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Good Practice Guide

Sustainable timber production in a changing climate

Brandenburg, Auvergne and Latvia

Timber Production

LAND BRANDENBURG

Office National des Forêts

INTERREG IVC

European Union

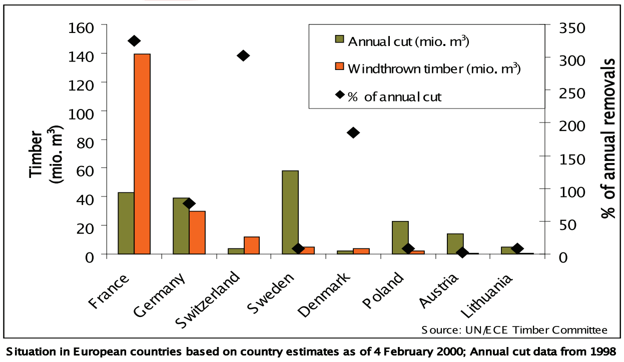
Sustainable timber production in a changing climatee

Pine processionary moth in the Auvergne, France

Background
Forests are severely affected by climate change. Increasing mean and peak temperatures, changes in the amount and distribution of precipitation, and increases in the occurrence and frequency of extreme weather events such as storms, droughts, wet snow, or hail alter the normal conditions for forestry and forest management.

Risks and challenges
Due to the changing climatic conditions, forests are facing increasing abiotic and biotic risks and other associated challenges, for example:

- Increased frequency of extreme weather events
  From 1990 to 2000, Western European forests were hit by 2 strong winter storms (Wiebke, Kyrill) that had a severe impact on the amount of industrial roundwood production.



Trends in the industrial roundwood production in Western Europe from 1960-2000

- Severe risk of damaging agents, pests and diseases

  As a result of increasing temperatures and decreasing frost days, numerous insect species are migrating north and establishing themselves in regions where they were formerly unknown. For example, the Oak processionary moth has appeared in Brandenburg, Germany, where it severely damages oak forests and already requires large-scale control measures. Similarly, the area damaged by the Pine processionary moth in the Auvergne region in central France has increased recently. In Latvia, the Gypsy moth has changed from a relatively small latent population to a serious forest pest. Increasing temperatures and humidity levels also enhance fungal infections, e.g., in Wales, UK, where *Phytophthora* infections of larch have become increasingly common.

- Increased competition by non-native species

  In addition to changing climatic conditions and increased risks, native species are threatened by the immigration of foreign and possibly highly competitive species. As a result, species distribution and forest composition will likely change considerably and certain species could become endangered or extinct. At present, the diversification of forests seems to be the best prevention strategy, distributing the risks on as many tree species as possible. For example, the introduction of deciduous species into pure coniferous stands prevents the loss of the entire forest stand during a bark beetle outbreak.

- Fluctuating timber production

  The ability to maintain stable and sustainable timber production could be at risk because of the above mentioned factors. Severe damaging events could result in timber supply fluctuations and influence timber demand and price. Affected forest owners will have lower revenues for the damaged timber whilst having to invest in reforestation. The timber industry will have to adapt to considerable fluctuations regarding the availability and quality of timber.

- Low adaptation rate of forest ecosystems

  Forest ecosystems adapt very slowly to changing climatic conditions, far slower than the climate is currently predicted to change. Forest management decisions, e.g., with respect to tree species selection, are long-term decisions and modifications can only happen relatively slowly. Compared to agriculture, for example, the flexibility of forest management is low due to long production periods of 40–250 years. As the climate changes, the ability to relocate timber production to different, possibly more favourable sites is very limited, making forestry highly dependent on the local environmental and site conditions.

Prevention is better than cure …
… adaptation strategies for forest owners
The current predictions of climatic changes have some uncertainty, thus rendering decision-making in forest management difficult. However, a number of recommendations can be made regarding the adaptation of forests and forest management to changing conditions and the minimisation of the associated risks:

- Continuous tending and thinning of forest stands can increase the stability and adaptability of forests by promotion of the most healthy and stable trees
- The reduction of the rotation period can lower the risk of damage which generally increases with increasing forest age
- Monitoring existing stands and understanding what changes are happening will allow for the site-specific development of silvicultural adaptation strategies
- The conversion of stands to site-adapted forest types by diversifying species composition can increase the ecological variability and resilience of the entire forest stand. Examples of this are:
  - Introduction of pioneer species such as birch, aspen, rowan, or black locust in regions with a predicted decrease in precipitation
  - Retention and further establishment of foreign species such as Douglas fir or Red oak in regions where these species have a higher suitability and adaptability than native species
  - Acceptance of native tree species currently subjected to sub-optimal growing conditions due to inter-specific competition, but possibly becoming more competitive in a changing climate (e.g., oak, Norway maple, Lime (Linden, basswood), yew, hornbeam, or pine)
  - Retention and further utilisation of naturally regenerated secondary tree species as future co-dominant species
- The sue of natural regeneration and self-thinning can increase the adaptive potential and decreases the cost of forest management
- Soil-conserving forest management will maintain site fertility, conserve or increase soil carbon stocks, and reduce erosion and drought (e.g., permanent extraction routes and abandonment of clearcutting systems)
- Management of game densities is essential for establishing highly structured, diverse, naturally regenerating forests, thus also reducing the cost of fencing and other game control measures

Outlook

The incorporation of these recommendations into silvicultural decision-making and forest management will diversify forests thus increasing their resilience to the risks and challenges associated with climate change. However, using adaptive forest management – the planning, implementation and monitoring of new forest management strategies – will be needed to address the complexities and uncertainties and to continuously improve the response of forest management to climate change.

Protection of oaks in pine regeneration

Case study - Brandenburg

In a mature pure Scots pine stand in Brandenburg, a complete natural regeneration layer composed of pine, birch, and oak established itself. However, the share of oak in the regeneration layer could not be maintained, because the oak seedlings were selectively browsed by game.

To maintain ecological stability of the pine-dominated stand, the naturally regenerated oaks (~100/ha) were protected by tree shelters – for less than 5 years. In addition to protection from browsing, tree shelters protected plants tend to grow faster due to enhanced micro-climatic conditions.

Implementation of a tending and thinning block system
To increase stability and adaptability of the overstocked stands, a tending and thinning block system was developed for all public forests in Brandenburg. Starting in 2005, each public forest district in Brandenburg was divided into 5 tending and thinning blocks. Each year, one block had to be assessed by the district forester with respect to the necessity and urgency of tending and thinning measures. Following the creation of maps, all required tending and thinning. Measures were implemented in the respective forest stands regardless of whether or not merchantable timber could be harvested or not. In total, tending measures have been implemented in ~80% of all forest stands.

Further reading

http://www.lfe.brandenburg.de/
http://www.unece.org/trade/timber
http://www.lvm.lv/lat/mezs/publikacijas/
http://www.lvm.lv/lat/lvm/zinatniskie_petijumi/
http://www.silava.lv/Mezzinatne/lejupieladei.aspx

Wood harvesting for decreasing insect pests

Case study - Latvia

Forest protection measures need to be incorporated into practical forest management to minimise the risk of outbreaks of forest pests. For example, the appropriate treatment of forest residues should be considered during timber harvesting. Recently the burning of branches and tree tops has been very popular in dry forest types in Latvia. However, this practice has adverse effects on biodiversity due to the reduction of deadwood amounts and nutrient availability. As an alternative practice, the collection of residues in small piles during spring and summer with subsequent burning in autumn (during fire safety season) maintains deadwood on site throughout the vegetation period, but facilitates pest outbreaks.

One possible solution is to leave forest residues scattered on site thus avoiding the concentration of breeding material for forest pests. Contrarily, another option is the concentration of harvesting slash in very large piles. Experiments show that aggressive pest species mostly populate the upper parts of large slash piles and that insect increases occur three times slower in large piles compared to small ones.

Aggressive pests generally colonise only a thin part of the living bark (phloem). The most suitable living sites for them are found in the larger-sized branches and tree tops. It is thus important to locate larger-sized residues in the centre of slash piles. Larger slash piles feature better aeration and shorter drying times, therefore being less suitable for insect colonisation. In addition, the production of wood chips for energy use are more economic and efficient when using larger slash piles.

Since 2007, the stock company “Latvijas valsts meži” has successfully applied this approach in managing state forests in Latvia to reduce the risk of insect outbreaks while producing wood chips from forest residues. On average, production amounted to 70 000 m³ of wood chips per year. In 2009, the production exceeded 1 million m³.

Harvesting by cable-mast-systems prevent to prevent soil damage

Case study - Auvergne, France

Soil protection has become a major concern for foresters because the deterioration, alteration, or destruction of soil properties during harvesting can have a serious negative effect on the stand and the establishment of regeneration. Sensitivity of soils to machinery traffic will increase as a result of climate change as the number of frost days is predicted to considerably decrease.

Forest managers in the Auvergne in central France have started using soil-conserving harvesting technology, particularly on sites featuring:

- steep slopes,
- low or inadequate density of forest roads,
- sensitive and/or protected natural areas, or
- high accessibility by communities and tourists.

In the Auvergne, large areas fall within the above-mentioned categories, thus considerably limiting the amount of timber potentially available for harvesting. Using cable-based skidding system, some of the issues can be addressed and successfully resolved.

What is it?
It is a mobile system of cables and masts which is temporarily installed in the stand that is to be harvested. Following manual felling, this system ensures minimal soil disturbance during timber transport from the stand to the nearest forest road.

Technical characteristics:
Maximum length: 800 m; extraction corridor on both sides of the cables: maximum of 40 m; 2 people are required for operating the system: one to lead the cable and one to attach the timber; system output: 70-80 m3/day at a cost of approximately 30€/m³.

Advantages
Positive balance sheet; lower impact on the landscape (lower density of road network required); positive ecological evaluation (intact streams and roads, less tree damage); the soil damage is decreased by two thirds; harvest operations can be implemented regardless of weather conditions; the system is mobile and can be applied in plains and mountainous areas.

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