POLICY BRIEF

MITIGATING WINDSTORM DAMAGE ON EUROPEAN FORESTS

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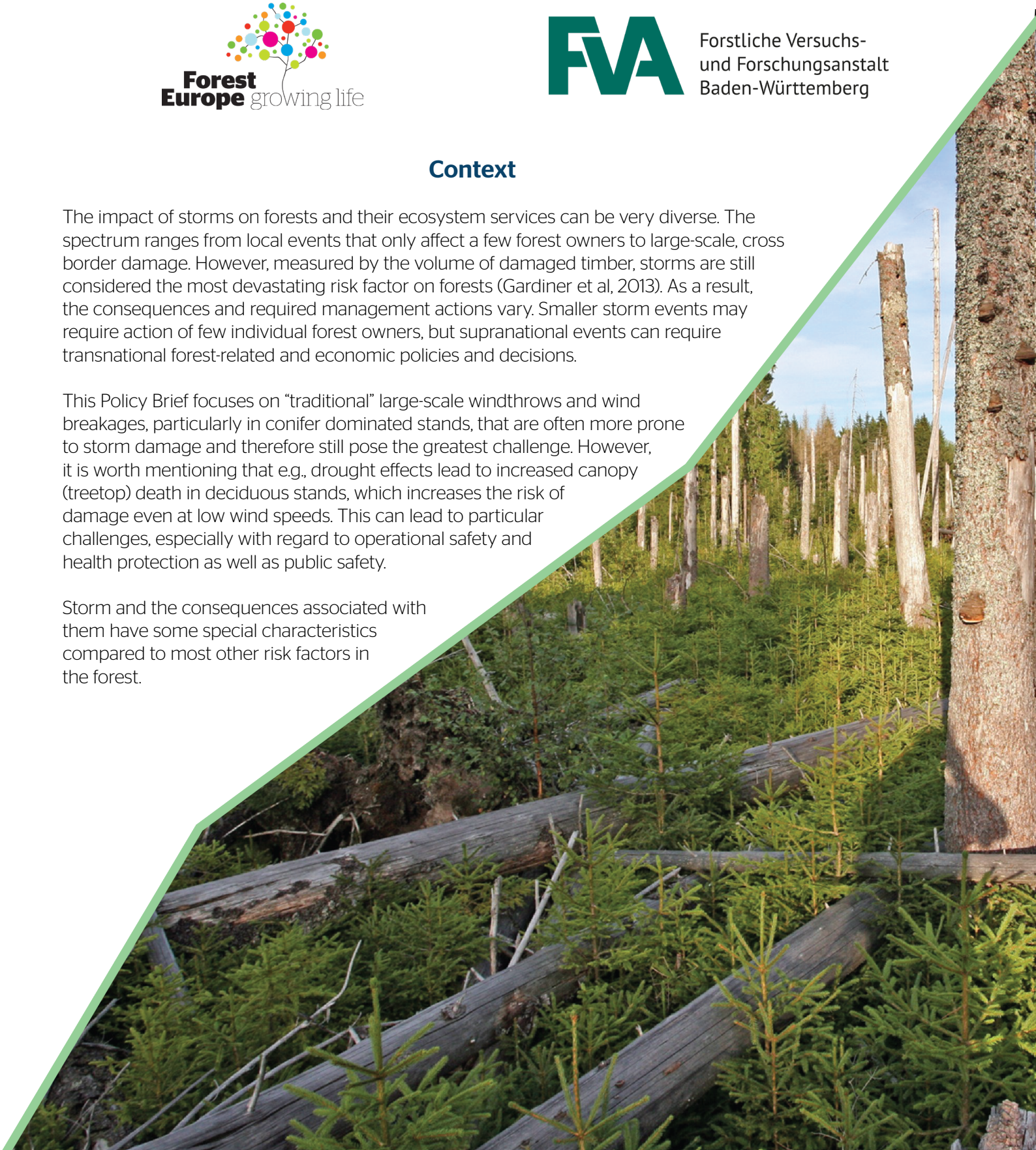
Context

The impact of storms on forests and their ecosystem services can be very diverse. The spectrum ranges from local events that only affect a few forest owners to large-scale, cross border damage. However, measured by the volume of damaged timber, storms are still considered the most devastating risk factor on forests (Gardiner et al, 2013). As a result, the consequences and required management actions vary. Smaller storm events may require action of few individual forest owners, but supranational events can require transnational forest-related and economic policies and decisions.

This Policy Brief focuses on "traditional" large-scale windthrows and wind breakages, particularly in conifer dominated stands, that are often more prone to storm damage and therefore still pose the greatest challenge. However, it is worth mentioning that e.g., drought effects lead to increased canopy (treetop) death in deciduous stands, which increases the risk of damage even at low wind speeds. This can lead to particular challenges, especially with regard to operational safety and health protection as well as public safety.

Storm and the consequences associated with them have some special characteristics compared to most other risk factors in the forest.



Characteristics of large-scale windstorm disasters

Major storm events rarely occur in individual regions. Although this could be regarded as fortunate circumstance, the irregularity of storm events is disadvantageous because there is a lack of experience and empirical knowledge in such situations. Without proactive crisis management, a lack of good advice can lead to inappropriate management.

The effects of storms extend far beyond the forested areas. Injuries or fatalities occur repeatedly and important infrastructures such as roads, railways or energy supply can be massively impaired. Especially in mountainous regions protective functions of forests can be negatively affected. Storm damage is therefore relevant to society as a whole.

Windthrow and wind breakages create a particularly hazardous situation, especially for forest workers and managers. The first two to three months after a storm event are often characterized by a large number of injuries and, in many cases, fatal accidents.

While other calamities often develop slowly, forest damage caused by storms occurs suddenly and can destroy livelihoods and life's work (professional identity crisis) especially during major events. The workload can multiply in a few hours and leads to a shortage of workforce, machinery and equipment. Similar to severe fire disasters or floods, storm damage can lead to extreme psychological stress for those affected. The temporal timber surplus on the market leads to an economic loss even for forest enterprises that are only indirectly affected.

Crisis management at three levels

A comprehensive crisis management "storm" should take place at three levels.

Forest level: The damage first becomes visible and affects the forest itself. Proactive silvicultural measures can increase the resilience of the forests in the medium to long term.

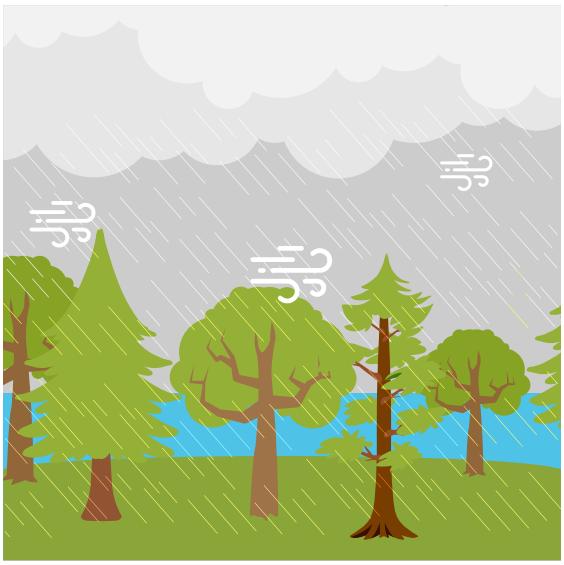
Operational level: The highly concentrated accumulation of large volumes of wood, psychological stress and a high-risk potential represent considerable organizational challenges. Only proactive crisis management can create the conditions for successfully coping with the diverse consequences of storms.

Social environment and policy level: Both storm damage and preventive measures are visible and are therefore perceived and discussed by society and media. It is therefore important to involve society in the dialogue about the consequences of storm events. In many cases, laws and standards are not tailored to major crisis events. At the political level, awareness should be created that crisis management can be massively supported by appropriately shaping the framework conditions (laws and other regulations) and using political instruments (e.g. subsidies).

Tree height plays a significant role on the likelihood of trees being uprooted or broken or snapping off, especially of Norway spruce, Douglas fir and silver fir and in combination with topography and soil condition. Even if little can be done to influence the storm itself, it is possible to influence the potential extent of damage in the medium to long term through top height management. However, this approach must also carefully consider other ecosystem services.

Windthrow is often associated with subsequent bark beetle outbreaks and infestations, which have equal, if not greater, potential for secondary damage. While direct storm damage depends on storm intensity and forest resilience, secondary damage can often be strongly influenced by appropriate management.

Weather forecasts often offer the opportunity to prepare for the occurrence of damage several days or at least hours in advance, in terms of public and road safety. In particular, weather alerts should take into account temporary closures of endangered areas and other civil protection measures.



Policy Recommendations

In general, it has to be mentioned that proactive sustainable forest management is a key to improving the resilience of forests. Due to the characteristics of storm damage discussed above, inactivity will lead to a steady increase in the probability and magnitude of damage.

Design and implementation of proactive crisis management concepts in advance to windstorms: An appropriate and proactive crisis management concept for storm damage should take into

account the specifics listed above. In the case of storms, it can be said that the major part of the consequences can only be mitigated if measures are designed and implemented in all phases of the crisis management cycle (see the Annex). After a large-scale disaster, the large number of damaged areas usually limits the possibilities of making up for the missing preventive and preparedness measures. The development of precautionary national and regional concepts as well as four-phased crisis management plans should be promoted through the provision of specifically trained personnel and financial resources. Strategies and plans should reflect risk-interactions, especially of bark beetle and wildfires after a storm.

From reactive contingency planning to pre-active four phase crisis management

Storm is a particularly good example of how the primary extent of damage is influenced exclusively by storm intensity and forest stand resilience, neither of which can be influenced at the time of the storm. After a major storm event, the amount of work often increases rapidly, in contrast to bark beetles and other biotic calamities, where the level of damages tends to increase over a longer period of time. Therefore, in many cases there is not enough time to make up for deficits in prevention and preparation for such a disaster in a satisfactory and timely manner.

It is of great importance not to limit oneself to the preparation of a contingency plan, but to also implement a comprehensive crisis management across all the phases: prevention, preparation, response, recovery.

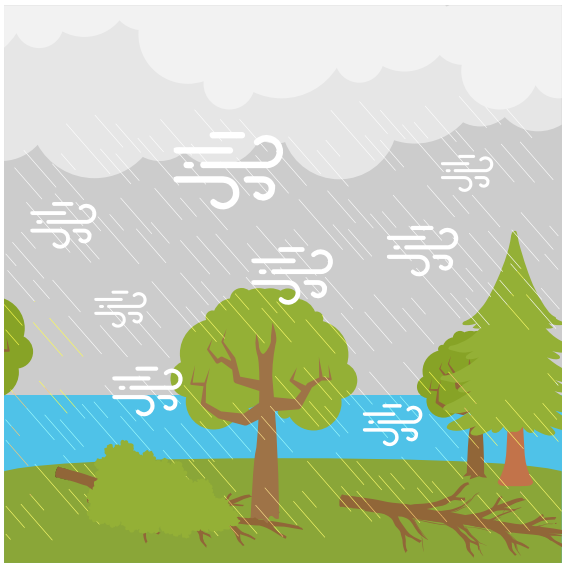
After the storm is before the storm - preservation of hands-on experience and knowledge: Since windstorms are rare events, there is often a lack of practical experience in this area. Any crisis management operation should only be undertaken after coordinated risk analysis and cost benefit assessments have been conducted. Establishing and funding long-term cooperation structures between countries and regions is essential to ensure the availability of up-to-date knowledge. The use of help from abroad should not be interpreted as a sign of a lack of competence in one's own country, but as the highest form of professionalism.

Diverse systems require diverse solutions: Silvicultural practices should not be unilaterally oriented towards the ideal-typical course of forest development without natural disturbances. Practices that are focused towards increasing the average age and thus are implicitly maximizing the tree top heights provide benefits and risks at the same time. For areas where falling trees could cause personal injury or endanger critical infrastructure, alternative approaches that allow active top height limitation can be seen as one way to minimize the likelihood of storm damage.

Prioritization of zones of preventive measures: Proactive sustainable forest management is required for the majority of forested areas, with practices which e.g., increase the diversity of the tree species composition, improve the stability of individual trees through appropriate thinning measures and will increase forest resilience to storms in the long term. Since the potential risk of storm damage can be modelled, appropriate vulnerability maps should be developed, updated and used to prioritize areas for preventive measures.

From the operational level to the policy level: Storms can only cause major damage if the time for preparations is a few days or hours. The necessary legal and sub-legal framework for optimized storm damage management must therefore be created in advance. Otherwise, a lot of valuable time will be lost during a storm event until these concrete regulations are implemented. Activation of these specific regulations should be based on pre-defined thresholds so that they can come into force without delay.

Proactive stakeholder engagement: Storm-specific prevention measures, that are noticeable due to far-reaching changes in the forest landscape, will be subject to intensive social discourse. This discourse should be proactively initiated. To raise awareness of the urgently needed changes among all stakeholders, forums and financial resources should be made available to ensure active transformation.



Built back better: Storm damage can also be seen as a chance to transform forests and create forests more resilient to climate change and future disturbances. However, in order to enable these changes, availability of sufficient and proper reforestation material needs to be ensured.

The annex provides a selection of useful measures that have proven successful in the past. As these individual measures are often interrelated, comprehensive proactive crisis management is crucial.

Annex

Prevention phase

- Identify potentially endangered forest areas based on multifactorial vulnerability maps, or at least using top height mapping.
- Conduct preventive zoning and designation of forest areas where protection of life and critical infrastructure is needed. Balancing different forest services by defining areas with short rotation cycles to reduce windthrow vulnerability and areas to enable old growth, without active management, is often a suitable approach.
- In windthrow-prone locations, site-appropriate tree species selection is necessary, always considering the naturalness of the tree composition, e.g., by increasing the proportion of deciduous trees compared to conifers.
- Extensive forest health monitoring contributes substantially to early detection of possible secondary damages.
- Political measures (e.g., subsidies, insurance, natural hazard damage fund, special loans with long term interest rates) to mitigate the economic consequences of different measures should be designed with a strong focus on preventive and preparedness measures.

Preparedness phase

- Establishment of a professional contingency planning and transformation management as well as continuous safety trainings.
- Provision of storage capacities, to relieve the market, to stabilize the wood supply and to maintain the economic value of timber.
- Establishment of permanent cooperation between authorities and forest owners to create concepts for a coordinated action in advance.
- Establishment of appropriate systems for rapid damage assessment.
- Proactive information management and the development of a concept and skills for media contacts in the event of an increased probability of damage.
- Provision of information and campaign material for various target groups.

Response phase

- Proactive evacuation and closure of vulnerable areas and provision of the labour resources needed outside of the forest.
- Adapt strategies to focus on all ecosystem services: A mixture of active removal and leaving of storm wood on the basis of transparent criteria and the use of decision support systems is an important prerequisite for prioritization and achieving a balance between economic, ecological, and social objectives.
- Centralized control of workforce and equipment.
- Due to the high visibility of the damage and the response measures, intensive and transparent external communication is important to maintain public trust.
- Provision of psychological support to stakeholders affected by the damage.

Recovery phase

- Advanced natural regeneration is essential in mitigating consequential economic damage and can provide an alternative to clearing damaged areas. Active game management and maintaining adapted populations of wild herbivores are key to efficient reforestation.
- The potential of natural regeneration is often underestimated. An objective assessment of the natural regeneration potential can support the decision of whether artificial or natural regeneration can lead to resilient forest structures.
- Tree species selection is crucial for the resilience of future stands. Therefore, a careful analysis of future climate and site development and improvement of knowledge of the climate resilience of individual tree species is required. If necessary, active enrichment with climate-resilient tree species should be pursued. Due to climate change-induced uncertainties in the future, small-scale mixtures with three or more tree species should be aimed for.
- Careful analysis and documentation of the current crisis is an essential prerequisite for improving skills in dealing with similar situations.

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