

# Forest landscape climate adaptation – why?



**Per Hallgren,  
Swedish Forest  
Agency**

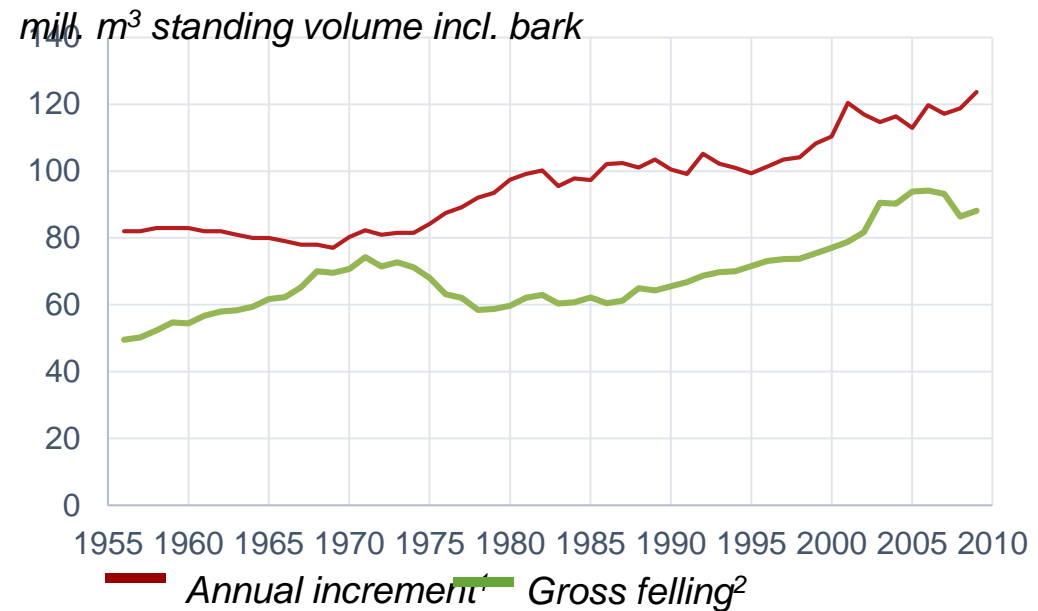
# Swedish forests

- Forestry coexist with other stakeholders and values
- 70% of the Swedes visit forests regularly
- Rein deer herding, 50% of the land area
  - 225 000 and 280 000
  - 1000 companies and 2500 people
- Moose 250 – 350 000



# Swedish Forestry

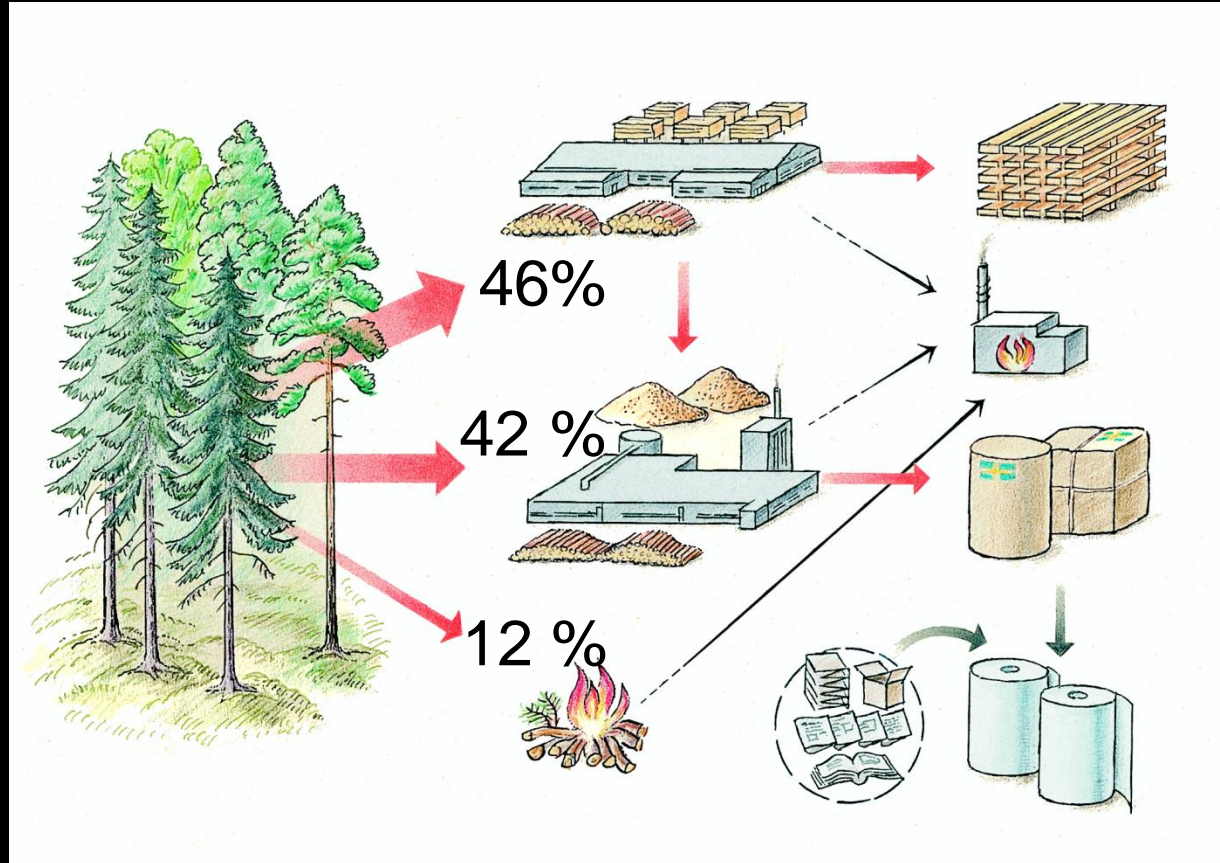
- 23,5 million ha productive forest land
- 3150 million m<sup>3</sup> standing volume
- 39% scots pine, 41% norway spruce



# Forests and Forestry in Sweden

Domestic 88 mill. m<sup>3</sup>

Uses of felled timber



Sawn Wood 17 mill. m<sup>3</sup>

Energy 115 TWh

Pulp 12 mill. tonnes

Paper 11 mill. tonnes

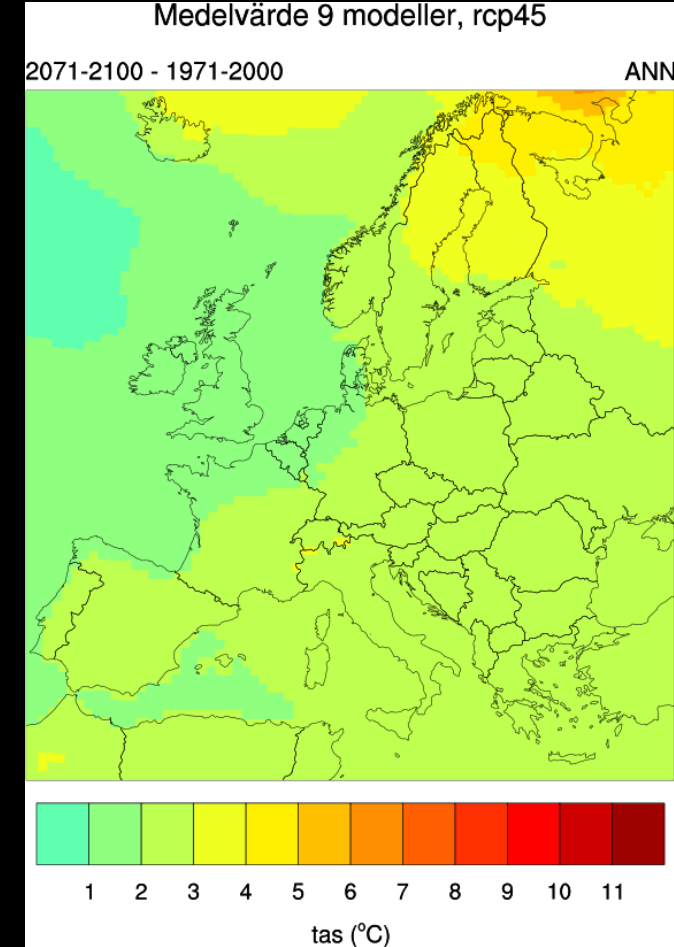
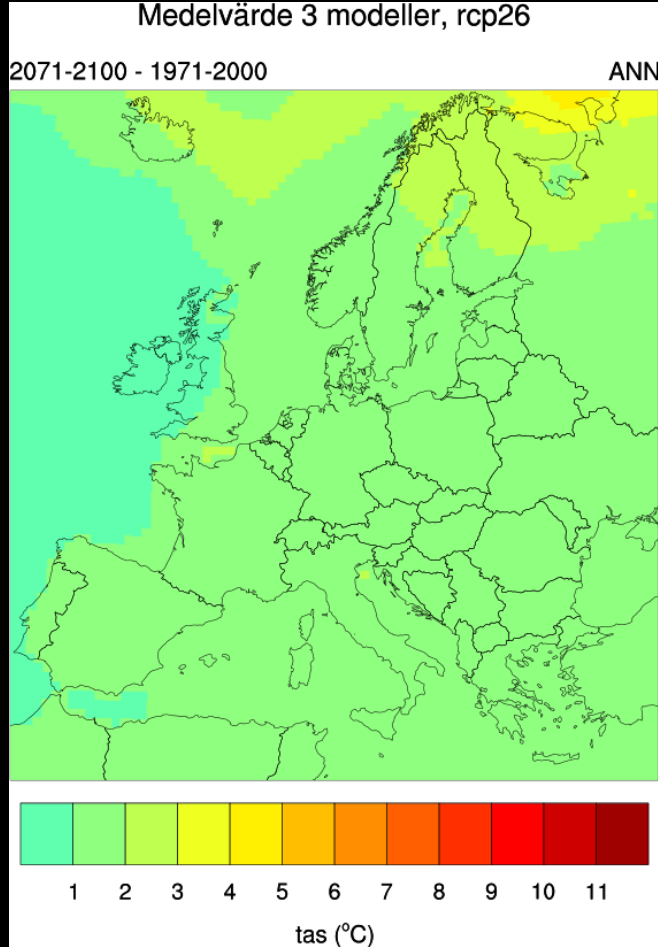
Import 7 mill. m<sup>3</sup>

Export 0.8 mill. m<sup>3</sup>

Source: Swedish Forest Agency

# Mean annual temperature

## RCP 2.6 (1.5 degrees) RCP4.5 (2 degrees)





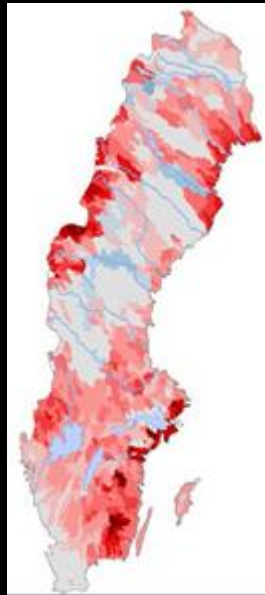
# Predicted change in water balance

- 2070-2100 relative 1970-2000 (RCP 4.5)

RCP 8.5



Spring



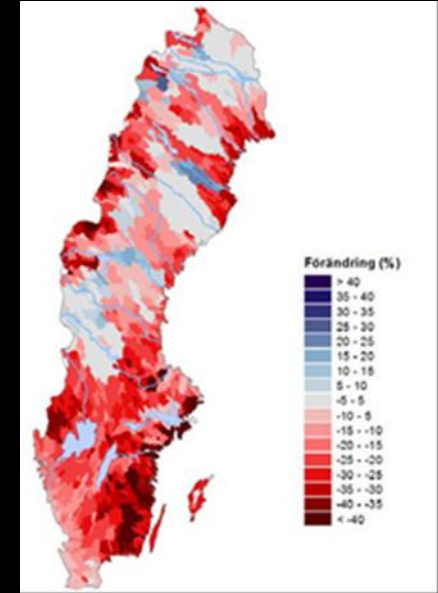
Summer



Autum

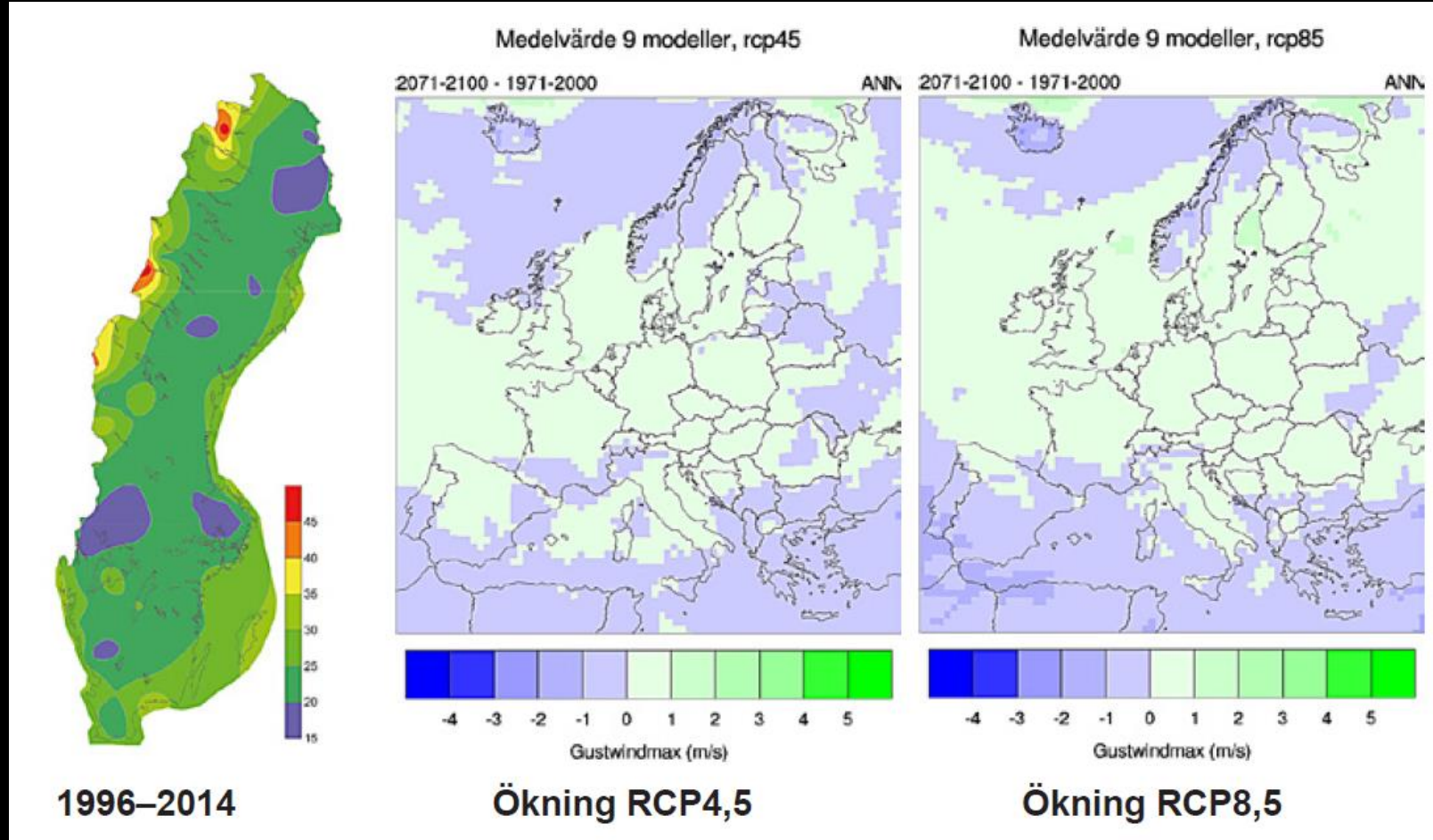


Winter



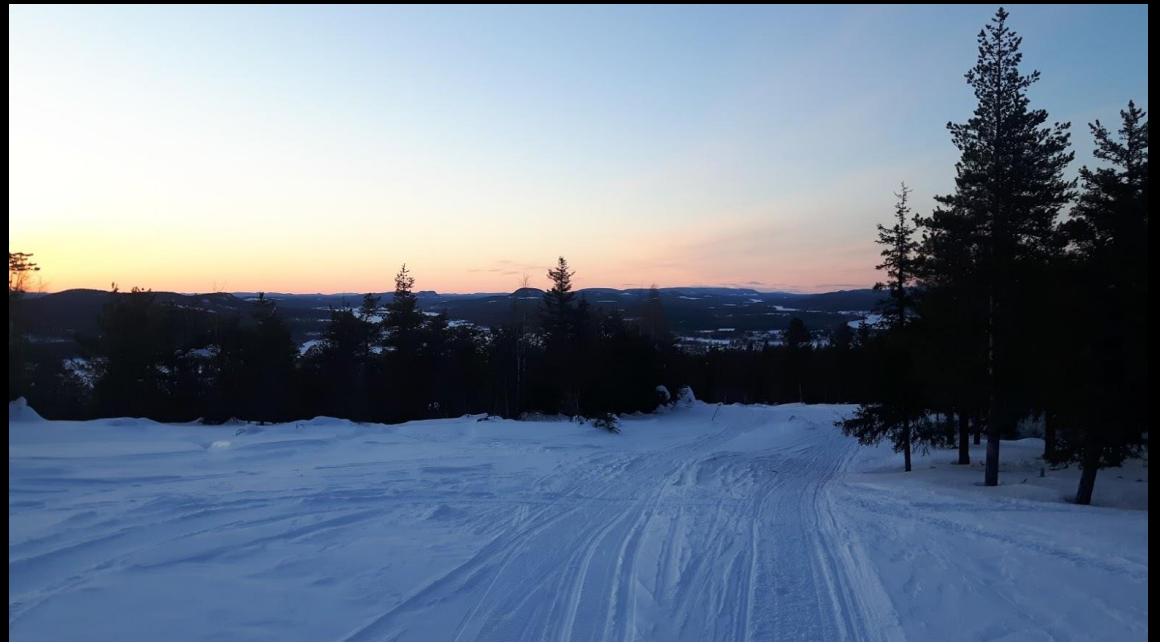
Summer

# Gust winds



# Climate Change in Swedish Forests

- A global temperature increase of 2 degrees means 3 degrees on average in Sweden, more in the north than in the south
- 1-2 months longer growth period
- 15-20 % increased annual precipitation
  - But also increased drought risk during summer
- 25% increased forest growth
- winds: affected only marginally,
  - slight increase in the south
  - slight decrease in the north
  - (*higher uncertainty*)





# Effects of Climate Change on Forests

- Increased growth due to longer growth period and more CO<sub>2</sub>
- Increased temperature means:
  - Better conditions for pine than spruce
  - Higher risk of insect outbreaks, especially
    - spruce bark beetle (*Ips typographus*) and
    - pine weevil (*Hyllobius abietis*)
  - Increased risk of rot and infections and spreading
  - Higher risk of introduced pest species
- More precipitation means
  - more difficult forest harvest operations
  - Problems with forest roads
- More summer drought means
  - Higher susceptibility to pest species, eg spruce bark beetles
  - Spruce is less favoured on many sites



# Effects of Climate Change on Forests

- Decrease of drought sensitive species
- Denser forests, with less light on ground layer
- Increase of mammalian browsers, especially Cervids
  - Thus increased total browsing pressure
- Changed population cycles of pest species, eg Bank Voles





# Climate adaptations in Swedish forestry

- In summary, adaptations to utilise growth potential and reduce risks
- Plant browsing:
  - Improved game management (smaller moose population)
- Storm-felling/pest insects/butt rot:
  - Spruce: stronger thinning, shorter rotation
  - More mixed-species forest
  - Less spruce in S Swe
  - More biological control of *Heterobas. a.*
- Growth and vitality
  - *Genetic adaption through breeding*
- Transportation and erosion problems:
  - Technical development
  - Better terrain-wise planning
- Forest fires:
  - Improved policies and fire management strategies
- Nature conservation:
  - Improved strategies – green infrastructure



Bild: Kenneth Johansson

# Climate adaptation of Forest Roads

- Sweden have approximately 210 000 km forest roads
- Climate adaptation is needed because
  - The time when roads are frozen is shorter
  - The run-off during winter may increase, thus increased dimension of drainage and water crossing culverts
- An important step in climate adaptation is well organised road management





# Secondary effects

- Increased utilisation of Forest resources as part of climate mitigation
  - Energy
  - Wood based fuel
  - Wood fibre
  - Construction wood
- Increased variability due to climate adaptation and risk dilution



# Experiences from working with climate adaptation information

- Climate policies (2003, 2009, 2019?)
- Synthesis reports (2007 and 2016)
- Large-scale information campaigns about conclusions – EU funding
  - 7% were reached out of 300 000 forest owners



# Each area needs different adaptations

Skog  
till nytta  
för alla

