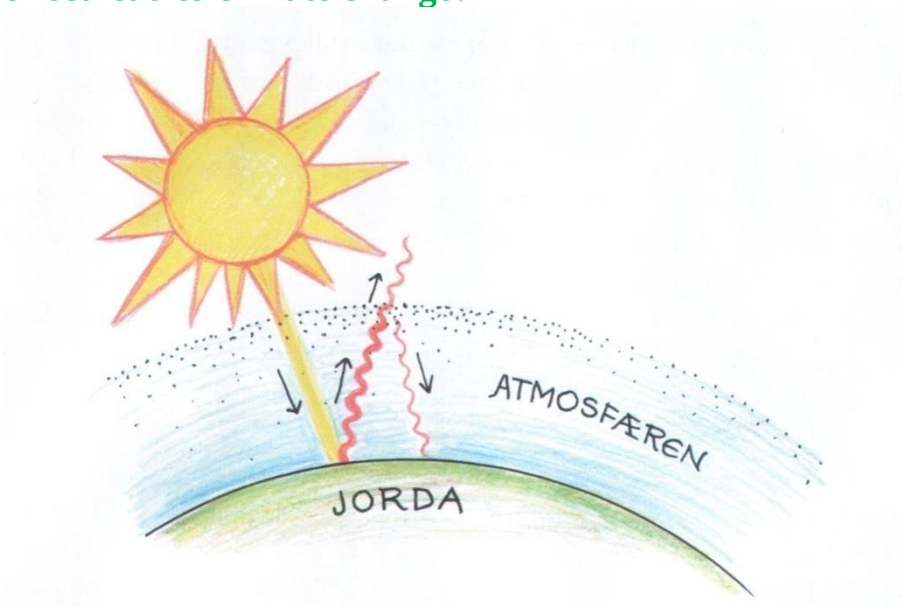
(Translated from Danish to English by Snorre Synnestvedt, Forest Society of Oslo and Akershus)

1. What is the greenhouse effect – and why does an increased greenhouse effect lead to climate change?



Illustrated by Lise Sandberg

There is no longer any doubt: The world's climate is changing. Human activity during the last 100 years, with deforestation and the burning of oil and natural gas, has caused the amount of CO_2 in the atmosphere to increase to a level the Earth is not "used to". The atmosphere surrounds our planet as a layer of gas – a layer that kind of works in the same way as the glass in a greenhouse. Sunlight passes through this layer and is absorbed as heat by the Earth. Some of this heat his radiated back into space, but the extra CO_2 in the atmosphere is now trapping too much of this heat.

That is why the Earth's temperature is rising – and why our climate is changing. During the last 100 years, the global surface temperature has risen by 0.7 °C. The next 100 years scientists think it likely that the temperature will rise a further 1.5 to 6 °C.

This can cause many changes. Already we can see that polar ice is melting. Sea levels are expected to raise flooding low-lying land and islands and changing the coastline. More extreme weather, with more storms, more rainfall and more drought with increased desertification in areas around the

Equator. All this can and will have a great impact on humans and all life on Earth. People will have to leave there homes. Species will become extinct.

Prospects are overwhelming, but we are not helpless. If we act now, it can make a big difference to the extent of the problems we will be facing the next 100 years.
Planting trees is one way to counter climate change. Saving energy is another. In addition, the invention of new solutions is a third way. They are all important.

2. What is the carbon cycle – and how does it influence the climate?

Carbon exists in many different places in our environment – dissolved in oceans and lakes, in the biomass of plants and animals, in the atmosphere as CO_2, in rocks and soils, and underground as oil, coal, etc.

Carbon is constantly exchanged between the different carbon sources and carbon stocks in a process known as the carbon cycle. Carbon is primarily exchanged in the form of CO_2 – and the carbon stocks are actually stocks that can absorb CO_2 and reduce its concentration in the atmosphere.

Humans and the carbon cycle
Each year humans emit 7 900 million tons of carbon into the atmosphere through the burning of fossil fuels and deforestation. Carbon stocks such as lakes, oceans and afforested land trap 4 600 million tonnes. This means that we are increasing the amount of carbon in the atmosphere by 3 300 million tons per year. It is not sustainable.

To deal with this we must at once emit less CO_2, stock carbon in new and existing forests and wood products, and develop alternative energy sources to coal, oil and gas.

Some figures
The European forests (outside Russia) hold 9 552 million tons of carbon. This amount increases each year with 115.83 million tons of carbon. The Russian forests stock 37 000 million tonnes of carbon and has an annual increases of 440 million tons of carbon.

3. Why is planting trees helping to reduce climate change?

There are two ways of reducing the amount of CO_2 in the atmosphere. We can emit less CO_2 – and we can remove CO_2 from the atmosphere and store it. Trees can do both! Forests have a key role in regulating the climate, because trees by their photosynthesis absorb CO_2 from the atmosphere and store carbon as wood and organic matter in the soil.

Photosynthesis
Using the energy from sunlight, green leaves absorb CO_2 from the air. Inside the leaf cells, CO_2 bounds together with water, and converts into the sugar substance glucose. The tree transform glucose to wood, branches, fruit, leaves, roots etc. In this way, CO_2 remains inside the tree as carbon. There is only one waste substance – oxygen.

Photosynthesis: CO_2 + Water + Sunlight → Sugar + Oxygen

Respiration
Only the green parts of a plant that can perform photosynthesis. All other parts of the tree "breathe" – or respire – like animals and other organisms without photosynthesis. In darkness, the whole tree respires.

Respiration: Sugar + Oxygen → CO_2 + Water + Energy

Growth and CO_2 capture
As long as a tree grows, it will absorb more CO_2 than it delivers via its breathing. When a tree is fully grown, it reaches a stable level where it respires as much as it does photosynthesis. Once the tree is old and deteriorating it will release more CO_2 than what is absorbed in photosynthesis. When the tree is completely decayed all the CO_2 bound in the tree will have returned to the atmosphere.

Forestry and CO_2 storage
Forestry is a way for people to take an active role in the carbon cycle. We can plant trees that absorb CO_2 – and harvest trees when they are mature and absorb less CO_2 than they release. If we plant new trees every time one is cut down, the trees we are removing from the forest are CO_2-neutral. If we plant trees on a larger area than originally harvested, we initiate a greater absorption of CO_2 – as well as greater storage of CO_2.

Research at the Swedish Agricultural University shows that the faster a forest grows, the more CO_2 is absorbed. From a climate point of view, it is better to cultivate the forest and make use of the trees rather than "leaving it alone" – provided of course that the forest is managed sustainably and that all necessary environmental concerns are taken in the production of timber. It is important to remember that there also is a need for old growth forest.

The trees we fell and extract contain a lot of carbon. This carbon can be stored for many years in wood products.

The table below lists how much CO_2 and carbon that is stored in an average tree at different ages:

Beech Tonnes carbon Tonnes CO_2	20 years 0,056 0,0205	70 years 0.69 2,48	100 years 1,66 6,08
Norway Spruce Tonnes carbon Tonnes CO_2	20 years 0,016 0,061	70 years 1,180 4,300	

Food for thought
A Dane emit on average about 10 tonnes of CO_2 a year. A mature tree contains on average 5 tonnes of CO_2. Very simplified we can say that we each must plant two trees per year to be CO_2 neutral. However: It takes quite a few planted trees to get one large tree that is mature for felling.

4. Why does the use of wood help the environment?

Wood stores CO_2 in the form of carbon. 1 m^3 of wood contains carbon from about 1 ton of CO_2. If we use wood for houses, bridges, furniture, paper, etc. the carbon will be kept away from the

atmosphere as long as the wood product exist. In Europe, estimations shows that we have accumulated about 60 million tons of carbon in wood products. The use of wood as material has several benefits for the environment:

- Wood products have a long life. The average lifespan ranges from 2 months to newspapers and 75 years for building materials.
- Wood products can usually be recycled – and the carbon continues to be stored. Finally, wood products can be burned and used as CO_2-neutral bio energy.
- Wood can replace other materials for construction such as concrete, steel, aluminium and plastic, which are more energy intensive to produce.

Here is an example:

If we use 1 m^3 of wood for a house, we have spared the atmosphere for 1 ton of CO_2. The carbon stays in the wood materials.

If we use 1 m^3 of wood instead of 1 m^3 of concrete, steel, plastic or aluminium, which are more energy intensive materials to produce, we will have spared the atmosphere for on average another 1 tonne of CO_2.

Therefore in total 2 tonnes of CO_2 are <u>not</u> emitted to the atmosphere if we substitute other materials and use 1 m^3 of wood for construction.

By comparison, 1 tonne of CO_2 equals the emission from the burning of 430 litres of gasoline.

5. How can wood be recycled?

Wood is a renewable and versatile raw material, and it has many lives:

1. Wood products
Timber is sawed and used directly as building materials, furniture, paper, packaging, etc.

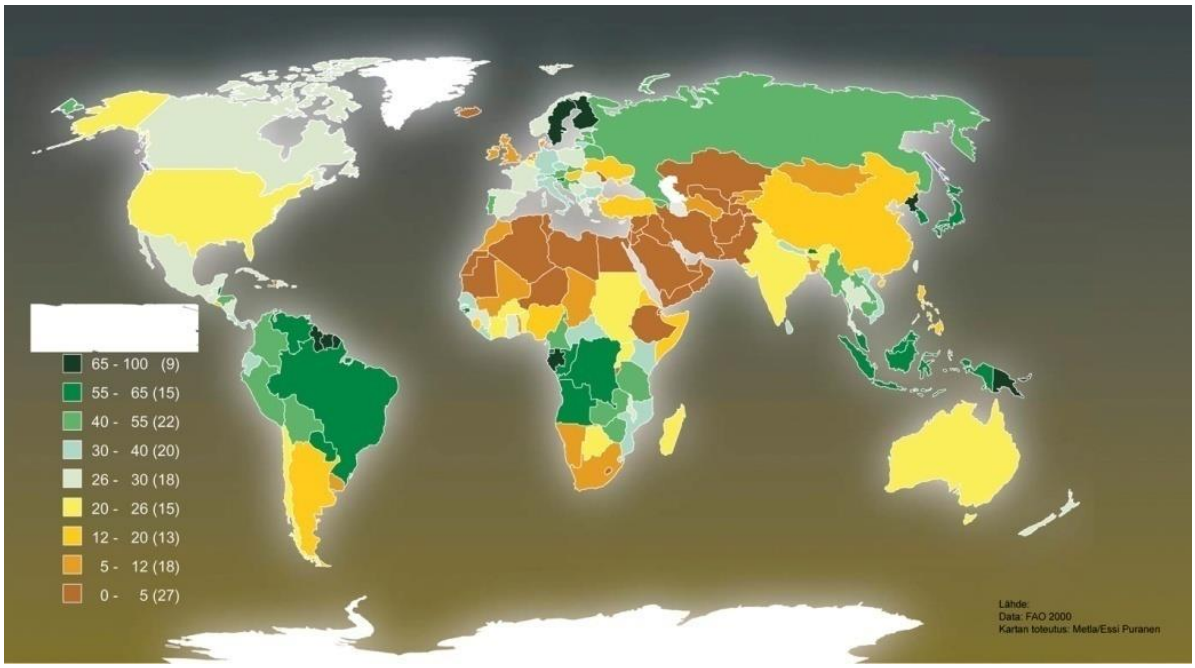
2. Recycling
Used construction timber and other wood materials can be reused. They can also chipped and used for fibreboards etc. Paper can be recycled several times.

3. Bio energy
Wood products can be used one final time as CO_2-neutral bio energy. Waste/bi-products from sawmills and other wood industries are frequently used as an energy source – both for heat and electrical power.

By recycling wood, the total CO_2 savings increase significantly.

6. Are we destroying the World's forests – and the climate – by using wood?

There is a big difference between felling a tree in tropical or subtropical forests and in temperate forests.



Forestry in temperate forests

In Europe (and Asia) the forestry sector is very much aware that the future of forest management is closely linked to nature conservation and reforestation. Past bad experiences have taught us to replant the forest after felling, to increase forest area, to cultivate the forest sustainably and to have an environmentally friendly wood production. Forests in Europe and Asia are growing. Europe's forests are increasing by 510 000 hectares every year – and only 64 % of the annual increment is harvested.

Deforestation in tropical and subtropical forests

Deforestation in tropical and subtropical countries are in turn an enormous problem – both ecologically and for the climate. The tropical rainforests are often called the world's lungs – they are ancient, enormous and filled with infinity of animal and plant species. Unfortunately, large areas of rainforest are cleared every day – harvested for timber or burned to create plantations and farm land. This is not a sustainable practice.

In the world overall, 13 million hectares of forest is cleared annually. This is an area equal to the size of Greece. Rainforest clearing is the cause of 20 % of global CO_2 emissions.

Countries with rainforest are often poor – and many of the people who live there have no other option than to exploit this resource. Therefore, an important part of the fight against climate change is to make agreements with rainforest-rich countries on how to protect their forests – and for the world community to help pay for this protection.

7. What is sustainable forestry?

A sustainable management of forests means taking into account the forests ecological, economic, social and cultural values. The forest manager use the forest to grow and produce wood – but is also responsible for maintaining forest health and biodiversity as well as taking into account alternative and non-commercial forest use, such as tourism etc.

In sustainable forestry, the environment is accounted for by doing the e.g. following:

- To map the forest and create green forest plans, to distinguish the areas for tree production and areas to be protected.
- To take into account key habitats and other environments that require special considerations.
- To leave standing and fallen deadwood to provide a basis for biological diversity.
- To let old trees with woodpecker holes remain standing, take account of anthills, etc.
- Create protection zones along watercourses.
- To leave areas of old forest standing.

Certification
Forests can be certified by organisations such as PEFC and FSC, which guarantees that the wood is grown sustainably. In Denmark, 39 % of the forest area – or 206 357 hectares – is certified.

8. How much forest is there in the world?

Forests cover 30 percent of the earth's surface. The total land area covered by forests in 2005 was just less than 4 billion hectares. (1 hectare = 100 m x 100 m = 10 000 m^2). This area is about a third less than before agriculture emerged 10 000 years ago.

Forests are unevenly distributed around the world. Top 10 most forested countries, which include 2/3 of all forests in the world, are Russia, Brazil, Canada, USA, China, Australia, Democratic Republic of Congo, Indonesia, Peru and India.

9. How does forest protect the planet?

Trees create the basis for many natural ecosystems. They create a stable climate and help stabilise the ground and prevent erosion. They protect coasts from waves and ocean swells, they stabilize sand dunes, protect the groundwater and prevent the spreading of desert.

Forests are very important for biological diversity. They are habitat for up to 90 percent of the terrestrial species of animals and plants we know.

Trees and shrubs play a central role for rural people throughout the world. The forest provide us with timber, firewood, food, feed for livestock, oils, rubber, medicine and new materials for new technologies, and more.

The world's forests only cover about 10 percent of the Earth's surface – but they account for 42 percent of the total photosynthesis of both land and sea.

10. What can we do?

To meet climate change with the forest as a starting point we have to do several things:

- We must protect the forests we have and manage them sustainably.
- We must reduce deforestation globally.
- We need to replant what we have lost – and plant even more forests.
- We must plan reforestation so as the new forests can be adapted to the climatic changes that will come.
- We must use wood as a material and for bioenergy – and replace concrete, steel, etc. with wood.

However, there are also many other things we can do:

Save energy
We can use less energy. Here are some simple ideas – figure out more on your own:

- Take your bike
- Use the train and bus instead of your car.
- Travel without flying
- Switch to energy-saving light bulbs – they last 6 to 15 times longer.
- Turn off lights and electrical appliances when not in use. Avoid standby mode.
- Take short showers.
- Hang-dry your clothes instead of using the tumble dryer.
- Isolate your house.
- Use new forms of energy – solar, wind and bioenergy.
- Eat less meat.
- Buy locally – and grow your own crops.

Explore and invent new solutions
With climate change, humanity is facing a great challenge – but also with an exciting time when many people at the same time are aiming to develop new technological and social solutions. To this, both children and adults can contribute. We need curiosity and smartness, and for many people to study and get more knowledge. We need creativity to use our knowledge in new ways. Moreover, we need compassion, so that everyone will be included in the progress. It could be a turning point for us all. So, it is just to get started.

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