Kennis voor Klimaat
Knowledge for Climate

Impacts of climate change on inland waterway transport; a literature survey.

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Agenda

- Knowledge for Climate
- Research question
- Climate scenarios
- Relevance
- Results
- Conclusions

Knowledge for Climate

Research programme for development of knowledge to climate proof the Netherlands.

Focus on 8 areas (hotspots). Characteristics hotspots:

- vulnerable
- economic importance

Current paper: hotspot Rotterdam

Research question

What is the current status of the literature regarding the effect of high/ low water levels (climate change) on inland waterway transport on the river Rhine w.r.t. the next factors:

- reliability
- transport costs
- share in modal split

Relevance

Transport costs and reliability are important determinants for the competitive position of inland waterway transport → may also affect competitive position Port of Rotterdam.

By means of literature study insight into current knowledge on effect of climate → transport costs, reliability, mode share inland waterway transport → determines focus of future research.

Results, transport costs

Study	Cost increase (annually)	Time horizon	Region	Low/ high water
Millerd, 2005	+3% - 14%	2001 - 2030	Great lakes, USA/ Can	Low
Millerd, 2005	+6% - 22%	2001 - 2050	Great lakes, USA/ Can	Low
Olsen, 2005	-44% - +35%	2002 - 2100	Middle Mississippi, USA	Low + high
Nomden, van Deursen, 1999	+10%	+-1990 - 2050	Rhine	Low + high
Jonkeren et.al., 2007	+15%	2004 - 2050	Rhine, Kaub	Low
RIZA, 2005	+54%	Average (1901 – 2000) – 2050	NL, domestic	Low

Results, transport costs

Differences in:

- climate scenarios
- time horizons
- geographical scope
- models

result in a wide range of outcomes.

Results, reliability

Reliability: degree (%) to which shipments arrive on time in a specific period (month/ year).

Not one study that specifically focuses on effect climate change on reliability inland waterway transport → focus on importance of reliability of inland waterway transport for shippers.

Importance of reliability compared to other determinants of mode choice.

Results, reliability

Study	Geographical context	Transport modes	Importance reliability
Beuthe and Bouffioux, 2008	Belgium	Road, rail, inland waterways, sea	Reliability judged as 4th important attribute out of 6 attributes.

	Road	Rail	Inland waterways	Sea	Air
Point of time or time frame	64.4%	77.8%	64.2%	65.4%	68.7%
On time is not important	35.6%	22.2%	35.8%	34.6%	31.3%

Source: Kouwenhoven et al.(2005)

	Inland waterways more reliable	Inland waterway less reliable
Road	22%	31%
Rail	20%	7%

Source: (I&O Research, 2009)

Results, mode share

Study	Δ share inland waterways	Time horizon	Region	Low/ high water
Jonkeren e.a., 2009	- 5,4%	W+: 1990 - 2050	Rhine, Kaub	Low
BfG, 2006	- 5,1%	2002 - 2050	Germany	Low

Conclusions

Transport costs: estimations vary between -44% to +35% for north American studies and +9% to +54% for European studies. Reasonable number of studies. Estimations in same direction.

Reliability: no studies on effect climate change on reliability inland waterway transport. No consensus on importance of reliability for shippers → more research needed.

Modal share: only a few studies (2 studies, ±5%) → more research needed.