ENHANCING CLIMATE RESILIENCE OF FOREST VALUE CHAINS

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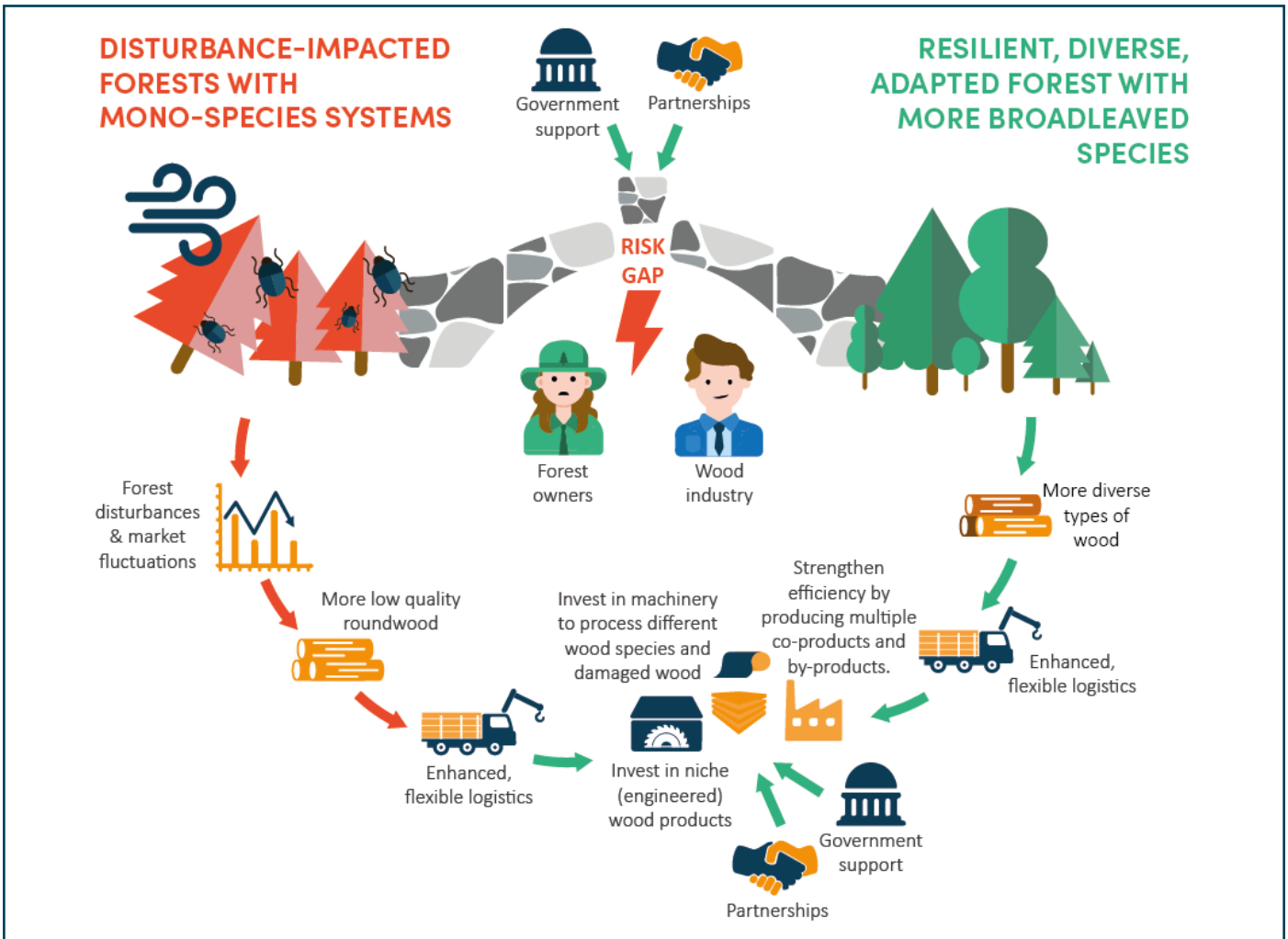
Background

Climate change is affecting forests and reshaping landscapes. In many countries, storms and bark beetle outbreaks exacerbated by drought have **reduced the availability of economically profitable wood.** Increasing disturbances also impact the forest value chain, causing both **short- and long-term trends:**

- Trend 1: In the short term, increased salvage logging on large forest areas impacted by forest disturbances (e.g. windbreak, drought or bark beetle) releases a **market surplus of lower quality wood**, leading to frequent, unpredictable turbulences on wood markets.
- Trend 2: In the long term, the gradual conversion to climate-resilient forests is expected to **favour mixed forests with a higher proportion of hardwoods,** terminating the dominance of softwoods. This change requires large adaptations in the forest value chain.
- Trend 3: Furthermore, **societal demands on forests are changing**, often making ecological functions such as carbon sequestration, water regulation or biodiversity more important.



Forest owners and wood industry jointly bridging the risk gap to transform from disturbance-affected coniferous forests to more climate-resilient mixed forests. Figure: Annechien Hoeben, Universität Graz; Gabriela Rueda, European Forest Institute.

Main findings

Forest management

Local forest owners can **face immense challenges and high costs** after disturbance events. Especially small-scale forest owners, who have little influence over the value chain and may lack access to robust infrastructure or international trade, are therefore confronted with huge economic losses. A main risk is the **weak socio-economic resilience** of forest management: In some regions, owners are reconsidering active management or shifting focus to non-(wood)production objectives. Due to insufficient profitability or compensation for pre-mature harvesting after disturbances, forest owners could **increasingly abandon forest management** completely.

In the long term, forest owners face **uncertainties of adapting to more mixed forests.** These include choosing the right species to diversify the forest composition and determining whether the processing industry will utilise these species in the future. Currently, hardwoods are particularly under-utilised, often relegated to lower value uses such as bioenergy. In future mixed forests, forest owners will have to manage more hardwoods in structurally diverse stands and use more challenging harvesting techniques to supply diverse types of wood to the value chain.

From a value chain perspective, we observe an unbalanced ***risk gap*** **between forest owners and wood industries.** Forest owners, being the first link of the chain, shoulder the biggest burden of the risks and face the highest costs, similarly to small-scale wood processing facilities with limited marketing capacities. At the same time, the mid- to large-scale wood industry, anchored on a higher regional or national level, is more flexible to react, and hence can deal with a delayed risk.

Wood processing industry

Natural disturbances lead to **short-term supply surges** in the availability of low-quality wood. Even larger companies with advanced processing capabilities can often only handle part of these temporary spikes of damaged softwood surpluses. Hence, large calamities often lead to increased exports with loss of value added for the domestic industry. The growing frequency of forest disturbances is already a **main driver of supply fluctuations**, causing wood market distortions. As long as regional wood resources in the forest are sufficiently accessible to the market, wood industries can take advantage of lower raw material costs. However, the wood industry structure and demand side are **not well adapted and flexible enough** to absorb such market shocks in the long run.

Investments into innovative products, notably also hardwoods, are manageable for larger wood industries. Smaller companies face difficulties to innovate, as such investments are costly and carry high risks. So far these remain niche markets in Europe, but we observe credible innovations gaining traction, for example in biorefinery, textiles, or engineered wood products for construction. Notably, many investments happen overseas, with European knowhow.

Main adaptation pathways for the industry are a) **increasing storage capacity** and use of **processing technology** fit to handle large volumes of salvage wood efficiently, and b) **diversification or specialisation** in high-quality wood products that meet changing forest structure and market needs.

Wood demand and consumer preferences

Stability in ecosystem supply and demand are critical for fostering the long-term investments needed for the provision of forest services. End users can deal with fluctuations by substituting with other products and services, yet it may prompt lower investment into forests, resulting in shifts toward substitute materials and services also in the long run. This is primarily a risk for the forest-based sector. However, non-substitutable ecosystem services, such as biodiversity conservation or water regulation, are far less resilient and vulnerable to depletion, as substitutes are unavailable.

Forest value chains are highly dependent on the changes in forestry. **The wood industry should acknowledge the growing risk of tipping points in softwood resource supply and take initiative to co-invest into serious forest adaptation and conversion programmes together with forestry actors.** Only with long-term partnerships adapted to local and regional contexts and targeted risk management, an overall value chain resilience can be strengthened.

RECOMMENDATIONS

1. **Raise awareness of the risk gap** between forest managers and the wood processing industry. Streamlining adaptation efforts, promoting partnerships like cooperatives or producer groups, and encouraging information exchange across the value chain can help mitigate future supply shortage.

2. **Increase knowledge on forest adaptation in the wood processing industry** and develop efficient technologies to process more diverse types of wood provisioning e.g. species, assortments, qualities.

3. **Develop measures to safeguard the socio-economic resilience of forest management** by e.g. exploring **risk-sharing agreements** such as price guarantees or insurance schemes with forest owners and wood traders.

4. **Develop flexible, efficient harvesting technologies and logistics.** Rapid deployment of fully mechanized logging systems combined with flexible logistics solutions e.g. larger storage capacities, enhanced transportation networks and well-equipped wood terminals, can substantially moderate the surge of damaged wood to the market post-disturbance.

5. Wood processing industries should **acknowledge the growing risk of tipping points in softwood resource availability.** To support forest adaptation at scale, supply for valuable, long-life products should be prioritised and be complemented with secondary resources and cascade use.

6. **Explore alternative species and novel applications, including hardwoods.** Disturbances and risks are becoming more severe and will affect increasingly large regions. Given the enormous scale and long duration of the required technological transformation, the wood industry must start now to develop and invest into novel uses for alternative species. Along these lines we recommend:
   a. **Diversification and resource efficiency strategies:** i) **broader portfolio** of sawmill products, higher specialisation and niche products. ii) **integrating downstream**, "getting closer to forest", e.g. larger mills acquiring sawmills or pellet plants. iii) **supplier networks**: with growing end-user demand for wood products, producers can benefit from more sophisticated partnerships and sizeable markets.
   b. **Innovation towards higher value-added products** exploring underused wood species, novel applications and growing markets in the construction sector and the bioeconomy.
   c. **Promote the cascading principle and a circular bioeconomy:** Increase **valorisation of material** by giving preference to high value applications first (e.g. wood construction, biorefinery) before low value mass use (e.g. bioenergy). Make use of the full spectrum of circular economy strategies (rethink, reuse, repair, repurpose, recycle, etc.) to enhance resource efficiency.

7. **Prioritise forest ecosystem services with high societal demand** and low demand resilience, such as soil protection or water regulation. **Provide forest owners with financial incentives** to ensure sustainable supply of non-marketed forest ecosystem services.

8. **Invest into long-term, integrated resilience research.** We need to build up capacities to improve forest resilience in a wider sense. Forests, wood industries and the society are interconnected, and the interplay of all drivers, actors, risks and potential solutions must be addressed from a systems point of view to enhance climate resilience of Europe's entire forest value chains.

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