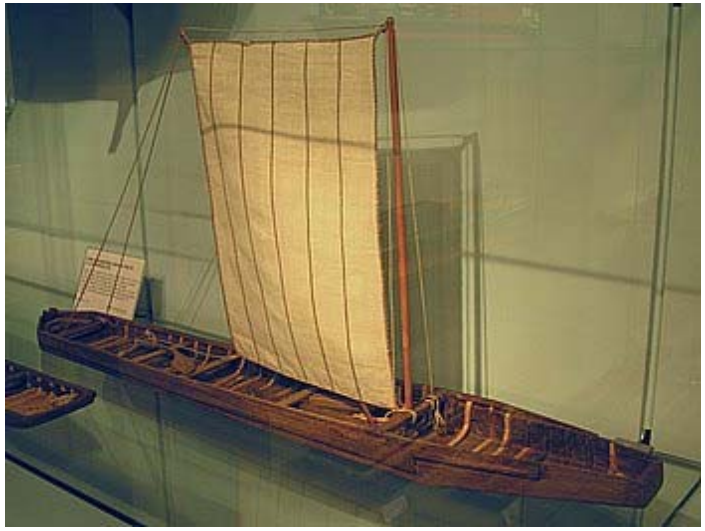
Climate change and inland shipping



Old Roman Rhine vessel

Container vessel “Jowi”

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This paper is based on the tentative results of the National Research Program 'Knowledge for Climate', working group: Climate change and inland shipping

Partners:

- Arcadis
- Deltares- Delft
- Rijkswaterstaat / DVS
- TNO-Mobility and Logistics
- VU-University Amsterdam
- University of Technology Delft / CiT&G

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Climate change and inland shipping

1. **Present** and **future** problems ?
2. **Analysis** of working group
3. **Short** term and **long** term solutions ?
4. What will be the right **policy** ?

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What are the present problems ?

- In ‘dry’ years, like 2003, with periods of **low discharges** of the river Rhine, there are already **strong restrictions** to the loading capacity of the main inland vessels.

- In ‘wet’ years, like 1995, with periods of **high discharges** there are already **some restrictions** to the heigth of (container) vessels with respect to bridges and some speed limitations because of dike (in)stability.

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What are the future problems ?

- Due to climate change the expectation is that there will be a sea level rise of 1,30 m in 2100. So the Maeslant barrier will close more frequent (1*/10yr > 30*/yr).

- Due to climate change the expectation is that there will be more fluctuation in the discharges of the river Rhine, e.g. in 2050 the ‘dry’ year 2003, will be an average one.

- Together with the continious upsizing of inland vessels, there will be even more restrictions to the loading capacity and/or height at that time (2050 / 2100).

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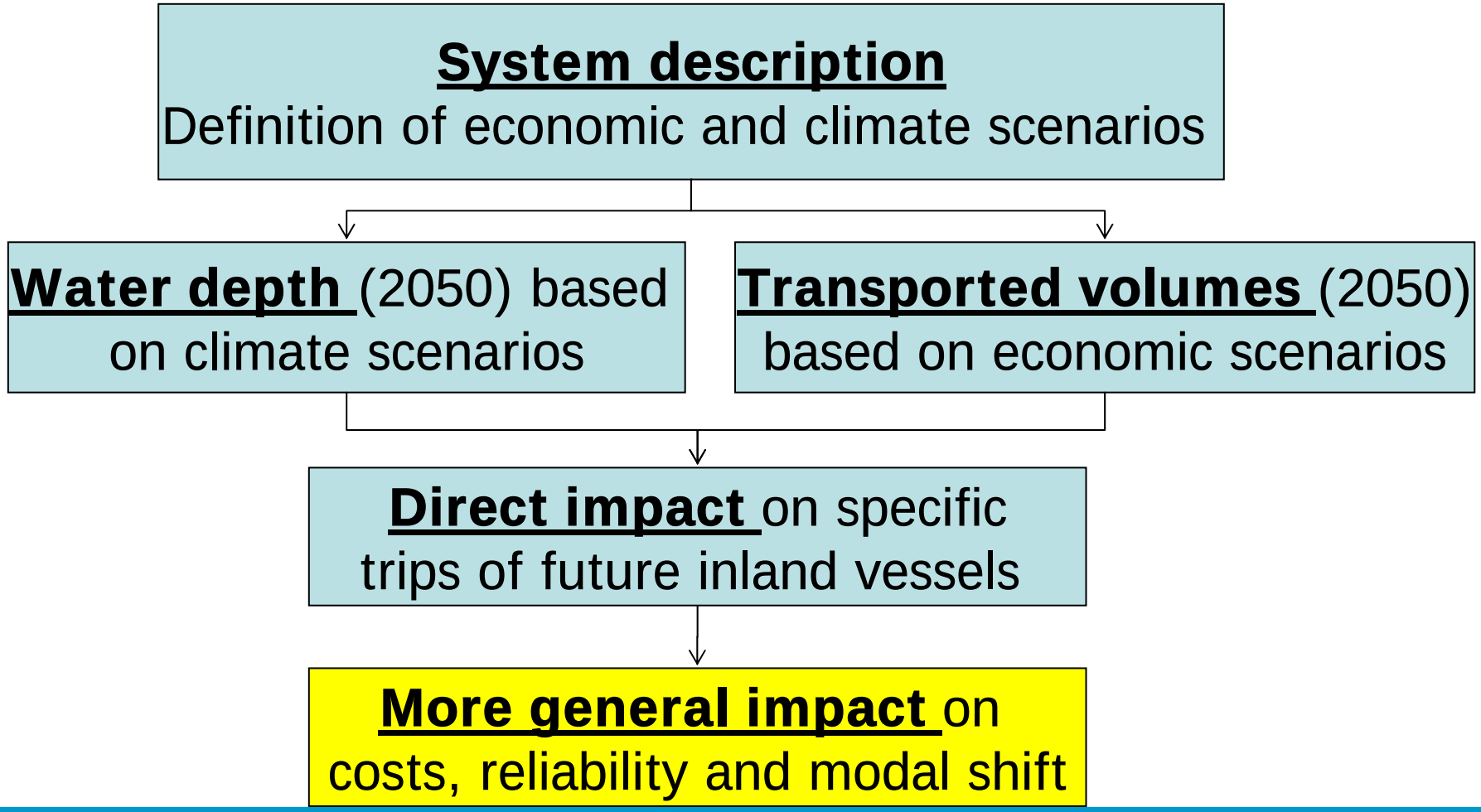
Analysing steps of working group:



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Results working group so far:

1. In 2050, with high economic growth and climate change, then in worst case 10 days periods 35% of the volume is infeasible and 10% is still feasible, but at higher costs.

2. The increase in unreliability and higher costs leads to a modal shift of 26% of the volume, of which ¾ to rail and ¼ to road transport.

3. In 2050, the closing frequency of the Maeslant barrier may be 1 in every 5 years, but will have no substantial impact on inland waterway transport.

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What are short term solutions ?

- Better **Information management**: More acurate actual and forecasted waterdepth, draught, heigth, etc.
- More adequat **River management**: Local dredging, local suppletion, etc.
- **Logistic management**: More stock or storage capacity, other routes, modal shift, extra handling facilities, etc.
- **Added buoancy** at critical locations (by ship camel)

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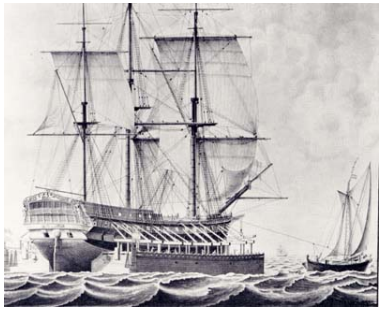
Added buoyancy ? What's new!



Ship camel, Amsterdam, the Netherlands, 1690 !

Airbags, Quingdao, China, 2010

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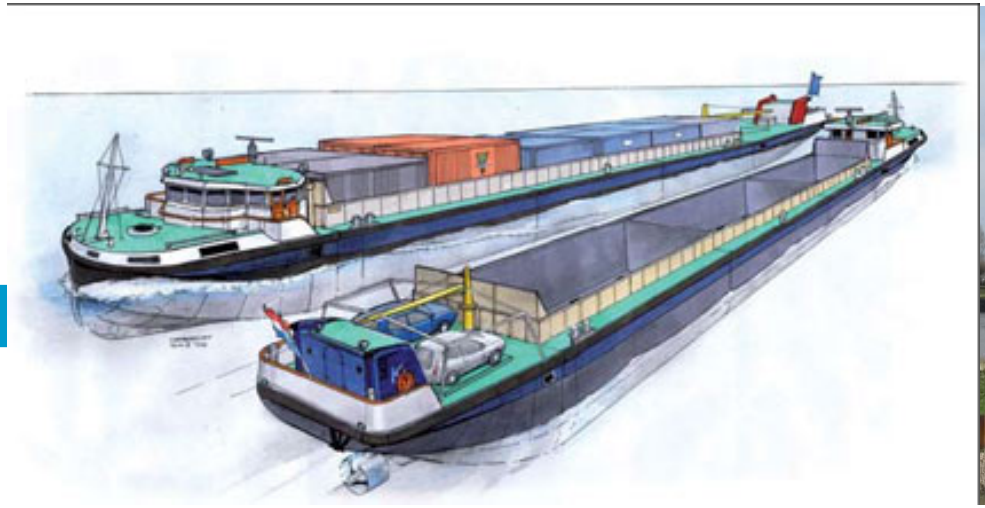
What are long term solutions ?

- **Fleet management**: Vessels with smaller draft, so broader, longer, light weight, extra buoyancy, etc.

- **River management**: Movable weirs, movable groins, reservoirs and retention basins, etc.



What will be the right policy ?

- Calculate costs and benefits of most promising short term and long term solutions.
- Try to convince stakeholders to make first small steps in their part of the (short term) solution.
- Monitor the developments of the main aspects to see if more (long term) solutions are needed.