Winter Road Maintenance and Carbon Accounting
The Technology Days 2019
Tools are just tools... But what can we do with the results from CO₂-calculations

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Agenda

- Winter Road Maintenance – what is it?
- How to Calculate GHG Emissions from Winter Road Maintenance
- Winter Road Maintenance in Norwegian Calculation Tools
- Ongoing Project About Environmental Impacts of Winter Road Operations in Norway
Winter Road Maintenance

Activities:
• Snow plowing
• Manual snow removal
• Planing of ice and snow
• Treatment plants for snow
• Road salt
• Sand and gravel
• Removing snow from and cleaning road signs
• Thawing - water management
• Inspection rounds
• Paving of holes
• Placing and removing snow poles
• Sweeping

Pictures: anleggsmaskinen.no og tekna.no
How to Calculate GHG Emissions from Winter Road Maintenance?

- Material production
  - Salt
  - Sand and gravel
  - Snow poles
  - Packaging
  - Asphalt
- Diesel
  - Maintenance activities
  - Transportation of materials
  - Transportation of snow
- Electricity and other kinds of energy
- Production, wear and tear of machinery

Figure: Irish Green Building Council
Winter Road Maintenance in Norwegian Carbon Footprint Tools
Winter Road Maintenance in Norwegian Carbon Footprint Tools

In general:
GHG emissions = amount * emission factor

Example:
[kg CO₂-eq.] = [litres diesel] * [kg CO₂-eq./litre]

In the calculations tools:
- Amounts given directly or estimated based on ex. km tunnel
Winter Road Maintenance in Norwegian Carbon Footprint Tools

Developed by NIRAS for Nye Veier

- GHG emissions
- Operations included:
  - Salting
    - Material production, A1-A3
    - Transportation, A4
    - Diesel
  - Snow plowing
    - Diesel
  - Cleaning road signs
    - Diesel

Figure: NIRAS/Nye veier calculation tool
Winter Road Maintenance in Norwegian Carbon Footprint Tools

• VegLCA v. 2.04
  – Developed by Asplan Viak for Statens vegvesen (Norwegian Public Roads Administration)
  – Not only GHG emissions
  – Winter road maintenance not included
  – Planned update

• EFFEKT
  – Statens vegvesen (Norwegian Public Roads Administration)
  – GHG emissions from winter road maintenance not included

• Tidligfaseverktøy (Early phase calculation tool, railway)
  – Developed by Asplan Viak for Bane NOR
  – Not included
Winter Road Maintenance in Norwegian Carbon Footprint Tools

Conclusion:
• More tools should include maintenance operations
  – Some updates already planned
  – Relevant in early stage evaluations?
• More activities should be included

• Potentially missing opportunities to save energy and reduce GHG emissions
Ongoing Project About Environmental Impacts of Winter Road Operations in Norway
Environmental Impacts of Winter Road Operations in Norway

• Project owner: Statens vegvesen Vegdirektoratet
• “Investigation of environmental impacts and potential for reduction of emissions caused by winter operation of roads”

About the project:
• The situation today
  – Tools and methods for calculation
• Energy use
  – Energy efficiency
• Environmental effects
  – GHG emissions especially
• Possible measures
Environmental Impacts of Winter Road Operations in Norway

• Literature review
  – Mapping the situation today
    ▪ Similar countries
    ▪ Contractors
  – Norway:
    ▪ Geography
    ▪ Climatic differences
    ▪ Different types of roads

Köppen climate types of Norway

*Koppen climate type

*Isotherm used to separate temperate (C) and continental (D) climates is -3°C
Data source: Climate types calculated from data from WorldClim.org

Figure: wikipedia.org
Environmental Impacts of Winter Road Operations in Norway

• System boundaries and limitations:
  – Qualitative, not quantitative
  – Environmental impacts considered:
    ▪ As in a standard LCA for a Norwegian EPD
    ▪ Dust
    ▪ Noise
    ▪ Plastics
  – Not included:
    ▪ Ecological impacts of salt
    ▪ Economical impacts
Environmental Impacts of Winter Road Operations in Norway

Outcome:
- List of important drivers of energy use and environmental impacts
- List of possible measures
  - Colour coded/graded and weighted
- Recommendations for further work
  - Implementation in calculation tools
Questions?