How does forests affect our climate, and what happens after forest fires?

By: Simon Andersson and Emil Kulusveen, Norway.

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Content

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- Project title

  How does the forest affect the global climate, and what happens during forest fires?

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- Arrival and departure route

  We will arrive 11. Sept 16:55 in Moskva Sheremetyevo flieght SK8712

  We will go home 15. Sept 11:05 from Moskva Sheremetyevo SK8711

- Names of the national organizer and contact person

  Knut Arne Gjems (teamleader)

- Names of national sponsors.

  Norwegian Department of Agriculture and Food.

Summary

In this task we have looked into how the forest and forest fires affects the global climate. We have also looked at how the problem of forest fires is dealt with in Norway.

The forest covers 30 percent of the land areas on the earth, and includes most of the biological activities on land. During the photosynthesis the forests convert CO2 from the air into new oxygen.

The forest have always been exposed to disasters, and one of the disasters that destroys most forest on an annually basis, is forest fires. Forest fires have increased a lot the last 50 years, and this affects the climate in some scale. Most of the changes after a forest fire are very local. Some of the changes that it seen on a local scale, is change in the soil structure, change in the hydrological flow and of course change of the biological activities in the area.

On the global scale the effects after a forest fire is small. If the right management decisions are made and new forest is established after a forest fire, the carbon footprint after a forest fire will be minimal.

We have looked into how the forest fire problem is solved in Norway, and how the system with forest fire insurances through the insurance company “Skogbrand Forsikring” (Forest fire Insurance) works.

Introduction.

The forest covers around 4 billion hectares of the earth, or 30 percent of the land areas. There are different forest types all over the world, except in Arctic and Antarctica. The forests contain a lot of different species, both animals and plants.

The forest can be divided into three main categories: The rain forests, the tempered forest and the boreal forest.

The tropical rain forest is in the areas closest to equator. These forests contain mostly deciduous trees and evergreen leaf trees. The largest rain forest in the world is the Amazonas forest.

The boreal forests are located in the subarctic climate. One of the world’s largest continuous forest areas, the Taiga, which stretches from the middle of Norway in the west, to the

eastern tip of Canada on the other side, is a part of the boreal forests. These forests consist mostly of conifers like Scots pine, Spruce and Firs, and some deciduous trees, like birch, aspen and alder.

The temperate forest's is in the areas between the tropical and the boreal forests. Here the forest mostly consists of deciduous trees like oak, beech and ash. There are also some evergreen coniferous trees, like Douglas fir, Sitka fir and Fir.

The forests are very important for all life on earth. The forest is the habitat for a lot of species. Some believe that the forest contains some 90% of the earth's land biodiversity. Generally, forest that mostly consists of deciduous trees will have a larger diversity than forests that mostly consists of needle trees.

The fresh water that falls over the forests as rain will be bound to the forest ground and the forest regulate the water to an even hydrological flow from the inland to the ocean. This means that water will be kept in the ground and can be used by humans as drinking water and to grow crops. The plant and animal life are also a lot richer because of the water supply the forest gives.

The forest also keeps the soil, and avoids runoff of organic matter. The root system binds the soil, and will keep it during heavy rain and floods. It will prevent mudslides, and will also prevent desertification in desert areas.

The root system also helps the decomposition of the organic matter. The entire forests system will thereby recycle different minerals and important nutrients.

The far most important role the forest has is the supply of new oxygen to the earth. During the photosynthesis all green plants and algae convert carbon dioxide into clean oxygen and sugar. Since the forest covers 30% of the land areas, they play an enormous role in this production.

The forests bind and convert about 1 billion tons of CO_2 into glucose and oxygen. This means that a lot of the manmade pollutions of CO_2 will be taken care of by the nature itself.

The forest has always been under pressure of natural and manmade disasters, and one of the most common causes, that ruin most forest worldwide, is forest fires. The forest fire can,

when uncontrolled, engulf enormous areas in short time. In the boreal and tempered forests it burn down forest areas as large as the entire forest area in Norway. In the dryer areas of the world it burns down even more every year.

The only natural cause of forest fires in Northern Europe, is lightning strikes. In other continents, volcano eruptions can start large forests fire.

The main reason for forest fires today, is human activities. Ever since the early humans tamed the fire almost one million years ago (Bleken et al. 1997), they have started forest fires in some scale. Some believe that over 90% of all forests fire worldwide is started directly or indirectly by humans (Wikipedia). Directly started fires are started by humans to burn down land to grow crops, clear ground, or by pyromaniacs that just have fun. Indirectly started fires can be uncontrolled camp fires, sparks from train and machinery, and by electric wires that fell to the ground during storms (Bleken, E. et al. 1997)

Since humans began growing crops, there has been a great need for good land for growing. Some of the best lands for growing are in the ashes after a forest fire, when a lot of the nutrients that is caught up in the trees are released. The nutrients will work as a fertilizer for crops. This method was used a lot in the south border areas between Norway and Sweden, called “Finnskogen” during the 17^{th}- 19^{th} century. Immigrants from Finland established in the areas and burned down large areas of forest to grow a special type of rye. (Wikipedia)

This method of farming is still used in The Amazonas areas, where large forests areas are cleared every day to grow new crops.

All these forest fires affect our global climate in one way or other, and in this task we want to take a closer look on this topic. We want to find out how the forest fires around the world affect our global climate, and what it is that actually happens during large forest fires. We will also look at how the forest fire problem is solved in Norway.

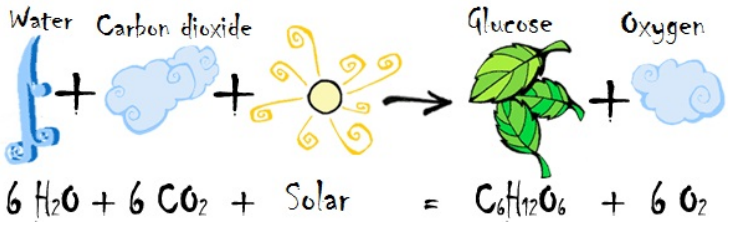
Photosynthesis and forest management

Photosynthesis is the basis for all life on earth. All green plants use sunlight as a source for energy and carbon and water to produce glucose and oxygen. CO_2 is nature's basic building material, carbon (C), the building material of plants and trees, and oxygen (O) is released

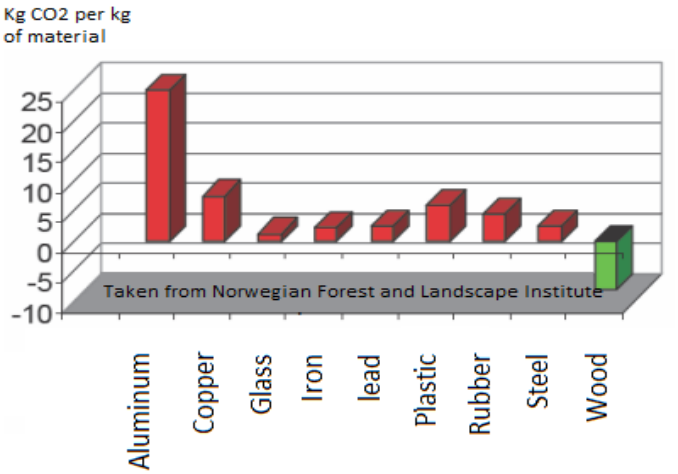
back into the air. Without photosynthesis no humans and animals could have existed. (Wikipedia)

Photosynthesis takes place in the green parts of plants (leaves and needles). The green chlorophyll grains captures energy from sunlight and with water, nutrients and carbon dioxide, it is converted to the plant material. The plants release oxygen back out to the air.

Dextrose or glucose ($C_6H_{12}O_6$) is formed in the green leaves. Glucose is converted and used as food and building materials. Glucose is for example, cellulose in tree trunks and starch in the potato. Glucose is then actually solar energy which is converted and stored as chemical energy (Nilssen. Et al. 2012).



There are two ways to reduce the amount of CO_2 in the air, we can emit less CO_2 and we can take the CO_2 away from the atmosphere and store it. Trees are by far the best CO_2 capturers and storers, doing both. By capturing CO_2 with the photosynthesis and store it, the CO_2 is changing from CO_2 to wood and oxygen. If we use tree products that bind CO_2 during growth, instead of using materials that produce CO_2 during the production of the product, we can emit less.



Trees are CO_2 neutral, they release as much CO_2 when it is either burnt or rot, as it has bound through time. This varies widely from tree species and forest types, what binds most CO_2. (Nilssen. Et al. 2012)

The rainforest is the most important forest that store CO_2. Rainforests cover only 2% of the world's land surface, and still takes up most of the 20% of global CO_2 emissions that the forest binds and accounting for the production of about 40% of the oxygen in the atmosphere. All forests binds some CO_2 at a young age, mostly in adulthood, and when the trees are getting old they release as much as they bind. (Nilssen. Et al. 2012)

Although rainforest converts as much CO_2 as it does, it is actually a very big source of CO_2 emissions in the form of deforestation and conversion of land. There are many popular species in the rainforest, such as Mahogany, Teak and Merbau and many people are willing to pay a lot for these materials. Logging companies cut large areas of rainforest, and it is harvested spaces equivalent to a football field every second and on an annual basis it will be cut areas of tropical forest equivalent to half of Norway. Other times the area is burned and used as agricultural area and other plantations so the increasing population can survive. These are some of the reasons why the rain forest is cut down as much as it actually is. This means that the rainforest has such a large percentage of CO_2 emissions despite the fact that it binds as much CO_2. The rainforest is so important that it is in the climate context, it should have been a higher focus on more sustainable use of rainforest.

Norwegian effort to reduce the amount CO_2 through forest management

The government of Norway has seen the value of the forest in climate terms and has on that basis chosen to lead an active forest policy through measures that increase the forest carbon stock. The forest also has valuable resources that can be used as wood or renewable energy; this makes it possible to avoid using materials that are more harmful for the climate. The forest's role as a renewable resource is strengthened through research, creation and long-term sustainable management of forests. (regjeringen.no)

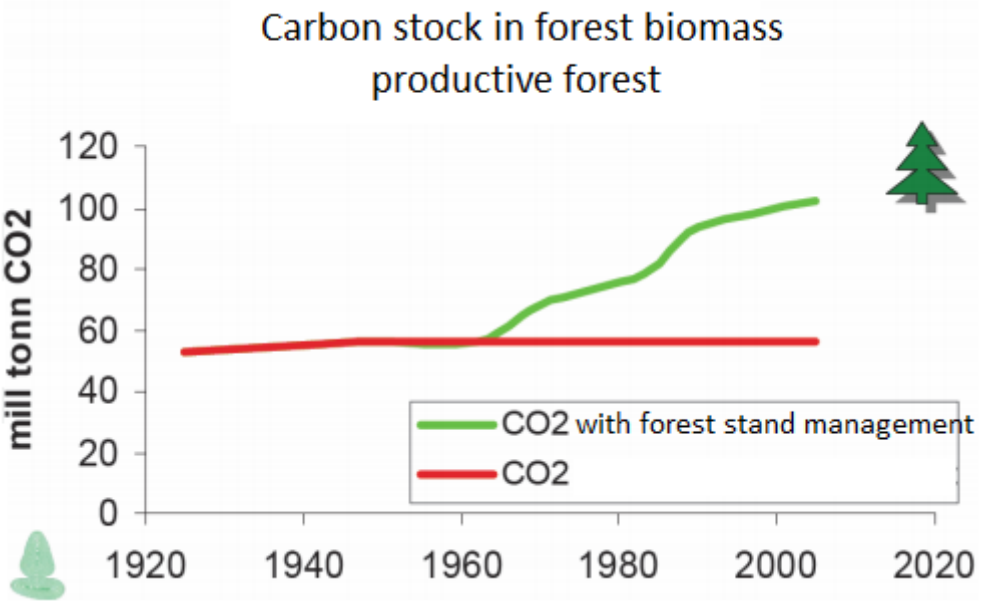
The Government wants to maintain or increase carbon storage, through an active and sustainable forestry policy. Some of the issues the government wants to focus on are:

- Increase the productive forest area by reducing deforestation and through an active and sustainable policy for planting in new areas.
- They will strengthen efforts in woodland plant, increasing plant density and the reintroduction of the ban on felling of young trees that are not mature and also

strengthen the forest protection. This leads to the maintenance or increase of carbon storage in forest

- Creating a system for volunteer initiatives and cooperation agreements with landowners for the establishment of climate forests.
- Increased production of raw materials from the forest to use as bio energy, especially logging waste. Increasing the extraction of raw materials from the forest to use as bioenergy, particularly logging waste.

Increasing carbon uptake through targeted fertilization of forests, and develop environmental criteria for this. Forestry in Norway has had a positive effect of industrialization in the 1960s, when forestry machines started to replace human labor. The machines are much more efficient in use, and the machines began cutting in stands to make it easier to monitor forest management. This makes it easier to find what measures to do, such as planting and thinning. With the stand forestry becomes even growth conditions better, and it produced more wood than in a mixed stand.



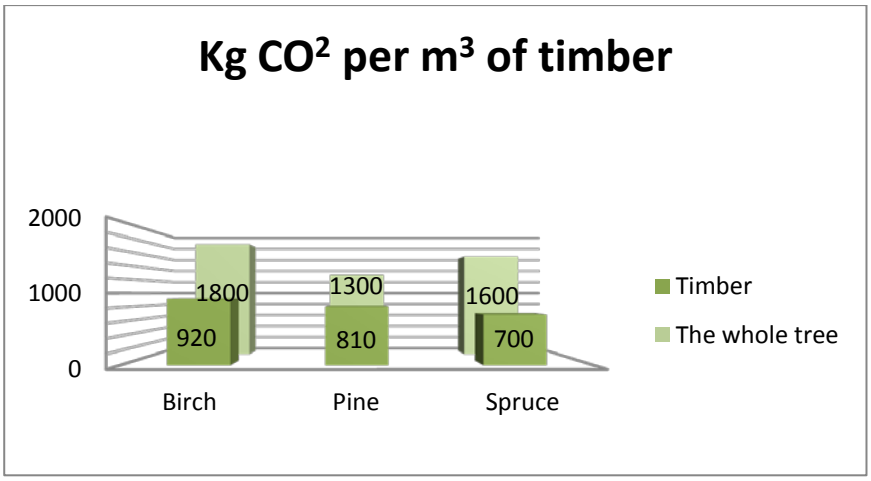
Picture redrawn from Skog og Landskap

The average Norwegian wood species binds 1.5 tons of CO2 per m3 of timber. Spruce binds an average of 1.6 tons of co2 per m3 wood, pine 1.3 tons of co2 per m3 of wood and birch 1.8 tons CO2 per m3 of timber.

These figures are calculated from the whole tree, trunk, branches, stumps and roots.

These numbers can be affected by forest management measures, different forest management measures increases both the binding of CO2 and increased use of wood.

If we increase the use of wood in houses, furniture, etc., it will bind the CO_2 for a longer time.



Picture from Skog og Landskap

International effort to reduce the amount CO2 through forest management

UN Climate Panel says that forest management will be important to stabilize CO_2 concentrations in the atmosphere. They write in their special report on land use, land-use change and forestry in 2000 and in its Fourth Assessment Report of 2007 that the largest greenhouse gas reduction in the long term from the forest you get with sustainable forest management that maintains or increases carbon storage in forests, while achieving an annual and sustained yield of timber, fiber or energy from the forest.

The four main points related to forest management measures from the UN Climate Panel:

- Maintaining or increasing forest area through reduced deforestation and by planting after harvesting.
- Maintain or increase carbon storage on the forest through decreased degradation and through planting, improved fertilization and other management measures.
- Maintain or increase carbon storage through forest protection, longer cutting cycle, fire prevention and protection against insect attack.

- Increasing carbon storage outside of the forest with wood products and substitute products with large carbon footprint, and increase the consumption of biomass-based energy instead of fossil fuels.

The Forest Fire.

The extent of a forest fire can vary a lot, from just a small fire that only burns the top soil, to a large fire that burn down an entire forest and whole ecosystems (references for this chapter are Bleken, e. et al.1997, Redogjörelse från skogforsk nr. 2-1997, unless other is written)

The intensity of a fire can be sorted into four groups.

Picture from Bleken et. al 1997

- Head Fire: Fires that ignite and spread in the bottom stratum of the forests and spread in the direction of the wind. This is often the start phase of larger forest fires, or the only phase in smaller fires. This is the most common type of forest fire. The phase can be divided into two groups; low and high. The low head fires only burn the vegetation on the ground, while the high head fires also burn the lover part/branches of trees.

Picture from Bleken et. al 1997

- A high head fire can develop to a more devastating **crown fire.**

Picture from Bleken et. al 1997

- Crown fire: Forest fire that burn down entire trees and can spread directly from tree crown to tree crown. This type of forest fire has a much higher intensity than Head fires at the ground. The crown fire travels with the wind, and this type of forest fires can “jump” hundreds of meters and start new fires beyond the originally fire ground.

- Backfire: Forest fires that spreads in the direction opposite of the wind direction. Not as intensive as Head fires or crown fires, and much slower than the fires that spread with the wind. Often used as anthropogenic fires, to clear ground.

Picture from Bleken et. al 1997

- Peat fire: Fire that is under ground in deep organic soil, often in peat land. This type of fire can glow in the ground for several days. These fires are dangerous, because they are hard to see, and can develop to a head fire or crown fire.

There are a lot of factors that determine how intense a fire will be. The wind is the most important factor. The wind direction and speed have a lot to say in the spreading of a forest fire. In fast dry winds the fires will spread really fast, while it will almost not move at all when the wind is still. The wind also supplies the fire of large amounts of oxygen.

Rainfall is critical. During dry periods over longer time, the chances for forest fires increases, and the fires will also spread much more rapidly after they`ve started. This is because the organic material on the forest ground will be drier, and therefore more flammable.

The seasons will also affect the intensity and frequency of forest fires. During the winter time/ rain season the chances for large forest fires are very, very small. During hot and dry summer the chances for forest fires are much higher.

The type of terrain also has a lot to say. A fire will go much faster uphill than downhill, as heat travels upwards, and the heat will warm up the materials above the fire so the fire can spread its way faster. The landscape also provides a lot of natural barriers for the fire, and determines the fire's intensity, size and shape.

Another important factor is the proportion of combustible materials in the area. If there is a site with a lot of dry wood, a fire will spread faster and with a higher intensity than a fire on a site where it is humid. Coniferous forests are better "fuel" for forest fires than the most deciduous threes. This is because the conifers often are lighter, and the deciduous trees often contain more minerals that don't burn that easy.

No matter how the fire spreads, the chemistry of a forest fire will be the same. Every fire needs three basic elements to be able to burn.

Oxygen: Every fire needs oxygen to be able to burn. The oxygen is the essential component to make the chemical process work.

Heat: Without heat over an ignition point, the chemical process will never start.

Flammable material: To make a fire, you also need one kind of flammable material. No materials=No fire. Most of the flammable materials are carbon based, and it is the reaction between carbon based materials and oxygen we will describe closer.

If you remove one of these elements, the fire will go out.

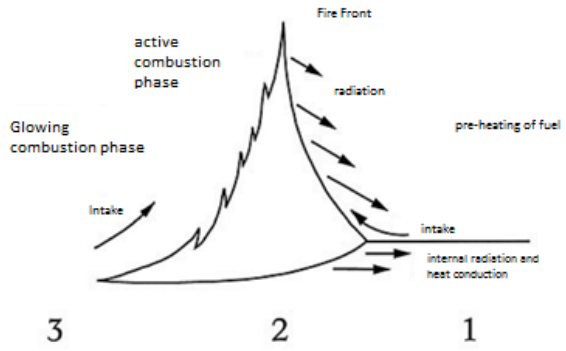
The chemistry of a fire in plant material can be descried as the opposite of the photosynthesis. During the photosynthesis, green plants takes carbon dioxide from the air, water from the ground and sunlight to produce glucose and oxygen (CO_2+H_2o+ sunlight -> $C_6H_{12}O_6$+ O_2)

During the combustion, the glucose in the plants will burn down and be reduced to water and CO_2 gas. ($C_6H_{12}O_6$+ O_2+ ignition-> CO_2+H_2o+ heat). The chemical reaction is an

exothermic reaction that produces heat. The heat will warm up other flammable material nearby and ignite. This chain reaction will go on and on until it stops.

This chain reaction is divided into two phases:

First of all we need a source of ignition to make it burn. When the material has caught fire, the heat from the reaction will start to heat other material nearby. This material will also ignite by the heat and then the fire will go on until all materials are burnt, or the fire is put out.



Picture redrawn after Bleken et. al 1997

When the forest fire rage, the materials in the front will be heated, and will after a while ignite. In the fire front the active combustion occur. The carbon and water in the tree materials will be released and sent into the atmosphere. In the areas behind the fire front the after combustion of the larger materials occurs. The larger material will glow and burn without a flame and turn into coal and ashes.

Forest fires can spread really fast during the right conditions. In California, USA, larger forest fires have spread over 60 km a day and covered areas over 40 square kilometers.(Wikipedia[1])

Effects of forest fires.

Every year there are between a few hundred to several thousand forest fires in Norway, most of them are really small, and the most common is Head fire. The smaller fires have little effect on the National and the global climate, but they change the local climate a lot.

On a local scale a fire affect the air, the soil, the water and also the biological life. Particles which are stirred up pollute the air over large areas.

The soil under a fire can change structure completely. The organic material in the soil is burned and the mineral and nutrients will be released. This result in faster conversion of the organic material and it`s more available for plants and organism after the fire. The soil may also change structure because of the heat and the ashes of the fire. CO" that have been bitten to the soil may actually be released of the heat.

The fire may also increase the soil temperature on both short and long term. The soil will be heated by the fire, and it's seen that the soil can be heated several degrees as deep as 20 cm. below ground. In the time after the fire the top soil will be dark from the burned material, promoting absorption of sunlight that heats the ground over a longer period of time. This is positive for the microbiological processes in the soil, which is positive for the conversion of organic material and the release of nutrients.

After a fire

The biological effects can be both positive and negative. One of the positive effects after a forest fire is that the forest ground is cleared, making it easier for new species to establish. The chemistry in the ground is also changed.

Crowberries (*Empetrum nigrum)* and Heather *(Calluna vulgaris)* release chemicals that make it impossible for specially Pine (*Pinus sylvestris)* to establish. After a fire the crowberries and heather are gone, and the ashes after the fire will bind to the chemicals that may be left, and making it possible for pine to establish after a forest fire in those areas.

A large problem in Norway is also that Spruce (*Picea abies*) takes over pine forests. Forest fire will take out the spruce and let the stronger pine stand back.

Forest fires are in certain cases therefore positive to hold the forest structure at the same level.

After a fire the forest will have a typically succession. Often pioneer species, like willowhearb (*Chamerion angustifolium),* Raspberry (*Rubus idaeus)* and Wavy Hair-grass (*Avenella flexuosa*) start growing. After the pioneer species have established, there will often be and change of succession, and fast growing tree species will establish. Often species like birch and Salix will establish fast, and soon outperform the pioneer species.

After some while the forest will grow into the climax face. Climax species like Pine or Spruce establishes and after a while dominate the forest image. The climax species will dominate the structure of the forest until there is a new fire or disaster, and the cycle is complete.

This example applies of course only to the boreal pinewood forest, but there will be similar changes of successions in all forest types, with their special, specially adapted, succession species.

These are just the local changes, how do the forest fires change the climate on a global scale?

During the last 60 years the number of larger forest fires has increased enormously. Only in USA there are now over 50 times as many forest fires as it was 50 years ago (globalis.no)

The larger forest fires in Russia, USA, and now also Spain, may affect the global climate in some scale. The fires release large amounts of carbon dioxide and other climate gases, and at the same time large forest areas that would take up CO_2-gas are burned down, so the release of CO_2 will have double effect; more CO_2 in the atmosphere and less green vegetation to take it up. During a heavy fire CO2 that is bitten to the ground also will get released (Wikipedia).

In some cases only 20% of the organic matter will burn under a forest fire (Nygaard 2012 (by mail)). This is because that larger wooden stems and branches rarely get completely burned. This means that the CO_2 emissions after a forest fire may not be so large anyway.

What determines the effects on the climate is actually what happens after the fire. Even if most of the organic matter isn`t burned, a lot of the green plants will go up in smoke?? This means that the area will be incapable of CO_2 uptake trough the photosynthesis, and the manmade and natural CO_2 emissions will have a larger effect.

To reduce the CO_2 emissions it is therefore very important to keep the forest in good growth. Forests that grow will bind a lot of CO_2. The best method to reduce the pollution after a forest fire, and deforestation generally, is to plant new forest and keep the forest in good growth.

The worst thing to do after a fire is to just clear the land and do nothing. If the fire area is cleared and not replaced with new forest, the effect on the climate will be larger. One of the biggest causes of CO_2 emissions are deforestation, just because the forest is removed and not replanted (globalis.no). The management after the fire is more important than the fire itself.

Forest fire in Froland

Forest fire in Froland started 9 June 2008 and lasted six days, to 14 June 2008. The fire was ignited by a forestry machine and during the six days that the fire had ravaged it burned down an area of approximately 2,700 hectare. It was really dry in this area, and strong winds made it difficult to control the flames. This is the largest forest fire in Norway since World War II. The fire did damage to about 30 million Norwegian kroner. (406000 euro)(Wikipedia)

The fire threatened the town of Mykland in the Froland municipality, and 15 homes were either burned or damaged during the fire. The fire also hit the high voltage line in the area, so there were power outages in some areas. More than 70 people were evacuated from their homes.

Many participated in the firefighting, after four days 250 people from the Heimevernet (Norwegian Home Guard), fire brigade and Civil Defense Forces took part in fire control work. It was also used up to 16 helicopters during extinguishing.

Norwegian Institute for Water Research (NIVA) started in December 2008 to ascertain that the fire had affected the lakes in the area. These events were both unexpected and unwanted. Sulphate in the soil from acid rain is released from the soil of new rain, and released from the soil flowing into streams, lakes and rivers. Acidification is worse than in the 1980s, and NIVA estimated that all fish and amphibians in the area are destroyed.

The fire has given researchers a great opportunity to follow the new vegetation in the area and also compare the areas where timber is cut and removed with areas that have been left untouched. The registration of damage started in the end of June and lasted two weeks.

The research will follow up the development of the new Scots pine regeneration, where the examination and description of vegetation regeneration and development over the first four years will be important. One of the things to be followed is remaining seed trees and their seed production, growth and stability. It is located a large number seed traps and insect traps, which can tell scientists more about the species that establishes itself on the fire surface. Researchers will also examine the soil, and to study carbon and nitrogen dynamics after a forest fire, in addition, it will be performed degradation studies and analysis of macro and micro nutrients.

The basis for the calculation of compensation was a usable cubic mass of 88 000 m3 from productive forest in cutting class III, IV, V and broken seed trees. The productive forest area that was destroyed was about 1.900 hectares. Per. 31.12.2008, it was cut about 30 000 m^3 and 30% of it was timber. At this point it remained the felling of about 5 000 m^3 of energy wood.

The big difference between registered damaged growing stock and cut timber is caused by three factors:

- One-third of the productive area has been changed to voluntary conservation, where no logging is allowed
- Remaining of seed trees, buffer zones and after the fire was more than expected.
- A general over classification of the forest production capability on the areas with the weakest production. This is due to no growth areas where it was recorded productive forest.

It was 12 different forest owners who got some of their property burned. All of them was insured and got compensation of the damages. (skogbrand.no)

Insurance of forest

In Norway we have an insurance company that insures the forest, called Skogbrand Forsikring (Forest fire insurance), and from now on referred to as Skogbrand. Skogbrand is an independent company that was founded in 1912 and it is administered and managed by foresters. Already in 1899, after several dry summers with forest fires, people was talking about establishing an insurance company for forest, but the plans were never realized until 1912. Skogbrand has 40 000 members, all policyholders are members and have voting rights. Over 80% of the privately owned forest area in the inland of Norway is insured. (skogbrand.no)

In Skogbrand there are two main groups one can insure against, there is fire and storm damage. Fire insurance covers damage from fire, rodents and insects that destroy needles. Storm insurance covers damage from storms and snow. You can choose to insure against fire, storm, or both. The insurance applies to all productive forest area.

Both wildfires and storms affect the forest owner economically. If you are insured, you avoid the huge financial losses. Although the timber after a storm is not worthless, the netincome for the forest owner is dramatically reduced. Powerful storms will also affect a young forest, and then the insurance will cover the loss of having to chop down wood too soon. The largest losses by storm damage is that the forest must be harvested early, increased operating costs, and reduced sales value and sales volume as a result of broken trees and high cutting of the stems.

On a global level, enormous value is lost every year due to forest fires, it is also devoted considerable resources to contain and control the damage to forest and land fires. In Norway the damages are often small compared to other countries, but during dry periods it may be hard hit by forest fires. Most often it is young forest and mature pine forests that's affected by fire. This leads to huge economic losses, and the biggest expense is to establish new forests if young trees burn. It is difficult to sell timber damaged by fire and at worst, it is not salable, economic loss from to early harvesting, increased operating costs, reduced sales value, been damage to cut timber, damage to property by fire fighting and destruction of soil.

Conclusion

Photosynthesis is the basis for all life on earth. If we exploit photosynthesis better, and with better management of the forest it will provide a very positive effect on the climate

Growing forest binds the most CO_2. It is therefore important to have good management of the forest to sustain growth. Most important is perhaps planting after felling. Forestry in Norway has had a positive effect on the climate after we started using stand management.

It is two main groups of forest fire; it is high and low head fire. Low fire does only burn the vegetation on the ground, but the high fire burn higher vegetation and lower part of trees. High fire can develop to a more devastating crown fire.

Wind affects the forest fire a lot. In dry periods with a lot of wind, it is high risk of large spreading. The terrain does also affect how the fire spreads. The fire is moving much faster uphill than downhill, and there are also many natural barriers.

The season affects the risk of forest fire. Dry periods of the year are dangerous, but winter or rainy periods are not that dangerous.

No matter how the conditions is, the fire need three elements to exist, oxygen, heat and flammable materials, if one of these elements is missing, the fire will go out.

There is both positive and negative biological affects after a forest fire. The positive is that the ground is cleared, which makes it easier to establish new species. It is also positive because it helps the forest to keep the same structure over time. The negative effect is that the soil will change after a forest fire, and affect both water nearby and new establishing of plants. This is just small scale effects, but larger forest fires do also affect our global climate. It releases carbon dioxide and other climate gasses while the forest is burning. If the forest burn down, it will not be photosynthesis, which gives a double effect, released co2 during burning and no green plants to bind CO_2. But if the forests are replanted, the effects of the fire will be just on a short term.

The forest fire in Froland was the biggest forest fire in Norway since the second world war, but globally not that big. Anyway, it is important to understand the gravity of a forest fire. It can cause a lot of damage.

Insurance against natural hazards is really important in case of an accident. If you have insurance the financial loss will be less.

All in all the conclusion of this task is that forests are very important to the global climate, and that forest fires don't affect the climate that much, if the right decisions are made by the forest management.

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