



COREALIS Livorno Demo/Training Webinar

Optimization planning tool for CT operations (PORTMOD)

Mr. Alexandr Tardo, CNIT

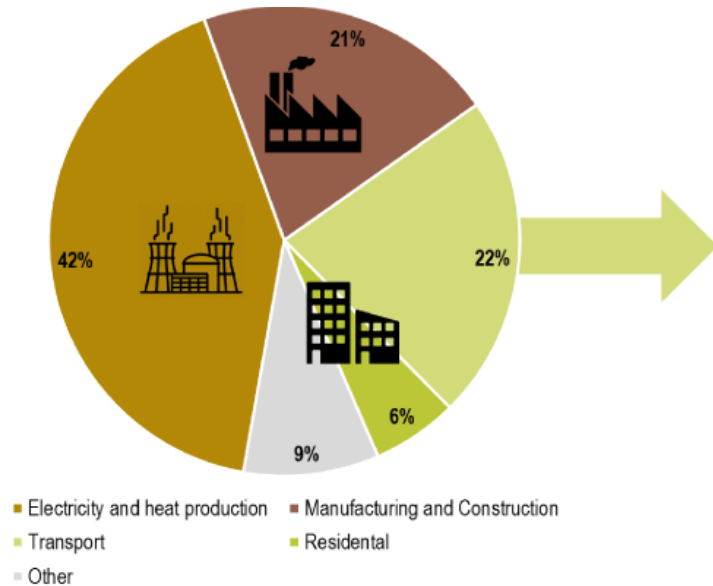
June 19th, 2020



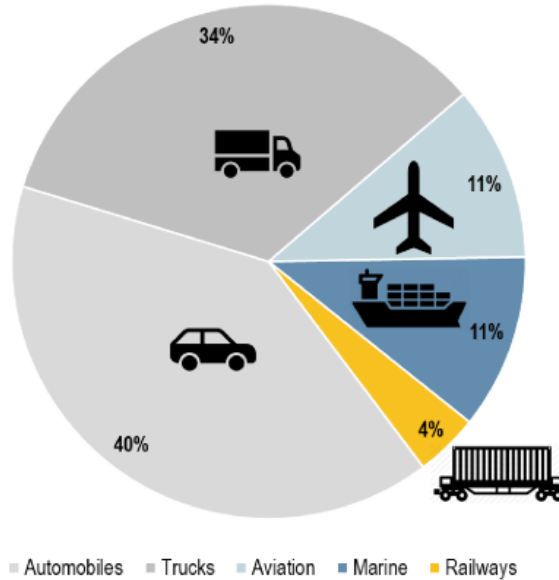
Green Economy & Sustainability

All economic sectors are moving towards the concept of sustainability.

Economic Sector



Transport Sector



2019 Annual Report on CO2 Emissions from Maritime Transport from EC

Maritime transport – a substantial CO₂ emitter

>138 million tonnes of CO₂ in 2018

- Over 3% of total EU CO₂ emissions
- Comparable to the CO₂ emissions of Belgium
- According to projections, CO₂ emissions from maritime transport are likely to grow in the future, reinforcing the need for CO₂ reduction efforts.

>44 million tonnes of fuels consumed

- 70% heavy fuel oils, which is a residual fuel and a heavy pollutant
- 20% marine gas oil and diesel
- 3% Liquefied Natural Gas (LNG)
- Represents around 90% of total marine fuel sales in EU ports.

Source: International Energy Association. IEA and IPCC (2014) Summary for Policymakers.





Intra-Terminal Operations Efficiency

Container Terminal



Seaport

Port of Livorno: from 2018 to 2019, 150.000 tons of CO2 have been produced:

- **56 %** produced by ships
- **37 %** cargo management (eg. yard equipment usage)
- **7 %** other



We need to improve the operational efficiency of the intra-terminal operations without additional investments when possible:

- **Digital Twin**
- **Simulation Tools**



PORTMOD - Optimization Planning Tool for Container Terminal Operations (I)



VTT - Technical Research Centre of Finland

PORTMOD is a modelling tool that aims to find improvements to Container Terminal (CT) operations by simulation:

- Optimize **machine movements** and location of container stacks;
- Evaluate new **equipment solutions**;
- Evaluate container yard **area layout** changes.

It is well suited to analyse historical events and it requires, as input, a complete sequence of incoming and outgoing containers within the studied simulation scope. It includes a graphical user interface with limited functionality for simulation runs, parameter choices and visualization of simulation results.

Haminakotka Port, Finland



Livorno Port, Italy



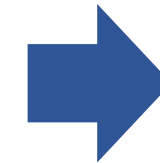
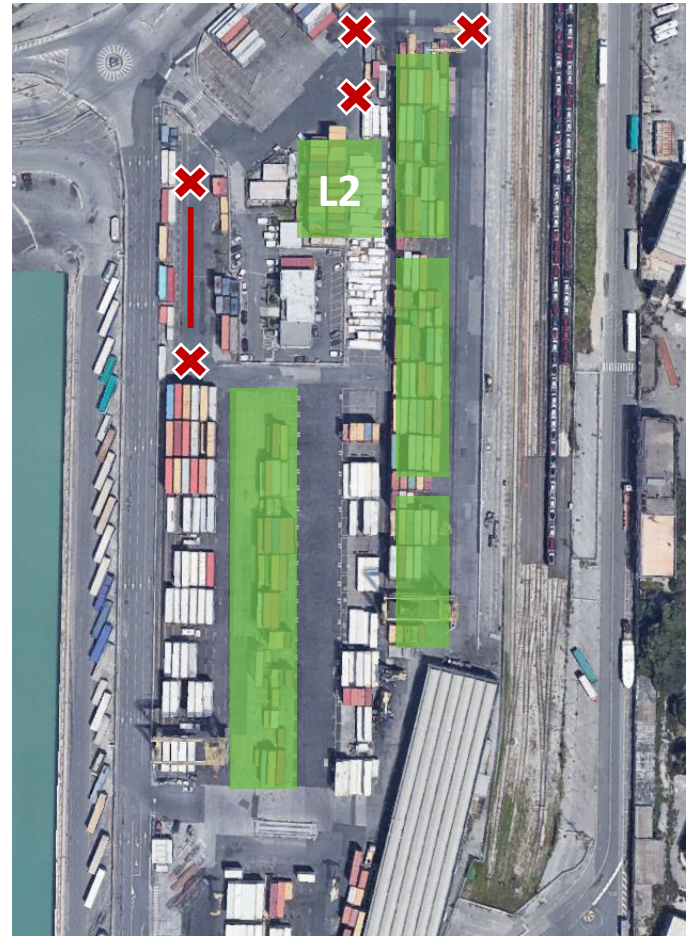


PORTMOD - Optimization Planning Tool for Container Terminal Operations (II)

PORTMOD is able to summarize container flows in order to assist in identifying potential bottlenecks in containers handling operations.

- ✘ Road Vertex
- | Path
- Storage Area

Data from **Terminal Operating System**



.csv-formatted data

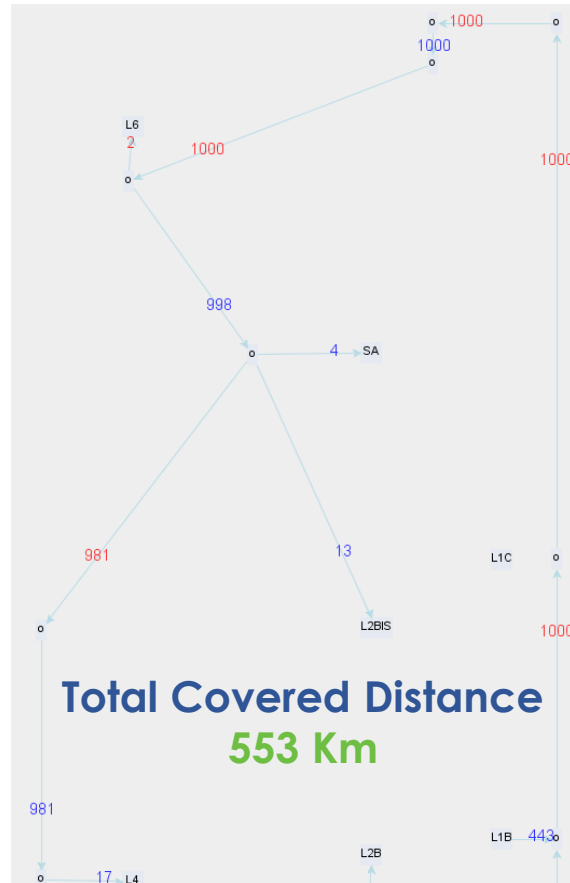


Import data into the tool and run the simulation



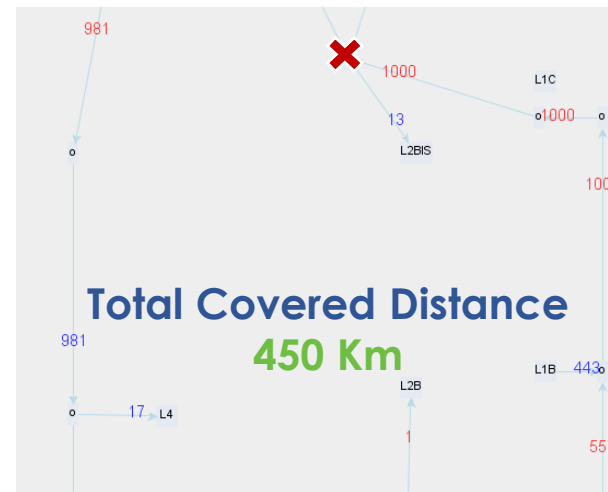
PORTMOD - Optimization Planning Tool for Container Terminal Operations (III)

Original Layout



In order to identify potential bottlenecks as well as improvements in container handling operations, the **state-of-the-art scenario** has been compared with a **simulated scenario** by means of yard area layout changes (**what-if analysis**).

Simulated Layout



Fuel Cost
1.12 Euro/Liter

Vehicles Fuel Consumption
(Average)
13 Liter/h



CO2 Emissions: **34.3 Kg/h (553 Km)**

CO2 Emissions: **27.9 Kg/h (450 Km)**



www.corealis.eu



[corealis_eu](https://twitter.com/corealis_eu)



[COREALIS EU Project](https://www.youtube.com/COREALIS_EU_Project)



[Corealis_eu](https://www.linkedin.com/company/corealis_eu)



info@corealis.eu

THANK YOU FOR YOUR ATTENTION



Mr. Alexandr Tardo

 alexandr.tardo@cnit.it



This project has received funding from the European Union's horizon 2020 research and innovation programme under grant agreement No. 768994