Financial implications of storm damage to coniferous forests in Latvia

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INTRODUCTION

Storms are the primary factor reducing carbon sequestration in Europe's forests, thus negatively affecting the ability of countries to fulfil their targets related to greenhouse gas balance (emission *vs*. sequestration). The impact of storms is rising due to an increase in forest cover, a preference for less wind-firm species (namely the Norway spruce) as well as the aging of forests in Europe (leading to greater vulnerability). Furthermore, climate change will affect the amount of damage. The frequency of windstorms and/or high speed wind gusts is expected to increase. The largest storms in our region occur mostly in autumn/winter – in the future this is likely to increase due to conditions in which it is more likely that tree anchorage is weak, due to the soil not being frozen and being saturated with water. From a sustainable forestry perspective, it is important to note that recreational use of those forests affected by storms as well as secondary damage (e.g. by bark beetle) will also be substantially reduced. Forest owners suffer direct financial losses as a result of storms. The aim of this study is to estimate the losses caused by storms and evaluate measures that could be used to reduce storm damage.

MATERIALS AND METHODS

Forest owners suffer direct damage as a result of a loss of timber value from stem cracks (which is estimated to account for 20% of the volume of first (bottom) logs reduced to fire-wood quality), increased logging costs as well as additional regeneration, tending and precommercial thinning. The cost of these processes and the timber prices used in calculations are obtained from the Central Statistical Bureau of Latvia; information on the amount of timber damage during storms in the last decade is provided by the State Forest Service. To obtain information on the possibility of reducing storm damage, growth models (LSFRI Silava) are used in addition to assessments of vulnerability to storm damage (ForestGALES). The financial impact of damage-reduction measures is given as equivalent annual annuity (EAA) - interest rate 4%.

RESULTS

During the last decade, windstorms in Latvia alone have caused direct economic losses to forest owners of around €164 million, an average of €9 per m^3 of wood from salvage logging. Vulnerability to damage increases as tree height increases (as critical wind speed decreases). Lower planting density slightly increases the critical wind speed (by 3-9%) (for Scots pine: 1500 trees ha^{-1}*vs* current 3000 tree ha^{-1}) and notably reduces the financial impact of storm damage: EAA for pine stands planted on the best soils is €15 ha^{-1} with sparser planting, and -€11 ha^{-1} with denser planting. If final harvest is planned by the stand age (101 years in majority of cases in Latvia), the financial impact of wind damage is higher in the best growing pine stands (site index Ia): in sparse stands the affect of wind damage reduces EAA by 38%, while stands with a lower site index are reduced by 25%. The reason for this is that faster-growing trees reach certain height, at which they are vulnerable to smaller (in terms of m s^{-1}) critical wind speed, at earlier age. For example, the above-mentioned sparse Ia stand has a critical wind speed of ≤20ms^{-1} for 38% of its total rotation period, compared to 26% for the I stand. Thus, harvesting by constant age reduces the financial gain from the best-quality sites and silvucultural treatments aimed at increasing tree growth (e.g. planting best-growing genotypes). Therefore, harvesting by target diameter is recommended.

CONCLUSION

Major damage to forests mean owners are less willing to invest – thus reducing future potential wood flow for the industry. Therefore, changes in legislation concerning criteria for initial stand density and target diameter are recommended to minimize the negative economic impact of climate change (adapt).

KEYWORDS

Wind damage, financial loss, rotation period.