ONEforest

Impact of forest management concepts on wood quantity and wood assortments from hemiboreal forests

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Introduction

- The main forest regeneration method in boreal/hemiboreal region is using clear-cut forestry with retention and seed trees.
- Uniform shelterwood and selection cutting are rarely used:
    - Problems with vital regeneration under mature trees.
        - Caused by low-fertility of soils.
    - Lack of wide-spread shade tolerant species for continuous cover forestry (CCF) in the region.
        - Norway spruce is prevailing, but is damaged by different biotic and abiotic disturbances which makes it unsuitable for CCF.
- Well-informed and well-timed silvicultural decision are needed to maximise the quality of logs obtained for maximum substitution effect.
- The wood quantity and assortment output was estimated when using different forest management strategies suitable for the region.

Methodology

Data from National Forest Inventory was used to model the growth and yield using different forest management concepts for period 2020-2060. The statistical models and algorithms used were CSR Estonia specific. The results were averaged per stand main tree species or shown as a whole CSR average.

Four different management strategies of increasing intensity were used:

A. Selection cutting
B. Shelterwood
C. Mixed forest management – harvesting regime closest to BAU
D. Intensified management with focus on wood

Results

With more intensive management methods, the amount of timber harvested is higher. The results per main tree species also reflect the site quality as aspen, spruce and grey alder are growing on the best site types.
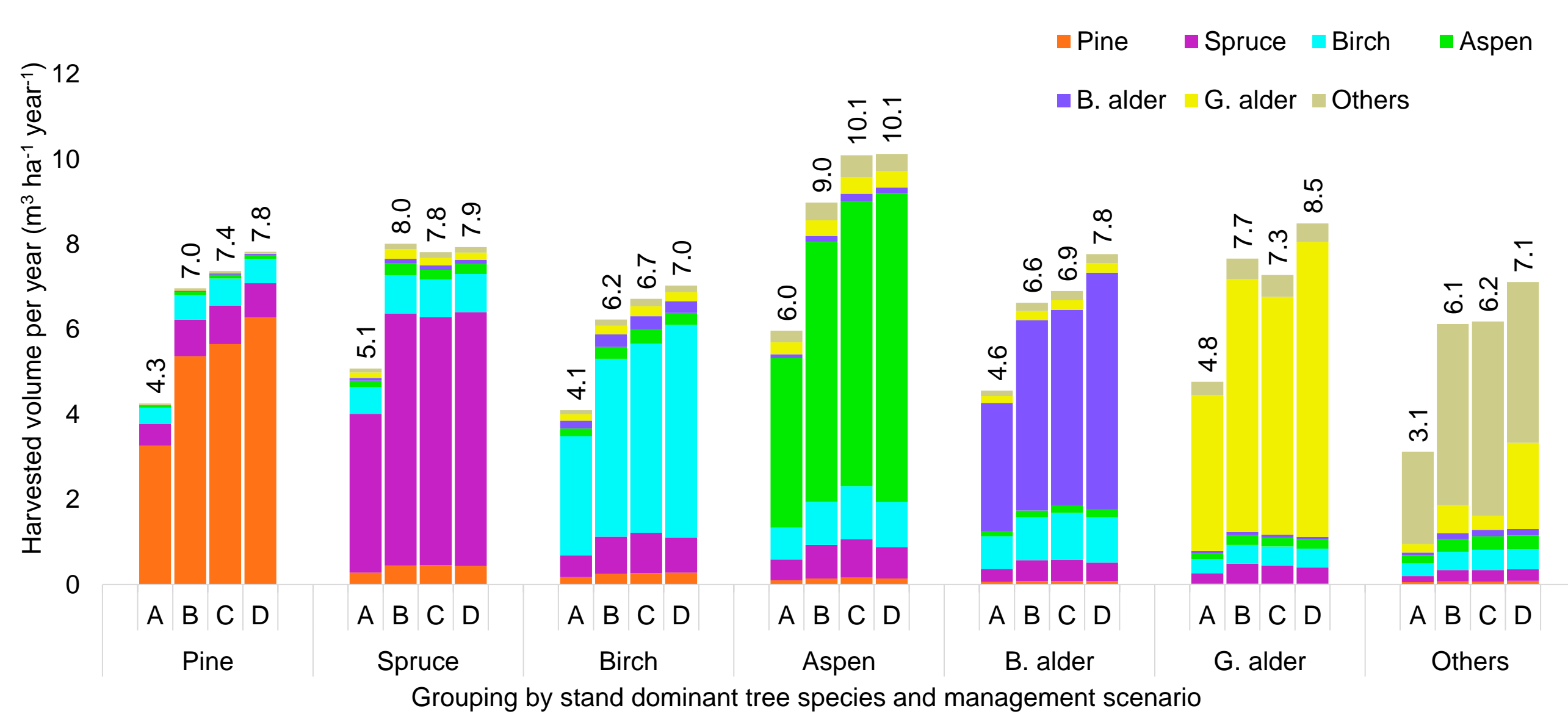

Figure 1. Average harvested volume (m^3 ha^{-1} $year^{-1}$) shown per stand main tree species and management strategy.

By the end of the modelled time period, selection cutting system yielded close to 60% of the extracted assortments when comparing to strategy C. The most intensive, strategy D, yielded 112% and shelterwood 93% of the assortments when comparing to management strategy C.
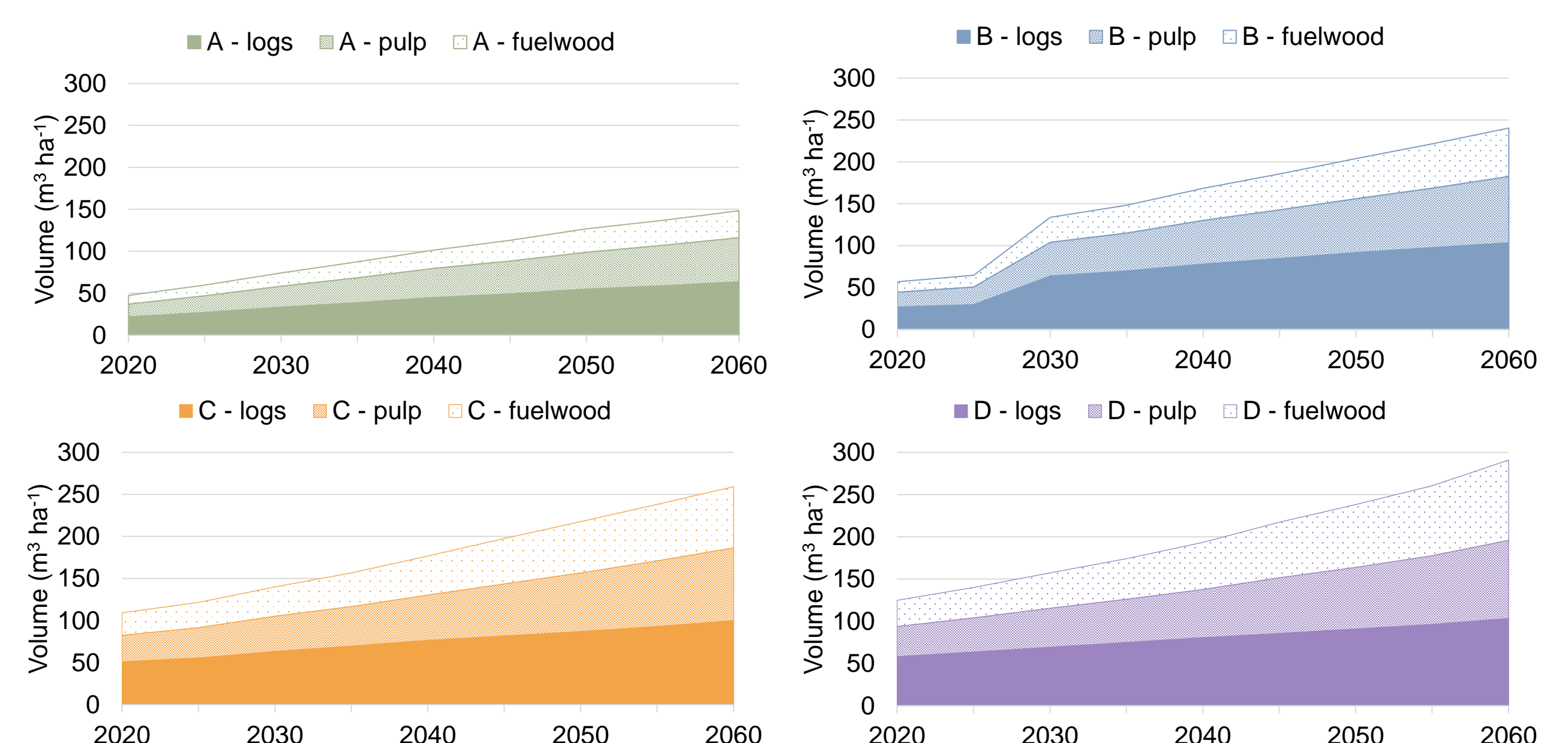

Figure 2. Cumulative sum of the volumes of harvested assortments from 2020-2060 by different management strategies.

When extrapolating the results to the entire CSR, it can be seen that the total forest standing volume decreases for all management strategies. The decrease is the lowest for selection cutting, as this strategy retains some mature trees for the entire studied period.
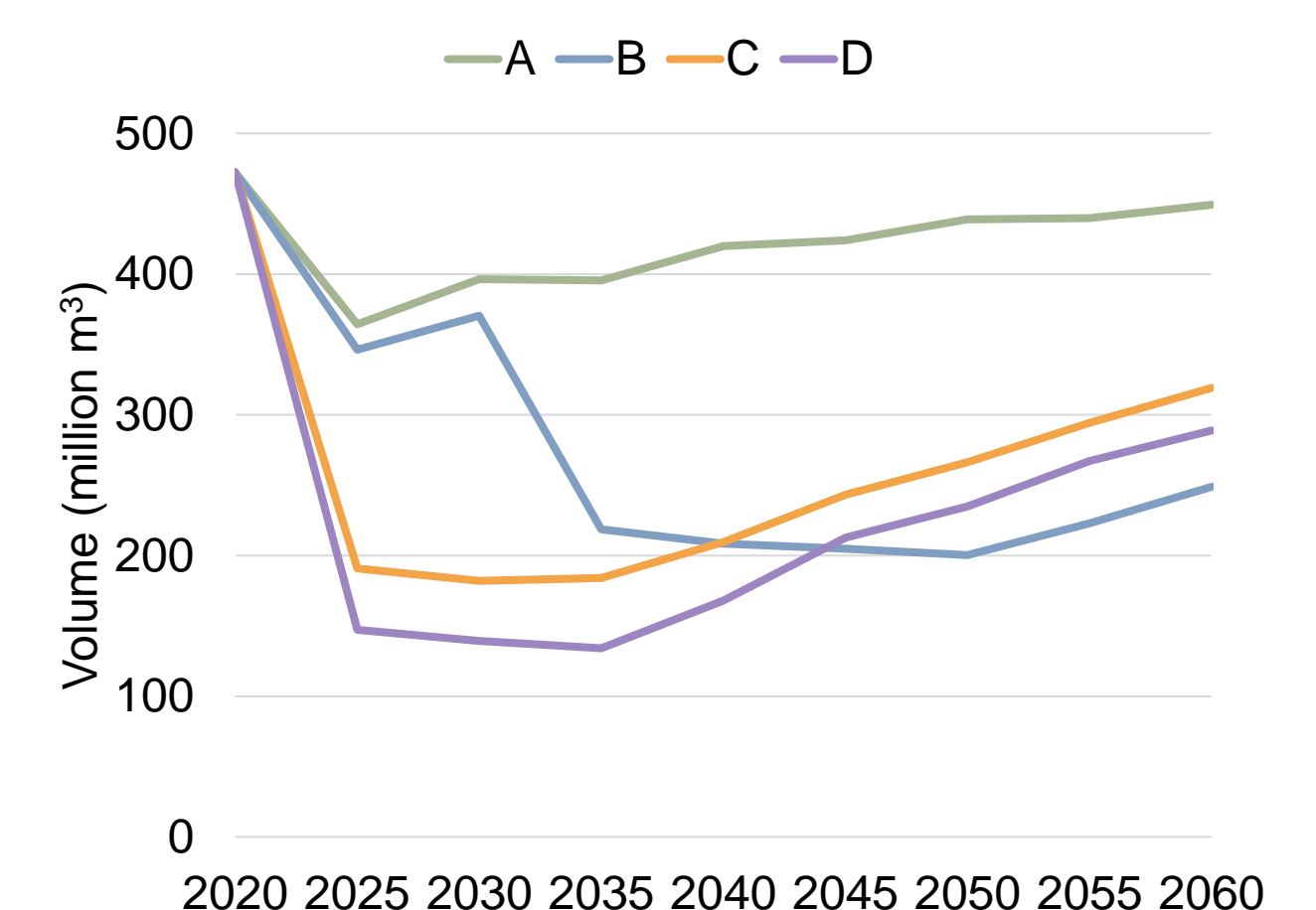

Figure 3. CSR Estonia total standing volume in forests.

Conclusions

- All NFI forest sample plot were included to capture the variability of CSR's forests.
    - This causes large harvests early in the period due to the forests being mature or overstocked due to different reasons.
        - Which brings down the standing volume of the CSR.
- Strategy A:
    - The share of logs are most likely over-estimated as the algorithm is unable to account for accumulating stem-rot in the case of short-lived pioneer species.
    - It needs to be taken into consideration that selection cutting is not really used in the region and the amount of empirical data to use for modelling is lacking.
    - Selection cutting likely is also the most susceptible to different disturbances in the case of birch, aspen, alders and spruce.
- All management strategies are feasible to use under certain conditions, but one single cannot provide the best results for all the different forest ecosystem services.
- With the aim of timber production, the management strategy C and D should be favoured, as they both provide a vital regeneration of new forest generation from early on.

Acknowledgements