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# Economic impact of droughts on inland navigation



CCR 18/01/2023

# Introduction and Background



Commissioned by De Vlaamse Waterweg, Panteia has conducted research on the economical damage of drought for inland navigation in Flanders



The aim of this study was to visualise the economic impact of the low water levels during the past dry periods in Flanders for the inland navigation sector, shippers and society



This involved assessing the direct and indirect costs, as well as the long-term effects on the operations of companies using the waterway.

# Introduction and Background

## 3 sections:



1. Hydrological and climatic framework, including climate change effects



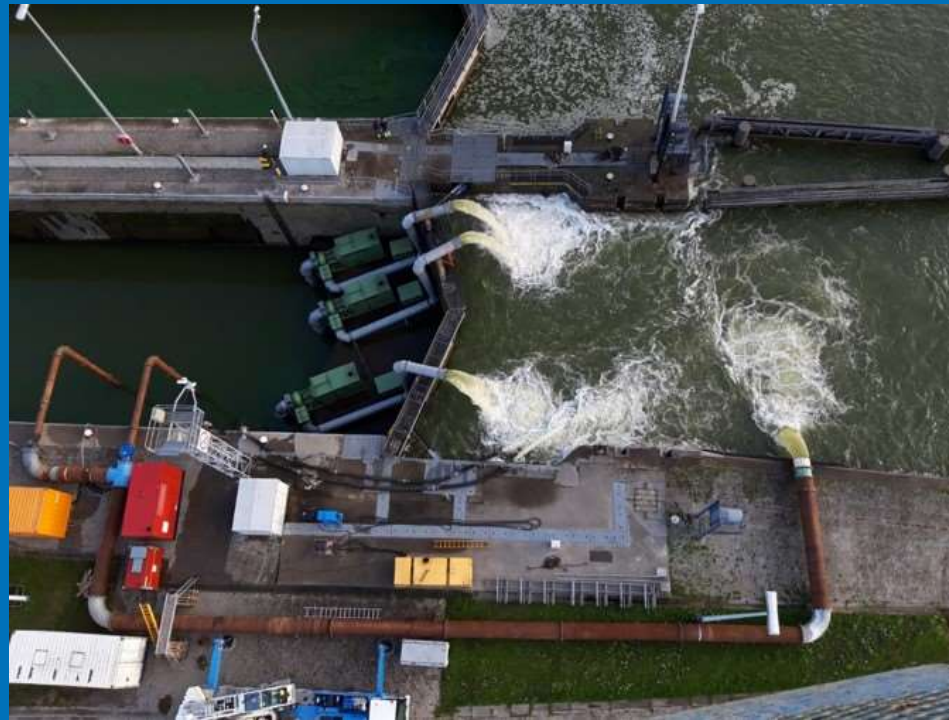
2. Economic impact for different sectors as result of drought on the Rhine and Flemish waterways.



3. Development of river discharges; risks and opportunities



# Section 1: Hydrological and climatic framework





# Hydrological and climatic framework

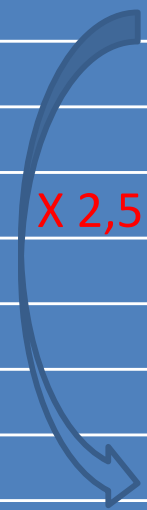
- Due to droughts, reduced discharge and low water levels can lead to an impact on inland navigation through measures such as draught restrictions, lock restrictions and navigation bans.
- In Flanders restrictions are linked to drought levels defined in the “Flemish reactive consideration framework on priority water use (VRAG)”:
  - Drought level 1: The water system may come under pressure with risk of water scarcity if no precautions are taken. The level corresponds to the “alarm” phase
    - Associated measures: grouped locking and navigation ban or restrictions for pleasure boats
  - Drought level 2: The water system reaches critical level where water scarcity effectively occurs. The level corresponds to the “crisis” phase
    - Associated measures: draught restrictions, if water level is lower than the target level, navigation ban, if water level is lower than the minimum level



# Hydrological and climatic framework

Frequency of occurrence in % of time	Scheldt and Lys	Meuse
<b>Current situation</b>		
Implementation drought level 1	23	8
Implementation drought level 2	2	0
<b>Measures:</b>		
Navigation ban pleasure boats	25	8
Grouped locking	25	8
Draught restrictions	1	0
Navigation ban	<1	0
		X 4
<b>Jaar 2100 (extreem klimaatscenario)</b>		
<b>Measures:</b>		
Navigation ban pleasure boats	63	30
Grouped locking	63	30
Draught restrictions	18	1
Navigation ban	0	<1

X 2,5



X 4





## Section 2: Economic and societal impacts





# Economic and societal impacts

- The damage to inland navigation varies greatly from year to year
  - The impact (on Flanders) of low water levels on the Rhine is very strong in the years 2018 and 2017
  - The impact of one month with average low water levels on the Rhine (such as January 2017) is equal to the impact of whole Q2 and Q3 drought and low water levels on the Flemish navigable waterways.
- The research findings were tested in interviews with stakeholders, which confirm the line of conclusions, although they could not link amounts to it





# Economic and societal impacts

- On the Rhine, the short-term economic effects can be positive, but only for some inland navigation operators and when navigation is still possible or when they can offer barges capable of navigating in low water conditions. In particular, companies operating on the spot market can benefit from low-water surcharges and a more favourable ratio between demand for vessel capacity and supply of vessel capacity. This is only true in the short term. In the long-term low waters have an impact on the reliability of inland navigation and can lead to a negative modal shift.
- The Flemish inland navigation managed to generate a total of €74 million extra turnover in 2018 due to the low water levels. However this was offset by €59 million in fuel and labour costs. Result: A net profit increase of €15 million for the carriers.
- However, shippers pay for this transport and that is where the damage is much greater. Shippers had to pay a total of €56 million extra for transport in 2018. On top of that, stocks were depleted and had to be replenished at €14 million. So the net damage to shippers was €70 million in 2018.



# Economic and societal impacts

- The impact of drought on Flemish waterways is smaller. In 2017: €1 million damage; €0,3 million in 2018; €16,75million in 2019; €9 million in 2020
- Most impact on Chemical and Steel industry
- Production processes that should not be interrupted are particularly at risk.
- Agriculture has been hit less hard by mainly landings from northern France, via smaller waterways with a smaller draught, anyway with smaller vessels and lesser impact of draught restrictions.
- Negative modal shift with a magnitude of 185.000 tonnes to 380.000 tonnes (container and construction materials)



# Indirect impact and societal cost

- Due to drought less efficient operation of inland shipping => increase in CO2 and air pollution.
- Reduction of transport capacity leads to production restrictions. It mainly affects large multinationals in Port of Antwerp. An econometric analysis shows that these production restrictions had a value of €160 million in 2018.
- The port of Ghent is significantly affected, due to lock restrictions at the Terneuzen locks.



# Total economic effects

	2017	2018	2019	2020
Direct effects of low water on the Rhine for Flemish inland navigation companies and shippers	-16,41	-55,44	0	0
Direct effects of low water on the Flemish waterways for Flemish inland navigation companies and shippers	-1,07	-0,37	-16,75	-8,99
Indirect effects (production restrictions, emissions, impact on sea harbours)	-22,57	-227,19	-4,43	-0,68
<b>Total (million euro)</b>	<b>-40,05</b>	<b>-283,00</b>	<b>-21,18</b>	<b>-9,67</b>



# Part 3: Development of river discharges; risks and opportunities





# Development of river discharges; risks and opportunities

## Discharges on the Rhine

- Currently the year 2018 has a return period of 60 years, in the future this will be a return period of 10 years
- A year such as 2016/2017 with a 'normal low-water period' occurs once every 5 years, in the future, this will be once every 2 years.
- The damage for the Flemish economy is now estimated at € 13 million per year and will increase in the future (>2050) to € 48 million.

## Discharge on the Meuse, Albert Canal and Campine Canals

- The occurrence of lock restrictions will increase from 8,1% to 29,8%.
- The damage caused by low water levels on Flemish waterways is estimated at €3,5 million a year and will increase to €13 million.



# Development of river discharges; risks and opportunities

## Opportunities:

- Take measures to retain water longer (Blue Deal, Pumping installations)
- Beter equipped ships for low water conditions.
- Logistic optimisation between, shippers, carriers and ports.
- Implementing higher reference levels before drought periods
- Development op digital watermanagement tools

# Hydropower and pumping installation on the locks of the Albert Canal

- <https://www.youtube.com/watch?v=2q877Q7CeIE>

