

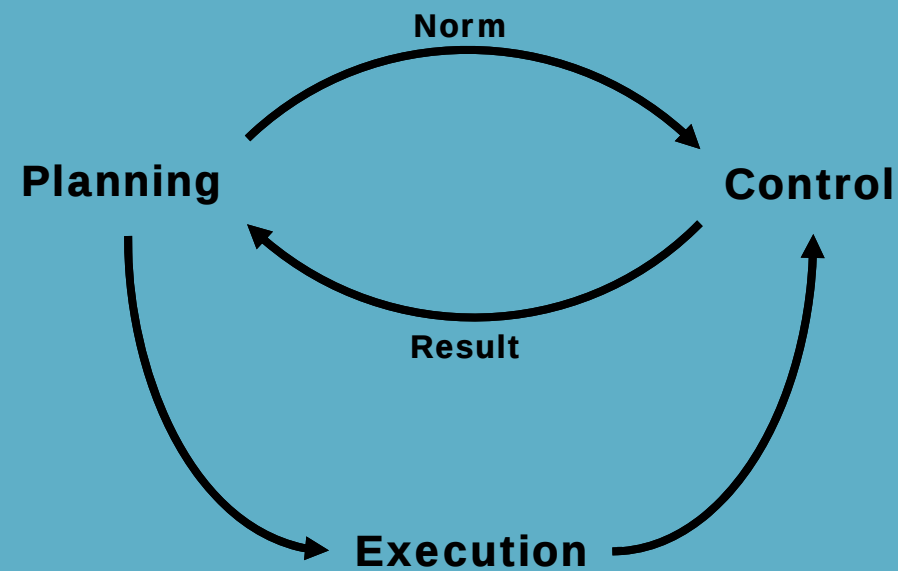
TRUPP - Development and test of software for follow-up of roundwood hauling at the contractor level

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¹ – MSc thesis, SLU

² – Supervisor, Norra Skogsägarna





Control of any logistics system requires a control process which provides feedback to the planning process

Round wood logistics

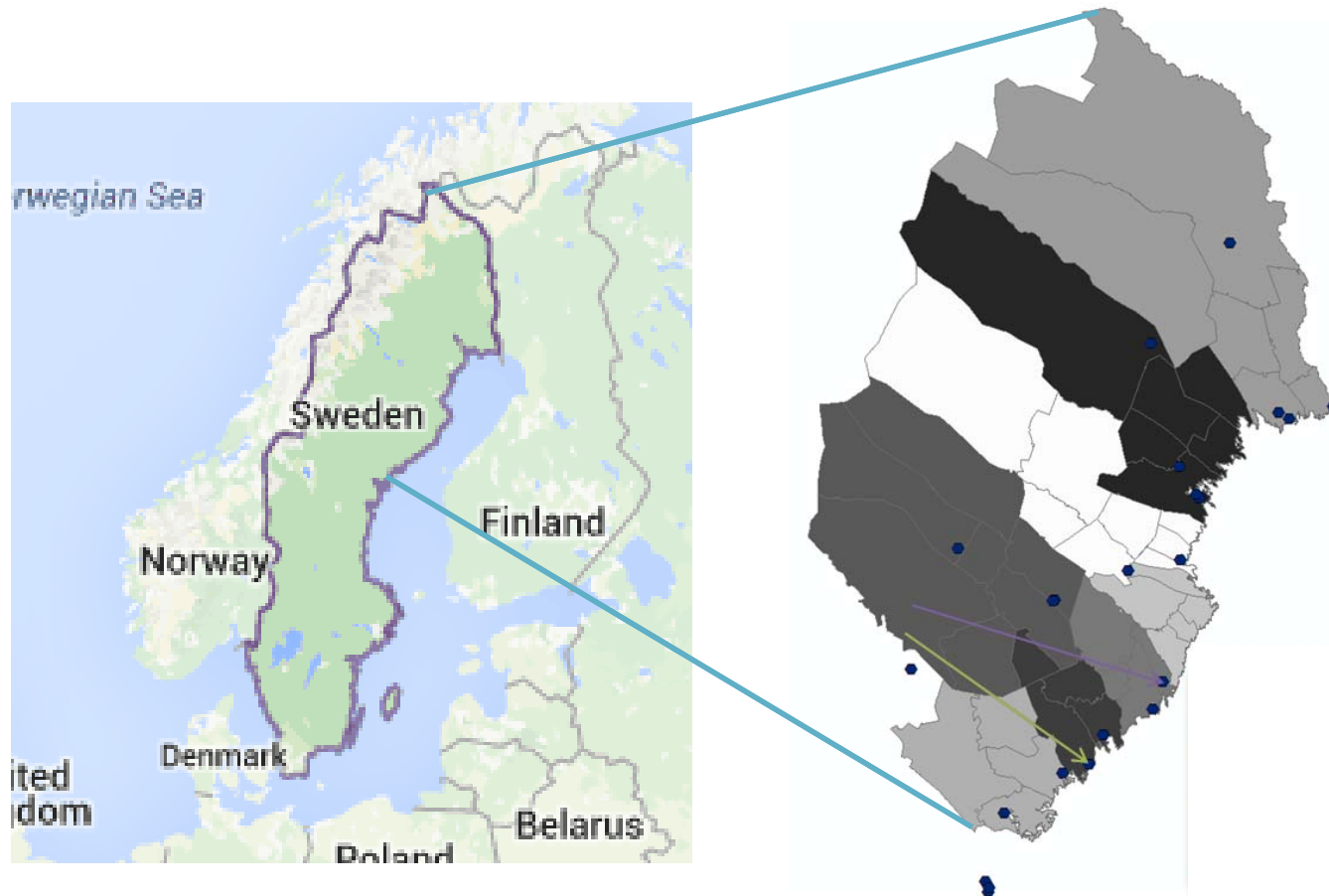
Much previous research in Sweden has focused on the planning processes

- Models and decision support systems (DSS) for:
- Planning of flows
 - *Carlsson och Rönnqvist (1998)*
 - *FlowOpt – Forsberg et al. (2005)*
- Vehicle routing
 - *RuttOpt – Andersson et al. (2008)*
- More on control and feed-back in
 - *Amrouss et al. (2015) + Marques & Rönnqvist(2015)*



Norra Skogsägarna

- Forest owner association
- 16 000 members
- 1,8 million cubic metres



Decentralised transport management

- Planning of flows with DSS NETRA (Edlund, 2014)
- Vehicle routing is done by the hauling contractors where in certain cases contractors are given the freedom to choose destination for their pulp- and sawlogs
- No systematic follow-up of the haulers destination decisions!

Slide 5

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Kanske ha med lite mer problembeskrivning här? Nu känns det som ett ganska stort hopp till syftet. Det skulle t ex kunna vara en punkt om att den decentraliserad organisationen medger ganska lite kontroll över entreprenörerna

Axel Sandahl; 2015-08-19

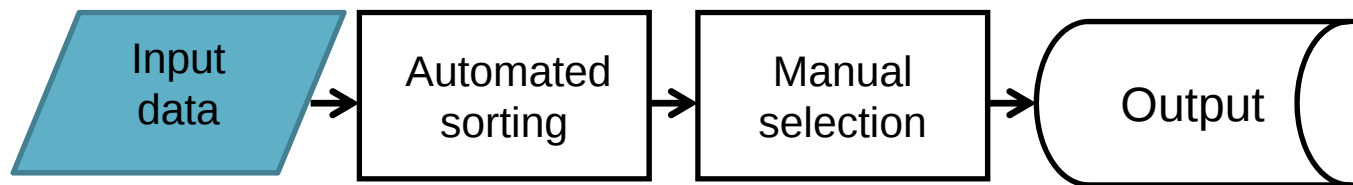
Study aim

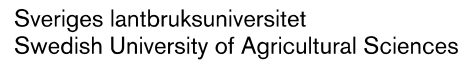
To develop a excel-based model that enables monitoring of transport work executed by individual hauling contractors on a daily to weekly level in order to identify possible inefficient solutions (wrong destination).



Available input data for follow-up

- Input data from Swedish forestry's data central (SDC)
 - Data for individual loads delivered by each sub contractor
 - Coordinates, volume, hauling distance etc.
- Weekly mill delivery quotas per hauling contractor
 - Per mill assortment



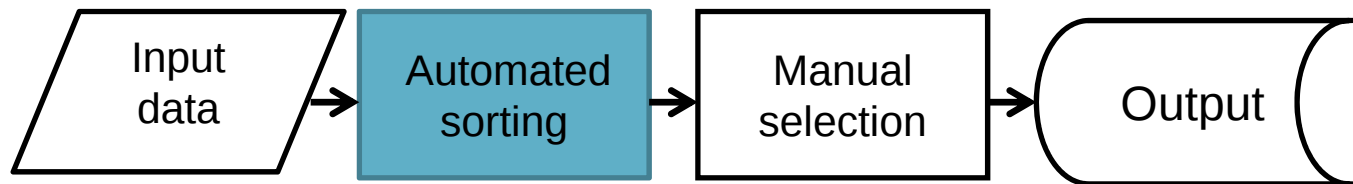
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TRansportUPPföljning (TRUPP)

2 – step semi-automated methodology

Step 1: Automated sorting of individual loads based on:

- Closest roadside stocks available to fill the individual hauling contractor mill quota for the given time period
- To evaluate different categories of risk for inefficient destinations



Slide 9

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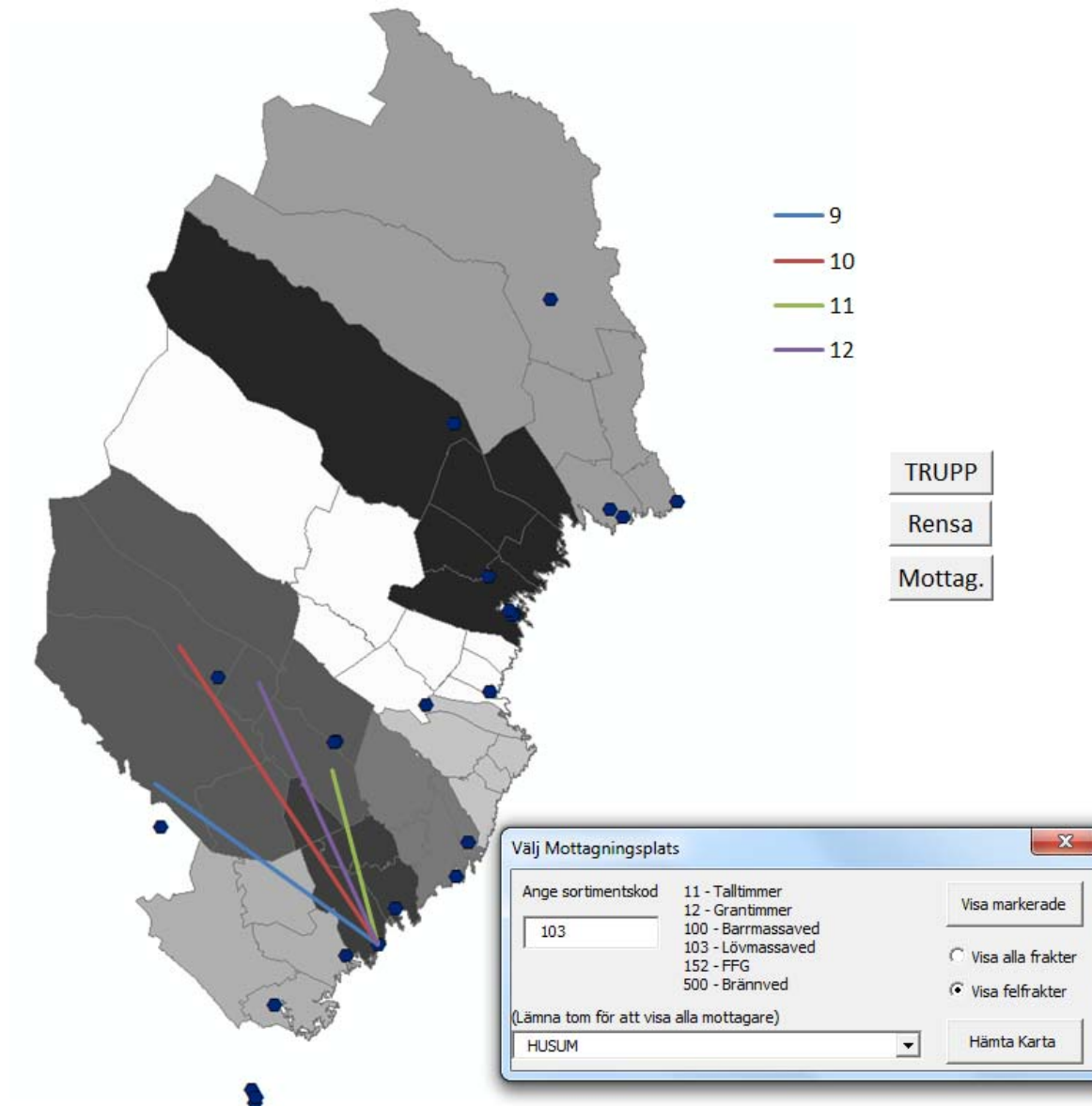
Tänk på att det intressanta är hur du löste problemet (alltså åtminstone delvis efter vad du sorterade lassen)

Axel Sandahl; 2015-08-19

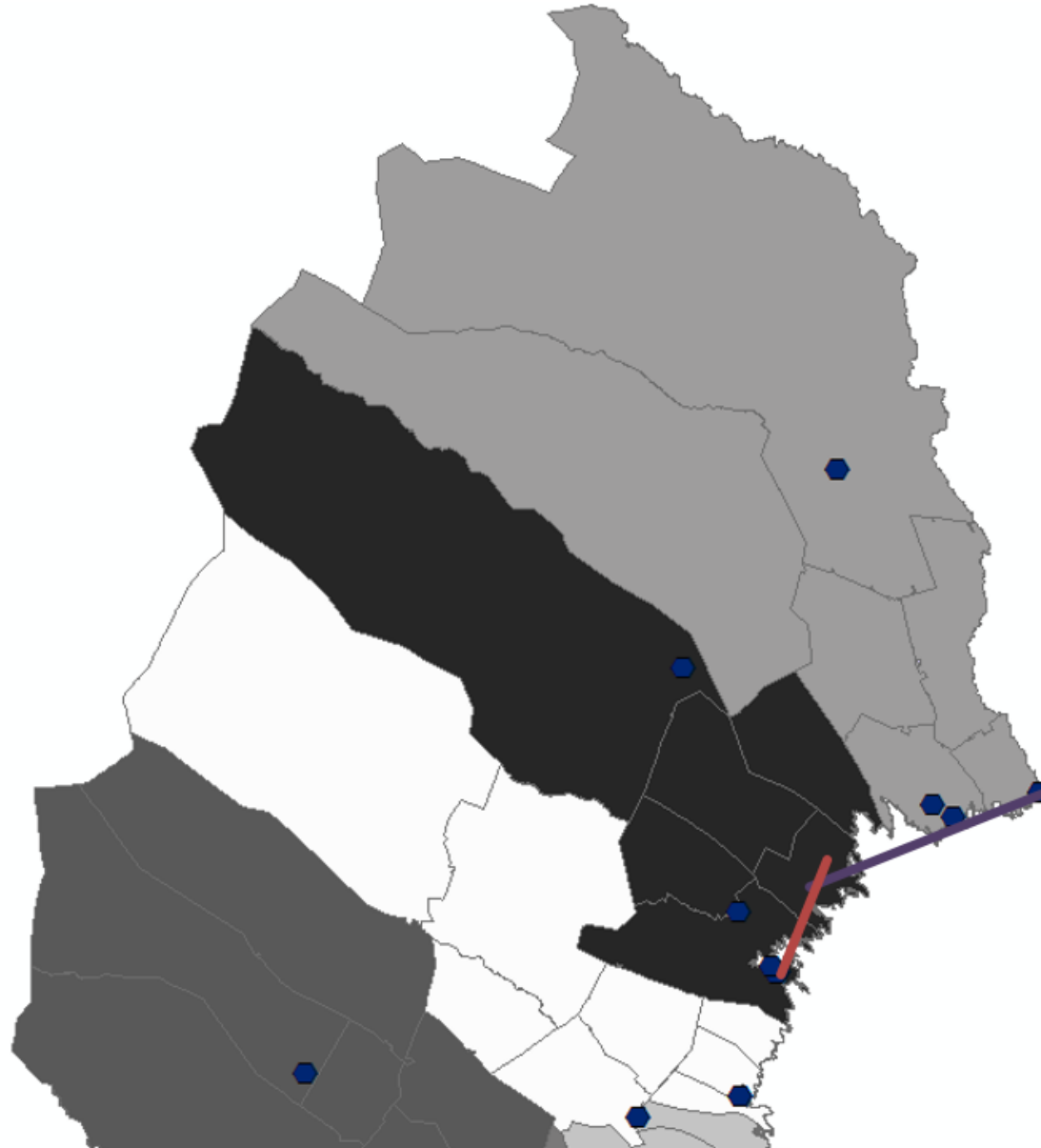
Risk categories

Category	Description
0	Hauler has not been assigned a quota to this mill
1	Closest landing to fill mill quota
2	Good choice of landing for a number of mill quotas
3	Wrong destination
4	Mill quota already filled (overdelivery)

Category 0 – Hauler has not been assigned a quota to this mill



Category 3 – Wrong destination

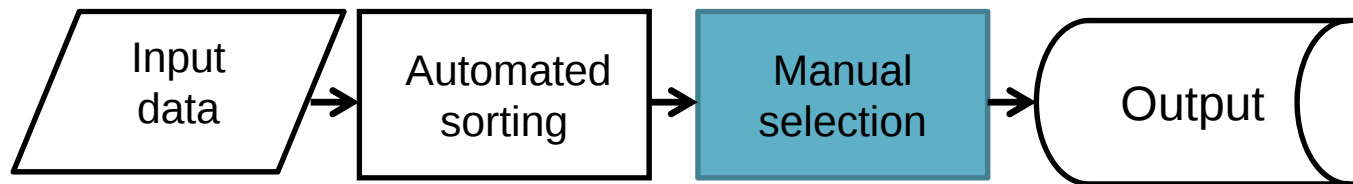


TRansportUPPföljning (TRUPP)

2 – step semi-automated methodology

Step 2: Manual selection of deviations using

- Excel-embedded map feature for visual inspection of indicated routes at risk
- Selection of inefficient destinations
- Possibility to take different real life restrictions into account



Slide 13

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Tänk på att det intressanta är hur du löste problemet (alltså åtminstone delvis efter vad du sorterade lassen)

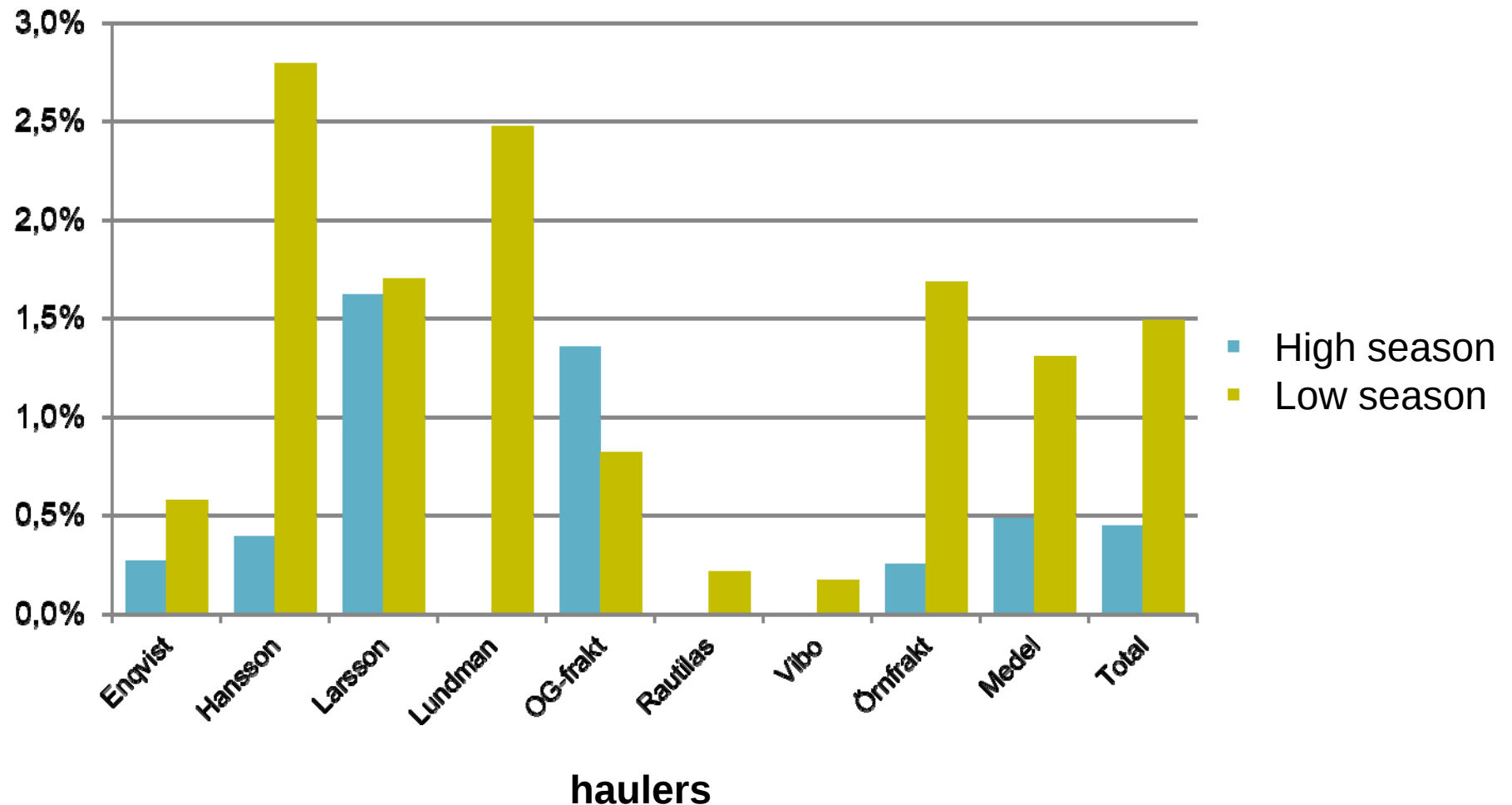
Axel Sandahl; 2015-08-19

Tests

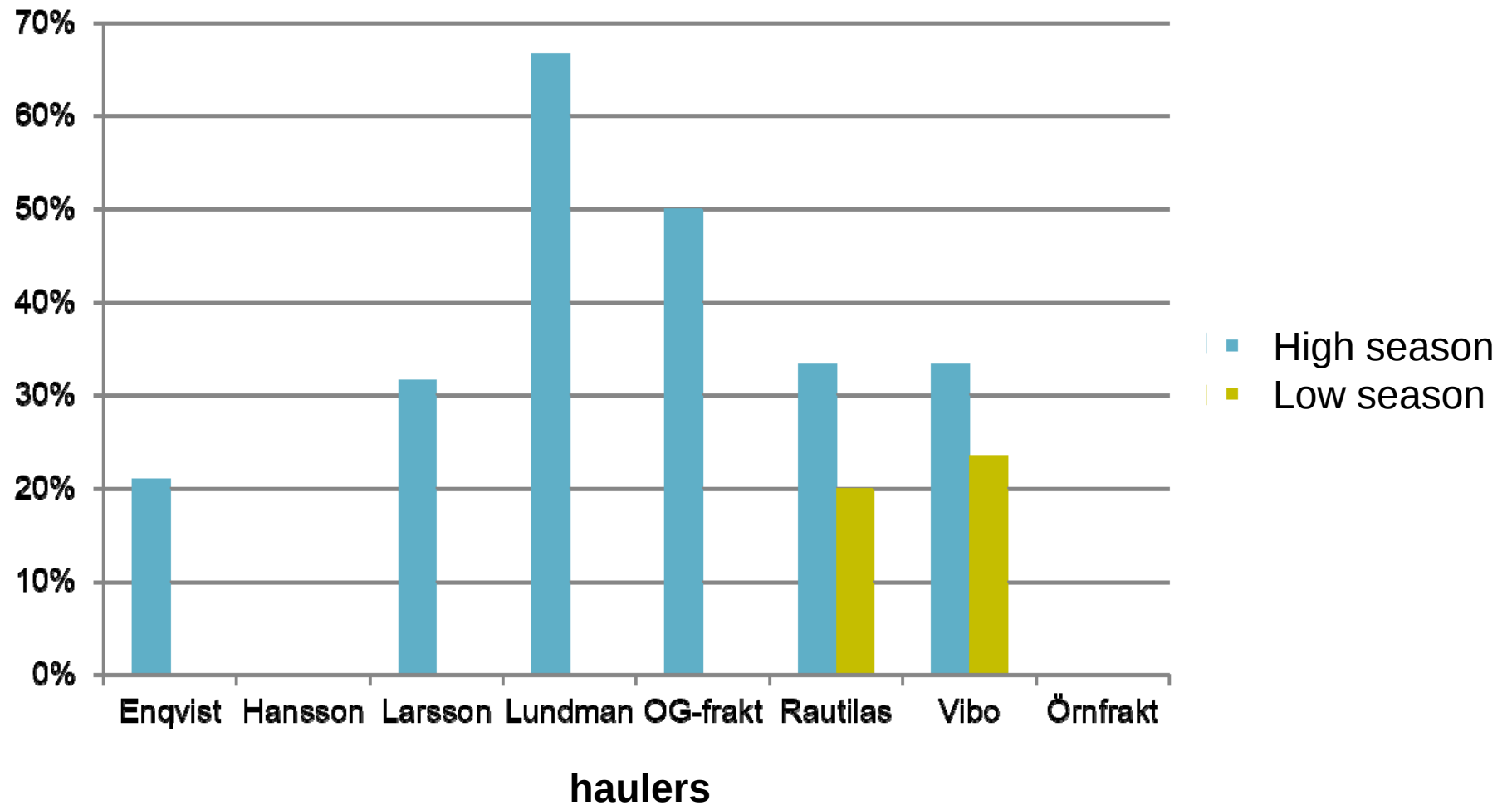
The model was tested for all of Norra Skogsägarnas hauling contractors

- 3-days during February & September 2014
- Examining possible reduction of transport costs
- Frequency of backhauling

Variation in potential cost reduction



Back haul percentage



Interpretation

- Despite lower hauling volumes during the low season, the haulers' transport work was greater than during the high season
- Because of a combination of:
 - Longer average transport distances from roadside stock
 - Deliberate choice of longer hauls to ensure high fleet utilization

Discussion

Comparison with previous studies

- Carlsson & Rönnqvist (1998) **2,9 %** reduced costs
 - Same region, one week planning period
 - After 10 years use of NETRA optimal flow planning
- TRUPP follow-up showed a **0,9 %** potential for reduced costs (only three day test period)
 - Practical potential and not theoretical
 - Shorter planning horizon gives lower potential

Conclusions

- PEC
- Gives Norra Skogsägarna the possibility for a more effective transport control
- Through the visualization a clear feedback can be given to the hauling contractors

Future studies

- Causes for differences in back haul usage
 - Area potential
 - Contractor cooperation
- Variations over time both at and between hauling contractors



Thank you!

