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When moose controlled bioenergy

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Ecosystems Services and Management (ESM) Program
International Institute for Applied Systems Analysis (IIASA)

Cool forests at risk? 17 September 2018

Outline

- Background
- Research objectives
- Modeling approach
- Expected results

Why Moose?

- Sweden: most dense population in the world
 - 300,000 individuals
 - Browsing on rowan, aspen, willows, birch, and Scots pine



Photos: Thomas Öberg

Moose create problems

- Damage on birch + Scots pines



Photos: Christer Kalén

Moose create problems

- 6,000 car accidents per year



Photo: digijahti.fi

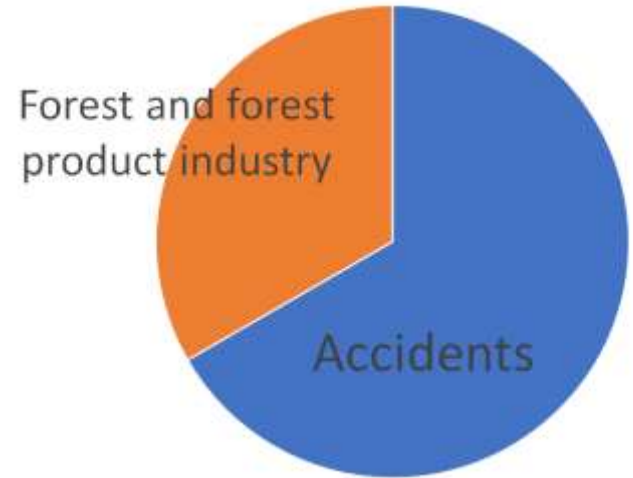
Economy impact & benefit

- Value (*hunting*) ~ 0.2 billion €/year



Photo: Thomas Öberg

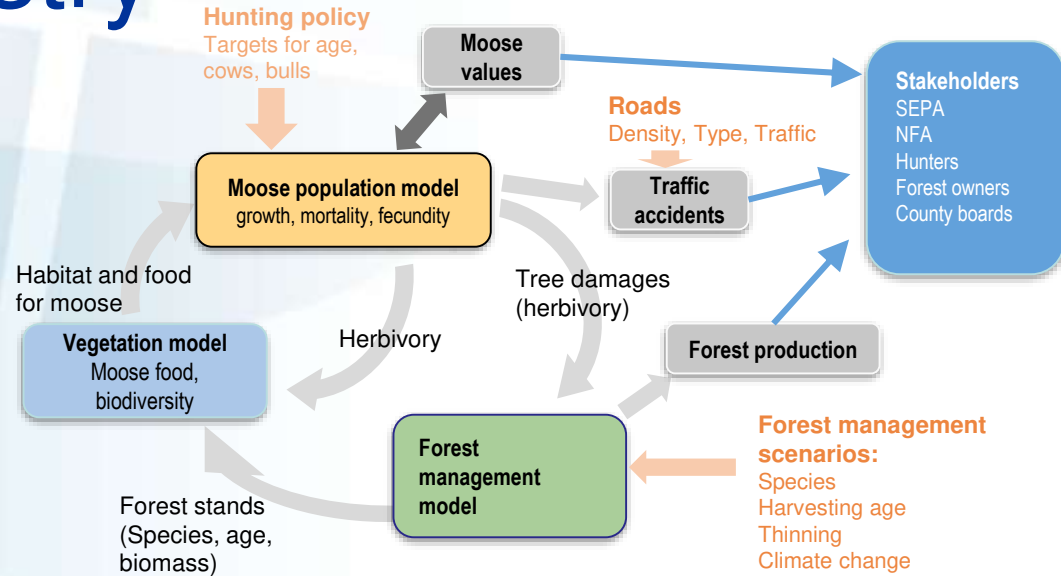
- Costs ~ 0.2 billion €/year



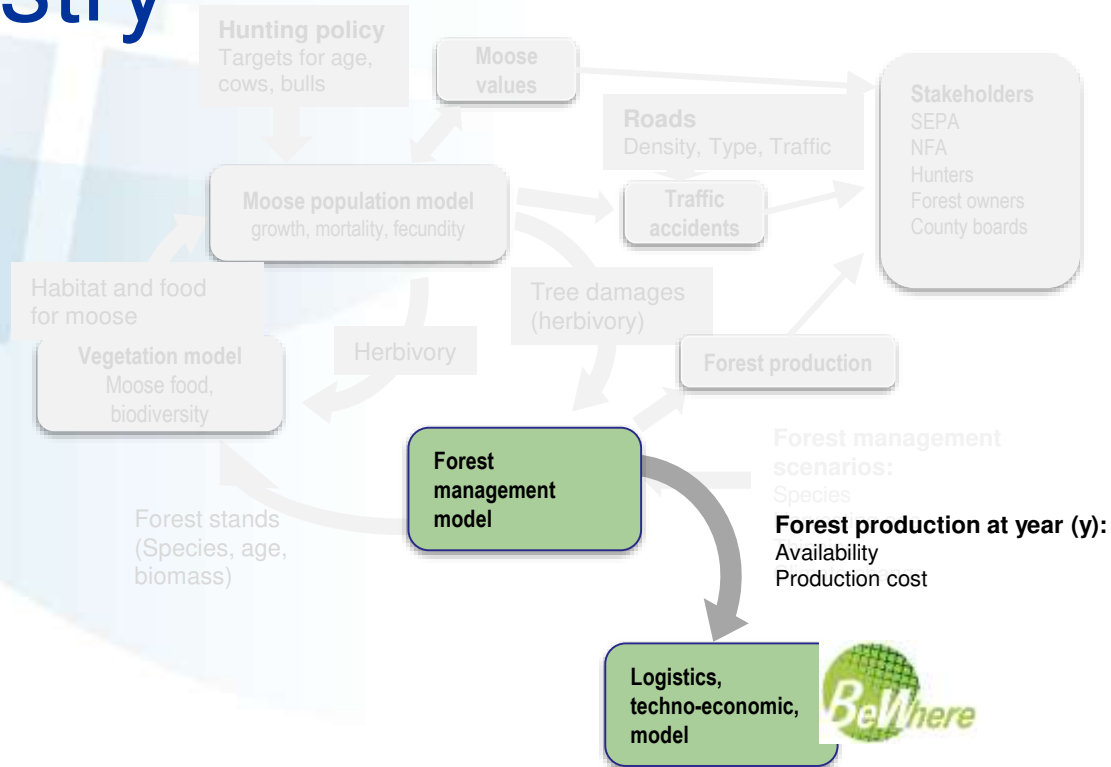
Objective

- Control the area and location of browsing
 - to decrease the cost
 - & to keep the economic value

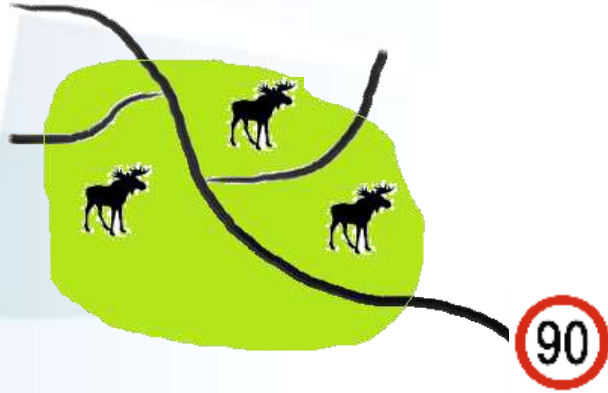
Integrated modeling of wildlife & forestry



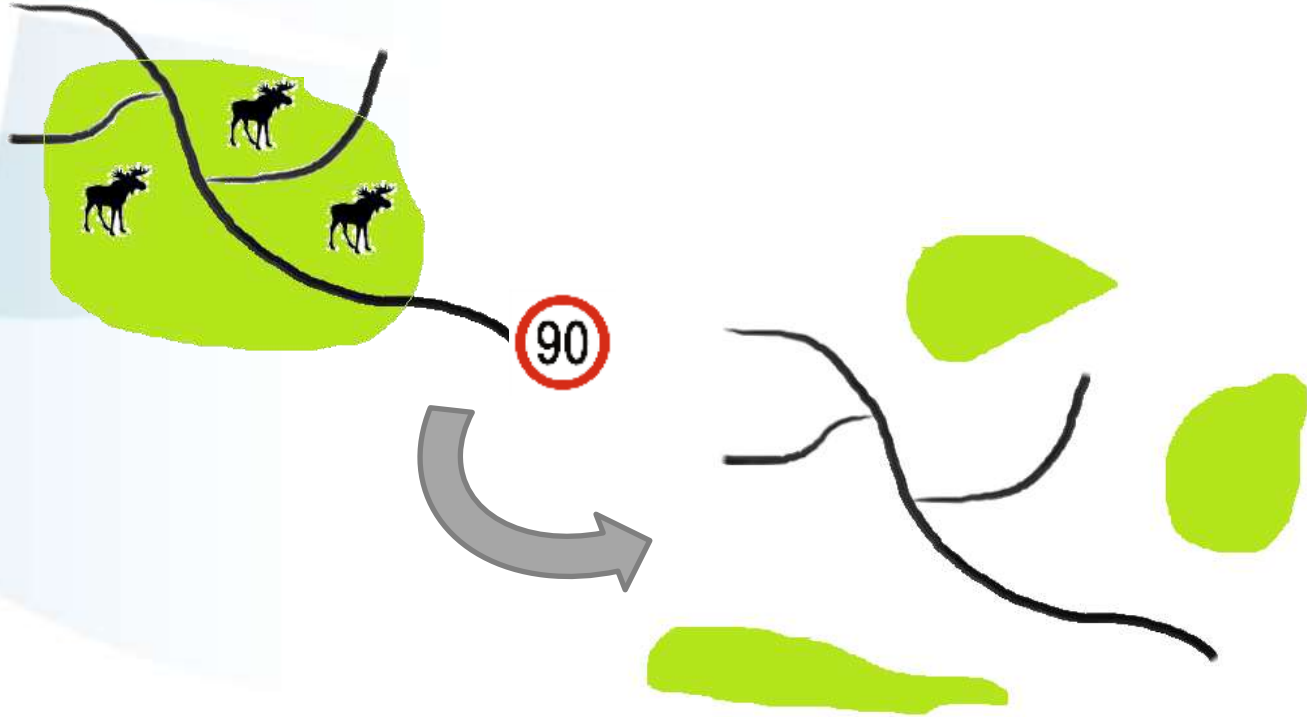
Integrated modeling of wildlife & forestry



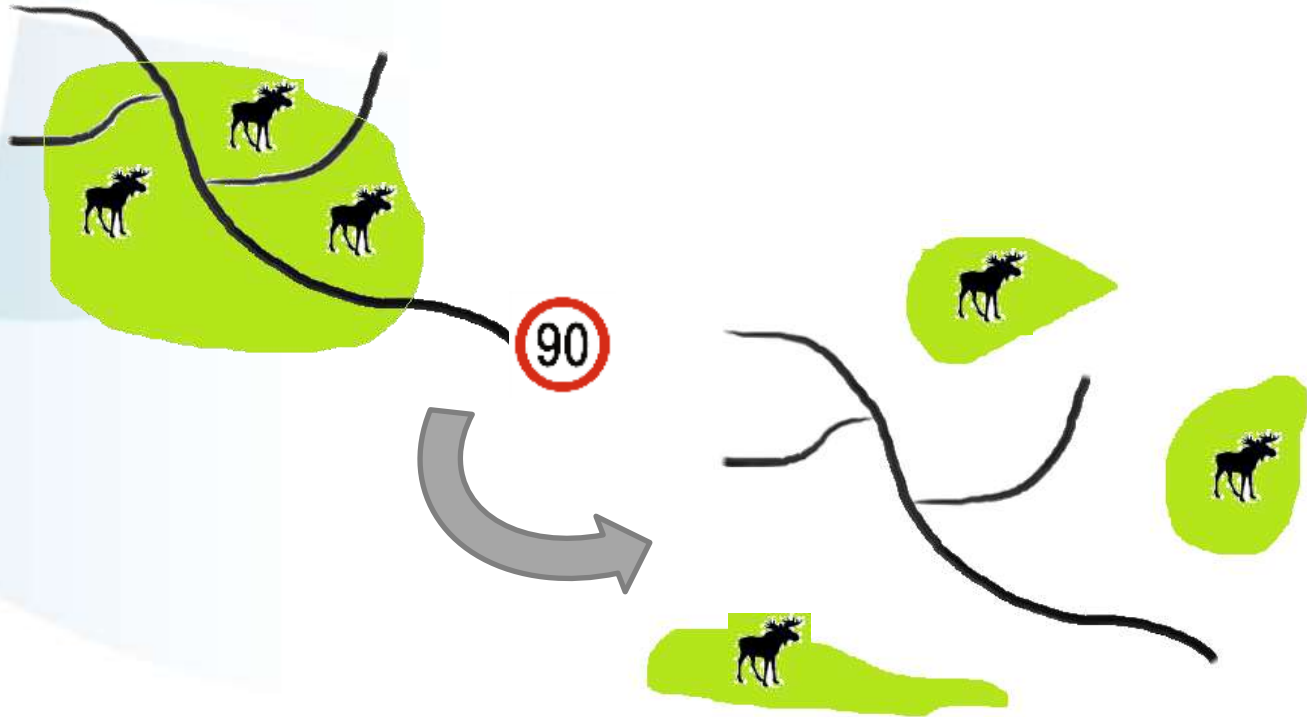
Consequence for forest industry



Consequence for forest industry

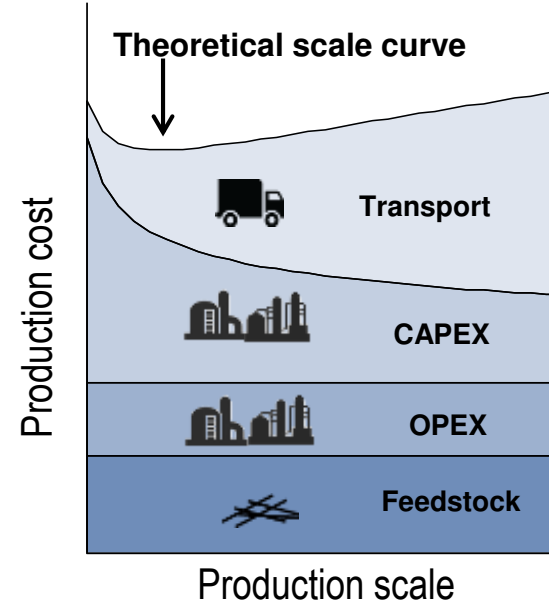
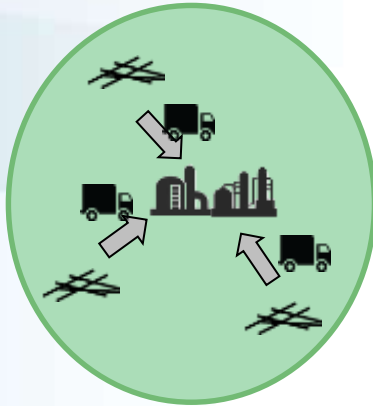


Consequence for forest industry



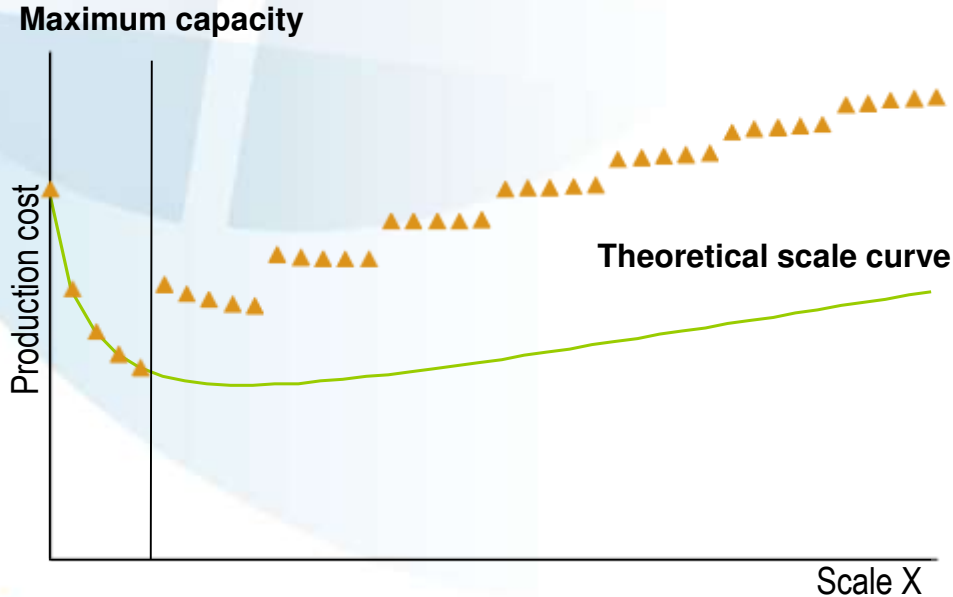
Theoretical economy of scale

Supply chain



Economy of scale in practice

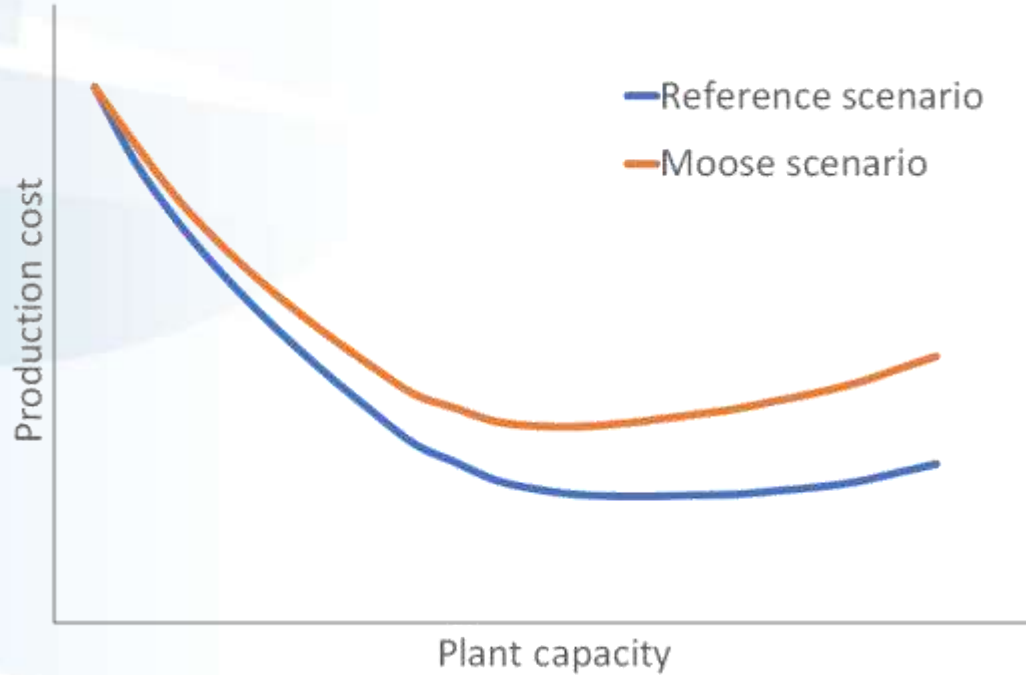
In practice more parameters affect the theoretical scale curve



Additional factors affecting the scaling curve in practice, e.g.

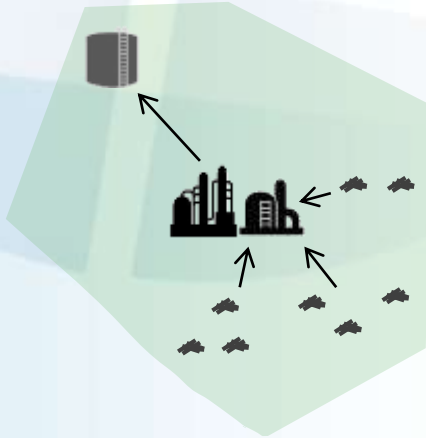
- **Maximum capacity**
- **Supply chain configurations**
- Inhomogeneous feedstock density
- Inhomogeneous feedstock price
- **Competing demand**
- Transport infrastructure
- Transport modes
- **Integration with host industries**

Expected results



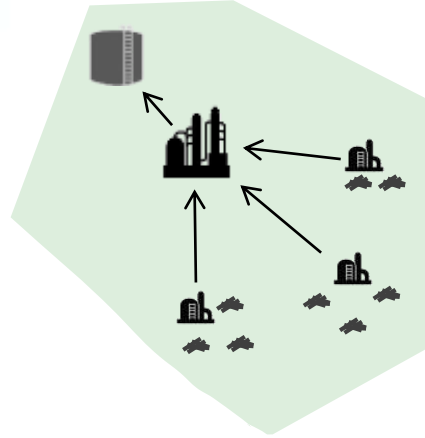
Centralised vs. distributed supply chains

Centralized supply chain







Lower CAPEX,
higher transportation cost

Distributed supply chain



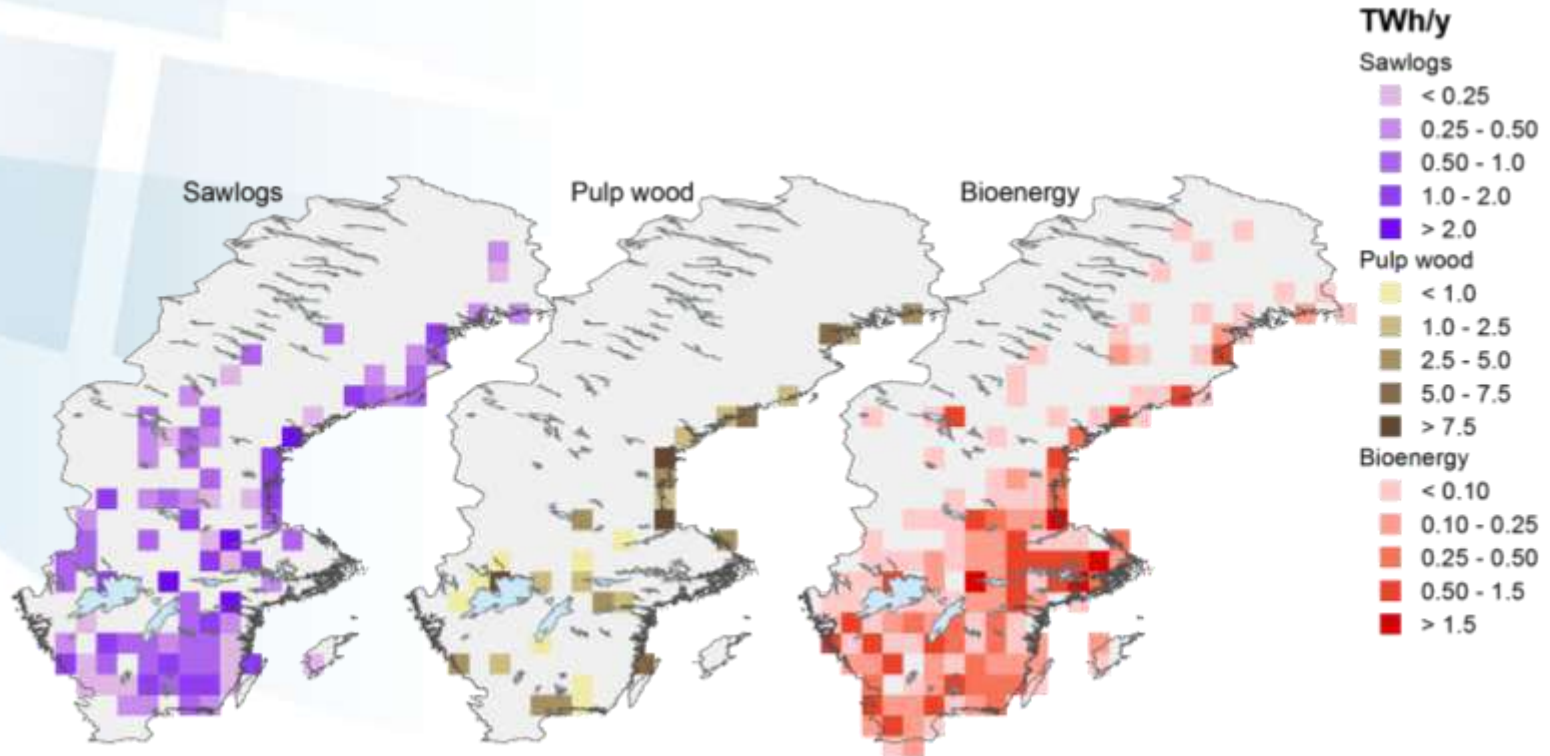
Higher CAPEX,
lower transportation cost

Legend

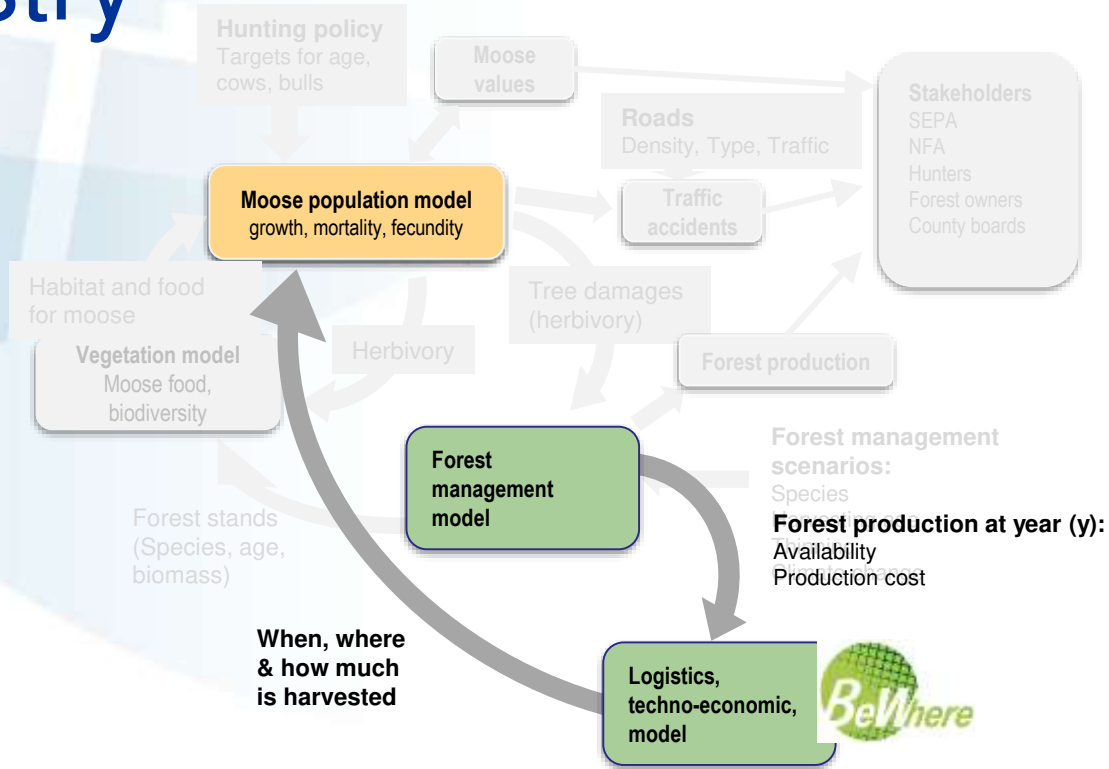
-  Feedstock
-  Pre-conversion unit
-  Conversion unit
-  Storage terminal

Distributed supply chain configurations can aid to limit the impact of growing transportation costs

Swedish forest industries



Integrated modeling of wildlife & forestry



More about Moose

- 2:00pm - 2:15pm - Marschallzimmer 2

Moose or spruce? Systems analysis for managing conflicts between wildlife, forestry, and society in Sweden (*Oskar Franklin*)



Thank you!

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