

# Forest4LV: advancing interdisciplinary capacity and bioeconomic innovation in Latvian forest research

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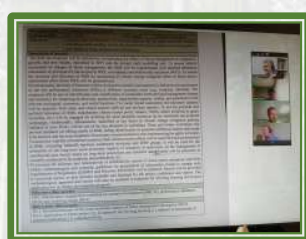
representing *Innovation in Forest Management and Value Chain for Latvia's Growth: New Forest Services, Products and Technologies (Forest4LV)* VPP-ZM-VRIIILA-2024/2-0002 WP 2 LSFRI Silava team.

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## Model, scenario analysis

Objectives: Analysis and development of recommendations on the socio-economic aspects, including public benefits, for the development of multi-purpose forest management, new forest services, products and technologies.



Uzsākšanas  
sanāksme

leinteresēto pušu  
iesaistes darbnīca  
scenāriju izstrādei  
(M8)

Galvenie  
darbības  
rādītāji  
(M10)

Modelēšanas  
rezultāti  
(M14)



Our activities are focused on the results obtained and published in the previous month of project implementation.

## LSFRI Silava forest resource modelling simulation model

LSFRI Silava Forest Resources Modeling System: a tool developed by forest scientists to support the forest sector without external funding (order) for strengthening the competitiveness of LSFRI Silava and the forest sector



- Data
- Forestry scenarios
- Forest Resources Modeling System
  - growth equations
  - forestry operations and natural disturbance modeling
- Results (growing, deadwood unfelled trees) and interpretation of it.

**+ calculations of indicators dependent on forest structure and forestry activities:**

- calculations of forest value
- various calculations of C sequestration and emission calculations of various socio-economic indicators related to forests

3

## From where data come?

Since 2004 we have :

### – National Forest Inventory:



characterizes all Latvian forests,

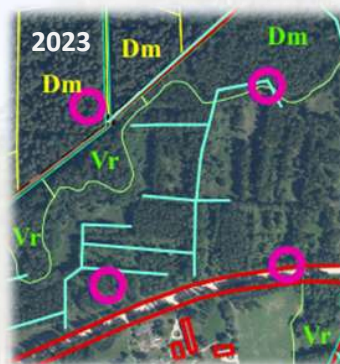
precise information based on measurements,  
data from the last 5 years available.

### – State forest inventory data:



characterizes partially voluntarily inventoried forests,

eye-level taxation, updated for n years, taxation can be 20  
or even more years old.



**Forest  
come  
back!**

*When modeling monitoring plots, one plot is one stratum with the  
same growth rate and forestry regime.*

Avots:  
LĢA kartes kartes.lgia.gov.lv www.lgia.gov.lv

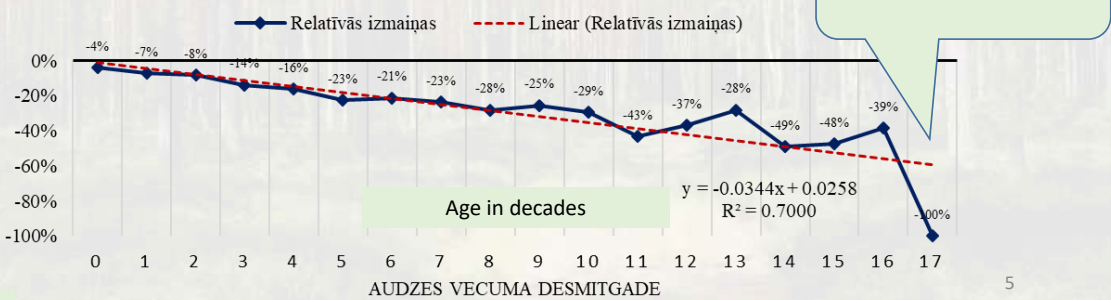
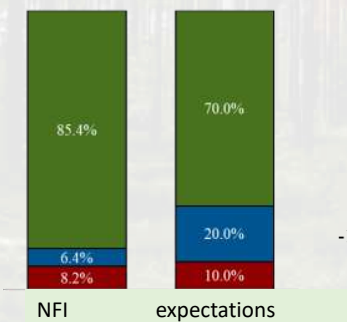
4



Scenarious - Expectation

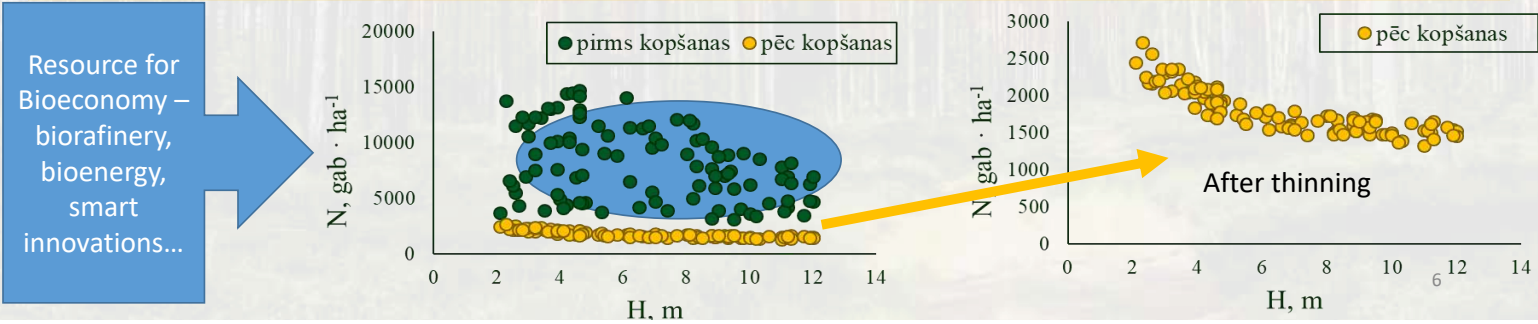
Calculation made by G.Šņepsts.2025

1. strictly protected forests or forests without economic activity (from 8.2% to 10%):
  - 1.1. all forests in which forestry activities are already prohibited and main felling and/or maintenance felling is prohibited;
  - 1.2. nature reserves, micro-reserves and nature reserves;
  - 1.3. state forests in National Parks;
  - 1.4. coniferous stands older than 160 years and deciduous stands older than 100 years;
  - 1.5. in state forests in nature parks and protected landscape areas, coniferous stands older than 120 years, deciduous stands older than 80 years;
2. protected forests or forests for non-clearance forestry (from 6.4% to 20%):
  - 2.1. all forests in which continuous regeneration felling is already prohibited and which have not been transferred to strictly protected forests;
  - 2.2. forests in national parks, nature parks, protected landscape areas;
  - 2.3. randomly in state forests 265 thousand ha, in other forests 90 thousand ha.



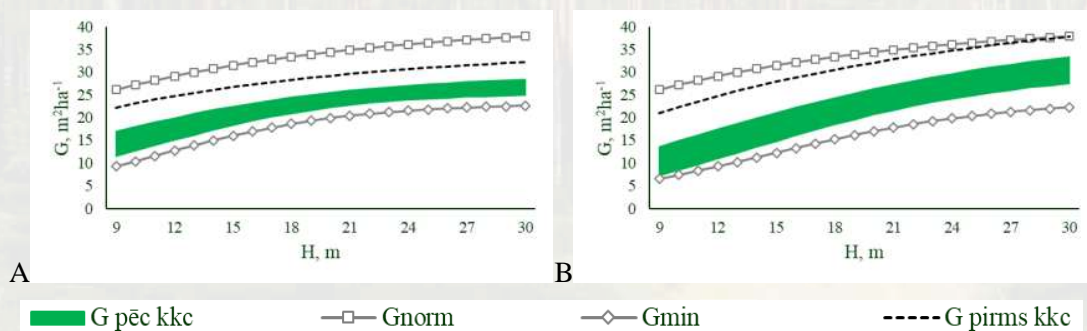
Scenarious

Forest management activity	Scenario 1	Scenario 2	Scenario 3
1. Forest regeneration	Proportion of planted areas, choice of species, number similar to 2022-2024		
2. Forest establishment (first 10 years)	20 thousand ha of low-value agriculture land and 8 thousand ha of former mining areas		
		40 thousand ha of overwetted or meliorated organic soil and 75 thousand. ha of low-value agriculture land	
3. Thinning of young forest stands			
Relative density	1.0	0.9	0.9
Proportion of stands thinned during 5 years	90-90%	90-95%	95-99%
Number of trees in stand after thinning	10-40% above optimal number of trees	10-20% above optimal number of trees	10-20% above optimal number of trees



## Scenarios

Forest management activity	Scenario 1	Scenario 2	Scenario 3
4. Commercial thinning			
Density when thinning should be implemented	$\geq 0.9$	0.8 – 1.0	0.8 – 1.0
Proportion of stands thinned during 5 years	35%	55%	70%
Basal area after commercial thinning	2 – 3 $\text{m}^2\text{ha}^{-1}$ virs Gmin	0.5 – 4.5 $\text{m}^2\text{ha}^{-1}$ virs Gmin	0.5 – 4.5 $\text{m}^2\text{ha}^{-1}$ virs Gmin



7

## Scenarios

Forest management activity	Scenario 1	Scenario 2	Scenario 3
5. Sanitary/reconstructive felling	algorithm that depends on stand age and selective cutting done in the middle		
6. Sanitary clear cut	4.0 thousand ha yearly	3.0 thousand ha yearly	
7. Replanting of low productive stands	1.0 thousand ha yearly	2.0 thousand ha yearly	2.5 thousand ha yearly
8. Clear cut algorithm	in proportion to what is available(property group and dominant tree species)	in proportion to what is available(property group and dominant tree species)	in proportion to what is available(property group and dominant tree species) at first cutting down less productive stands first
9. Amount of clearcuts	18 milj. $\text{m}^3$ yearly	19 milj. $\text{m}^3$ yearly	20 milj. $\text{m}^3$ yearly

8

## Scenarios.

Forest management activity	Scenario 1	Scenario 2	Scenario 3
10. Forest fertilization or soil improvement after Commercial thinning Sl, Mr, Ln, Dm, Gs, Mrs, Dms, Av, Am, As, Kv, Km, Ks	40% from all stands		80% from all stands
11. Renovation of forest melioration systems	State forest 7.5% from suitable stands Other forests 2.5% from suitable stands		State forests 15% from suitable stands Other forests 5% from suitable stands
12. Forest melioration in first ten years			80 thousand. ha

### Notes:

The forestry scenario is defined by property groups (state and others) and forestry restriction groups (the scenario can be changed during the modeling process).

The scenario cannot be defined at the level of each property or stand (strata), and within a calendar year.

The behavior of forest owners in everyday forestry is known, changing forestry requires assumptions about the change in behavior of forest owners.

9

## LSFRI Silava forest resources modeling

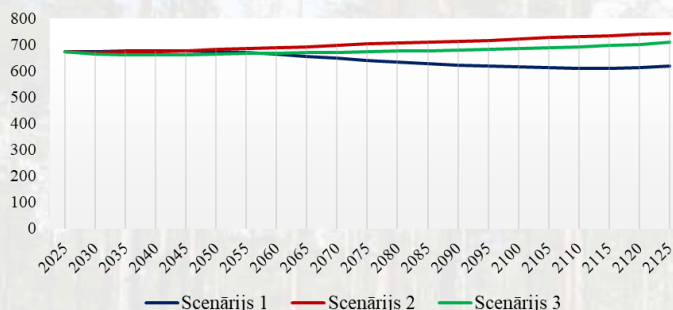
- ✓ **Growth rate equations**  
supplemented with the latest (approximated in 2024 studies) coefficient values, regeneration and young stand management algorithms have also been changed, to what extent are they affected by the changed growth equations or their coefficient values
- ✓ **Regeneration and ingrowth**  
model prepared and the latest available information from SRI and SFS has been entered into the system, improved growth model after regeneration (taking into account origin, soil preparation)
- ✓ **Young stand management model**  
supplemented young stand care felling model with ingrowth after felling
- ✓ **Selective cut model**  
regeneration success and changes in growth rate
- ✓ **Natural disturbance model**  
natural disturbances depend on the dominant tree species and its age, and economic activity
- ✓ **Continuous regeneration felling models**  
(main felling, sanitary continuous felling, replacement of low-productive stands) supplemented with ecological tree conservation
- ✓ **Continuous regeneration felling**  
added main or final felling calculation model (increase is taken into account in the simulation)

10

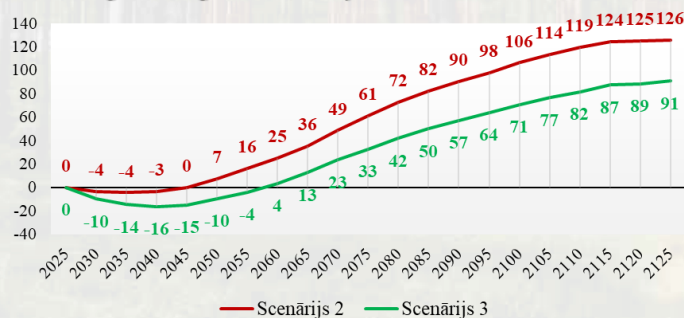


## First results

Growing stock, milj. m<sup>3</sup>



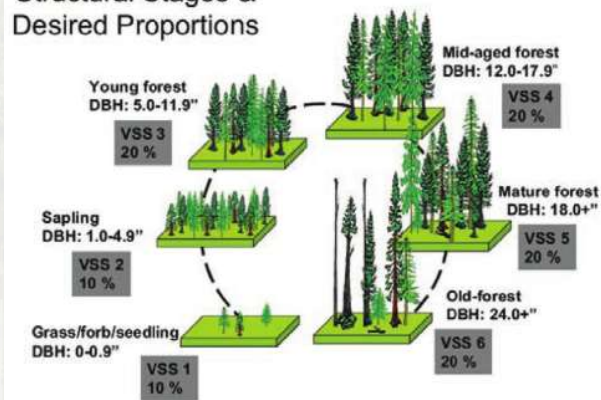
Difference in growing stock, milj. m<sup>3</sup>



Sustainable Forestry Cycle



Structural Stages & Desired Proportions



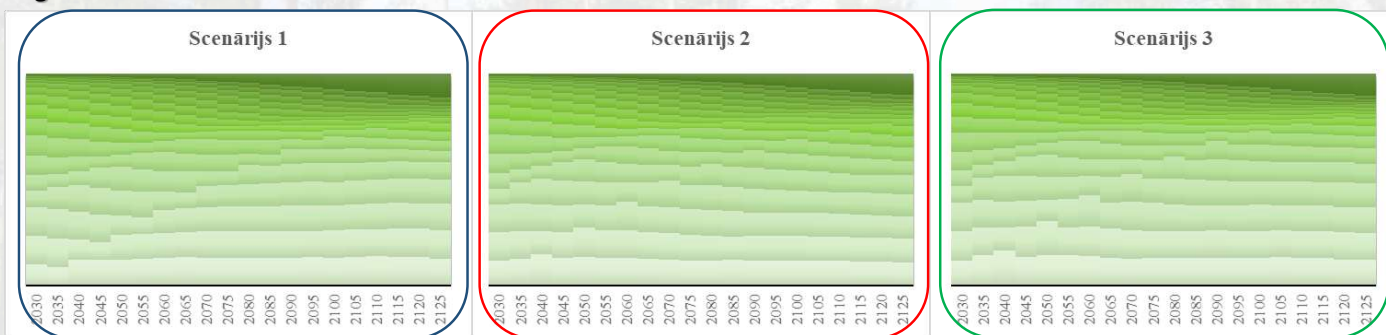
Calculation made by G.Šņepsts.2025

11

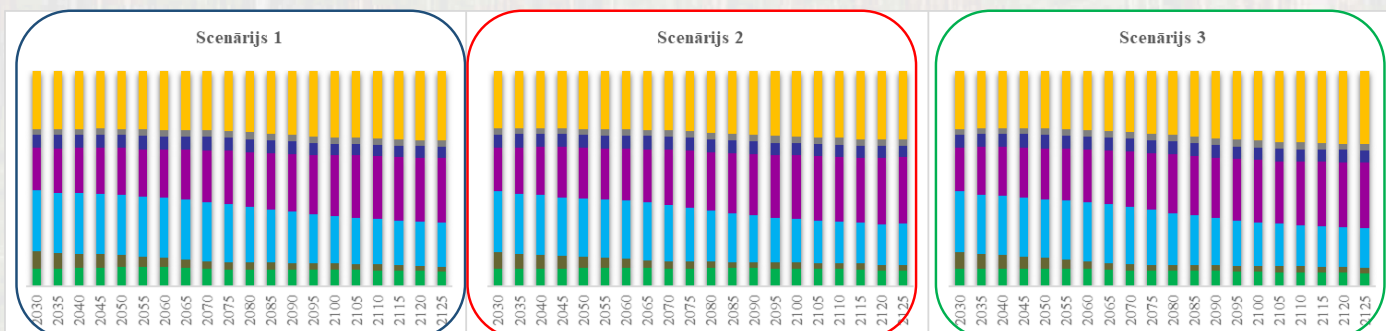
## Modelling results

Calculation made by G.Šņepsts.2025

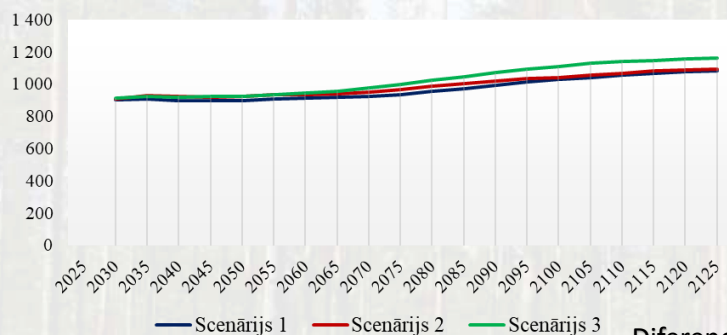
Age structure



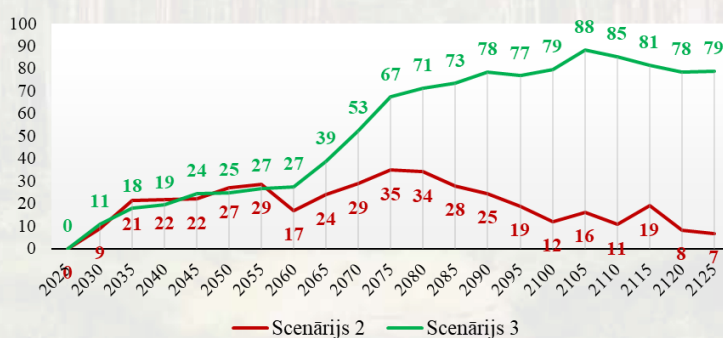
Forest tree species composition – Scot pine, Norway spruce, Alder, Birch, Aspen, Grey alder



## First results differences in Scots pine forest coverage in thousands ha



Difference according to scenario 1



Calculation made by G.Šņepsts.2025

13

## Conclusions

- With more intensive forest management and thinning of stands, a greater amount of small-diameter wood will become available. For chemical processing and other types of utilization, logs and branches of different tree species will be accessible.
- In both the 2nd and 3rd scenarios, as well as under the continuation of current forestry practices, an increase in the proportion of spruce and pine stands is expected in the future. There will be fewer grey alder stands and birch forests.
- Increase in the area of old stands is expected in the future, as forestry activities will take place on a smaller forest area, meaning that a larger proportion of forests will gradually become older. The possible decrease in birch stands may also be related to the fact that the lifespan of birch is shorter than that of conifers.

14