

Storm “Gudrun” and the Swedish forest

January, the 8th, 2005

Sweden

- Natural risks
- Forestry industry
- Timbers
- Pesticides
- Irrigation
- Material and environmental damages
- Regulation

LOCATION OF THE STORM AND LEGISLATION INVOLVED

The storm mainly affected the southern parts of Sweden. In this area, the quantity of coniferous forests with spruce is large. The major effects caused by the storm consisted of fallen trees, shown in the map below illustrating the volume of timber damaged in different parts of southern Sweden (Figure 1).



This presentation will focus on the environmental issues concerning the storm.

The most important consideration after the storm was the possibilities to handle and store all of the fallen timber. Storage usually involves irrigation or even storage in lakes.

Until the storm occurred, environmentally hazardous activities like these always requested permit from the County Administrative Board (regional authority) according to an ordinance in the environmental legislation called “environmentally hazardous activities and health protection”. Normally a licensing process lasts for as long as a year.

For hazardous activities with less environmental impact, a notification is made to the local authority (municipality) instead of the permit.

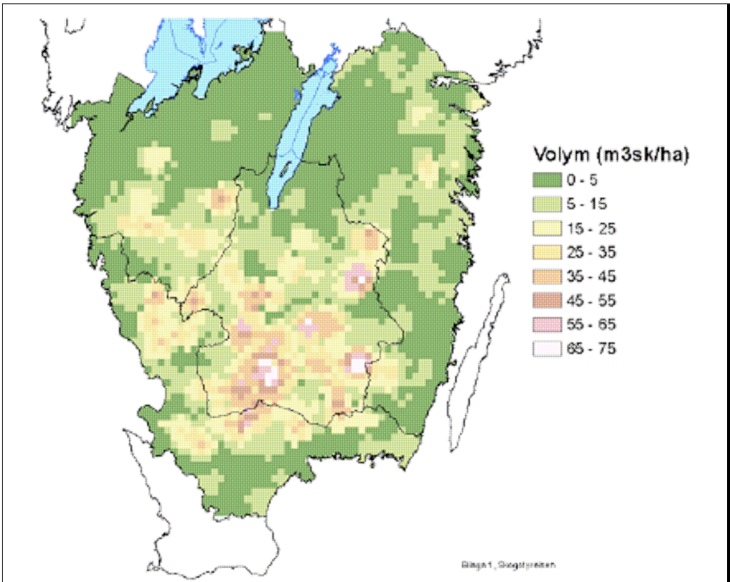


Figure 1 – Volume of timber per hectare (10 000 m²) damaged by the storm in January 2005

THE EVENT, ITS DEVELOPMENT, ITS EFFECTS AND CONSEQUENCES

The event :

The storm called “Gudrun” struck southern Scandinavia on the night between 8th and 9th of January 2005. In Sweden, the winds first reached the west coast at storm levels. The storm grew further during the evening and spread all over the south of Sweden. In some places, even in the inland, the winds reached the strength of a hurricane (≥ 33 m/s). The storm is considered to be the worst in Sweden since September 1969.



During this storm, more than 75 million m³ of timber were damaged, compared to 35 million m³ of timber in the storm 1969. Most of it fell down, but some trees were broken like matches. The major part of the trees that fell were very old aged spruces (*Picea abies*).



The consequences :

Immediate consequences

As an effect of the large number of fallen trees, the following consequences emerged.

- ✓ At least seven persons were killed, mostly in traffic accidents with falling trees involved.
- ✓ An estimate of 410 000 households had no electricity after the storm. Even as long as a month after the storm, many households still lacked electricity.



- ✓ For at least 200 000 households, the telephone network was out of order.
- ✓ Immediately after the storm, many roads where closed due to fallen trees. As the road authority was prepared, many of the major and middle sized roads where open within a couple of days after the storm.
- ✓ As the railroads were struck harder than the roads, rail traffic was affected for a month.
- ✓ In many watercourses, the water level rose but sank again shortly after the storm had abated.



Subsequent consequences

To avoid damage of the timber by insects, fungus or dryness, it needs to be irrigated or put in water during the summer months. In the worst case, treatment with pesticides can be a possibility. Irrigation is used on timber transported to larger terminals and pesticides are used on smaller timber stacks gathered along country roads. To avoid the use of pesticides, the objective by the forest industry is to transport the timber in timber stacks to larger terminals.

- ✓ Irrigation and lake-storage timber lead to a leachate containing substances released by the timber. These are mainly phosphorous, toxic substances like phenols, and terpenes, and a lot of oxygen demanding organic substances. Due to organic acids, the pH-value of the leachate becomes low. The environmental impact from lake-storage is greater than from irrigation of timber. Lake-storage is also an expensive method and is nowadays not used by the forestry industry. Because of this, there are not many good places for lake-storage.



Therefore, irrigation with water in terminals is the most important method to store timber fallen in the storm. With the irrigation of several millions cubic metres of timber, the consequence will be enormous : amounts of contaminated leachate throughout the south of Sweden. Irrigation normally lasts for 12-15 hours a day during the summer months. About 3 litres of water are needed per second to irrigate 1 000 m³ timber.

- ✓ For the treatment of fallen timber with pesticides, only two pesticides whose effective substances are cypermethrin and deltamethrin respectively, are allowed in Sweden. These chemical products are very toxic to fish and other water living organisms. Treatment with pesticides may present an interest if the forestry industry does not succeed transporting the timber gathered in timber stacks along country roads to larger terminals for irrigation.

Recently, the forestry industry suggested that the use of pesticides would be less than first expected. This is mainly due to economical reasons and that the government simplified the legal process for irrigation and lake storage of timber. The effort made by local authority (municipalities), handling the notification for irrigation and lake-storage very efficiently, is also an important factor.



ORIGIN, CAUSES AND CIRCUMSTANCES OF THE EVENT

There are many theories about why the storm caused such a large number of fallen trees. The following are the major theories.

- ✓ Mostly spruce were fallen by the storm. This is probably due to a root system that is very shallow in comparison to deciduous trees.
- ✓ In the south of Sweden, spruce is mainly planted for the forestry industry. It has been established that different ways of attendance and thinning of the forest have led to different amounts of timber fallen in the storm.
- ✓ The exposition of forests to a lot of wind had created clearings, places which are more vulnerable in case of hard winds.

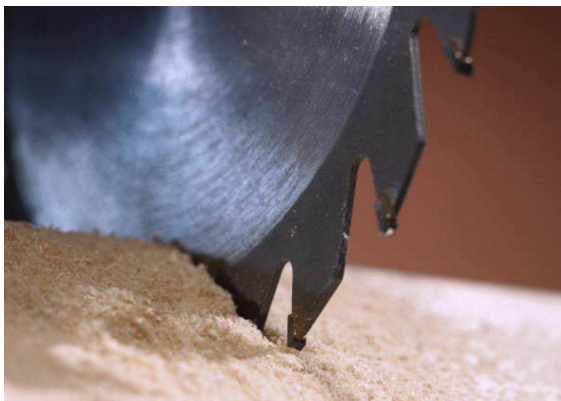
ACTIONS TAKEN

By the forestry industry

The problems for the forestry industry mainly concerned the transport of timber from the forests to terminals and the industries. There was a lack of timber-lorries, which was finally solved by borrowing lorries from the north of Sweden and even from the Baltic States. The objective now is to deal with all the fallen timber within 18 months.

One of the tasks was to find appropriate locations for terminals to irrigate the timber. In order to serve as a terminal, some requirements had to be fulfilled : supply of water and electricity, being in a logistically good position. Terminals are now found mainly at industries and in harbours, and at places between forests and industries/harbours.

Although some of the timber is exported from the harbours by boat or transported by timber-lorries to the north of Sweden, the sawmills and paper mills in the south of Sweden are highly under pressure.



By the government

The legal process to get a permit to irrigate or lake-store timber in a certain location was changed by the Government. The licensing process may take up to a year, which is normal, and the processing of permit applications is done by the County Administrative Board (regional authority). With a process of this kind, there was an imminent risk that a lot of the fallen timber could be destroyed or preserved by treatment with dangerous pesticides that would be spread throughout the forests. To simplify and speed up the licensing process, the Government immediately changed the ordinance to the Environmental Code regarding “environmentally hazardous activities and health protection” to an extent : a notification to the local authority was sufficient to store fallen timber due to a storm or hurricane. It is also possible to submit a notification up to six weeks after the storage has begun at a location.

By national authorities

The Swedish Environmental Protection Agency was the authority that made the proposal to the Government about changes in the legislation. They also made the work easier for regional and local authorities by guidance and information.

Also the Swedish Chemicals Inspectorate assisted the regional and local authorities as well as the forestry industry with guidance and information concerning pesticides.

Being relieved of the procedures of irrigation and lake-storage of timber, the County Administrative Board concentrated on guidance to local authorities concerning the incoming notifications and gave status reports to the forestry industry and individual forest proprietors.

Other legislation remained. This results for example in that permit is required according to the Environmental Code for pumping water for irrigation from watercourses and lakes in case of disturbance of individual or general interests in the watercourse. The licensing process lasts a very long time and is arbitrated by the Environmental Court. Questions about the requirement for permits are handled by the County Administrative Board that was exclusively concerned, along with the forestry industry, with finding locations where permits were not needed.

Due to the high pressure on sawmills and paper mills, some of the industries now need a new permit from the County Administrative Board to produce more than they are allowed in the present permits.

By local authorities

The local authorities (municipalities) deal with the notifications. Since the other aspects of the legislation remain the same, the demands concerning the impact on the environment due to irrigation of timber also remain. It leads to rejections of some locations for irrigation of timber, for example soils such as sand and gravel drain water easily, or within protection areas of water catchments. The approval documents of the notifications are also combined with certain conditions regarding how to decrease the environmental impact from the environmentally hazardous activities.

LESSONS LEARNED

- ✓ Our legislation was not prepared for unexpected natural catastrophes. This knowledge can, with the help of risk assessment, be avoided in other similar unexpected situations.
- ✓ Better understanding is needed between forestry industry and authorities.
- ✓ Increased knowledge about the methods for environmental protection, preferable to irrigation and lake storage of timber. Infiltration of leachate in soil and use of clean water for irrigation are for example a better solution than water recirculation. When you use the same water many times over the timber, it can give severe problems with growth of bacteria in the water.
- ✓ Several research projects have been started to study effects of the storm, for example;
 - the environmental impact from irrigation and lake-storage of timber
 - how to attend and thin the forest efficiently to avoid storm fallen trees
 - other options than using pesticides, for example pheromone traps
- ✓ Deciduous forests are less likely to be affected in a storm than coniferous forests.

