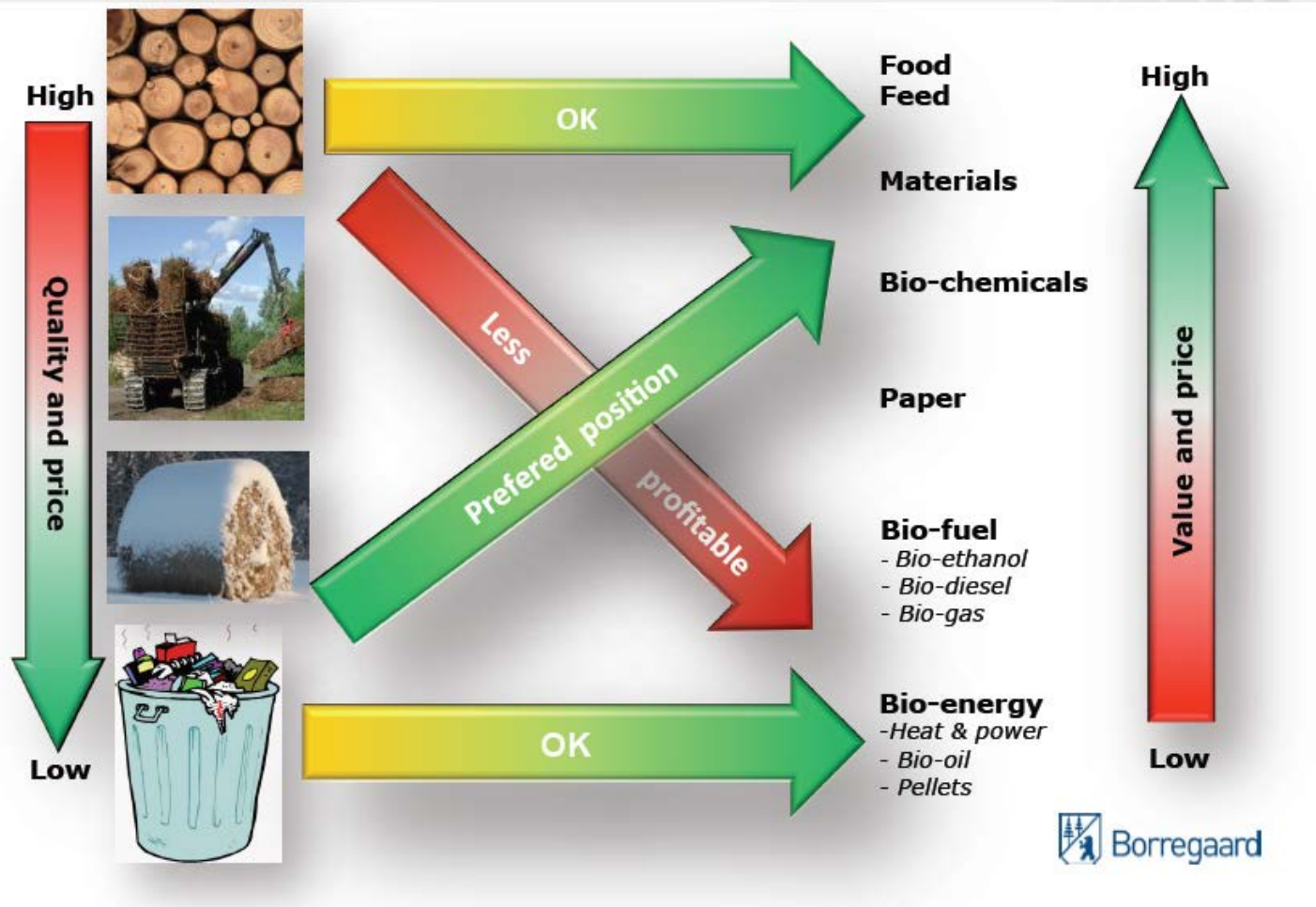
The use of wood before, now and in the future



HEWLETT-PACKARD

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Content

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  The use of wood before, now and in the future

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  Velg skog, forestry

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Summary

In this task we have looked into different ways to use wood, both how it was used before, how it's used now and how we think it will be used in the future. The forest has always been important to us. Not only because it converts CO2 into new oxygen, but also because it's an important source for food, raw-materials and recreation.

In these years there is a lot of research on what we can do to reduce the emissions of CO_2 to the atmosphere. In this task we have mostly looked at biofuel, as a possible replacement for fossil fuel in the future.

Then we have looked at how the situation is here in Norway compared to other countries, especially our close neighbor, Sweden. The poor situation in the Norwegian forest industries today, is a consequence of the global economic crisis. A lot of the traditional forest industry has been shut down, and we have to start thinking in new ways how to use our wood in a valuable way.

The economics is one of the big factors that it will depend on how the future for the Norwegian forest industry will be. Scientific work will continue to be a big part of this puzzle all over the world to exploit as much as possible of the wood. All actors in the forest industry will have to continue their research to find out what's best for each country. This is what we have worked with in this task.

The use of timber back in time

The forest has always been important to us people, first and foremost it has been used as a source to food, weapons, for heating and for cooking. In the transition into the Neolithic we got more settled and we started to build houses, and use of tree in buildings started to grow.

In many years after they discovered the use of the tree, the forest got more and more important to the culture and industries. But in the late 1500s and in the start of 1600s the use of wood changed. The big mine industries in Norway needed more wood for breaking down ore and melt it into metals. About the same time as this happened, the saw mill came. This made it easier to chop wood into planks, and the big plank trade to the cities stared. The forests were chopped down, then cut – and sold as planks to England and Netherland. After a while the demand for timber got higher and the whole land were used where the lakes were used to float timber.

In the forests, was all the big trees harvested, and only the smallest one was left. This made the forest management Agnar Barth to come up with his claim about *"our forests are now going its underground in meeting with fast approaching"*. This was his "warning" about the fact that if all the big trees were harvested, there would be nothing left in just a few years. And when all the trees were gone, then what should we use? This was in 1916 and the beginning of the National Forest Inventory where Norway. As the first country in the world, conducted a registration of the Norwegian forest resources, norway got their first forestry law in 1932.

Floating timber is a way to float timber down rivers and across lakes. This method was the main way to transport timber from the forest to the saw mill before the transportation on trucks began. This method was in use in Norway

until the 1960's. Since timber floating was depending on large water masses, the main period for timber floating was during the spring floods. This made a crucial role for the use of utilization of forests in the time when there were no other way to bring the timber from the forests to industries.

The first circular saw came in 1840, and the first steam saw came in 1853. The steam saws needed greater privileges and this is also when the planer industry started. All this lead to higher prices on the timber and better terms for the lumber industry and the forestry. The forestry kept being economic important also at the 1900s, especially after the second world war when we needed timber for reconstruction after the war. The increase of timber production on further sight got more and more interesting, and there was set in resources from the state to rationalize the forestry and increased production.

The tree has also been used for charcoal, tar and paper.
A coalmine is used as preparation of charcoal. In the beginning, the charcoal was produced in one meter deep pits in the ground. But in the 1500s they started to use the traditional coalmine, which is called the "reisemile". The principles of this mile was dominant until the end of 1800s. You can still see remnants after old coalmines today. The mile is ignited at the bottom. A part of the timber burns, and the heat converts the rest into charcoal. It's important that the oxygen supply is reduced regularly so the fire is held alive- but it still has to be enough oxygen so the temperature is high enough to burn the timber into charcoal.

Tar was earlier an important industry for farmers in Norway. Tar was used as impregnation and protection of for example wood, tool and harness. For making tar, they took stumps and roots from old pine because they contain resin. Roots were dried out, freed from bark and then splittet into small sticks. A tar mile is not supposed to burn, it's just supposed to have high temperature. This is because the high temperature makes the tar coming out. Usually it takes three

days to burn a tar mile, and it has to be guarded day and night so the temperature is high enough.

Paper have since the mid 1800's been an important product from the forest, and was mostly used for writing and in books and newspapers. Paper is made by breaking down the wood into wood-fibers in water, and thereafter dry the mass into paper. Today this production is in big industrial papermills.

Today's situation in the Norwegian forestry

Today we have a negative situation in the Norwegian forestry. Due the economic crisis and the relative high cost level in Norway, several pulp and paper factories have been closed down over the last couples of years. Therefore we send more and more timber to Sweden and their forest industry, and we have also started to export more to the European continent. We also try to export as much as possible to get money in that way, but the market for export is going a bit down. The international economic crisis and the relative high costs in Norway also affect the negative development we have in the Norwegian forest industry sector today.

Today we get the wood out from the forest with machines and trucks, and then we can start to magnify the timber. Here in Norway we have four different wood qualities that we sort by. We have one quality that is called special timber, and this is the most paid materials. Different types of special timber can be poles that are used both in Norway and other countries. We also cut timber for old looking wood houses. The special timber is the strictest type of the different sorts. This is also the sort that is most exported to other countries because of the use and the quality.

We also have the wood that is used for regular timber. This sort is the second best paid in Norway and it is more usually all over the country if you compare it

with the special timber. This sort are going in to sawmills here in Norway so this sort we work with ourselves compared with the sort we send to Sweden.

The sort we send a lot of to Sweden in these days, is the pulpwood, the wood that's left after the materials like planks and the special timber is taken out. This is timber that is much used to make for example paper and a ingredient for vanilla ice cream. This is the sort that makes the problem for the Norwegian forest industry. The pulp and paper plants that process the wood are getting less profitable, and many of them therefore have to shut down.

The last sort is what we use for energy. This is the part of the tree that is not qualified for any of the other qualities because it can be for example to dry or rotten. We also use deciduous wood for energy and this is often cutted in the forest or when someone cleans around their ground edges. Then the owner of the land around gets it cleaner around and the hardwood can be cutted up to be energy. But this sort is not the most used sort used here in Norway. It is now in the later years that this with the energy has started up, to get more energy without the need to use for example oil and other not renewable energy sources.

There is no tradition for using wood in energy purposes in big scale in Norway. This is because we have the oil and a lot of cheap energy from the many hydro-electrical plants in Norway. Today the use of timber is slowly increasing, since the population is more aware of the climate changes, and wants a green renewable energy source.

So this situation we have now in Norway is not so good. The prices for timber are low and we have to export a lot, especially to Sweden. The difference between Sweden and Norway in this situation we have now is that Sweden is ahead of us in the technology, their techniques and how they do it. In Sweden they often cut down big areas, and they plan more cutting in one area than we do here in Norway. This is a more rational method. One of the big problems in

Norway is that the area that each forest owner has is long and narrow, often from the bottom of a valley, to the top of a mountain. The areas are at the same time relatively small (the average forest owner owns about 50 hectares…). This makes it more difficult to have an rational forest treatment on the single properties.

Here in Norway several timber industry sites and pulp and paper plants have been shut down over the last years, because of the economic crisis. Earlier we had many of them but in the last years several has been shut down due the economic crisis. The last one that has been shut down is the Tofte factory. 25% of the timber produced in Norway, went to Tofte.

When the factory that have used 25% of the timber that have been cut down here in Norway, is shut down, other ones get problems . For example, Moelven that is the leading saw mill company in Norway, may get some problems in the future. Because when forest owners can't deliver pulpwood, they probably don't want to cut their forest because they can't deliver all the wood. So this is the result of a chain where the whole wood industry depends on each other.

This factory that is called Tofte has also been on the market for sale to get new owners to keep up the processing of wood there. The government has been trying to help out as well as they can, but it has not been any solution on it yet. Because when Tofte is laid down we have to send even more over to Sweden, and one day it may say stop in Sweden too.

So with these problems we have in the Norwegian forestry industry, the government has tried to help us out aswell as they can. The Norwegian government this spring gave financial help that contained 96 million Euro to stabilize the situation in the Norwegian forest industry. This help from the government comes for at least one reason, and that is the fact that 25.000 people around in Norway works with forestry in some way.

The financial help is split in two; 32 million Euro shall go to ease the costs of transportation, and to support research and development. The main reason to support transportation with this help is because the transportation is one of the most costly bits of the value chain. The transportation costs are in Norway, as an example, around 25-30% higher than in Sweden. The research and development need support to find new and better ways to use timber.

The last 64 million Euros of the financial help goes to a capital increase in the Norwegian investment company Investinor, earmarked for investments in the forestry and timber industry. So what the government wants with this financial help is to contribute to more efficient transport, stimulate new use of wood in buildings and provide more capital for strategic government investments in the timber industry.

So the situation, as it is now, contains mostly the economic problems. From the outside it can look like its problem in each sector, but it is mainly the bad economic situation that has brought us this problem. So maybe we have to start all over again and take a look on how we should do different things to get it better and so it can last without any problems. We have to take a look back in the forestry and see if maybe some of the stuff that we have done earlier can be brought up on the market again. We also need to see what we want in the future. Because if now what we want to achieve, we have a goal to reach.

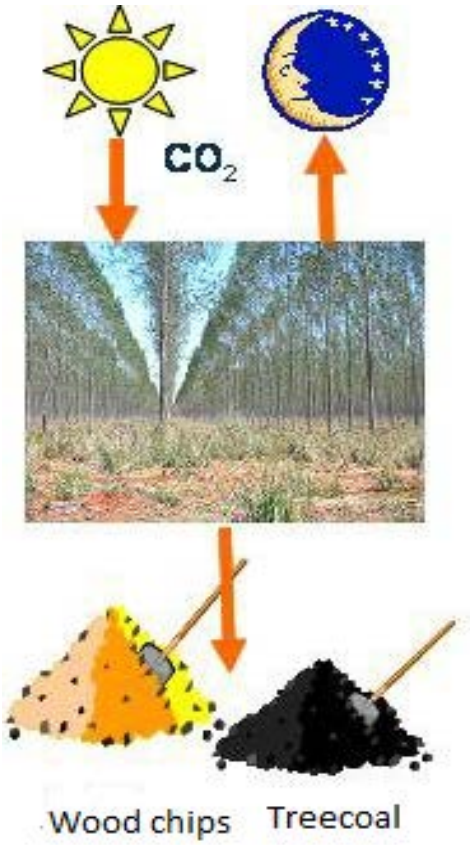
The forestry future

In Northern Europe the forestry future can look kind of dark because of problems like economics and how to use the timber in the best way. The timber is used in many different ways all around the world and it will continue to vary how much it is used for the different things. Paper for newsprints etc. is not so much used as it was earlier, but tissue, the soft paper that is made, and packaging are still growing markets. So can this be a clue together with more

chemical products (for example Borregaard Industries Ltc) when the paper used for paper and photos will be replaced with more electronic?

For construction it's wanted to use more timber than it is today. All over the world it is worked on to get more and more buildings in the cities made out of timber and wood. With timber you can have an opportunity with both form and shape because of the natural look of the timber. This opens a new gate at the design part to because of the natural look. The timber relative till the concrete and steel in buildings, it comes at last place.

Both concrete and steel are mainly used, and they do not often think of the timber before it is too late. This is not a good thought at this moment if we want to get more and more timber in the construction and cities. To get competitive, wood has to be a part of the planning from the beginning. One thing that determines the use of timber is if price is competitive with other materials.



Bio carbon is the carbon that's absorbed by plants through photosynthesis and stored in their biomass and soils. Maintaining stores of bio carbon is important for minimizing carbon dioxide in the atmosphere. An example of use of bio-carbon, is bioenergy, were wood is used for energy. This is one of the main markets for wood. One example of bioenergy that is much used now is pellets.

The forest takes up CO2 from the atmosphere and releases fresh oxygen. The fresh oxygen is turned into CO2 up in the atmosphere before the trees again takes up the CO2. Then the trees are chopped down, turned into wood and decomposed into wood chips and tree coal. When the wood chips and tree coal burns, it releases CO2 that the forest again takes up and refreshes.

The pellets got a big production and it is used for heating systems that use pellets. Both German and Great Britain premieres the use of pellets for production of electric power, and this is good for recruiting more and more people to use it. Also the timber is used for firewood, to heat up buildings with timber cut down in pieces, and this is much used in Norway.

Fuel is also a source we can get out of the timber if it is done in the right way. The thing about the timber as a fuel source is that it has to be researched on to have the most efficiency and advantage of it. To compete with the fossil fuel and fuel made out of other biomass (corn, sugar etc.) it has to be some good solutions on the logistics and the transport. At this moment it is probably no solution that is as good as it should be in some years to compete with other fuel sources.

Biofuel is fuel made of biological materials. Examples of biofuel are biodiesel, bioethanol and biogas. The advantages in using biofuel are that it does not release as much CO_2 as fossil fuel does and its renewable CO2 which is a part of the nature. But even though it should be good for us, it does not give the net subsidy of CO2 to the atmosphere like fossil fuel does. This could lead to a change in the atmosphere, which could lead to both negative and positive changes for us people.

But one of the biggest questions is; what can we use for making biofuel in Norway? We can use among other; *potatoes, corn, grass, energy forest, food waste, waste gas, offal, scrub, logs, branches, tops and roots*. There are others too, but I want to think most about the forest as a resource for biofuel. One log can give us 4 kWh which is the same as 2-6l diesel. This depends on the conversion method, of course.

Today's trucks, boats, cars and planes are today using as good as only fossil fuel like diesel and gasoline. Biofuel is together with electricity and hydrogen the

fuel that's in use for going over to the low-emission. Biofuel will have either higher or lower effect on our climate, depending on which production method that is used. In a few years when the technology is developing can as good as every type of biomass be used as preparation for all types of fuel.

The technological benefit with biofuel is that it's quite similar with fossil fuel, which means that the fuel can be used in many of today's engines and machines. In fact, diesel cars are already driving with biodiesel implicated in the regular diesel.

The market of the fuel source is kind of unpredictable as it is now. Many factors can determine like prices, the need and is it profitable against other sources for example. But one of the biggest factors is; how much oil and gas is it left in the world? Tax regimes also regulate some of it around the world. If the taxes are too big no one wants to use it if they can find something else to use that is cheaper.

Biofuel is a part of a big research area called bio-refinery. In the theory everything that is made of the fossil carbon can be made of the biological carbon too. Some products that are made of this is biofuel, bio chemicals and fibers for different clothes.

The futuristic bio refinery is based on cheap biomass, like energy wood. This should not be depending on oil, gas or coal and it must handle the logistical challenges that biomass have. In the future we will use bio carbon as a replacement for fossil carbon where no other alternatives can be used, and we will be focusing on using the whole biomass.

"Borregaard" has the worlds most advanced bio refinery with timber as raw material. The company is producing green and sustainable biochemical, biomaterials, biofuel that replaces oil based products. EUs goal is to switch out a significant proportion of chemicals based on oil with products based on a

renewable, degradable and sustainable raw materials. These products can in most cases be switched out with oil based products.

Special cellulose

Fibers from the timber is turned into advanced specialty cellulose for products within the construction- and oil industries for preparation of food, tablets, cosmetics, painting and so on. Textiles as viscose and rayon are timber based products, and they could be great alternatives for synthetically products or cotton, because these products are often grown through significant pesticides, fertilizing and through genetically modified organisms.

Lignin

Lignin is the binding material in the timber, and is an ingredient in among others; concrete and building materials, textile dye, ceramic products, batteries, mining, and also in agricultural- and fishery products. The biggest area for using lignin is in concrete. Lignin doesn't only give benefits such as strength and quality; it also makes it possible to reduce the water and cement content. This contributes to lower energy and lower CO_2 emmisions related to preparation of cement.

People around the world have been researching on this and they often get their ideas to work in small scales. But often it is hard to get them to work in bigger and industrial scales and this is a problems that stops it from being more used in bigger scales and not only in the small scale when researching. The wood is a complicated piece to research on to get out what is wanted of it.

So in the years we have ahead of us both bioenergy, paper and the construction made out of timber will be maintained. This is a good thing since a lot of the timber that is cut down in the forest can be used for this. Another thing that is important to keep up is continuity of researching to still find different things that can be made of the wood and forestry generally to continue to be

environmentally conscious. A problem that can be met on the way is the competition with other areas to get on new markets to compete on. Here it has to be researched on to be as competitive as possible to gain as much as possible of it. Nano technology is also one post to mention, and this is a technique that is used, and may grow in more use as the years go. So it’s a big possibility to change the future to better than it is now for the forestry, but we have to cooperate with each other.

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