MULTI-METHOD SIMULATIONS IN LOGISTICS

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Background

- Live, study, and work in Lappeenranta
- 2008 M.Sc. Industrial Management
- 2009 B.Sc. Business Administration & Economics
- 2012? Dr. Industrial Management
- Simulation engineer
- Also some statistics and mathematical programming
- During 2008 – 2010 involved in two large EU-funded projects, STOCA and MobilePort
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Background to STOCA

- Due to high traffic of oil tankers, countries’ coast lines are constantly in danger of an oil spillage
  - Gulf of Mexico (2010)
- Oil spillages might also hinder logistical operations as seaports might not be usable during an oil accident
- Gulf of Finland is especially a sensitive area due to high volumes from the port of Primorsk and Muuga (Kämärä 2010)
- Simulation was chosen as the approach, as it allows the studying of complex dynamic systems
Baltic Sea Region

Map from Wikimedia Commons
Lappeenranta University of Technology
Ships in the model

- Travelling
- Arrive to seaport
- Delay

Next location?
- Route
- Current Location

Stochastic variable
Model structure
Ships during emergency situations

**Flowchart:**

1. **Travelling** → **Arrive to seaport**
2. **Hanko/Rauma or other?**
   - **Hanko/Rauma** → **Delay**
   - **Other** → **Queue**
      - **Hanko/Rauma** → **Delay**
      - **Other** → **Stochastic variable**

**Notes:**
- **Next location?**
  - Route
  - Current Location
Information used by coordinator

- Amount of ships in Hanko
- Amount of ships in Rauma
- Ships arriving to Hanko
- Ships arriving to Rauma
- Capacity available at both seaports
Background to MobilePort

- Analyzing the feasibility of dry ports in a Finnish context
- Interested in both costs and emissions
- Approached the issue with the help of simulation
- In addition to simulation, results were compared against a survey with local logistical operators
- We created cost estimates both for rail and road transportation
  - Included both internal and external costs
  - Road: 0.0506 € / TKm
  - Rail: 0.027 € / TKm
  - Shifting cost: 35 € / container
- Emission estimates from lipasto.vtt.fi
- In the model we compare two systems: the first one uses a dry port structure, while the latter one uses a more traditional seaport system
Normal seaport

Modified from Roso 2009
Dry port

Modified from Roso 2009
Any questions?

- All of the models are available online
  - [www.stoca-simulation.fi](http://www.stoca-simulation.fi)
  - [www.kuivasatama.fi](http://www.kuivasatama.fi)

- Any questions?

- Thank you!