

# Material flows in the Norwegian sawmilling industry

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# Agenda

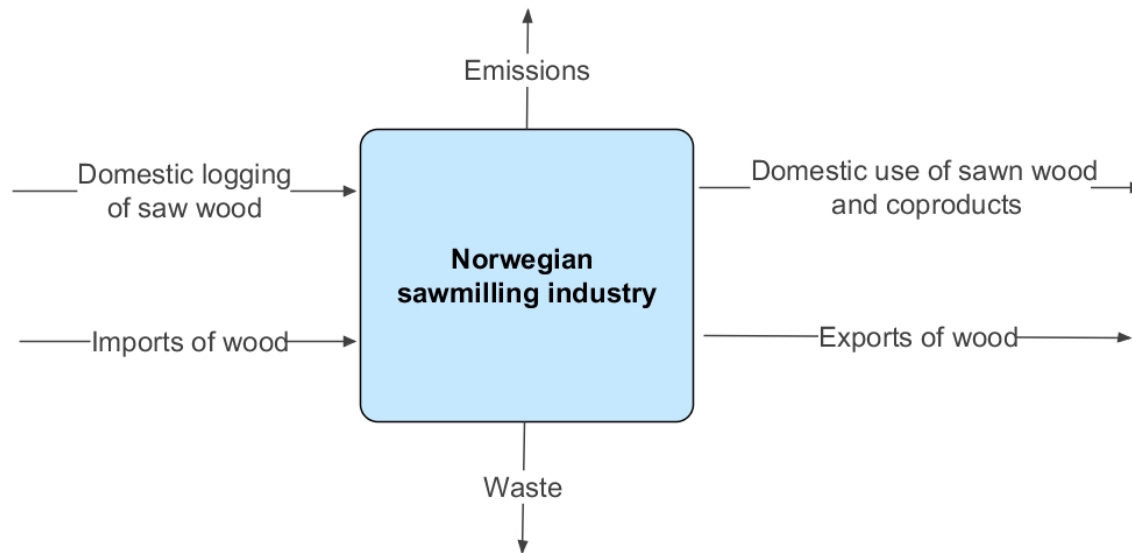
- **Introduction**
- **Objective**
- **Methods**
- **Results**
- **Discussion**
- **Conclusion**

# Introduction

- **Forest are well monitored compared to flows and stocks of wood resources through industrial value chains**
- **Two recent master thesis have attempted this, but both have faced difficulties on data for material flows (Rødland 2009 and Grinde 2010)**
- **Previous work often on company or product level, not on total domestic industry.**

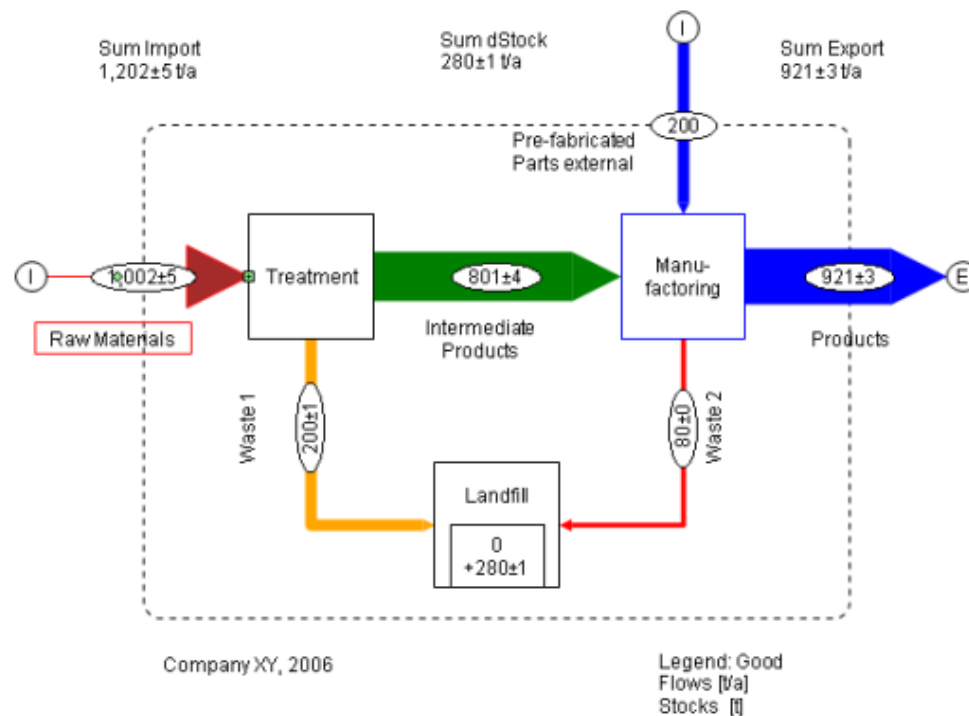
# Objective

- **The objective of the study was to quantify the main flows of wood in the Norwegian sawmilling industry and main foreign trade**



# Methods

- **Material flow analysis (MFA)**
- **Inputs = outputs + stock change**



# Material

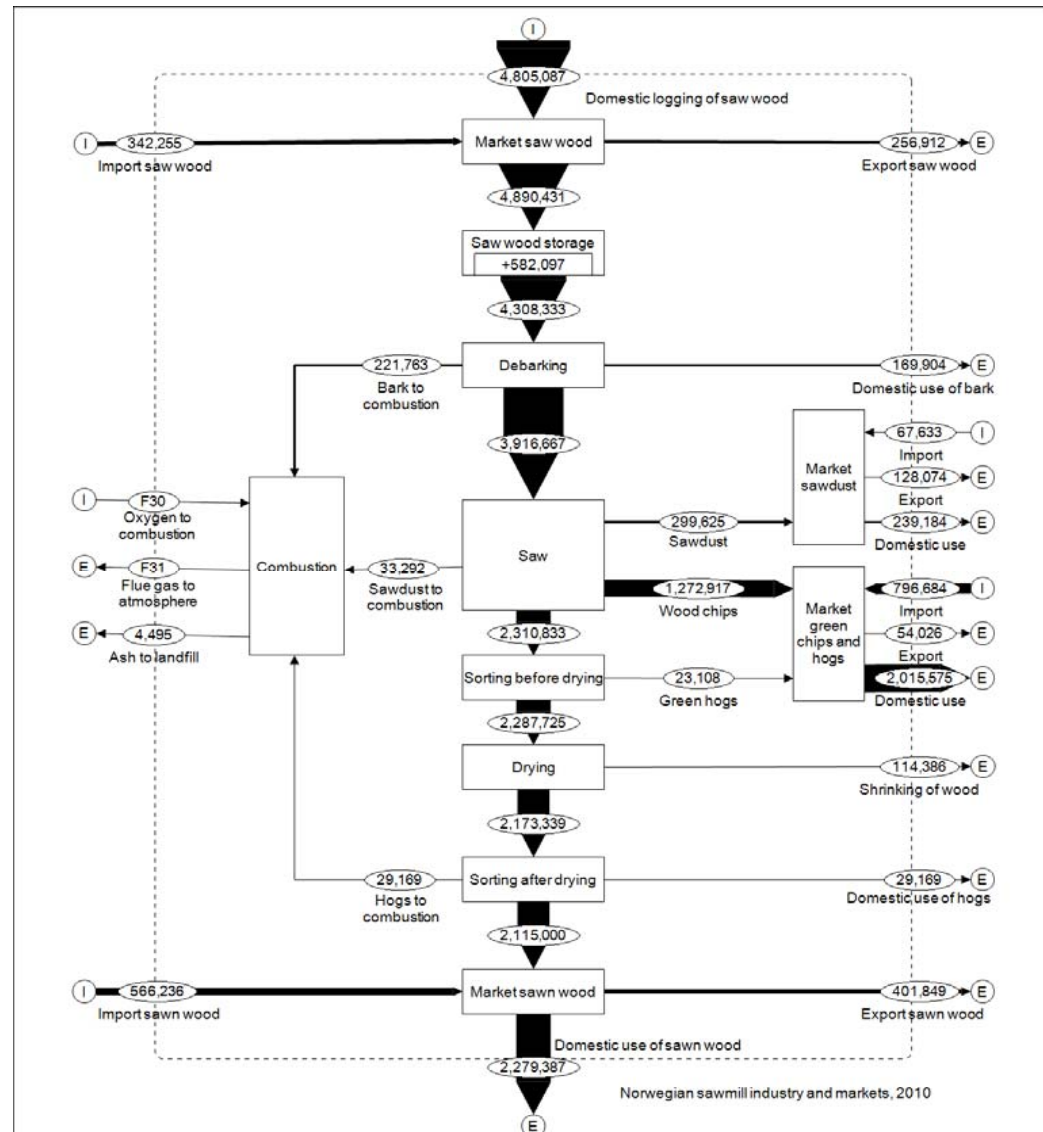
- **Process data from previous surveys**
- **Activity data from annual statistics**

**Table 1:** Process and activity data with sources.

<b>Process data</b>	<b>Sources</b>	<b>Activity data</b>	<b>Sources</b>
Generation of co-products	Tengs and Opdal (1997), Moelven Van Severen (2009)	Domestic logging	Skog-data AS (2011)
		Bioenergy production	Statistics Norway (2011a)
Wood densities	Bramming (2006)	Foreign trade	Statistics Norway (2011b)
Ash contents	Belbo and Gjølso (2008)	Sawn wood production	Treindustrien (2011)

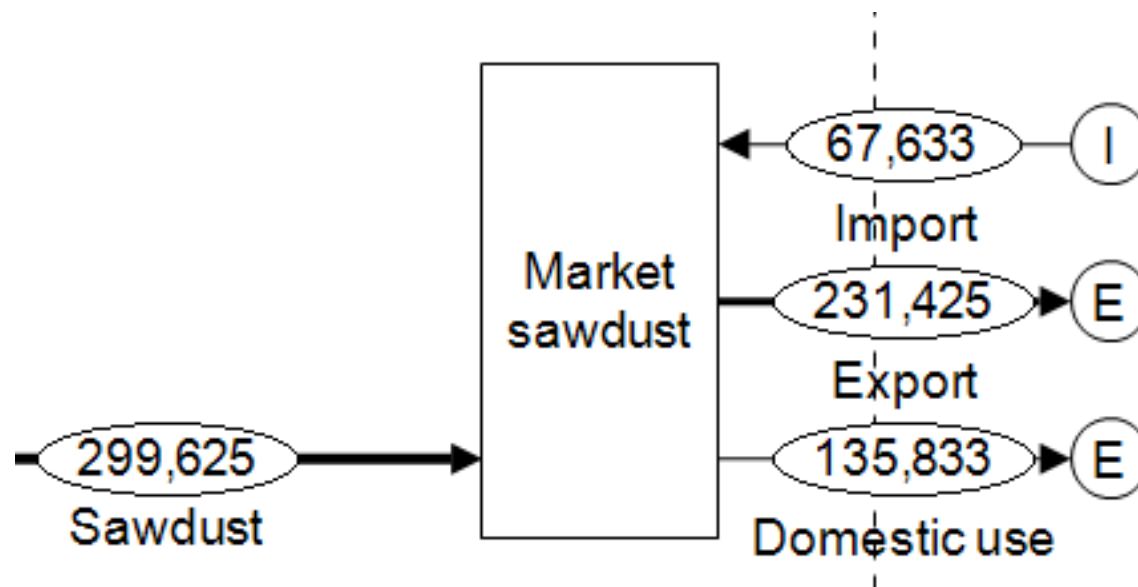
# Results

- Volume flows in 2010
- Solid cubic meters



# Discussion

- **Uncertainty in foreign trade data on sawdust.**
- **One single particleboard factory in Norway uses >200 000 sm<sup>3</sup> of sawdust**



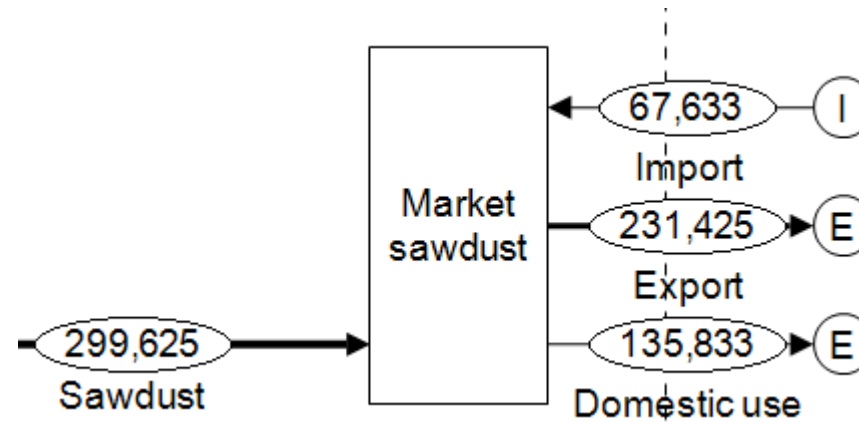
# Data variations

- **Variation in densities could be caused by mixed units**
  - **solid cubic meters vs. loose cubic meters**
  - **Dry weight vs. wet weight**

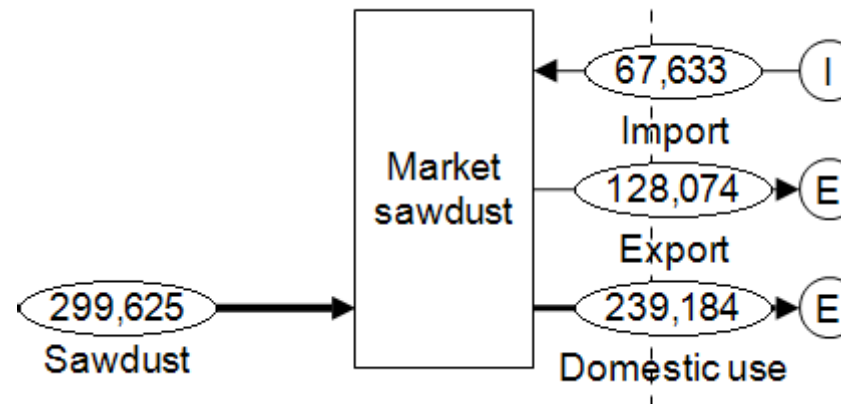
Year	2007		2008		2009		2010	
Unit	kg	m3	kg	m3	kg	m3	kg	m3
Statistics export of sawdust	45521652	99352	28238677	207306	78769077	159760	83247876	231425
<b>Calculated densities</b>		<b>458</b>		<b>136</b>		<b>493</b>		<b>360</b>

# Adjusted

- **Before**



- **After**



# Conclusion

- **MFA is a useful tool when data quality is questionable**
- **The various uses of units for wood can be a cause of large data uncertainty.**
- **Further work to also include planning and preservation part of the industry**