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platform for the implementation of NAIADES II

Review of European data sets and gap identification for external costs calculations on emissions to air by inland navigation

PLATINA SWP 2.2 Knowledge basis for innovation take-up and internalization of external cost

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Presentation Version

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Objectives and scope

- Main objectives:

    – Review quality of datasets for calculation of emissions and external costs for IWT at EU level, in euro per tonkilometer

    – Identify the knowledge gaps for external costs of emissions to air

    – Providing views on how to close the gaps

- Scope:

    – EU level

    – Only emissions to air (no other external costs)

    – Tank to propeller (well to tank excluded)

    – Freight transport

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Research questions

- Which are the main parameters for the estimation of external costs for IWT?

- What are the key factors influencing these parameters?

- What is the bandwidth in the values and how does this influence the outcome?

- What data collection is needed per parameter?

- To what extend is the required information available on a European level?

- How can the reliability of the datasets be improved?

- How can the gaps be closed for parameters that are not being measured?

- What is the advisable regularity for measuring and monitoring?

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Structured in different areas (1/2)

- **Logistics parameters (transport efficiency):**

  - Loading capacity of vessels
  - Loading factor of loaded trips
  - Loaded kilometre factor

- **Energy consumption:** the energy consumption is determined by **models**:

  - Waterway parameters: depth, width and current
  - Vessel related parameters: vessel size, draught, installed power and specific fuel consumption

  The interactions between the waterway and vessel, provide input on:

  - Operational speed and the respective power needed

- The vessel related parameters depend also on the logistics data: average load factor => draught of vessel => resistance => energy consumption, emissions.

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Structured in different areas

- **Emission parameters:** emissions produced per km sailed estimated using **emission factors**, generally expressed in **g/kWh** (power output of the engine) or **g/MJ** (fuel consumption).

- **Parameters for the monetisation of emissions:** Cost factors per unit of a pollutant, also known as 'shadow prices'. Monetary values (income elasticity of willingness-to-pay [WTP] and macro-economic parameters)

- **Aggregation:** to convert the external costs from €/vkm into €/tkm, input is needed on: ton-kilometres (tkm) per region or country or vessel kilometres (vkm) per region or country.

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Logistic parameters

- The **load factor** of a loaded trip will vary depending on the available water depth => free-flowing sections
- There is a huge gap regarding information on the empty trips
- Eurostat statistics: only two categories for vessels over 1500 tonnes.

Energy consumption

- Specific energy consumption values may differ from waterway to waterway and per vessel type. Models used to estimate fuel consumption.
- Data about sailing speed is a big gap

Emission parameters

- Real emission factors of engines in practise: NO_x and $PM_{2.5}$
- Emission factors for LNG engines are hardly known yet.
- Information on auxiliary engines is missing

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Monetisation
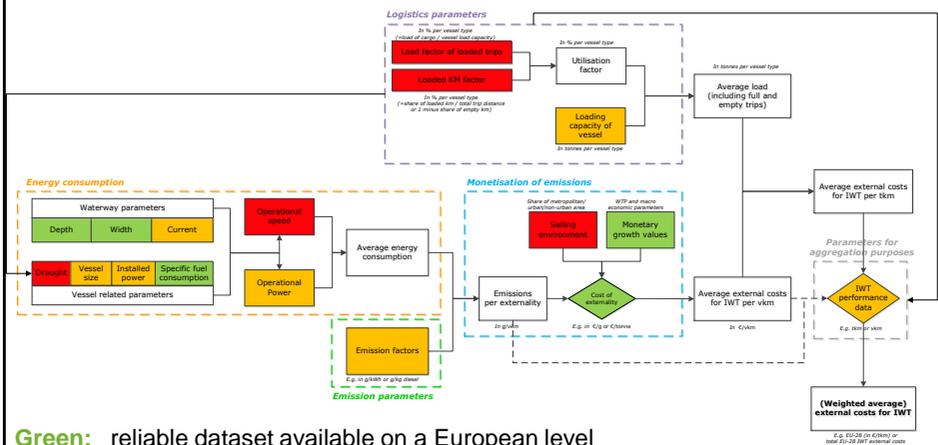
- Large differences between countries and type of areas as regards the shadow prices for NO_x and $PM_{2.5}$. Detailed information on the geographic breakdown of the traffic and transport performance is needed

Aggregation

- No complete and reliable datasets are available on a European level on vessel kilometres and average load factor
- More differentiation needed between vessel size classes
- The largest gap: empty trips, **voluntary** Eurostat datatable (B2).
- Significant information about IWT gets lost when translating information from a single dataset per trip to the aggregated Eurostat statistics.

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Main gaps

Green: reliable dataset available on a European level

Orange: improvements needed on the current dataset to enhance the reliability

Red: no dataset available on a European level

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Concluding

- Weak basis for making reliable calculations. Most important gaps:

  - the lack of reliable and detailed data on the **fuel consumption** of vessels active in inland waterway transport

  - lack of reliable data on the **average tonnage carried** by inland vessels per travelled kilometre, properly taking into account the <u>share of empty trips</u>

  - lack of **geographic detail** to determine impact of NO_x and $PM_{2.5}$ emissions by IWT
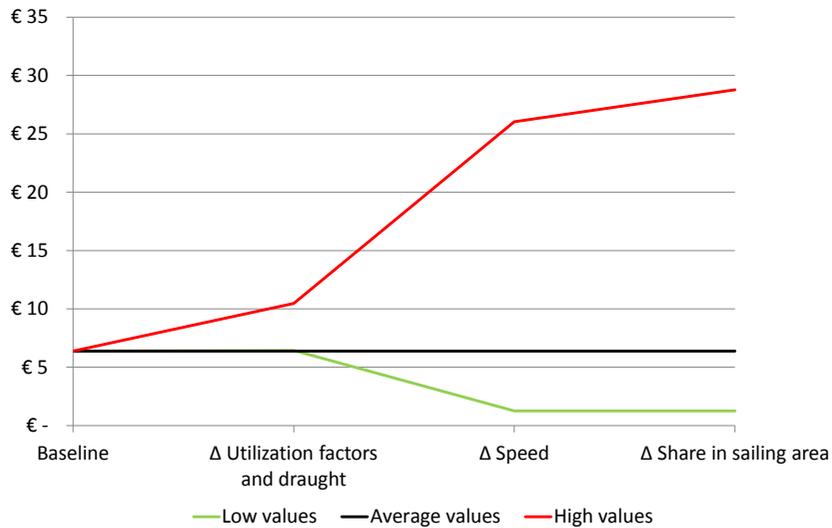
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Sensitivity (1/2)

	Extreme values observed leading to lower external costs per tkm	Base line situation, average values used in IWT external cost studies	Extreme values observed leading to higher external costs per tkm
Utilization factor (load factor x load km factor)	62%	52%	25%
Load factor of a loaded trip	75%	68%	55%
Speed	8 km/h	15 km/h	18 km/h
Sailing environment	100% non-urban	5% urban and 95% non-urban	14% urban metropolitan, 53% urban, 33% non-urban

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Sensitivity (2/2)

Chart showing € values from € - to € 35 across categories: Baseline, Δ Utilization factors and draught, Δ Speed, Δ Share in sailing area.

Legend: —— Low values —— Average values —— High values

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Recommendations (1/2)

Address first the largest gaps and the highest impacts:

1) Fuel consumption and sailing speeds
- Real measurements of fuel consumption (detailed)
- Model based assessments

2) Loading factors
- Use existing datasets: DESTATIS institute and Austrian statistics office.
- Sailed (empty) kilometres: Automatic Identification System (AIS) data in combination with information on the kilometres of loaded trips

3) The impact of air pollutants NOx and PM and the geographic location of emissions to air by IWT
- Statistical information on the population densities per NUTS 3 region
- GIS application, OD freight data and traffic flows by IWT, e.g. AIS

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Recommendations (2/2)

- Focused first on those countries and waterways with the following characteristics:
  - High share in the tonkilometre performance of IWT
  - Where the shadow prices for $PM_{2.5}$ and NO_x emissions are high
  - Where parameters change dynamically
  - Where the available data is relatively weak

- Expand legislative basis for statistics on European level:
  - information on empty trips mandatory
  - further differentiate the vessel types and regional areas
  - information on emission profiles and engines installed in IWT (e.g. EHDB)

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Next steps

- A workshop with policy makers and experts from the waterway authorities and statistical institutes

- A discussion with a broader group of stakeholders and to discuss in particular the solutions and quick wins to close the gaps and the next steps.

- Subsequently, the results will be integrated in a final report scheduled for end of 2015

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Thank you for your attention!

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