

Environment information
from the
Swedish Forest Industries Association

The forest industry the ecocycle and the environment – a summary

The UN's environmental conference in Rio de Janeiro in 1992 adopted a number of principles based on the concept of "sustainable development". The point of departure was that natural resources should be used with consideration for the needs of future generations. Planet Earth's resources should not be wasted.

Many governments, industries and enterprises are now endeavouring to guide developments towards these goals. Forestry and the forest industry are among those with the best chances of success.

Swedish forestry has long been based on the principle of good housekeeping. For almost a century we have all we can to ensure that the forest is not wasted and that harvesting does not exceed regrowth. In consequence, Sweden's forests now contain more timber than ever before.

The forest is not only a renewable source of raw material. It is also a place for recreation and experiencing wildlife for many people. Protecting these natural values is just as important today as producing timber.

Today, pulp and paper are produced in harmony with nature. The forest industry has evolved from an environmentally destructive activity to one which is environmentally adapted.

With its renewable raw material, environmentally adapted processes and products and recovery of material and energy, the Swedish forest industry is approaching the goal of sustainable development.

Naturally, however, the system is not entirely perfect. In some areas some environmental problems still remain to be solved, and these are described in the following chapters.

The goal of maintaining biodiversity represents a challenge to the forest industry. We have made much progress, but there is still room for considerable improvement.

The environmental clean-up of factories and processes has been completed, but we still have more to do before we have achieved an ecologically balanced factory, where all environmentally hazardous emissions are eliminated.

The forest industry also faces the task of developing even more effective recycling systems for its products. It will probably become possible to recycle even more material and energy into the production cycle. And endeavours to develop functional new paper products that require a low

resource input never cease.

The forest industry's environmental work is a continuous process. New environmental issues constantly arise as new facts emerge. And new process and purification methods are being developed all the time. There will probably always be areas where further improvements can be demanded in the forest industry.

However, the key point is that forestry and the forest industry are based on the concept of sustainable development. We can harvest useful products and valuable energy from the forest, without depleting resources.

A sustainable ecocycle

The forest and the products made in the forest industry all form part of an ecocycle. The sun drives the cycle. With water, nutrients and carbon dioxide, photosynthesis transforms the solar energy into wood fibres in the growing trees. This cyclical process is endless.

Wood fibres are used to produce timber products, pulp, paper and board, and also to generate energy. The modern processes used in the forest industry are environmentally adapted and do not waste resources. Recycling of the used products means that the raw material is used effectively and waste volumes are minimised. Waste paper that is not recycled can be used as bio-fuel to produce energy, which reduces our dependence on fossil fuels. Regardless of whether the waste paper is incinerated or decomposed on a refuse tip, the carbon dioxide is released, and absorbed once again by the trees in the process of photosynthesis. In this way, the carbon dioxide goes full circle round the ecocycle.

In this chapter we have described this ecocycle as a puzzle with five pieces: renewable raw materials, environmentally adapted processes and products, recovery of material, production of energy and recycling of carbon dioxide.

When all the pieces fall into place – and they fit together perfectly – they form a cycle that is in harmony with the environment. See the illustration below.

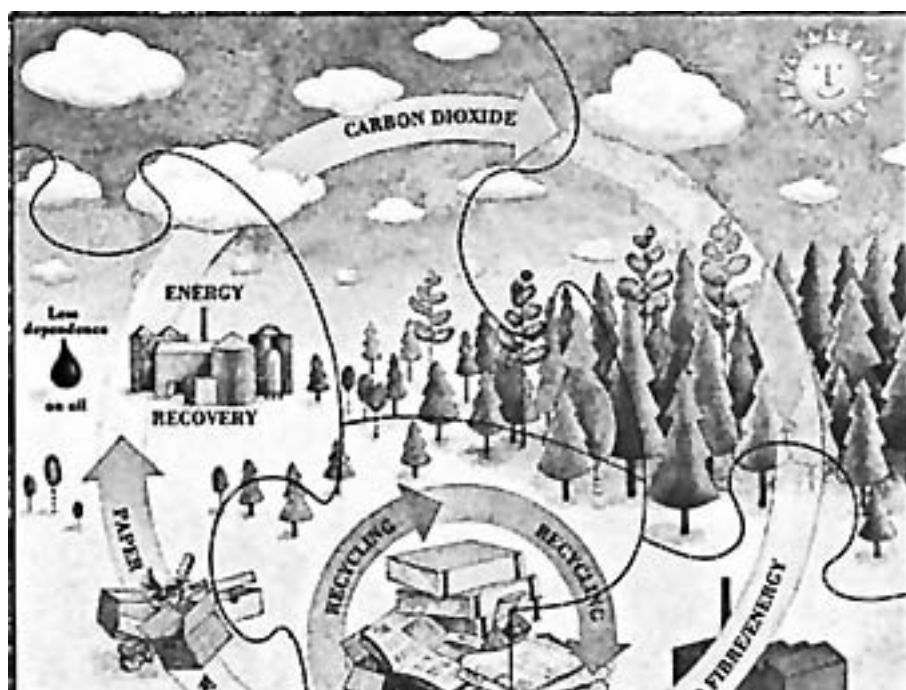


Figure 1.

The sun is the source of power for the ecocycle. Photosynthesis uses carbon dioxide and water to convert solar energy into fuel for the growing trees. In this way, the forest is a renewable

source of a raw material that provides both wood fibre and energy. The wood fibres are used to make paper and other products. If the products are recycled after use, the fibres can be used several times over.



If the waste paper is incinerated, the energy it contains can be utilised. Paper is a bio-fuel that can help us to reduce our dependence on fossil fuels such as oil and coal. Regardless of whether the waste paper is incinerated or decomposed on a refuse tip, the carbon dioxide is released into the atmosphere. The forest absorbs it once again in the process of photosynthesis, thus closing the circle and starting a new ecocycle.

Renewable raw material



If we use our forests efficiently they will provide us with a renewable source of raw material. In Sweden, regrowth has exceeded harvesting throughout the whole of this century. The stock of standing timber has doubled and regrowth has trebled. Forecasts show that timber stocks will increase by some 60 per cent over the next 40 years (see ill. 2).

Million m³ of forest

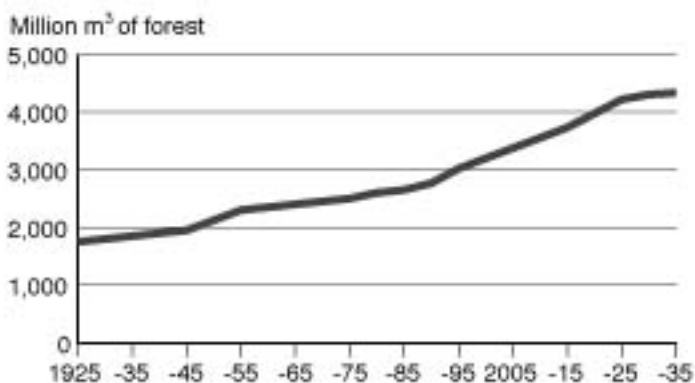


Figure 2.

Changes of stocks of growing timber during the 20th century and forecast for 21st century.

If we compare maps of forests with the distribution of population in Europe, it is easy to realise why the Nordic region is called the timberyard of Europe.

The large forests are found in the Northern regions, while the population is concentrated on the Continent further south.

The forests on the Continent are not sufficient to provide the people of Europe with timber and paper products. Moreover, forecasts indicate that paper consumption will grow steadily in Europe, by some 2.5 per cent annually. Both the International Institute for Applied Systems Analysis in Vienna (IIASA), and the UN body FAO forecast a shortage of wood in Europe. In other words, Sweden's forests are a resource which **{will continue to earn valuable export incomes and}** will help to provide people in Europe with a sustainable supply of timber, pulp and paper products.

The fact that forest regeneration exceeds the level of harvesting is the basis for sustainable forestry. However, it does not end here. The forestry methods used must also satisfy the requirement that they help to maintain natural values and biodiversity.

In Sweden we are well on the way towards achieving sustainable forestry in the true sense. In the 1980s, forestry methods underwent radical changes. Old, ingrained forestry methods were abandoned and the choice of tree species, silvicultural and regeneration methods became more closely adapted to the biological features of each site. The result of this is a wider variety of animal and plant life with better chances of survival.

Substantial resources have been invested in training in nature conservation. Nowadays it is natural for everyone who works in the forest not to harvest sensitive and characteristic areas, and to leave wide screens and shelter trees along lakes and flowing water. More old trees and dead wood are left in the forests. Simple measures, but they are already showing results.

Now the next, more long-term phase of nature conservation has begun. The country's leading forest companies are applying strategies aimed at emulating the features of virgin forests. Ecological landscape planning is one new, effective method. The object is that all the animals and plants that belong in Swedish forests should be preserved in lively colonies.

Air pollution harms the forest. The most disturbing aspect is how acid rain affects the productive capacity of the soil. Forest regeneration and a vast treasure of natural beauty are at risk.

European pollution containing sulphur and nitrogen oxides is carried far from its source. Almost 90 per cent of Sweden's acid rain is blown in from other countries.

In southern Sweden, the precipitation of sulphuric rain would need to be reduced by 60-80 per cent and of nitrogen-containing rain by some 60 per cent before we reach a level that is sustainable to the soil in the long perspective (see figure 3).

International agreements are the only long-term solution. All countries must successively lower their pollution to ecologically acceptable levels.

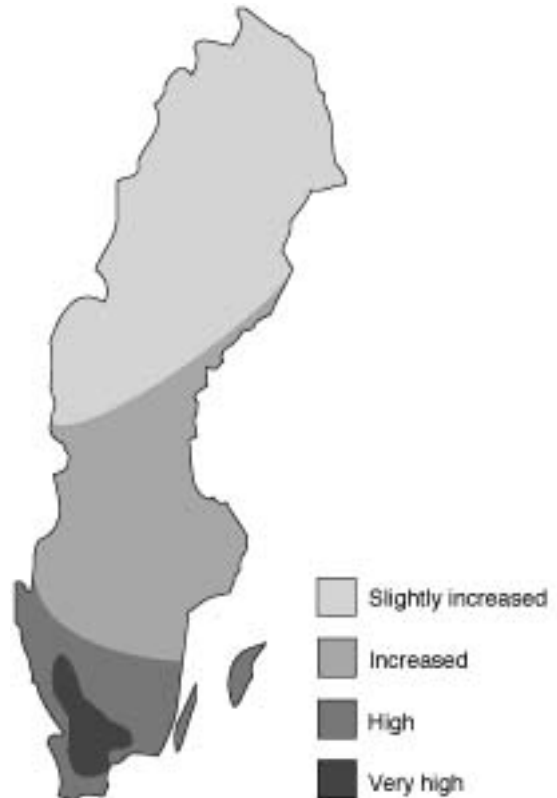
Slightly increased
Increased

High
Very high

Figure 3. Soil acidification. Almost 40 per cent of all forest land in the black area and almost 20 per cent of the remaining forest land in southern Sweden have a pH of less than 4.4 – the critical point at which aluminium is released, which damages both trees and groundwater.

Environmentally adapted processes and products

Pulp and paper can be produced by means of processes that make economical use of resources and are environmentally adapted. We have been successful in our attempts to reduce emissions into water and air. These processes have been improved, energy consumption has been reduced and effluent treatment is now more effective.



Sweden's forest products companies began to deal with environmental problems systematically in the 1960s. The strategy was to tackle the problems at the source and to reduce emissions by modifying the processes. The second alternative was to improve purification and cleaning methods.

The environmental debate has mainly been concerned with emissions of organic chlorine compounds (AOX). These emissions have been reduced by more than 90 per cent since the mid-80s by modification of cooking methods, the introduction of new bleaching methods and more effective purification (figure 4). The use of chlorine gas has been completely phased out at Swedish pulp mills.

AOX, kg/tonne pulp

Figure 4. Emissions of organic chlorine compounds (AOX) have now been reduced to very low levels.

Emissions of oxygen-consuming substances (COD) have also been radically reduced with the new techniques and various measures to close processes (figure 5).

COD 1,000 tonnes

Figure 5. Emissions of dissolved organic compounds have been reduced by almost 90 per cent since 1960.

Emissions of sulphur dioxide into the air have been reduced by more than 90 per cent since the late 1970s (figure 6). The main measures taken to achieve this are to reduce the use of oil, conversion to

low-sulphur fuel, and to install fume purification and destruction systems for sulphurous gases the produce unpleasant odours. The closure of some sulphite pulp mills has also helped to reduce sulphur dioxide emissions.

S/1,000 tonnes

Figure 6. Emissions of sulphur (S) into the atmosphere from Swedish pulp and paper mills have been radically reduced.

Over the past few years, emissions of nitrogen oxides have also been reduced thanks to better control over combustion in the steam boilers at the mills. Lower oil consumption has also helped to reduce emissions of nitrogen oxides from pulp mills.

Environmental activities are now focused on reaching the target formulated by the Government that all emissions should be reduced to harmless levels by 2000. Within the forest industry, we believe that many emissions are already down to such low levels that the target for 2000 is well within reach.

The industry's long-term goal, however, is to go even further, if possible to achieve what is known as the ecologically balanced mill.

Paper used as a carrier of information, for packaging and for hygiene products satisfies many of our daily needs. Since paper is used in so many fields, many different demands are made on the product. The choice of raw material is important, and often a combination of different wood fibres is used to achieve the desired product features.

Demands on the market for "environmentally friendly" products have lately had a radical impact on product development work. The new chlorine-free pulps (ECF and TCF) are two examples of this. Swedish companies have pioneered, and are still leaders in, this product area.

In order to assess the environmental aspects of a product we have to adopt a holistic perspective. No one benefits if a change for the better in one field is offset by adverse effects elsewhere in the ecocycle. On the whole, paper products – made of renewable resources, with environmentally harmonised processes and capable of being recycled – can be produced using environmentally sound methods.

One method which is used increasingly for performing a comprehensive environmental evaluation is the life cycle analysis (LCA). Many people are demanding a standardised method, and several research institutes around the world are now jointly developing such a uniform methodology.

Environmental labelling mainly benefits consumers who wish to choose products that are environmentally adapted.

The Nordic Swan label and the Good Environmental Choice label issued by the Swedish Society for the Conservation of Nature are the labelling systems that are best known in Sweden

Recovery of material

Using waste paper to produce new paper is a natural aspect of a cyclical society. Recovery makes effective use of the raw material, and also minimises the amount of waste.

Recycled fibre and virgin fibre from the forest are both part of the same ecocycle. Paper cannot be recycled indefinitely. Each time they are recycled the fibres become worn, and some are destroyed or lost. Therefore, paper production can not be based solely on recycled paper. The system needs to be "topped up" with virgin fibre from the forest. In consequence, the use of recycled paper will not eliminate the need to use forests in paper production. Both sources of raw material are needed.

From the European perspective, it is only natural that this injection of virgin fibre should come from the Nordic countries, which have abundant forest resources. The fact is reflected in the use of Nordic pulp in paper mills throughout Europe. Or when paper from Nordic paper mills based on virgin fibre is recovered as waste paper. Continental paper mills, which are closer to immense quantities of recycled paper naturally use large amounts of recycled fibre in their paper.

Virgin fibre fresh from the forest and recycled fibre have different characteristics, and paper producers have to take this into account. In the choice between virgin fibre and recycled fibre the demands on the end product are decisive. If the technical requirements, expressed as strength, stiffness, purity, durability and so on, are the most important requirements, then virgin fibre is the best – not to say the only – alternative. In other cases, the market demand for low price and "environmental friendliness" is paramount. Here a high proportion of recycled fibre is usually to be preferred.

Sweden is among the leaders when it comes to collecting waste paper. More than six out of ten newspapers and seven out of ten cardboard boxes are recycled, which is a high level by international standards. The total recycling rate for 1994 was 50 per cent, while the average for EU countries was around 40 per cent. This means that half of all the paper used in Sweden is recycled.

The amount of waste paper collected in Sweden in 1994 was one million tonnes. Almost half of this came from households. The retail trade accounted for a quarter, and the rest came from offices, printers and converting industries.

Forecasts indicate a further increase in paper collection. The paper industry's needs are expected to rise from 1.4 million tonnes in 1994 to 1.7 million tonnes in 1999, on account of technical, commercial and financial factors.

Virgin fibre is naturally the predominant raw material used in the Swedish pulp and paper industry. The addition of recycled paper is around 15 per cent, compared with the average of more than 50 per cent in the EU countries.

Energy recovery

The principle behind the ecosystem is that waste paper should be used preferably – and wherever

possible – to make new paper. However, it is unrealistic to expect that all paper everywhere can be collected for recycling. Too much recycling could even give rise to adverse environmental consequences, for instance by leading to increased transport needs. If industry uses large quantities of waste paper instead of wood this may also increase the need for fossil fuels, since this will lead to reduced secondary production of bio-fuel in the form of bark and lye.

Nor should the admixture of recycled fibre be allowed to affect the function of the paper products. Nor is it possible to disregard the financial aspects – if recycling becomes unreasonably expensive the whole system will collapse. The cost of collecting paper rise the higher the collection rate is in any country. This cost increase is particularly noticeable in sparsely populated countries such as Sweden.

In other words, collecting paper must not become an end in itself, but should be environmentally motivated and economically viable. Instead of concentrating entirely on recycling of material, it is rational to allow some of the waste paper to be incinerated. Like wood, paper is a bio-fuel. The energy that is released by incineration can be used to heat homes. It can also be used to generate electricity. In Sweden more than 250,000 homes obtain their heating and hot water from incineration of refuse.

With today's incineration and purification methods, the incineration of paper does not cause any environmental problems. If fossil fuels are replaced with waste paper, pollution is reduced, especially with regard to carbon dioxide. Compared to oil and coal, waste paper also generates lower sulphur emissions.

More than two thirds are recycled

In Sweden 50 per cent of all paper is recycled as a material, that is, as recycled paper for making pulp, and then paper again.

Sweden is also well to the fore when it comes to recovering energy from waste paper. Around one-third of all household refuse consists of waste paper, and some 60 per cent of this refuse is incinerated to recover energy.

In total some 70 per cent of all waste paper is recovered, either a new material or as energy. Few countries in Europe reach a level anything like this.

Energy recovery 20%

Material recovery 50%

Filing, sewage, refuse tips 30%

Utilisation of waste paper in Sweden

Uptake of carbon dioxide

While the products from the forest industry generate, direct or indirect, carbon dioxide emissions, the forest re-absorbs even larger quantities of carbon dioxide.

Forest products, timber products and paper contain large quantities of carbon. This carbon is

absorbed at the beginning of the ecocycle in the form of carbon dioxide. When the forest products become waste the carbon dioxide is returned to the atmosphere. This takes place when the waste is incinerated or when it decomposes under controlled conditions.

If we fail to consider this input of carbon dioxide from a holistic perspective, it might be regarded as an environmental hazard as it adds to the greenhouse effect. But as part of the ecocycle of the forest and its products this carbon dioxide is re-absorbed by the trees and transformed via photosynthesis into the matter and energy needed for the trees to grow. In this way the system is in balance.

In fact, Swedish forests absorb more carbon dioxide from the atmosphere than is generated by the production processes and the disposal of its products. This more than offsets the greenhouse effect, which is considered to be one of the most serious environmental problems at the global level.

IVL, the Swedish Institute for Water and Air Pollution Research, has estimated that the forest industry currently accounts for a net absorption of greenhouse gases corresponding to 20 million tonnes of carbon dioxide per year, taking into account the aggregate effect of carbon dioxide, nitrogen dioxide and methane. This net absorption is constantly increasing since the volume of wood in Sweden's forest is also increasing.

However, at a global level, forests are rapidly being depleted, especially in the tropics. The UN organ FAO estimates that some 15 million hectares of tropical forests disappear each year. The depletion of forests increases the greenhouse effect as well as the risk of global warming.

In this perspective, the forests in Sweden and the other Nordic countries represent a valuable countervailing force. Admittedly, Sweden has less than one per cent of the world's forests, but our forestry methods demonstrate that it is possible to use the forest in a way that is in harmony with the global environment.