Case Study Report FRISK-GO

Title: Disturbance to harvest ratio in Central Europe

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Adding value with a European Forest Risk Facility

Case study reports are a tool to investigate and document how a European Forest Risk Facility can add value to current actions using concrete examples based on real events/incidents

A) Description and background

Natural disturbances in European forests

European forests have always been exposed to disturbances, as evidenced by reports for more than 600 years and fire marks found in trees and peatlands. They can be of abiotic (e.g. storms, fires) or biotic nature (e.g. insect infestations) being either of natural origin or human induced. From an ecological perspective they play a key role in forest ecosystem dynamics affecting stand structures and evolutionary processes linked to regeneration and succession.

However, they can, in the case of forests under management, strongly disrupt targeted goals, have severe consequences to wood production and timber markets and in cases destroy the economic base of forest owners. They may seriously affect the provision of various goods and services including for example carbon and water balance and biological diversity. Forest managers and policy makers should be aware of possible risks and take them into consideration in their daily management and policy decisions. However, information on frequency and intensity of occurrence of many disturbance agents is very scattered and many decision makers are not very well aware of the risks (Schuck and Schelhaas, 2013).

Collecting information on disturbance events

With this in mind, the '*Database on Forest Disturbances in Europe (DFDE)'* was developed in the early 2000's at the European Forest Institute, and is still hosted at its website[3] (Schelhaas et al. 2003; see also Figure 1). Although the online web database has not been updated since, information on disturbances is further collected as background information for more recent scientific papers (see e.g. Seidl et al. 2011, Seidl et al. 2014).

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[3] http://www.efi.int/portal/virtual_library/databases/; password protected; password can be requested from EFI/Alterra

DATABASE ON FOREST DISTURBANCES IN EUROPE

Country **Period** **Damage type**

Germany 1999 - 2001 Abiotic

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Year / period	Country	Region	District	Damage type	Cause of damage	Detailed cause of damage	Tree species	Volume (m^3)	Area (ha)	Number (see comments)	Percentage (see comments)	Status (e.g. sanitation fellings)	Bark (e.g. overbark)	Date	Comments	Reference
1999	Germany	Baden-Württemberg		Abiotic	Wind			1500000							Big private forest	Forstliche Versuchs- und Forschungsanstalt Baden-Württemberg 2000
1999	Germany	Nordrhein-Westfalen		Abiotic	Waterlogging		Poplar		30.00							Emschermann et al 2000
1999	Germany	Hessen	Rhein-Main-Ebene	Abiotic	Summer drought			13200							Beech and pine	Gossenauer-Marohn 2000
1999	Germany	Hessen		Abiotic	Wind		Spruce	40000								Gossenauer-Marohn 2000
1999	Germany	Rheinland-Pfalz		Abiotic	Wind			300000				Damaged		December 26		Schröter et al. 2000
1999	Germany	Rheinland-Pfalz		Abiotic	Hail			150000				Damaged		June 2		Schröter et al. 2000
1999	Germany	Hessen		Abiotic	Winter drought				49722.00						Trocknis. Trend: no change	Waldschutzsituation 2000
1999	Germany	Baden-Württemberg		Abiotic	Winter drought			30400							Trocknis	Waldschutzsituation 2000
1999	Germany	Mecklenburg-Vorpommern		Abiotic	Frost				369.00						Trend: increasing	Waldschutzsituation 2000
1999	Germany	Brandenburg		Abiotic	Frost				1368.00							Waldschutzsituation 2000
1999	Germany	Sachsen-Anhalt		Abiotic	Frost				125.00							Waldschutzsituation 2000
1999	Germany	Sachsen		Abiotic	Frost				55.00							Waldschutzsituation 2000
1999	Germany	Thüringen		Abiotic	Frost				242.00							Waldschutzsituation 2000

Figure 1. Screenshot from the Database on Forest Disturbances in Europe.

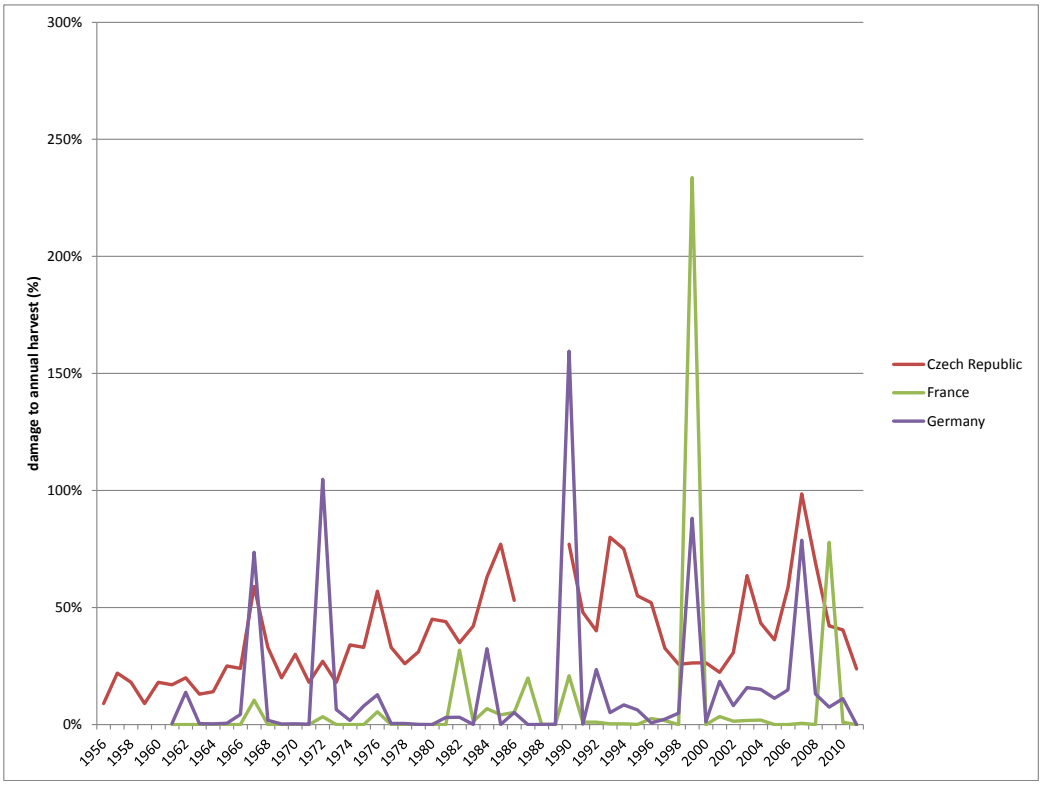
The current and updated offline database contains more than 30,000 records with reported disturbance events throughout Europe, ranging from local minor damage to European-scale impacts. Often the information identified and extracted from published reports is presented in terms of area and/or volume damaged. Storms especially are in cases reported also by their magnitude compared to the annual harvest of a country/region. The ratio of damages as compared to average annual harvest figures is an excellent and visual measure in seizing the impact of disturbances on everyday forest management. It also gives an indication on additional amounts of timber that need to be managed in terms of harvesting, storage and marketing as compared to a normal situation.

Analysing data and information from the database

For investigations such as Seidl et al. (2011) and Seidl et al. (2014) annual time series are essential and have been extracted for disturbance damage of all types for a few case study countries where such data is sufficiently available. They are compared with the annual harvests as reported by the FAOSTAT[4]. The annual harvest is calculated as a 10-year moving average to smooth the effect of the disturbances on the harvest. In case the ratio was already reported in the database, those values are used.

The damage percentage is highly volatile (Figure 2), dominated by the stochastic occurrence of storms. It is clear that the extraordinary storms of 1999 affected more than one country heavily. Damage due to bark beetle is usually spread over more than one year and is therefore less visible in the figure. The average damage percentage over a longer time period can range from 9% to 40% in selected countries and regions, while it reaches almost 300% in years with significant disturbance events. The average damage percentage is negatively correlated with the size of a country (Table 1). Thus large countries such as France and Germany visibly have a lower percentage. Not only is it unlikely that a whole country will be hit by one single storm, also forest composition will be more variable (species, sites, altitudes, climate). That will spread the risk over many different forest types. However there are also exceptions where large countries can be severely affected by single storm events. Examples are the storms that occurred in 1990, 1999 and 2009.

[4] http://faostat3.fao.org/download/F/*/E



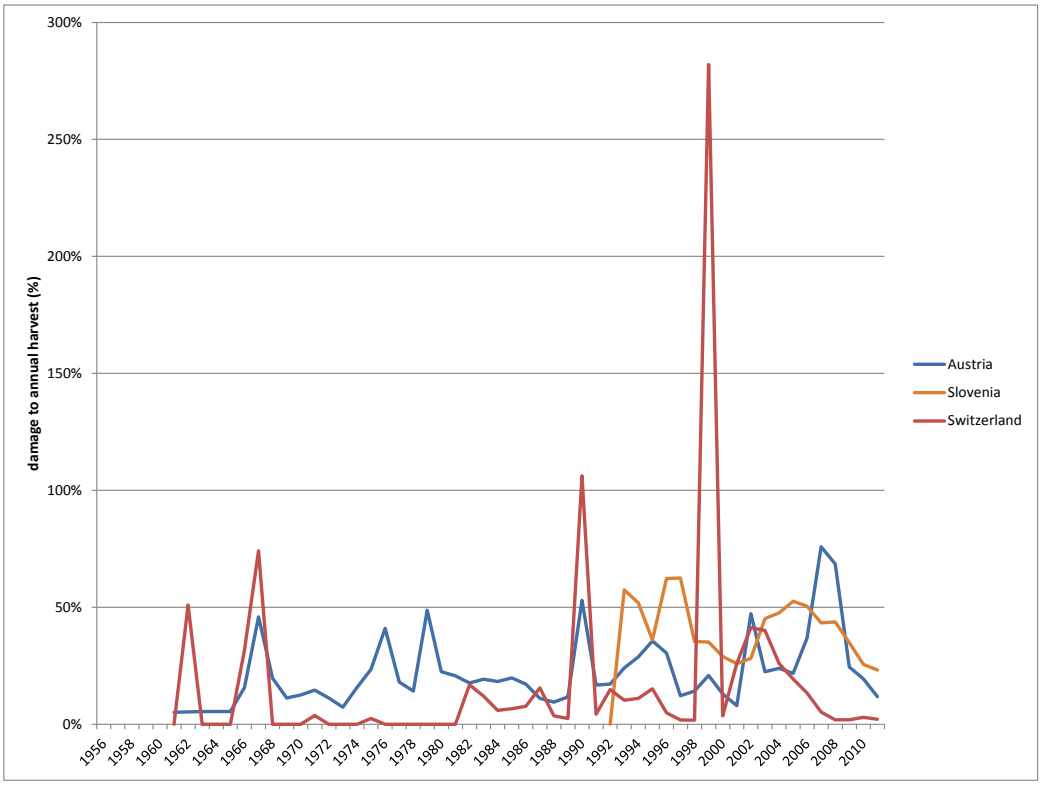


Figure 2. Annual damage percentage for 6 selected countries (Czech Republic, France, Germany, Austria, Slovenia and Switzerland).

Table 1. Average and maximum damage percentage for countries/regions with long time series (including all abiotic and biotic damages)

Country	time period	average	maximum
Austria	1961-2011	22%	76%
Czech Republic	1956-2011	38%	99%
France	1961-2011	9%	234%
Germany	1961-2011	15%	159%
Slovakia	1985-2011	29%	93%
Slovenia	1992-2011	40%	63%
Switzerland	1961-2011	17%	282%
Baden-Württemberg (Germany)	1986-1999	30%	84%
Bayern (Germany)	1950-1995	27%	88%

B) Approach taken

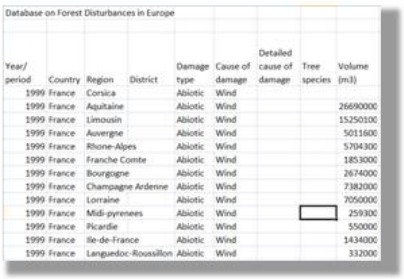
The events presented in the time series of Figure 2 range from small, localised damage to large, multi-country catastrophic damages, and cover different disturbance agents including fire, storm and bark beetles. The level of preparedness and response to each of these events is highly variable, and is not documented in the database. However, one thing that can be learned from such type of overviews is that disturbances frequently happen and that they make up for a considerable portion of the annual harvest. It is therefore proposed that in order to be more extensively prepared for upcoming incidents such scientific analysis can serve as support when addressing mitigation of risks by appropriate management actions.

C) Added value

Although the database contains a considerable amount of records, it is far from complete. Especially data for Mediterranean and Continental (Eastern) Europe are scarce. However, before trying to implement any mitigation measures and increase awareness, it is of utmost importance to know what the risks are that should be addressed. Although climate change may change the playing field, it is still valuable to be aware of the past events and patterns.

To ensure a sound basis for comprehensive scientific investigations and support other scientific and management directed outputs and tools a reliable, up-to-date and maintained information source is required. A European Risk Facility could assist in collecting data and information on natural disturbances based on the efforts taken in the establishment of the DFDE.
It can act as a broker for synthesizing information and scientific results and disseminate them. In particular sharing good practices and lessons learned will constitute a valuable contribution to the various actors to enhance interaction of science and operational management in the context of forest disturbances.

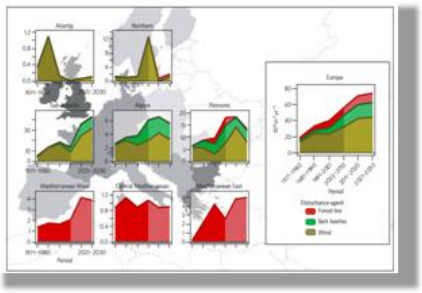
data and information



Database on Forest Disturbances in Europe

Year/ period	Country	Region	District	Damage type	Cause of damage	Detailed cause of damage	Tree species	Volume (m3)
1999	France	Corsica		Abiotic	Wind			
1999	France	Aquitaine		Abiotic	Wind			26690000
1999	France	Limousin		Abiotic	Wind			15250100
1999	France	Auvergne		Abiotic	Wind			5011600
1999	France	Rhone-Alpes		Abiotic	Wind			5704300
1999	France	Franche Comte		Abiotic	Wind			1853000
1999	France	Bourgogne		Abiotic	Wind			2674000
1999	France	Champagne Ardenne		Abiotic	Wind			7382000
1999	France	Lorraine		Abiotic	Wind			7050000
1999	France	Midi-pyrenees		Abiotic	Wind			259300
1999	France	Picardie		Abiotic	Wind			550000
1999	France	Ile-de-France		Abiotic	Wind			1434000
1999	France	Languedoc-Roussillon		Abiotic	Wind			332000

analysis, synthesis



presentation and exchange

knowledge transfer

implementation

D) References

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