

How to achieve a

sustainable Baltic Sea

with the help of GIS (and ESRI)

Mike Haufe

HELCOM

Hello! I am Manuel Frias.
I dare to say that after this presentation you'll be a lot wiser. Isn't it so, Joni?





True, Manuel! Hello, I am Joni Kaitaranta and among other things you will know that the Baltic Sea is fragile…





…and that it’s is not feeling good…



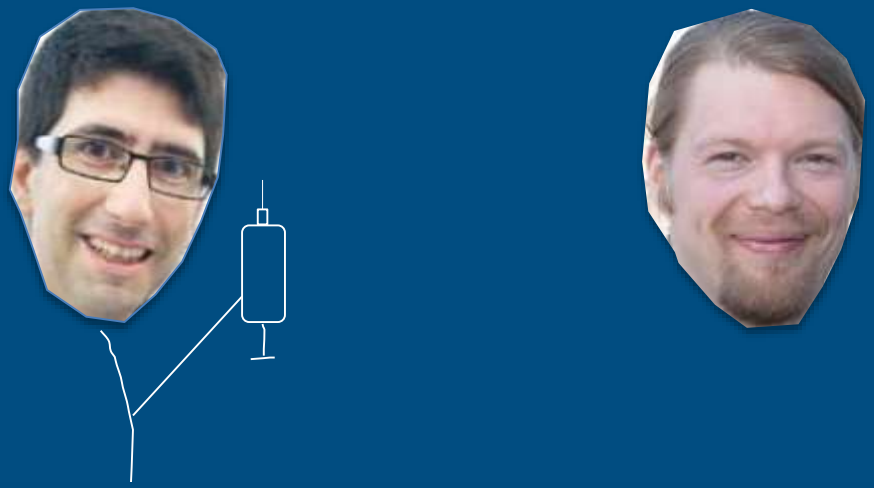


…and that there is a thing called HELCOM who is a kind of a doctor of the Baltic Sea…





…and that there is
a medicine called
Geographical Information
System (GIS)…



Exactly! But let's stop talking. Shall we start?





Yes! Let's go!





The Baltic Sea is unique and fragile

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The Baltic Sea is surrounded by 9 countries
Sweden
Norway
Finland
Baltic Sea
Estonia
Latvia
Lithuania
North Sea
Denmark
United Kingdom
Ireland
Belarus
Netherlands
Poland
Belgium
Germany
Czech Rep
Slovakia
Ukraine
Austria
Moldova
Hungary
Bay of Biscay
France
Romania
Croatia
Serbia

But the catchment area covers 14 countries



The catch…what?



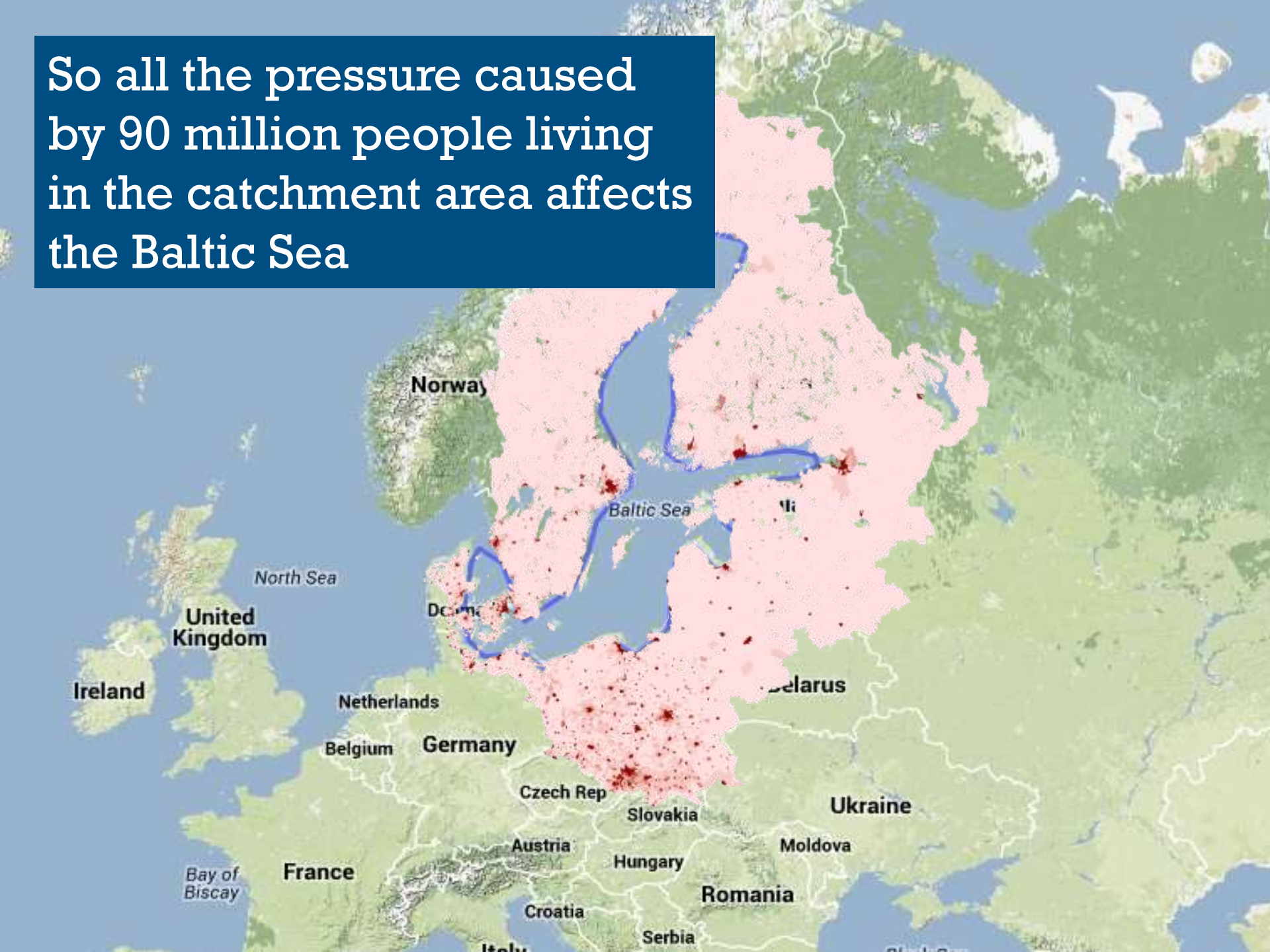
The catchment area means that if a cow poo in, say, Belarus



Norway
Baltic Sea
North Sea
United Kingdom
Ireland
Netherlands
Belgium
Germany
Czech Rep
Slovakia
Ukraine
Austria
Moldova
Hungary
France
Bay of Biscay
Romania
Croatia
Serbia

That poo will end up possibly in the Baltic Sea




So all the pressure caused by 90 million people living in the catchment area affects the Baltic Sea
Norway
Baltic Sea
North Sea
United Kingdom
Ireland
Netherlands
Belgium
Germany
Belarus
Czech Rep
Slovakia
Ukraine
Austria
Moldova
Hungary
France
Bay of Biscay
Romania
Croatia
Serbia


This pressure affects a rather small area
Sweden
Norway
Finland
Baltic Sea
Estonia
Latvia
Lithuania
North Sea
Denmark
United Kingdom
Ireland
Belarus
Netherlands
Poland
Belgium
Germany
Czech Rep
Slovakia
Ukraine
Austria
Moldova
Hungary
Bay of Biscay
France
Romania
Croatia
Serbia

Almost the size of Spain



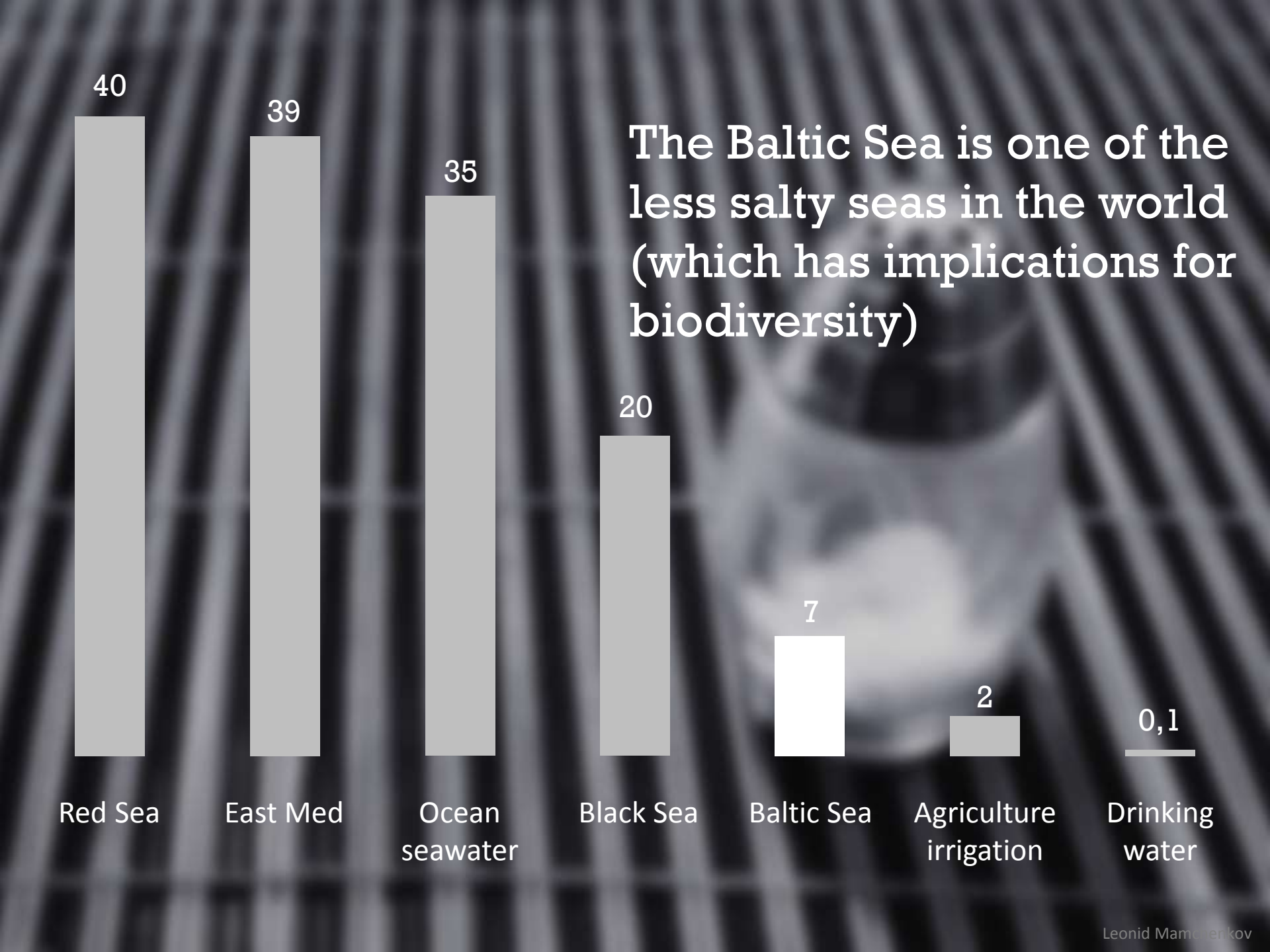
Very small at global scale!



For example, how many Baltic Seas fit in USA?



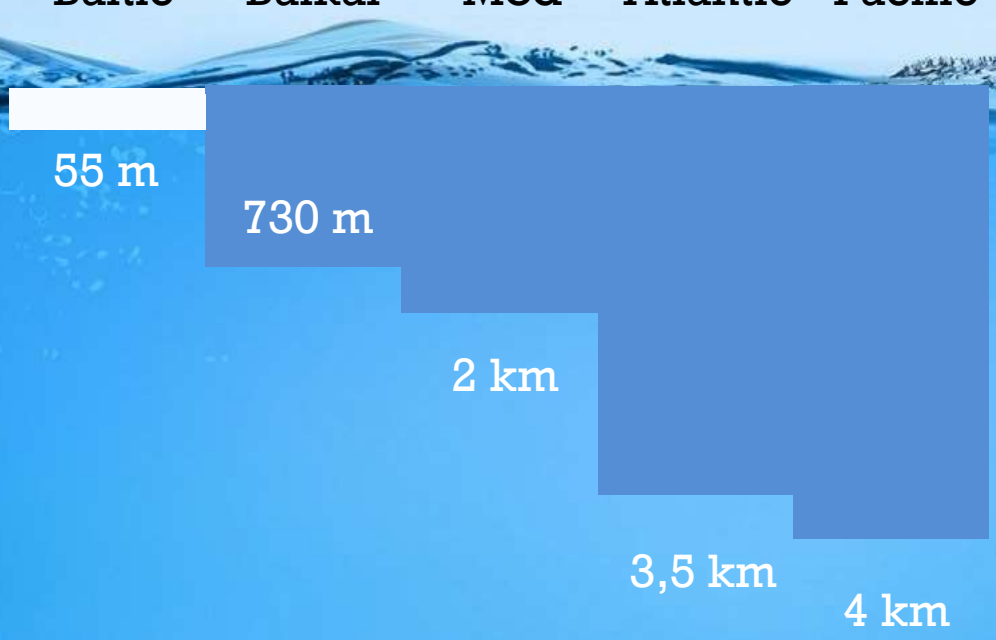

About 15!
Russia
Canada
Mongolia
China
South Korea
Japan
North Pacific Ocean
Mexico
Thailand
Venezuela
Colombia
Indonesia
Papua New Guinea
Peru
Bolivia
Australia
South Pacific Ocean
Chile
New Zealand



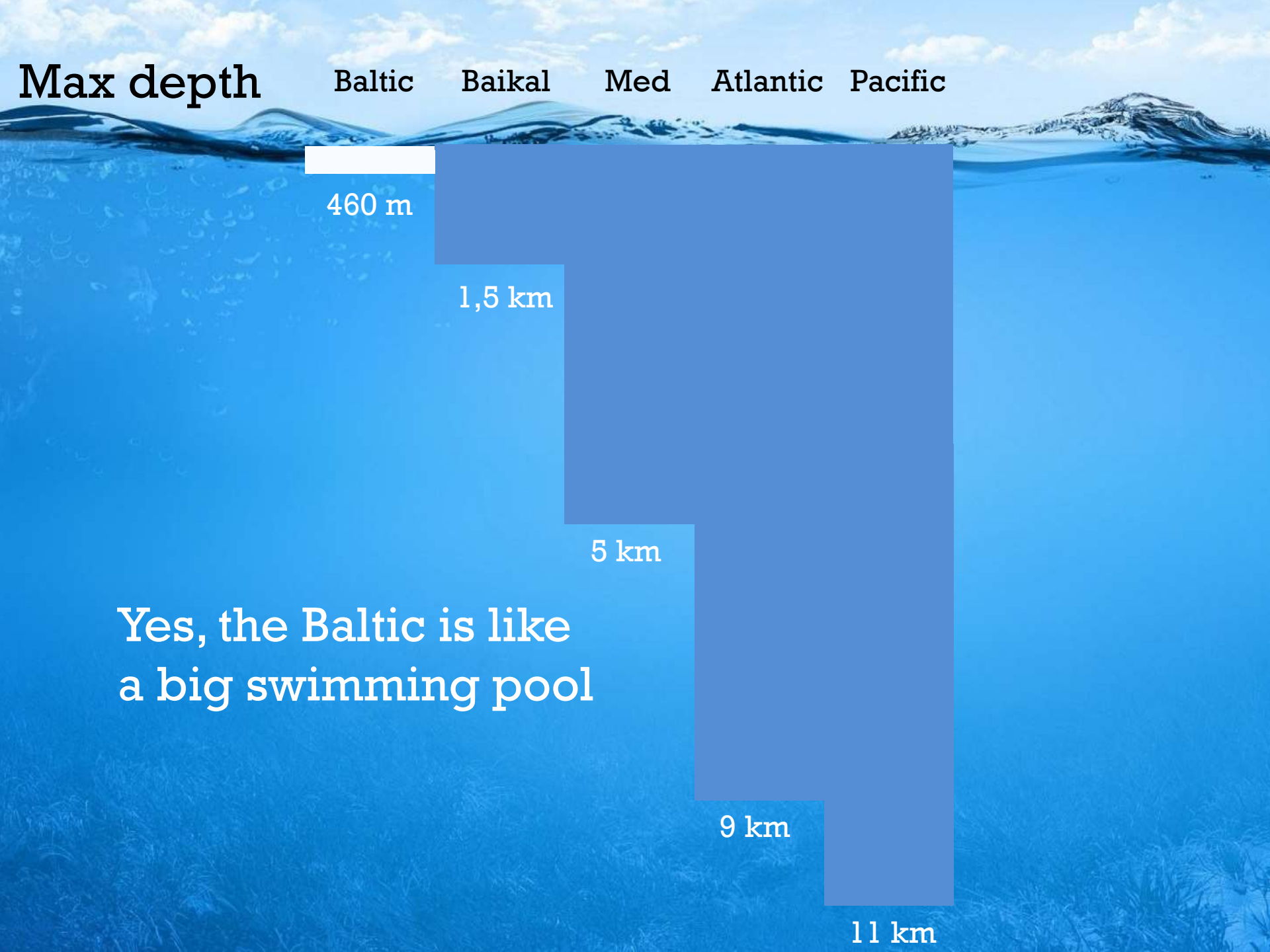
The Baltic Sea is one of the less salty seas in the world (which has implications for biodiversity)

Leonid Mamchenkov

Mean depth



It is also one of the shallowest seas in the world


Max depth
Baltic
Baikal
Med
Atlantic
Pacific
460 m
1,5 km
5 km
9 km
11 km
Yes, the Baltic is like
a big swimming pool

The Baltic Sea is unique.
These special characteristics
make it very fragile…





Our dear sea has been so sick… and still is! That's why HELCOM exists.



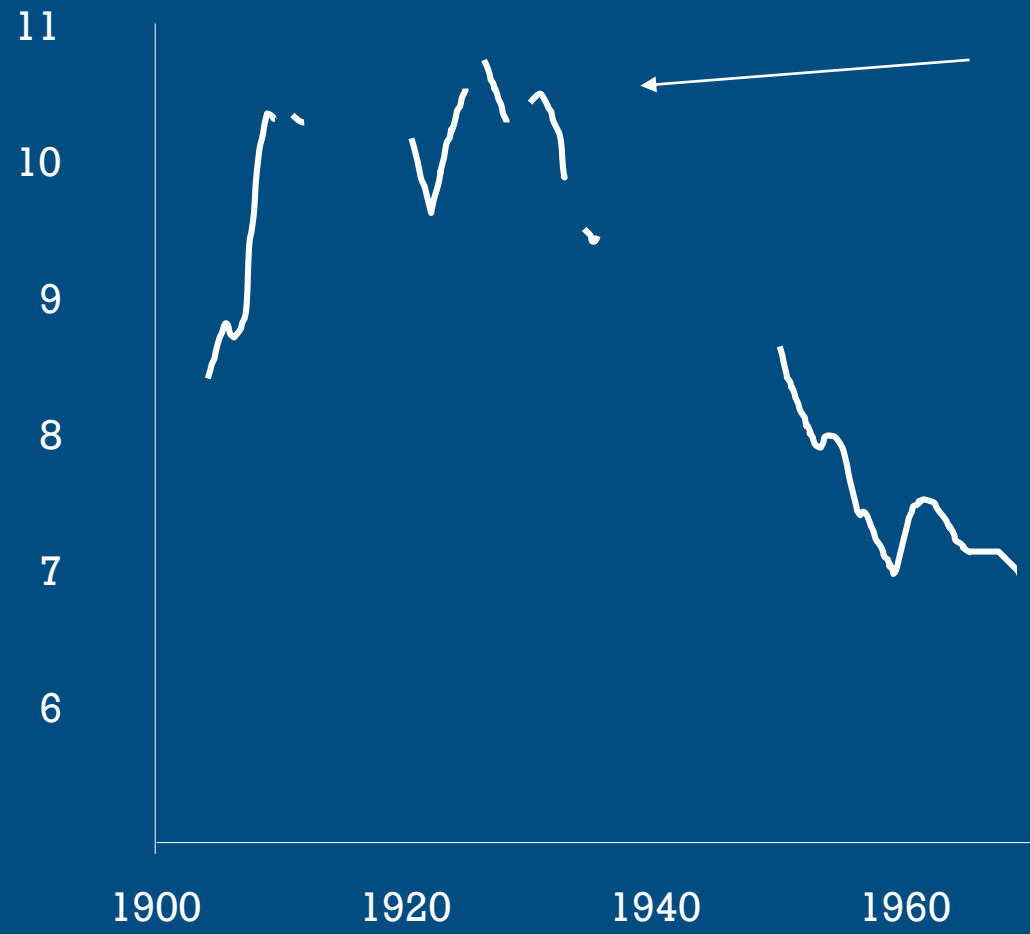


HELCOM? What's that?

HELCOM

WATER CLARITY summer Secchi depth

In meters

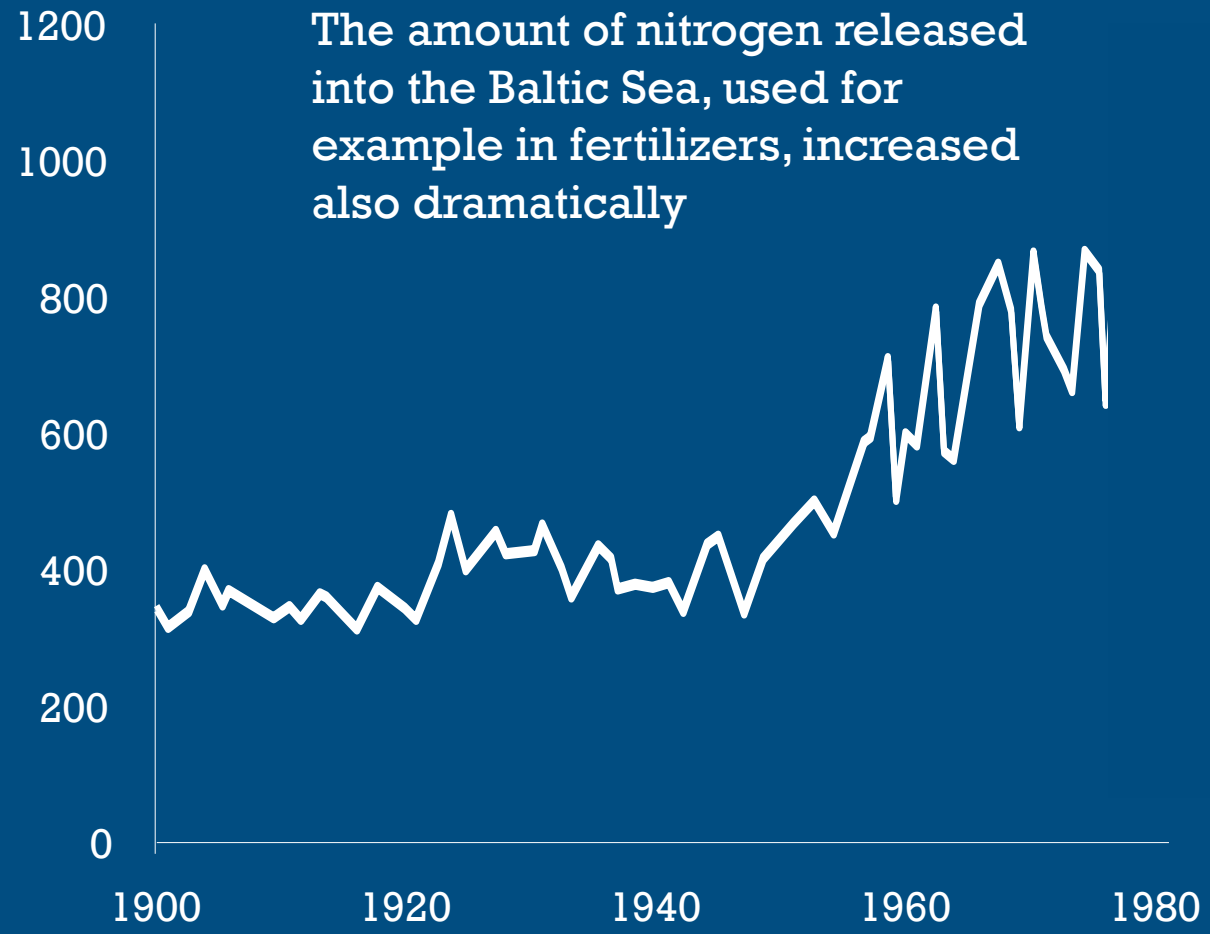


In the beginning of the century the water was clear

But the population increased dramatically from the 50's and therefore its needs (more shipping traffic, more agriculture, more waste water…)

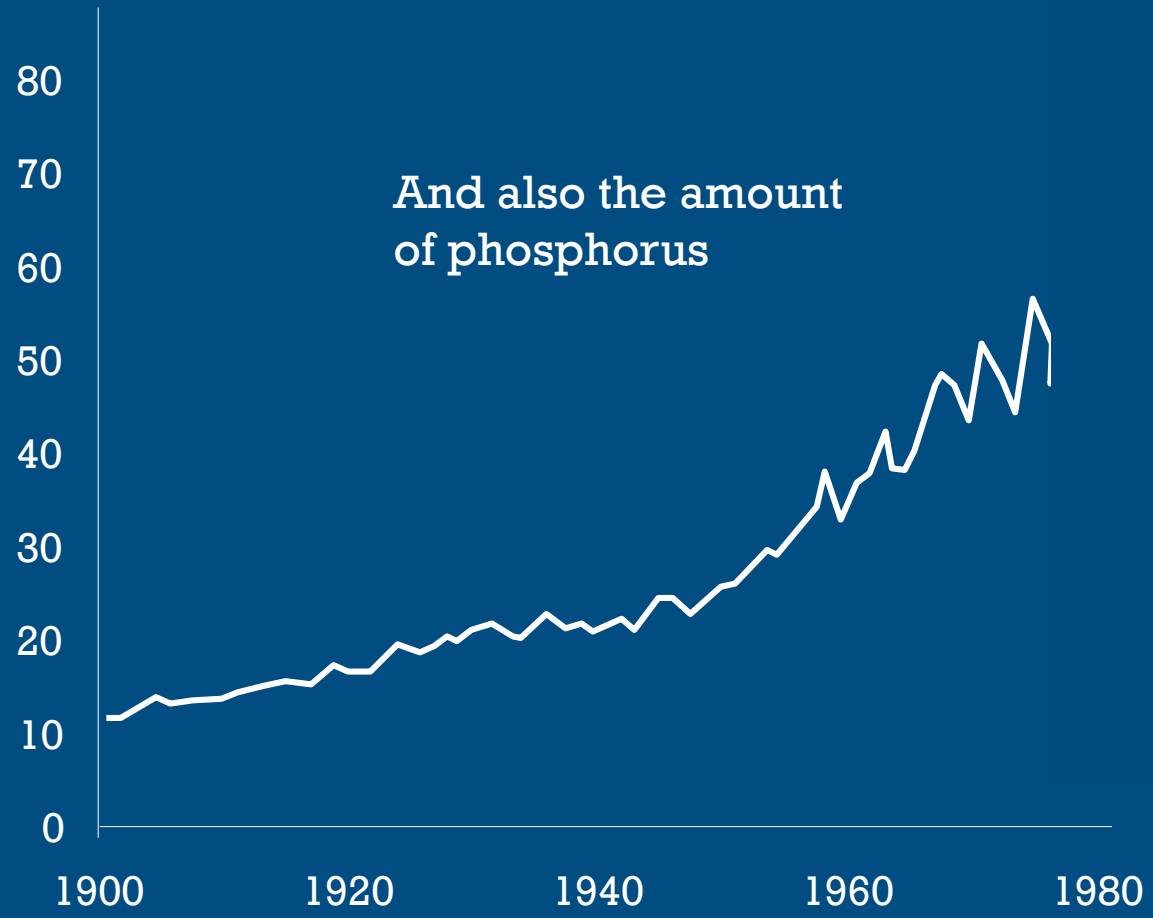
NITROGEN waterborne inputs via waterways

Tons per year (t/a) in .000



PHOSPHORUS waterborne inputs via waterways

Tons per year (t/a) in .000




The excess of nitrogen and phosphorus causes EUTROPHICATION, one of the main problems of the Baltic Sea

In 1974, all countries around the Baltic Sea decided to react and signed the HELSINKI CONVENTION to protect the marine environment.














The Helsinki Commission (HELCOM) was established in order to apply the Convention. It is formed by all representatives of the 9 governments around the Baltic plus the EU



And the first HELCOM Secretariat was formed in 1981. The Secretariat coordinates HELCOM activities.

An important task of the Secretariat is to host and manage data





HELCOM has moved from hand-drawn maps to cutting-edge mapping technology





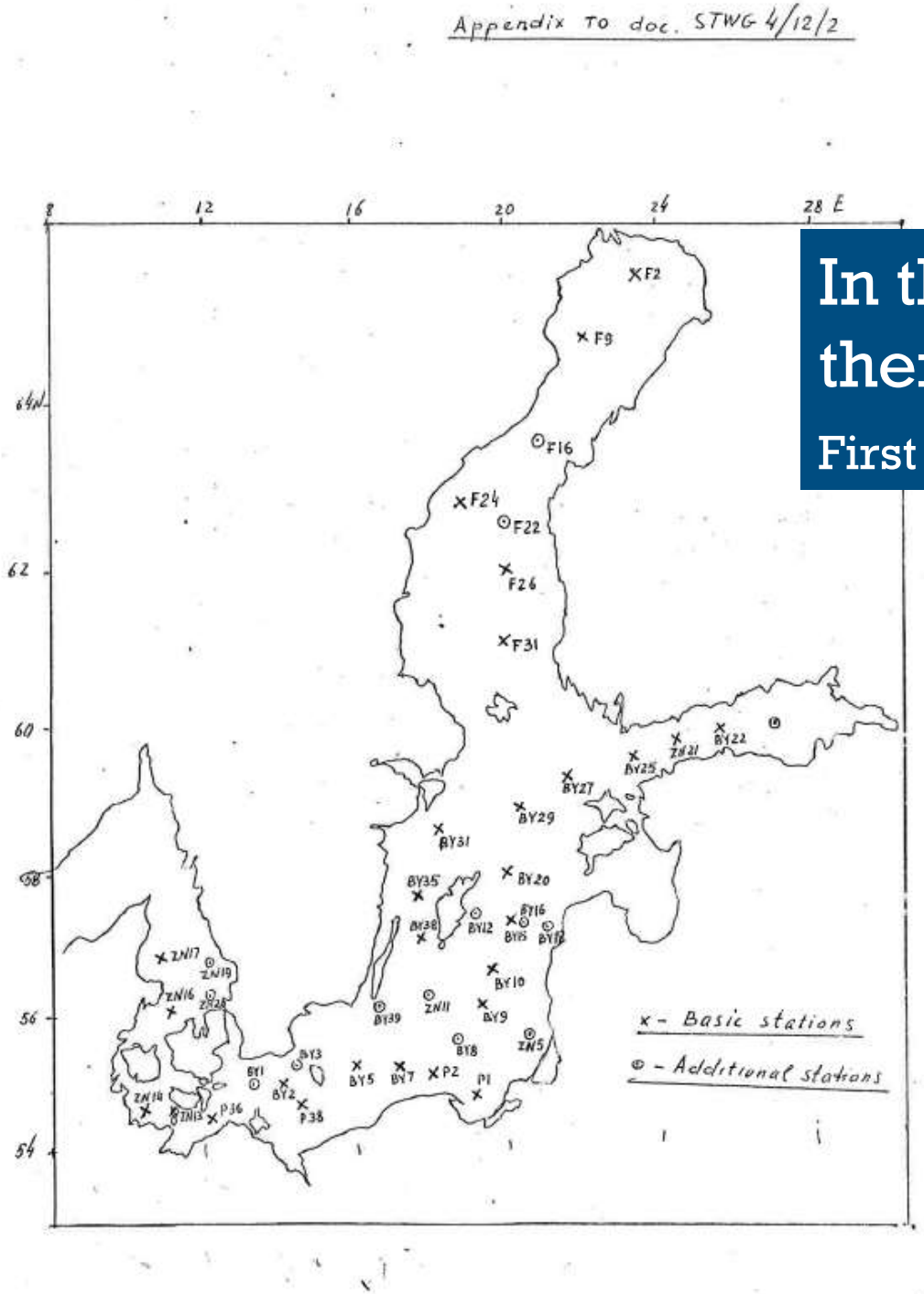
We played Indiana Jones
and dived into our archives



GIS in HELCOM

From hand-drawn maps to ESRI

HELCOM



In the beginning there was''analog GIS''

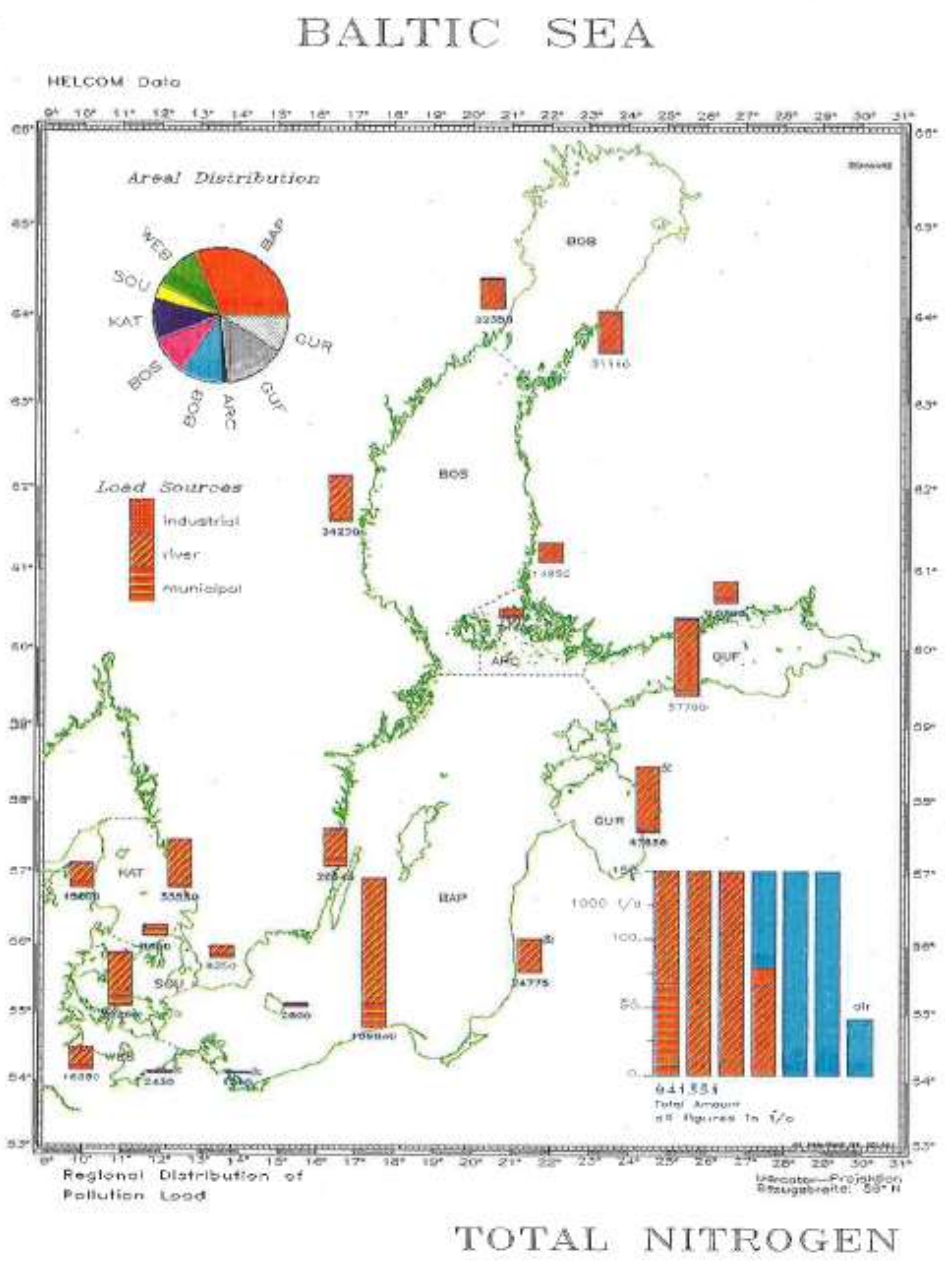
First map found, 1980

There were also home-made infographics

Author and year unknown

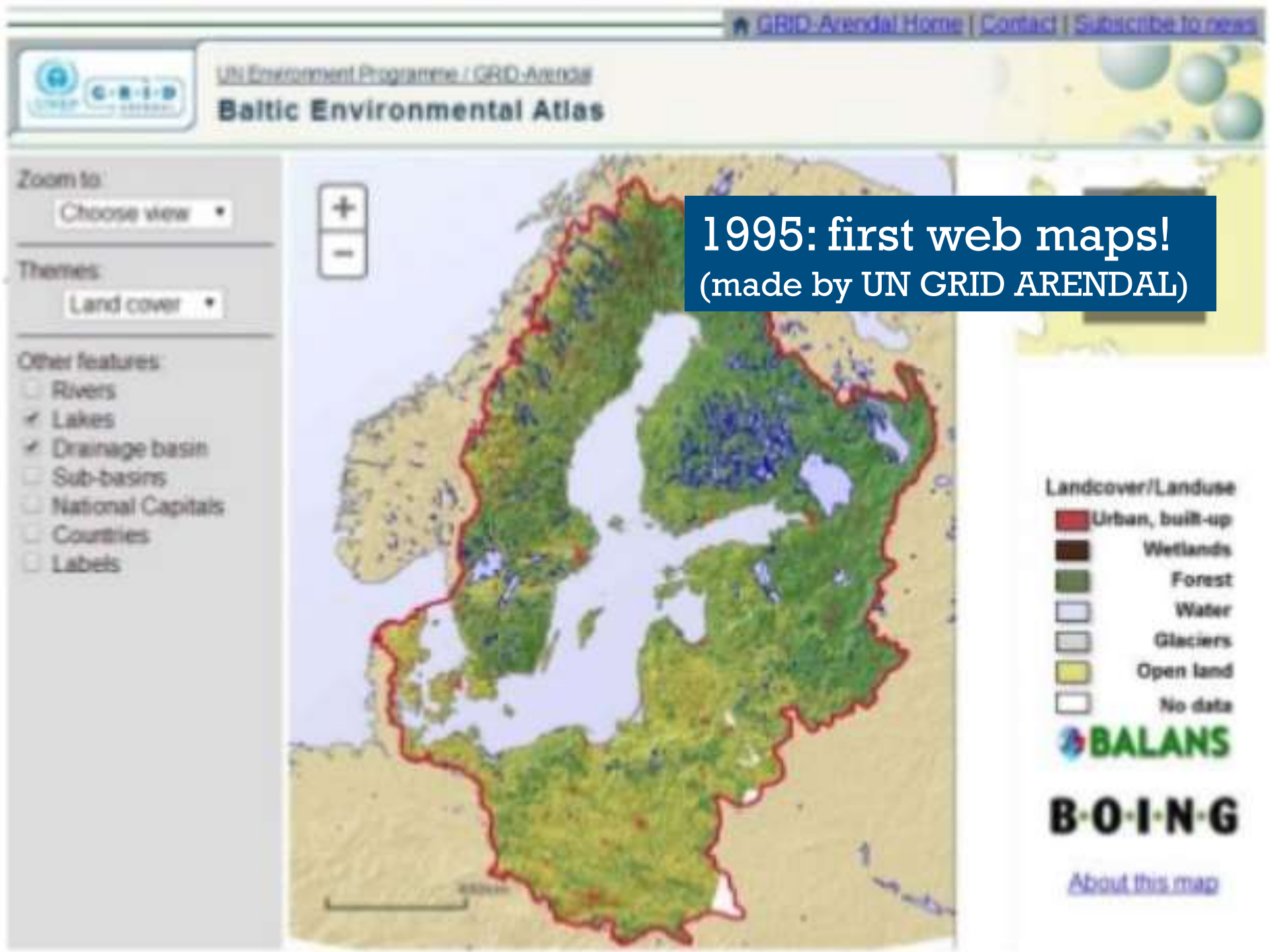


Figure 1 Pollution sources



Color appears!

Did computers exist in 1986?


GRID-Arendal Home | Contact | Subscribe to news
UN Environment Programme / GRID-Arendal
Baltic Environmental Atlas
Zoom to
Choose view
Themes
Land cover
Other features
Rivers
Lakes
Drainage basin
Sub-basins
National Capitals
Countries
Labels
1995: first web maps!
(made by UN GRID ARENDAL)
Landcover/Landuse
Urban, built-up
Wetlands
Forest
Water
Glaciers
Open land
No data
BALANS
B·O·I·N·G
About this map



2000: Web maps get more functions

(but still very rudimentary)

But in…

2004

…something important happened.

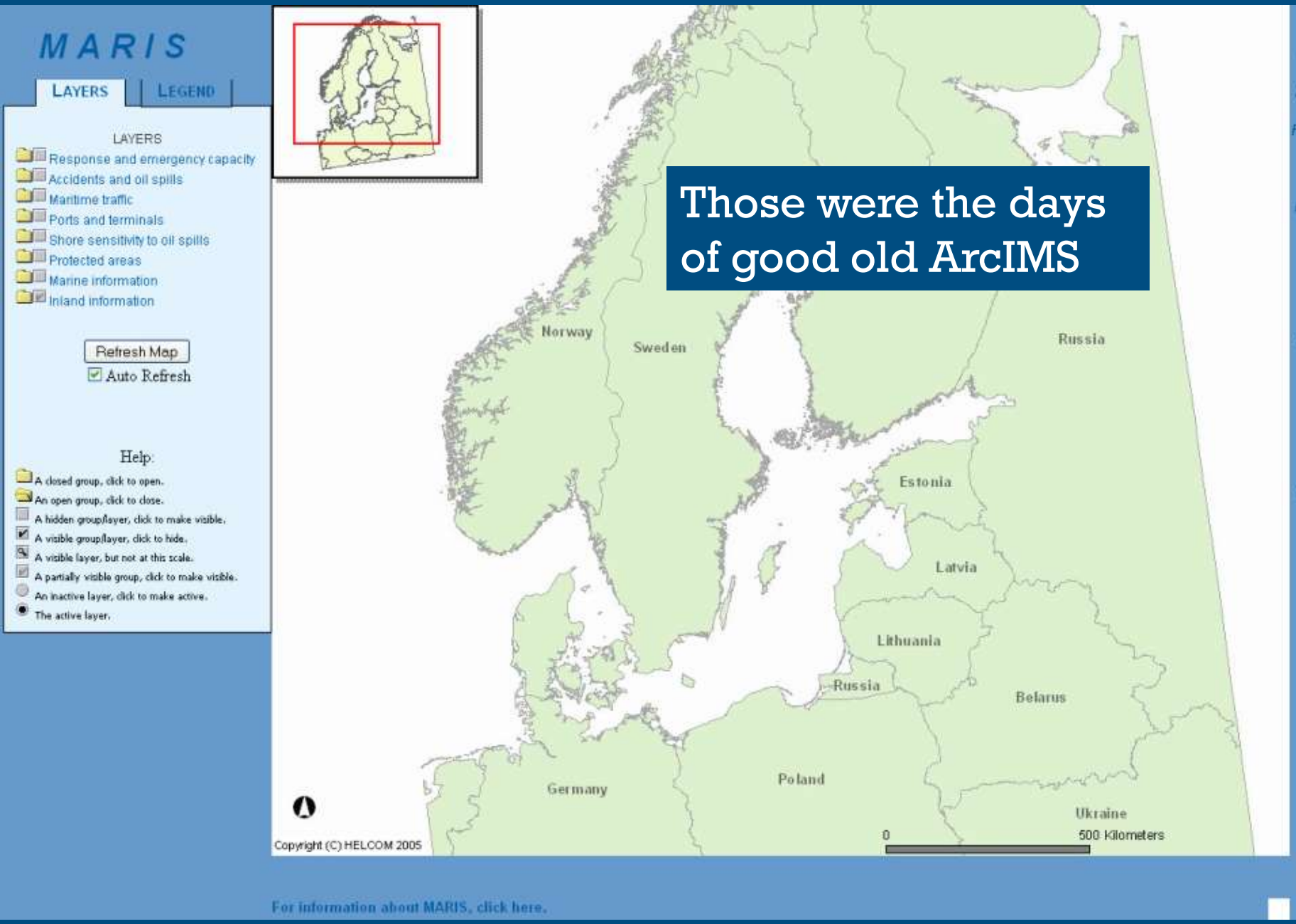
The Data and Information Strategy was signed by HELCOM. According to the strategy…

HELCOM should facilitate access to data to general public

For that purpose, the first ESRI license was purchased in 2004!



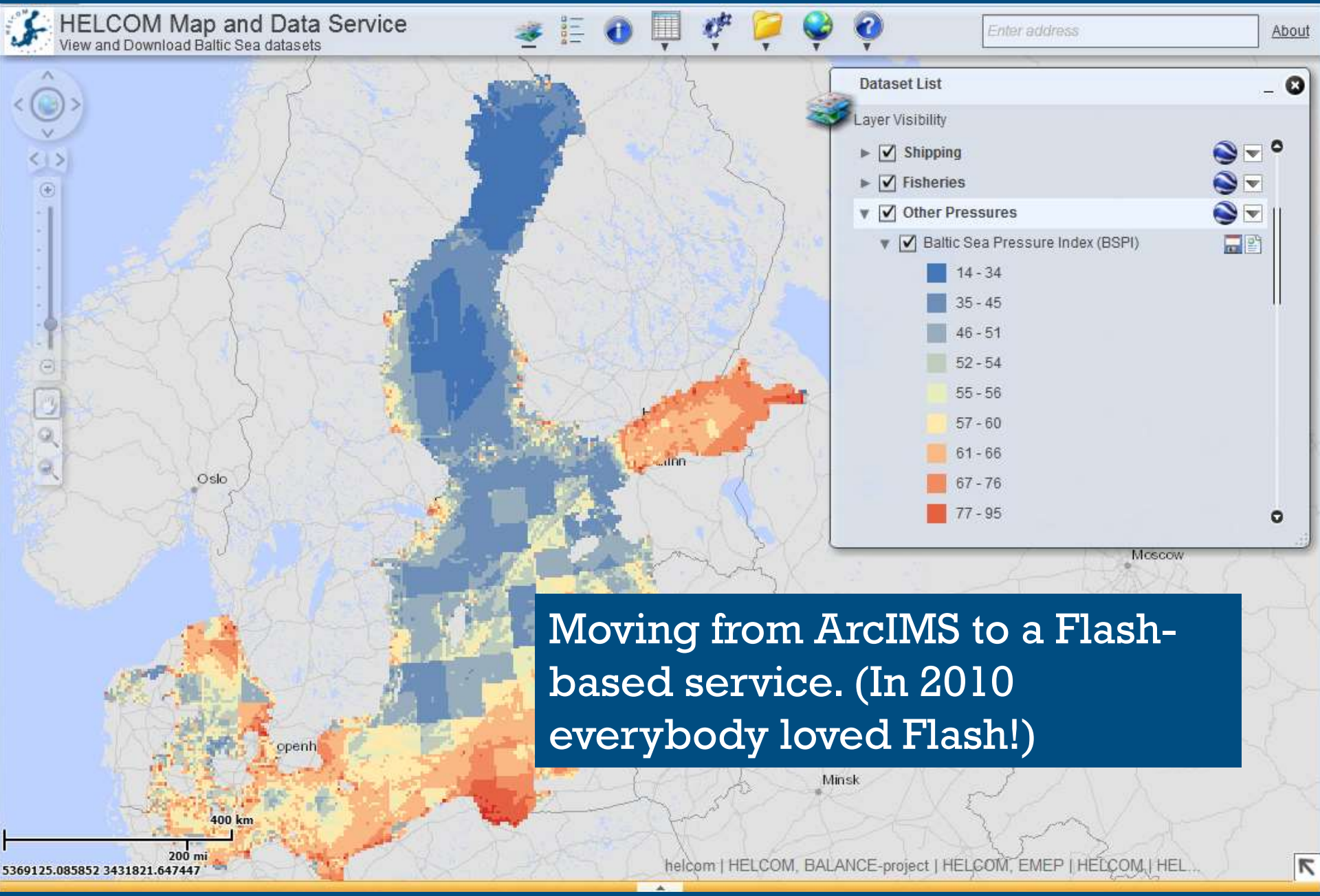
ESRI


MARIS
LAYERS
LEGEND
LAYERS
Response and emergency capacity
Accidents and oil spills
Maritime traffic
Ports and terminals
Shore sensitivity to oil spills
Protected areas
Marine information
Inland information
Refresh Map
Auto Refresh
Help:
A closed group, click to open.
An open group, click to close.
A hidden group/layer, click to make visible.
A visible group/layer, click to hide.
A visible layer, but not at this scale.
A partially visible group, click to make visible.
An inactive layer, click to make active.
The active layer.
Those were the days of good old ArcIMS
Norway
Sweden
Russia
Estonia
Latvia
Lithuania
Russia
Belarus
Germany
Poland
Ukraine
Copyright (C) HELCOM 2005
0
500 Kilometers
Zoom In
Zoom Out
Full Extent
Pan
Hyperlink
Buffer
Select
Clear Selection
Identify
Query
Print
Snapshot
Help
For information about MARIS, click here.

And in…

2010

HELCOM took a big step forward



Moving from ArcIMS to a Flash-based service. (In 2010 everybody loved Flash!)

Year…

2013

…was even more important…

…because HELCOM got ESRI's…

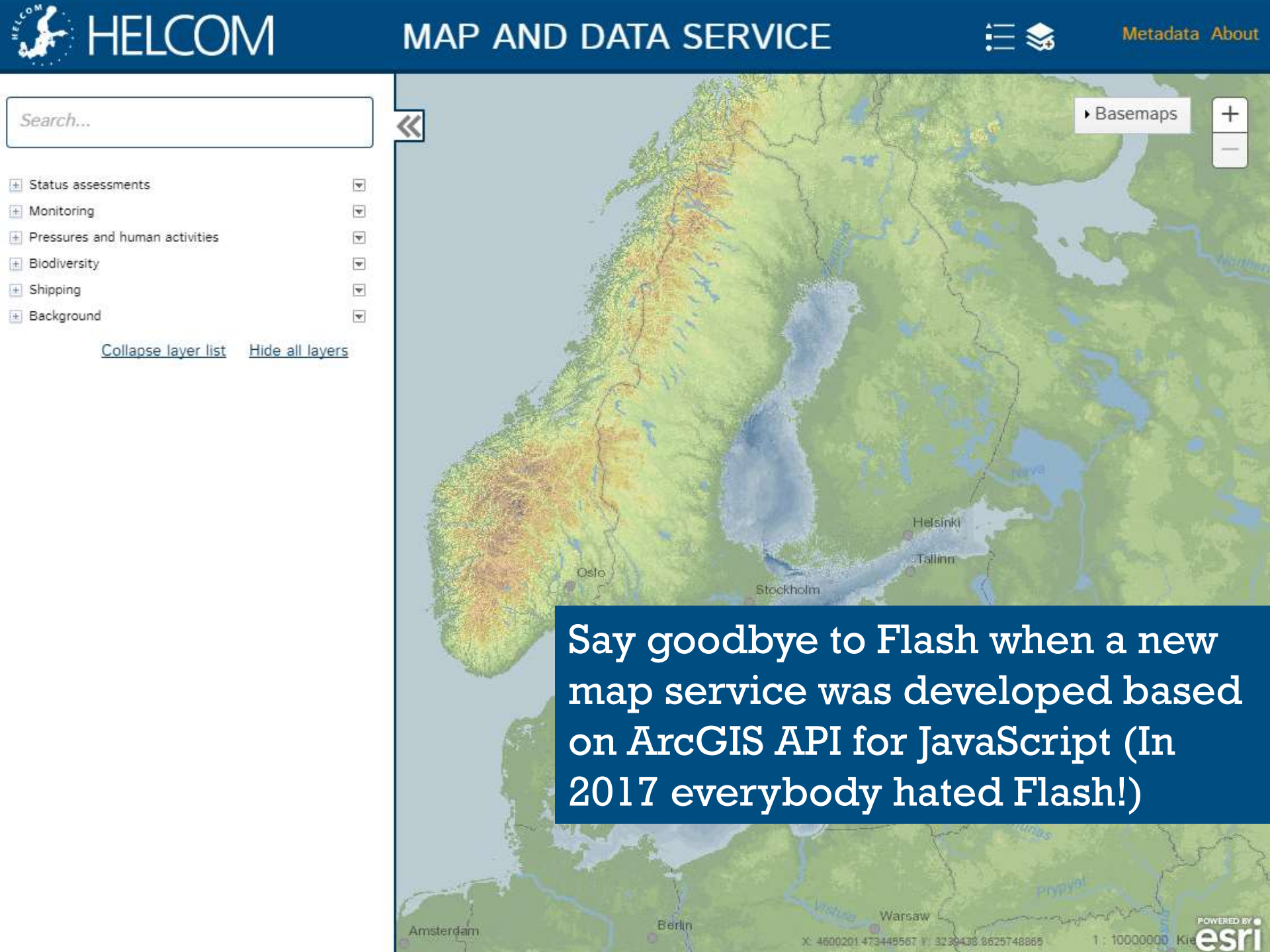
Non-profit license!

Without it, HELCOM couldn't possibly afford ESRI products—HELCOM is financed by states which means the budget is usually low.

Finally…



…was the year to say goodbye.


HELCOM
MAP AND DATA SERVICE
Metadata
About
Search...
Status assessments
Monitoring
Pressures and human activities
Biodiversity
Shipping
Background
Collapse layer list
Hide all layers
Basemaps
Helsinki
Tallinn
Oslo
Stockholm
Amsterdam
Berlin
Warsaw
Say goodbye to Flash when a new map service was developed based on ArcGIS API for JavaScript (In 2017 everybody hated Flash!)
POWERED BY esri

Now that we know the history of HELCOM and GIS, wouldn't talking about how we use GIS and maps be interesting?





Agreed! Let's talk now about our current systems and the future!







We are a small team. About 25 people work currently at the HELCOM Secretariat but only a handful of them work intensively with GIS.

HELCOM maps and data are meant mainly for…



Scientists
They produce data and maps
and use them for research



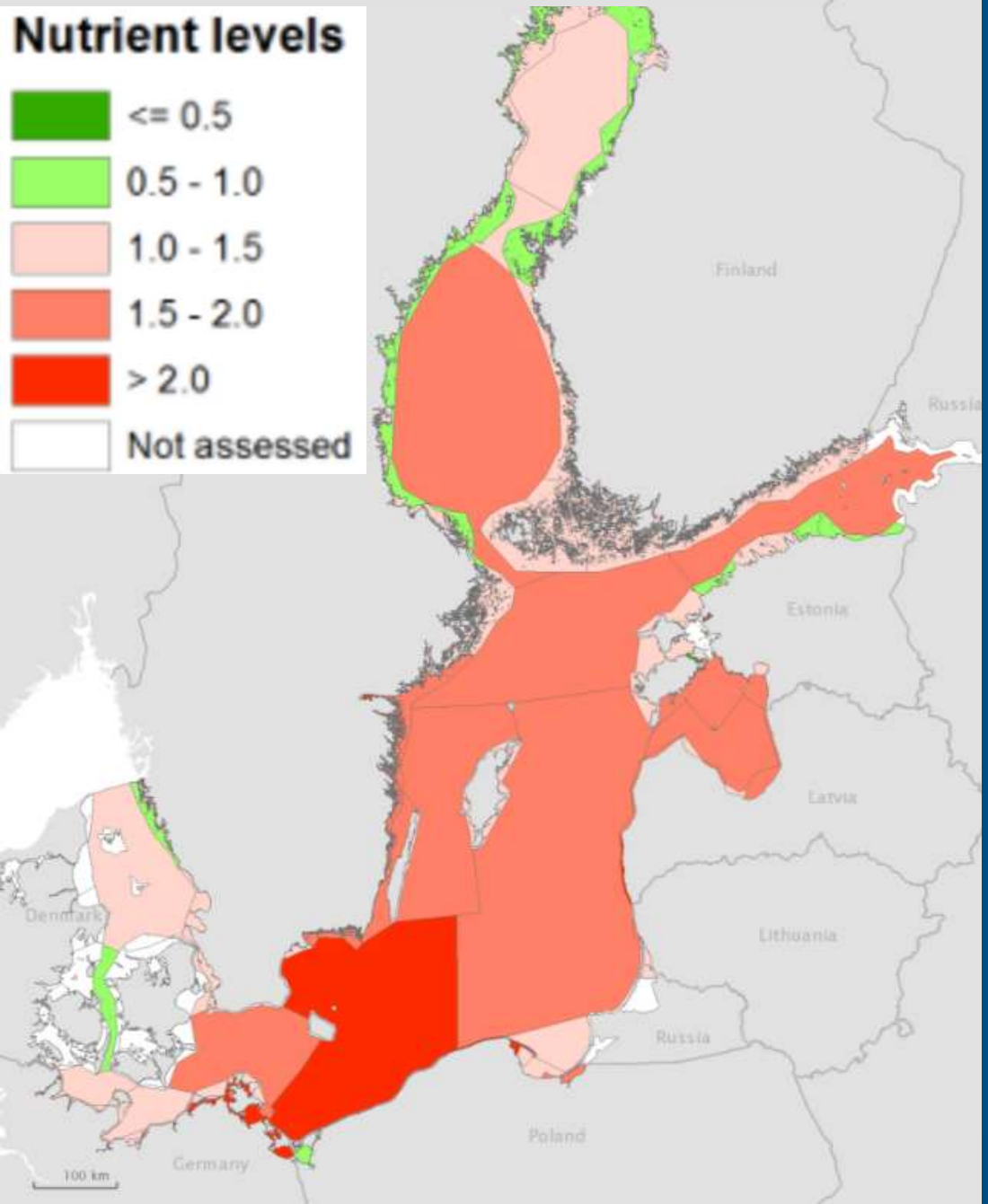
Policymakers
They use data and maps
to produce policies

They have something in common:
they need user-friendly data and maps

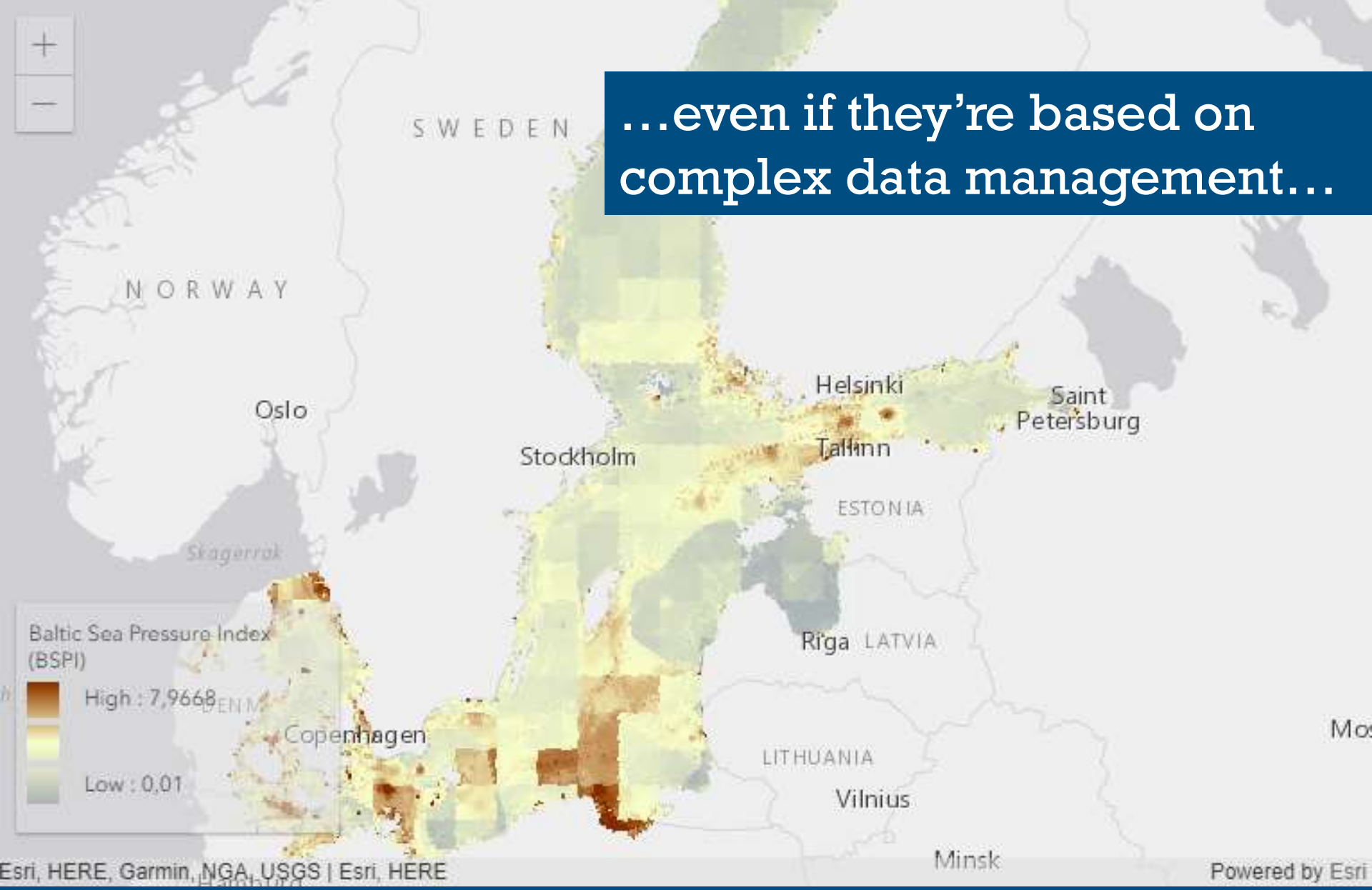




Eutrophication assessment

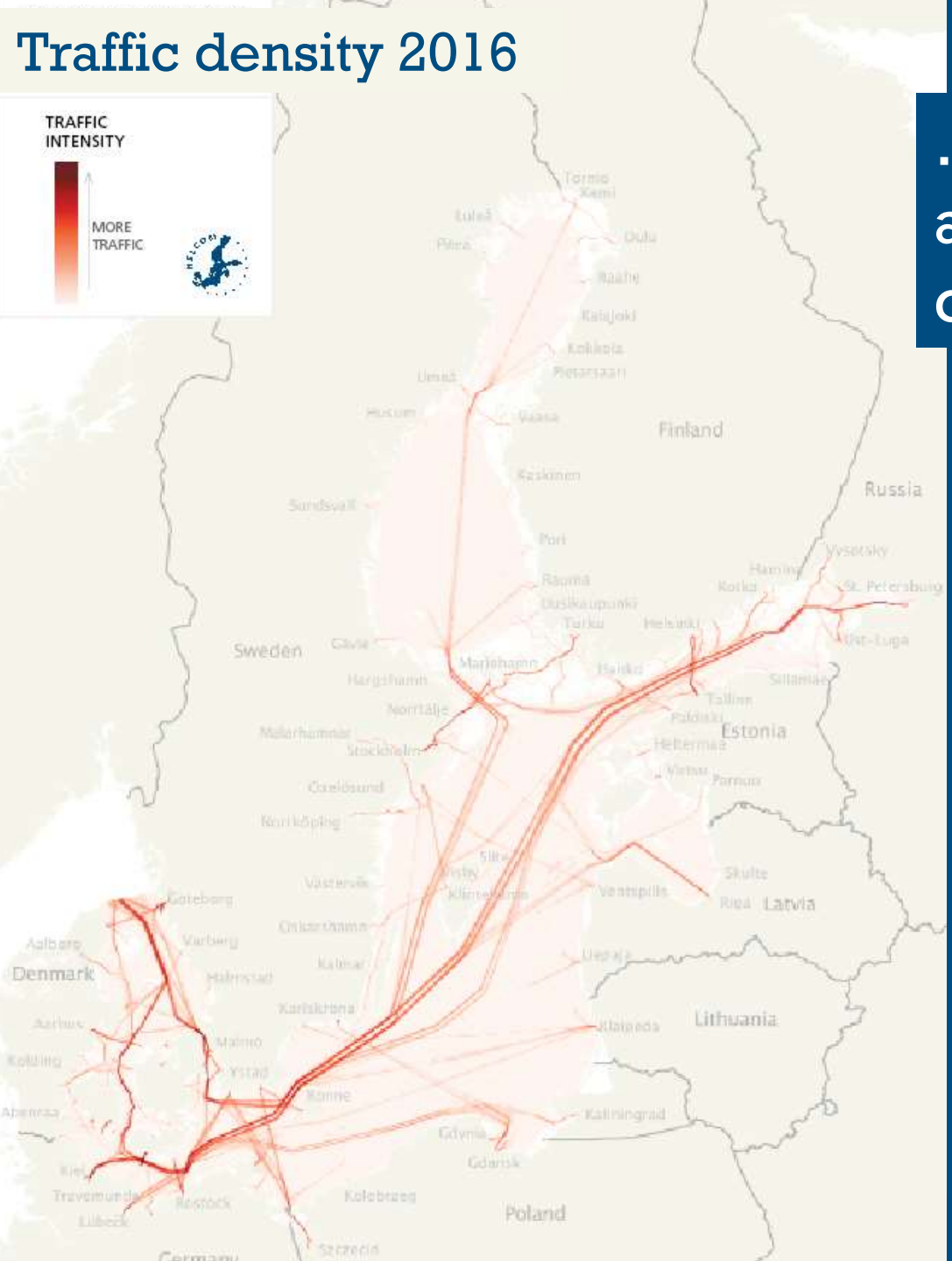


Producing maps that are understandable is very important…



…even if they're based on complex data management…

Traffic density 2016



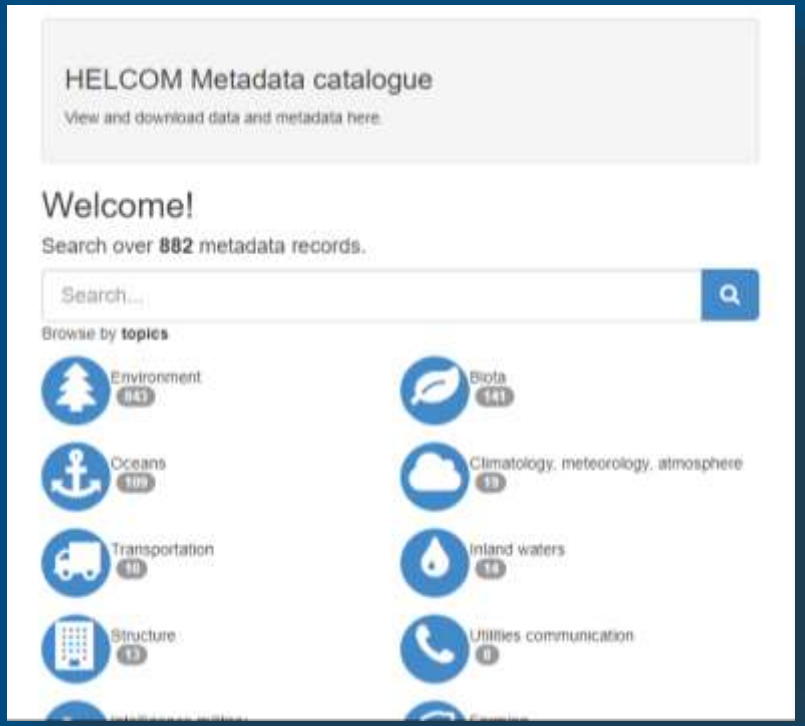
…or very, very complex and time consuming data handling.

To make life easier for everybody maps and metadata have been smoothly linked.

http://maps.helcom.fi



http://metadata.helcom.fi



HELCOM MAP AND DATA SERVICE

Metadata About

Search...

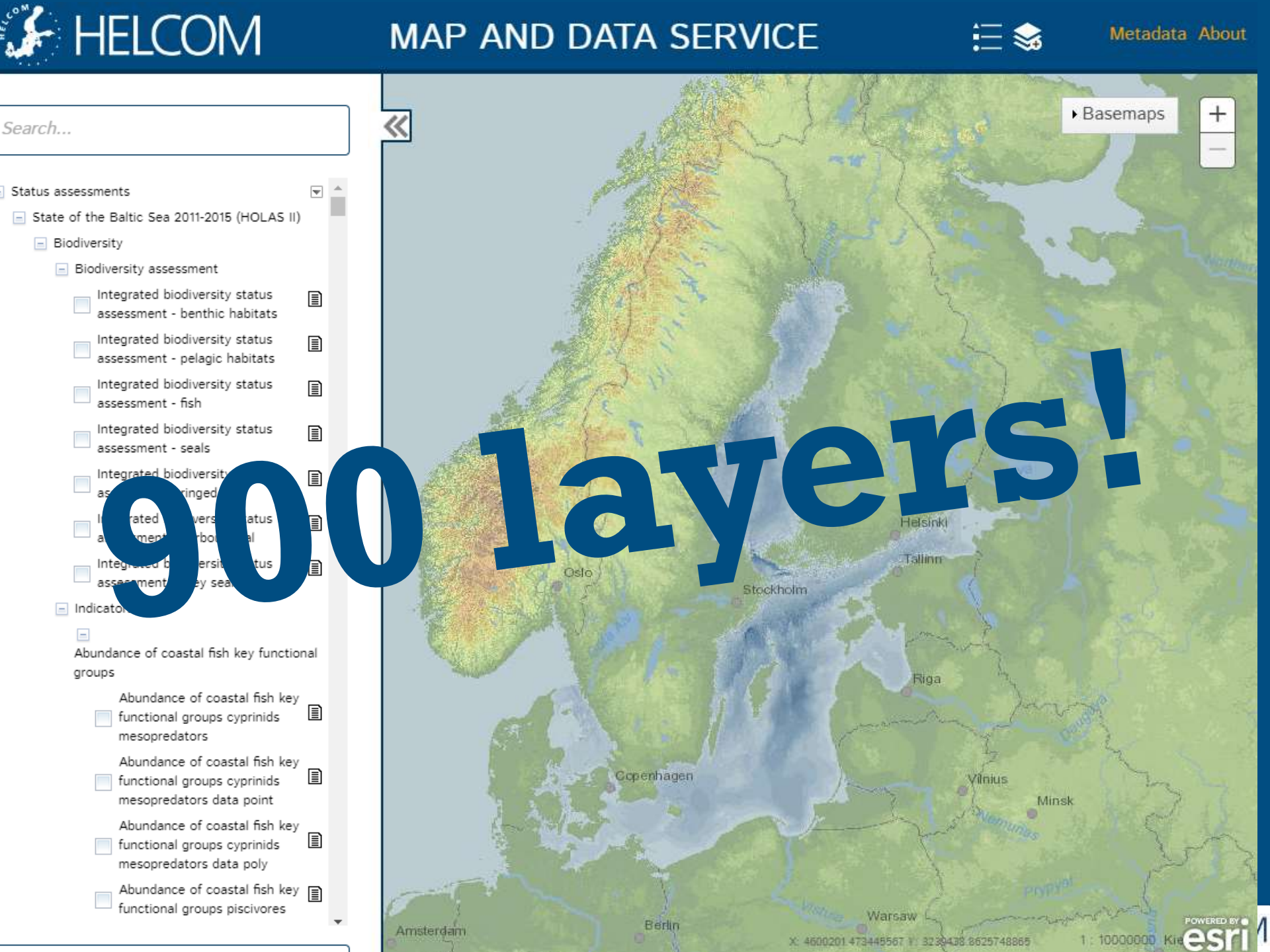
Thanks to this search field users can now search more than…

- Status assessments
  - State of the Baltic Sea 2011-2015 (HOLAS II)
    - Biodiversity
      - Biodiversity assessment
        - Integrated biodiversity status assessment - benthic habitats
        - Integrated biodiversity status assessment - pelagic habitats
        - Integrated biodiversity status assessment - fish
        - Integrated biodiversity status assessment - seals
        - Integrated biodiversity status assessment - ringed seal
        - Integrated biodiversity status assessment - harbour seal
        - Integrated biodiversity status assessment - grey seal
      - Indicators
        - Abundance of coastal fish key functional groups
          - Abundance of coastal fish key functional groups cyprinids mesopredators
          - Abundance of coastal fish key functional groups cyprinids mesopredators data point
          - Abundance of coastal fish key functional groups cyprinids mesopredators data poly
          - Abundance of coastal fish key functional groups piscivores

maps

Oslo
Stockholm
Helsinki
Tallinn
Riga
Copenhagen
Vilnius
Minsk
Warsaw
Berlin
Amsterdam

POWERED BY esri

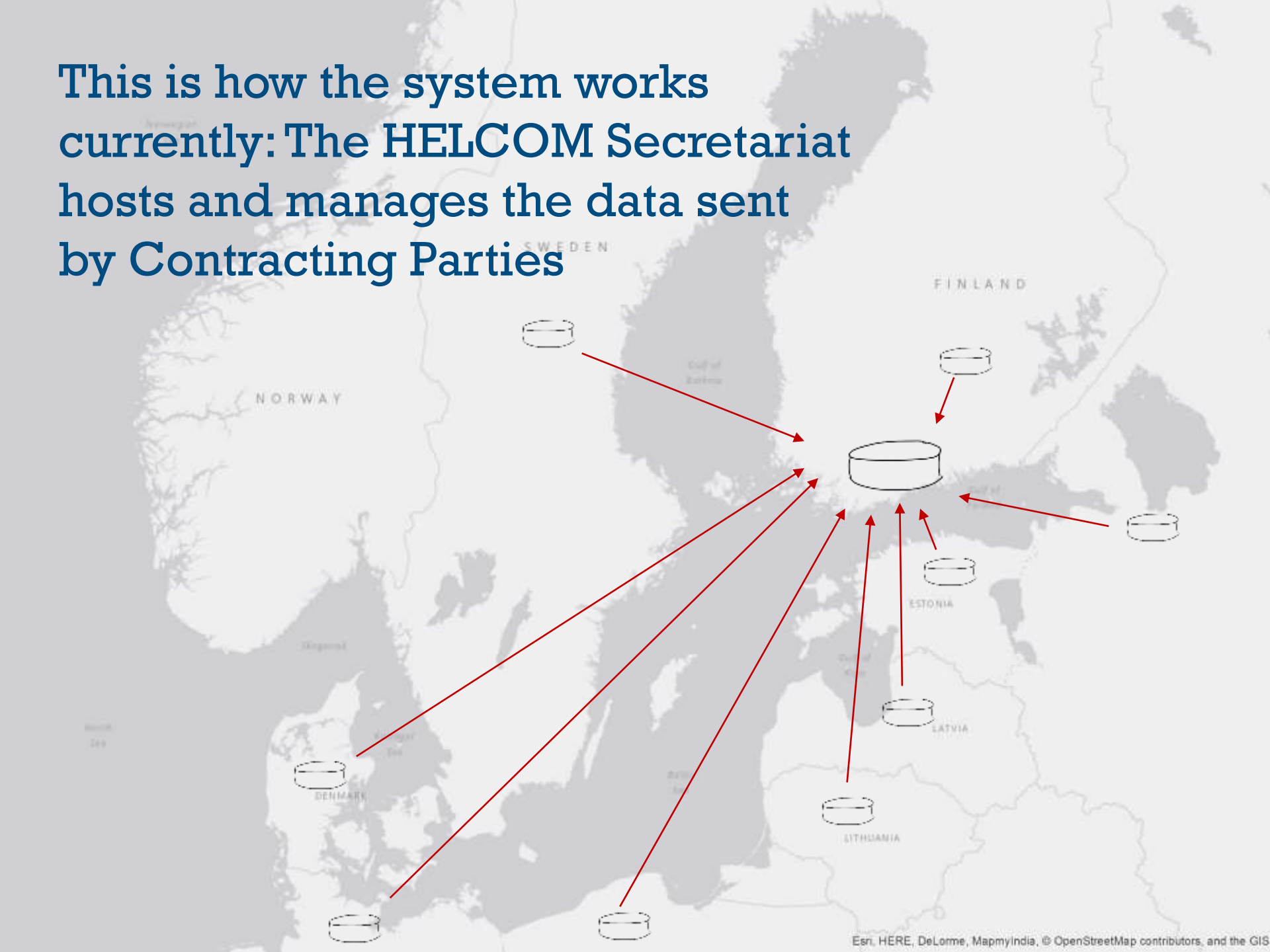

HELCOM
MAP AND DATA SERVICE
Metadata
About
Search...
Status assessments
State of the Baltic Sea 2011-2015 (HOLAS II)
Biodiversity
Biodiversity assessment
Integrated biodiversity status assessment - benthic habitats
Integrated biodiversity status assessment - pelagic habitats
Integrated biodiversity status assessment - fish
Integrated biodiversity status assessment - seals
Abundance of coastal fish key functional groups
Abundance of coastal fish key functional groups cyprinids mesopredators
Abundance of coastal fish key functional groups cyprinids mesopredators data point
Abundance of coastal fish key functional groups cyprinids mesopredators data poly
Abundance of coastal fish key functional groups piscivores
Basemaps
900 layers!
Helsinki
Tallinn
Oslo
Stockholm
Riga
Copenhagen
Vilnius
Minsk
Warsaw
Berlin
Amsterdam
POWERED BY esri

What about the future?

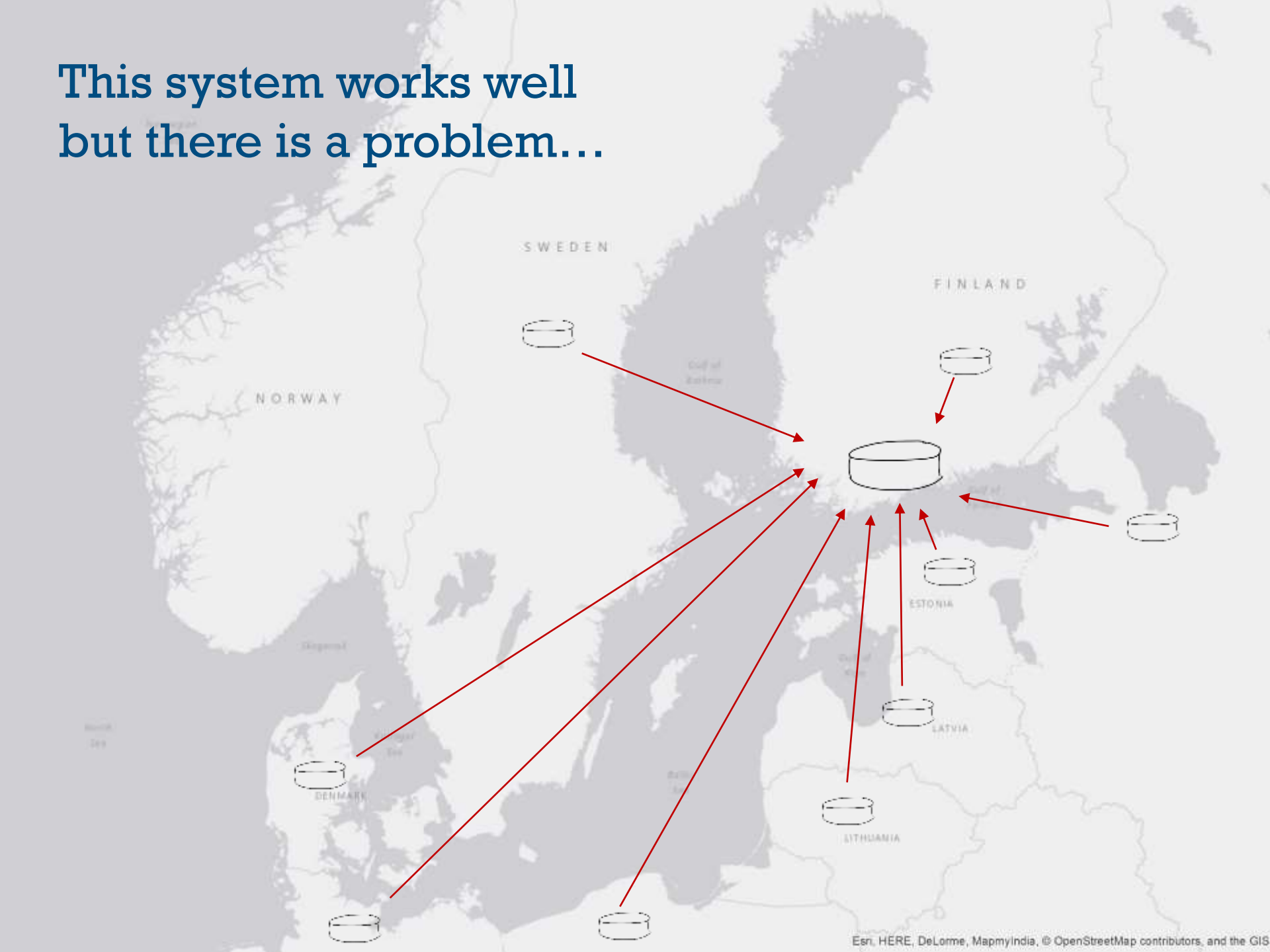


HELCOM

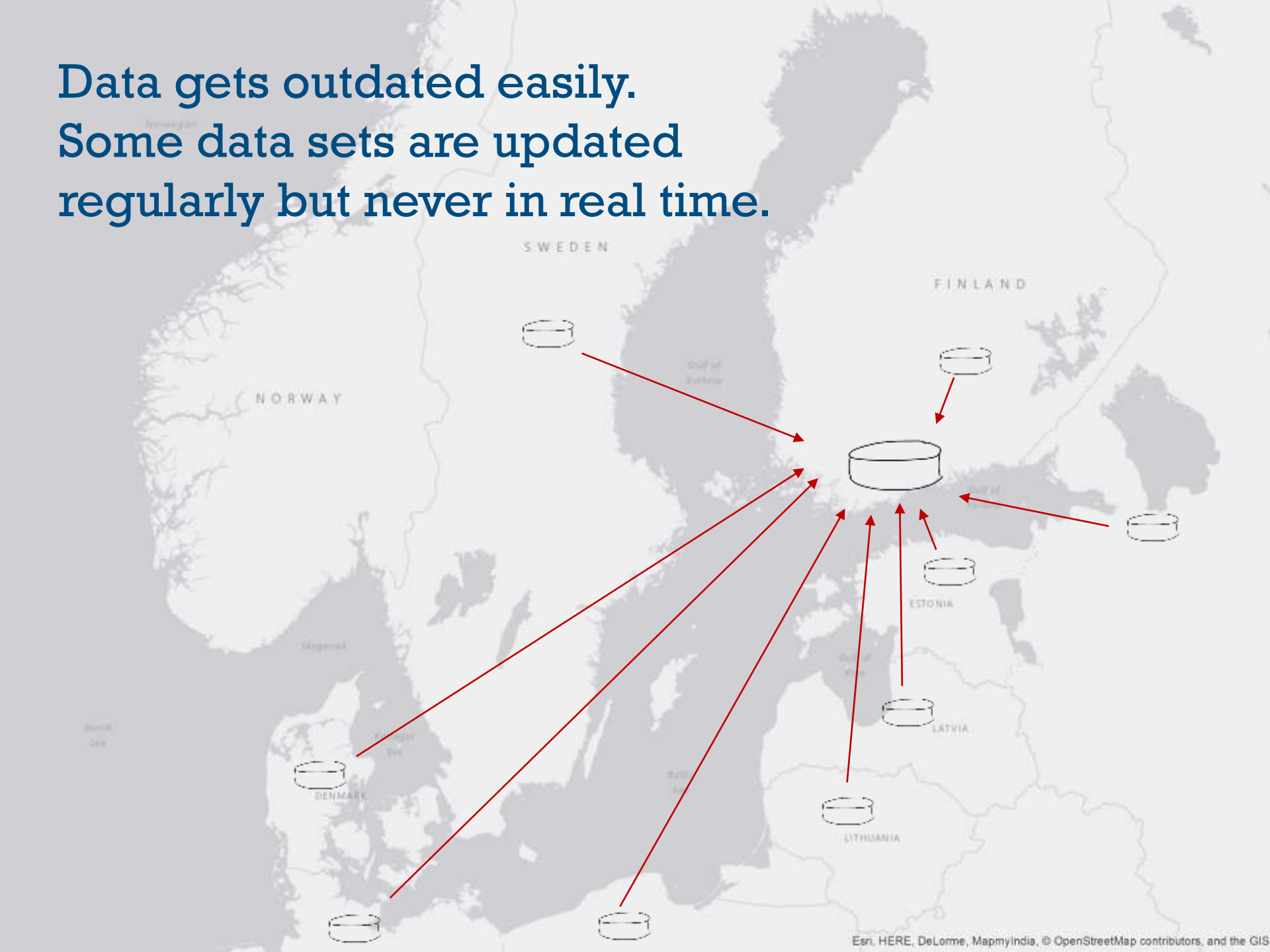
This is how the system works currently: The HELCOM Secretariat hosts and manages the data sent by Contracting Parties



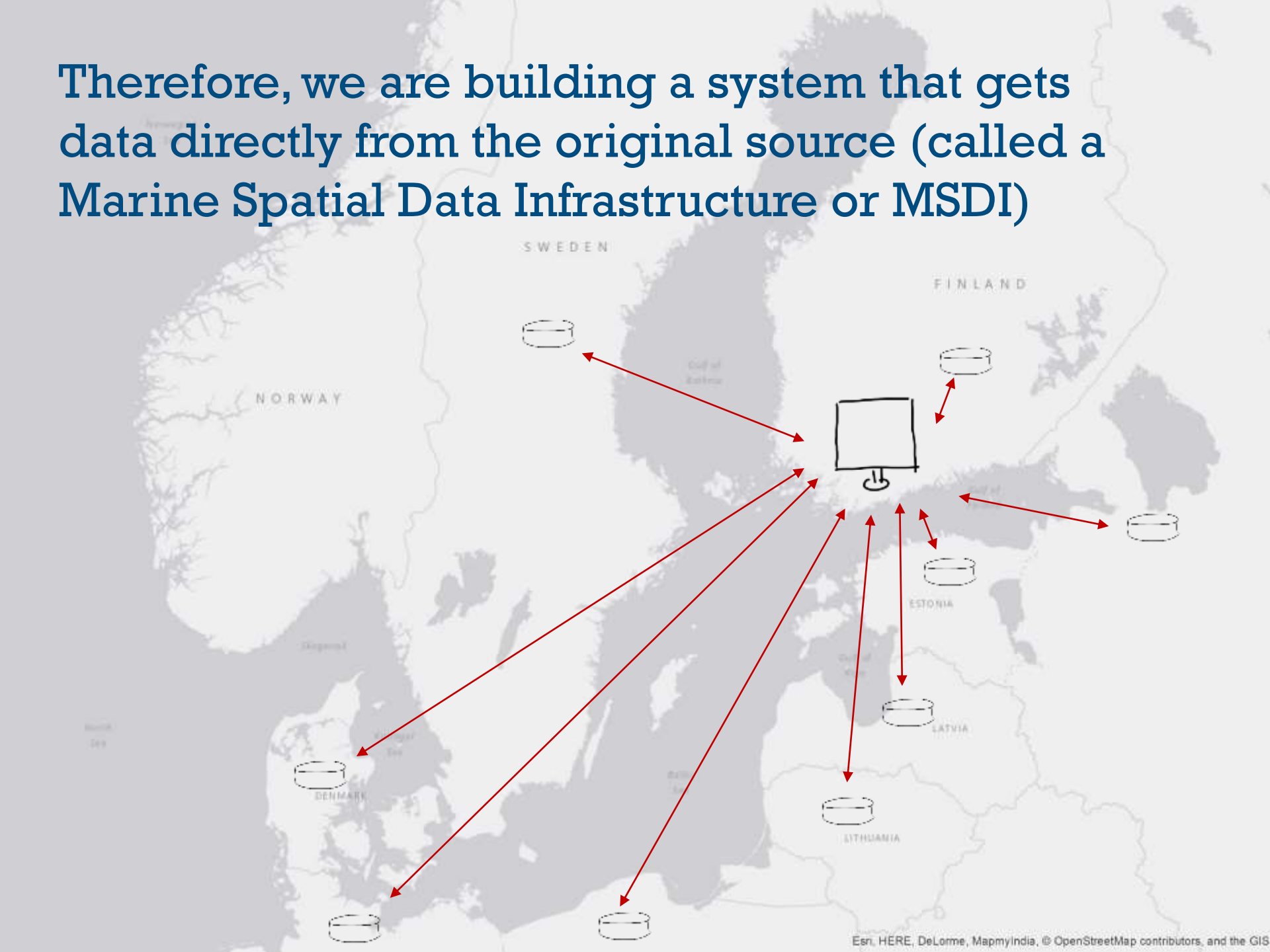
This system works well but there is a problem…



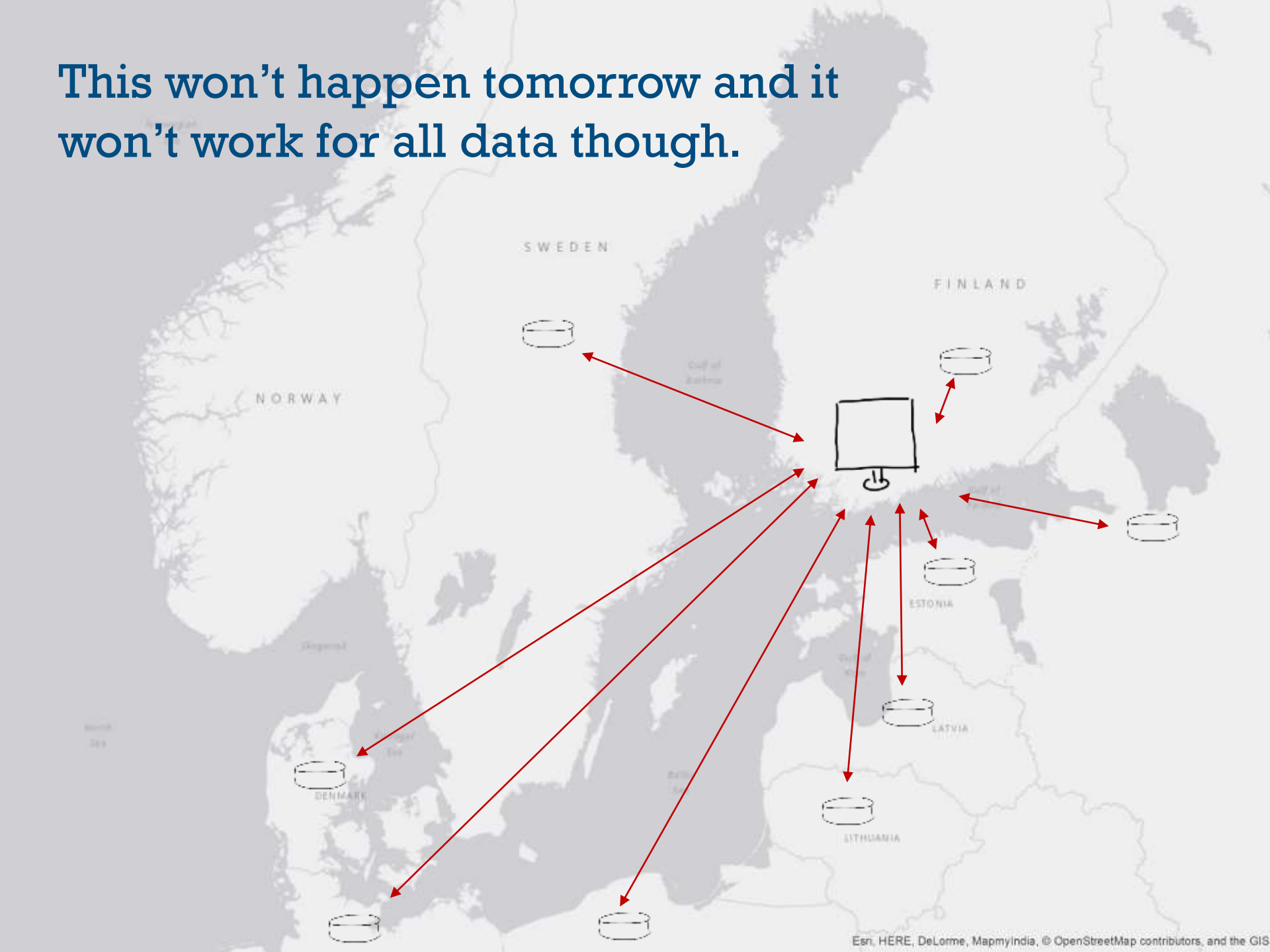
Data gets outdated easily. Some data sets are updated regularly but never in real time.



Therefore, we are building a system that gets data directly from the original source (called a Marine Spatial Data Infrastructure or MSDI)



This won't happen tomorrow and it won't work for all data though.



Good. Now we are wiser
than 70 slides ago.





Yes! We learned that the Baltic Sea is fragile and it was getting sick…





…that the Helsinki Convention was signed to avoid an environmental catastrophe…





…and we saw how much GIS is helping to avoid that catastrophe





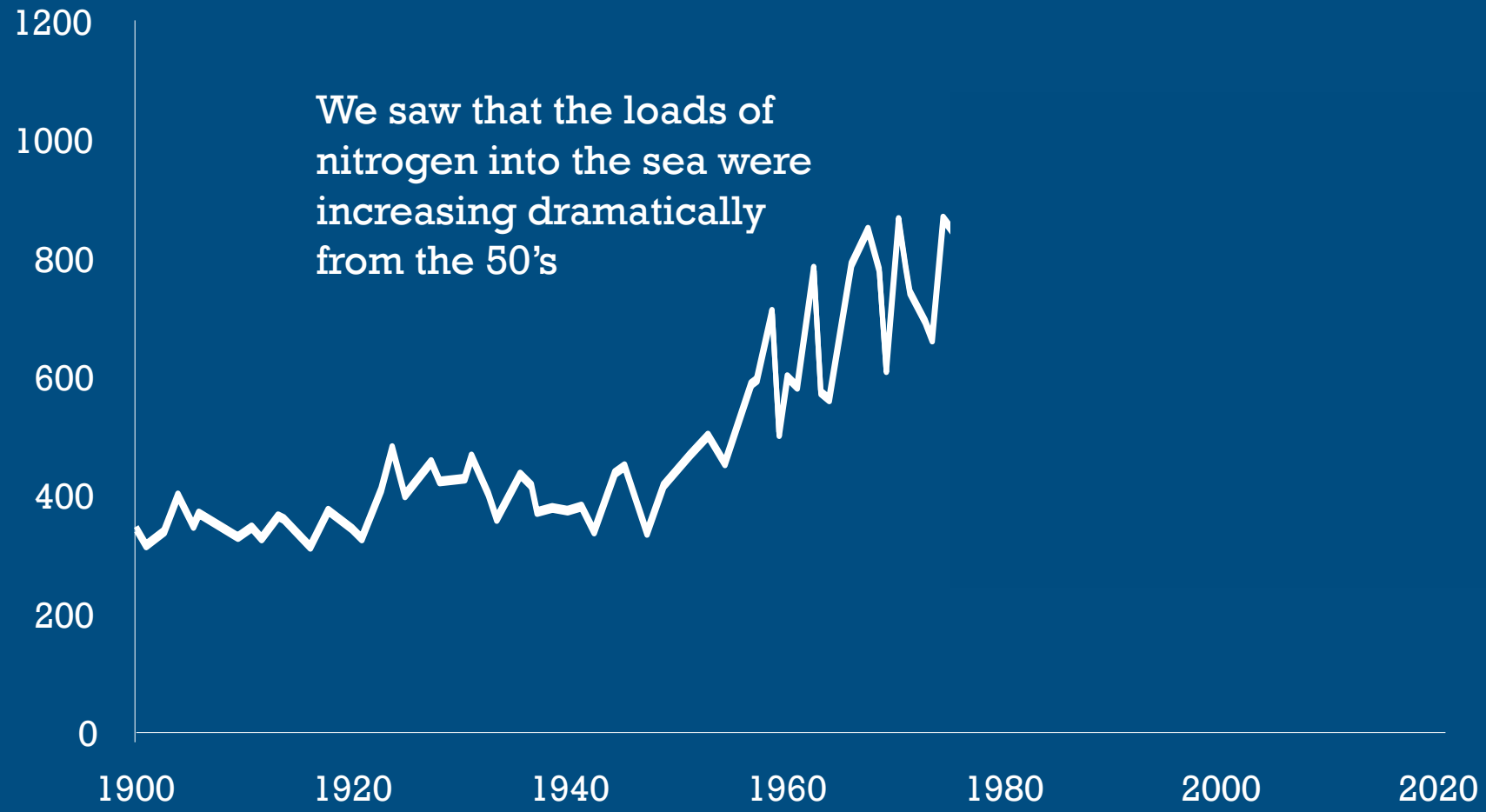
But what is the situation in the Baltic Sea NOW?





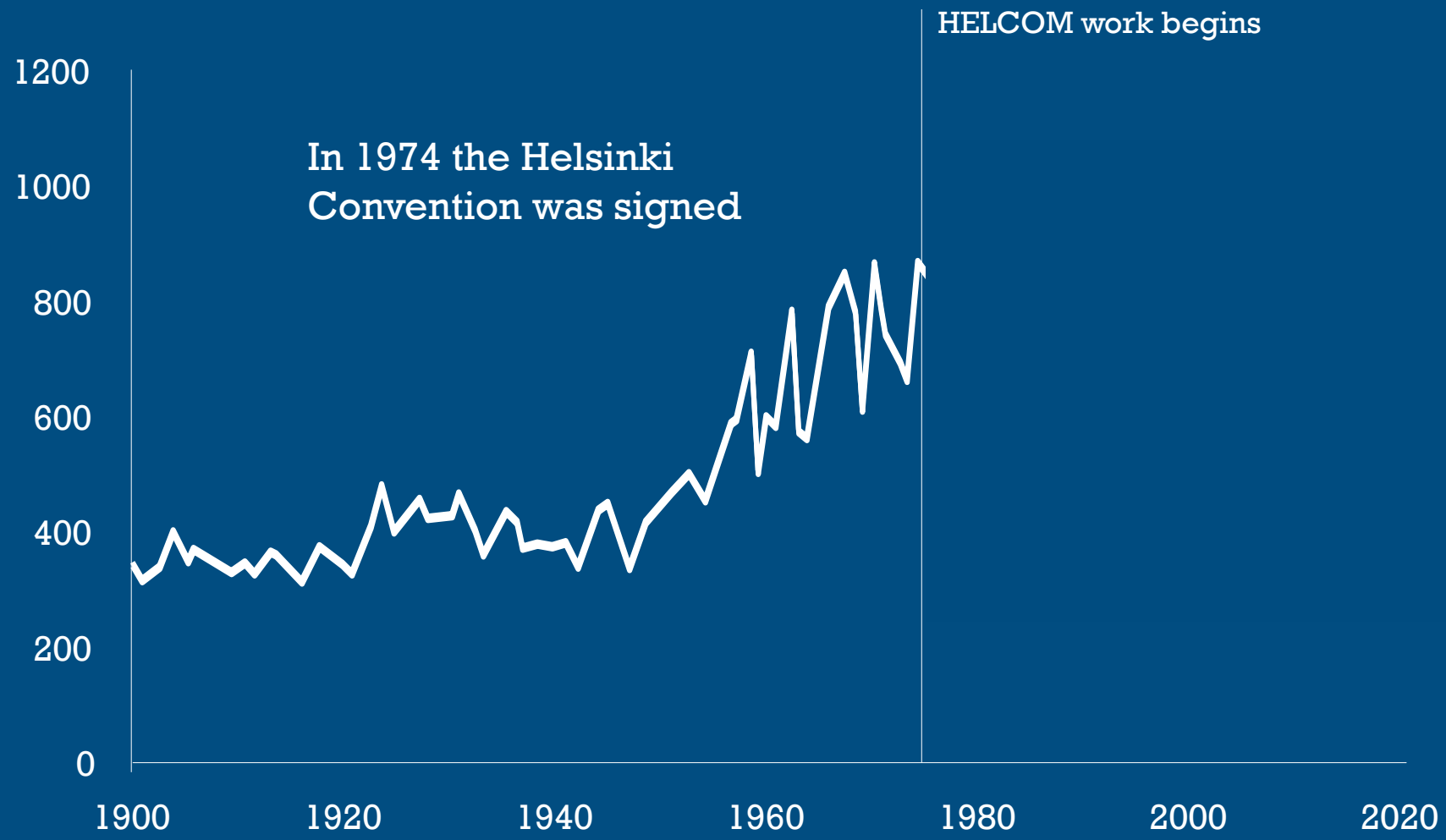
NITROGEN waterborne inputs via waterways

Tons per year (t/a) in .000



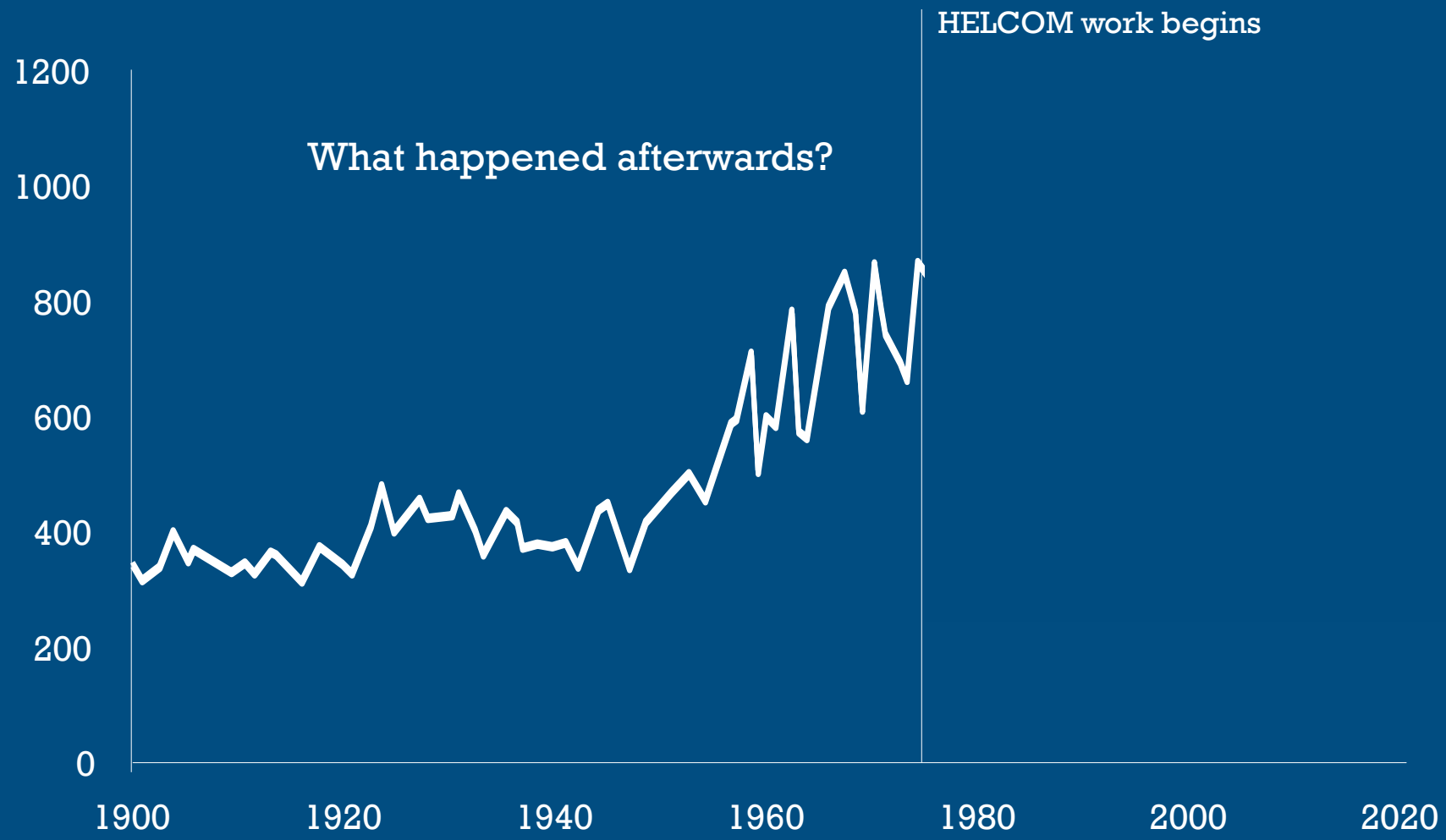
NITROGEN waterborne inputs via waterways

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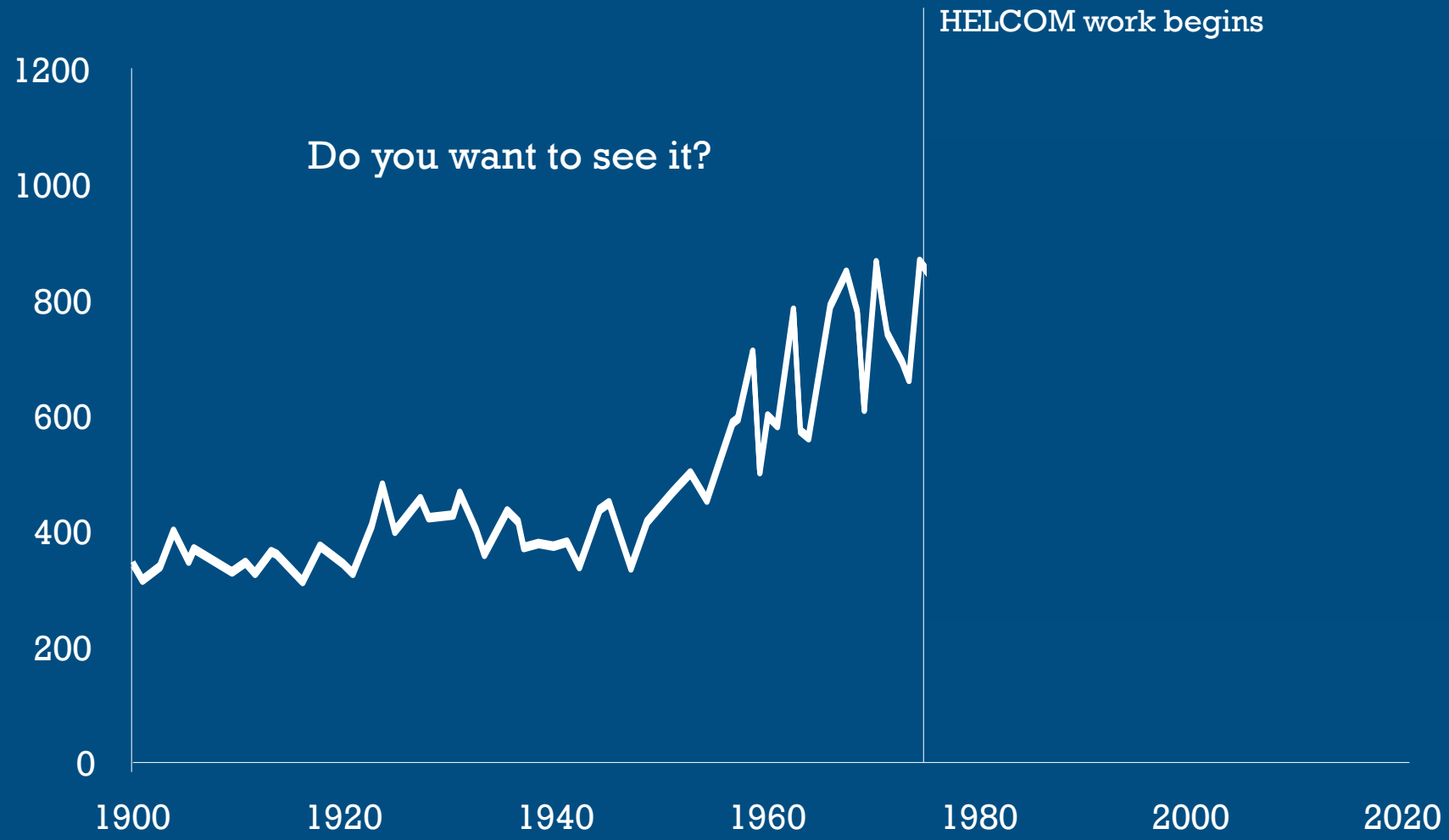
NITROGEN waterborne inputs via waterways

Tons per year (t/a) in .000



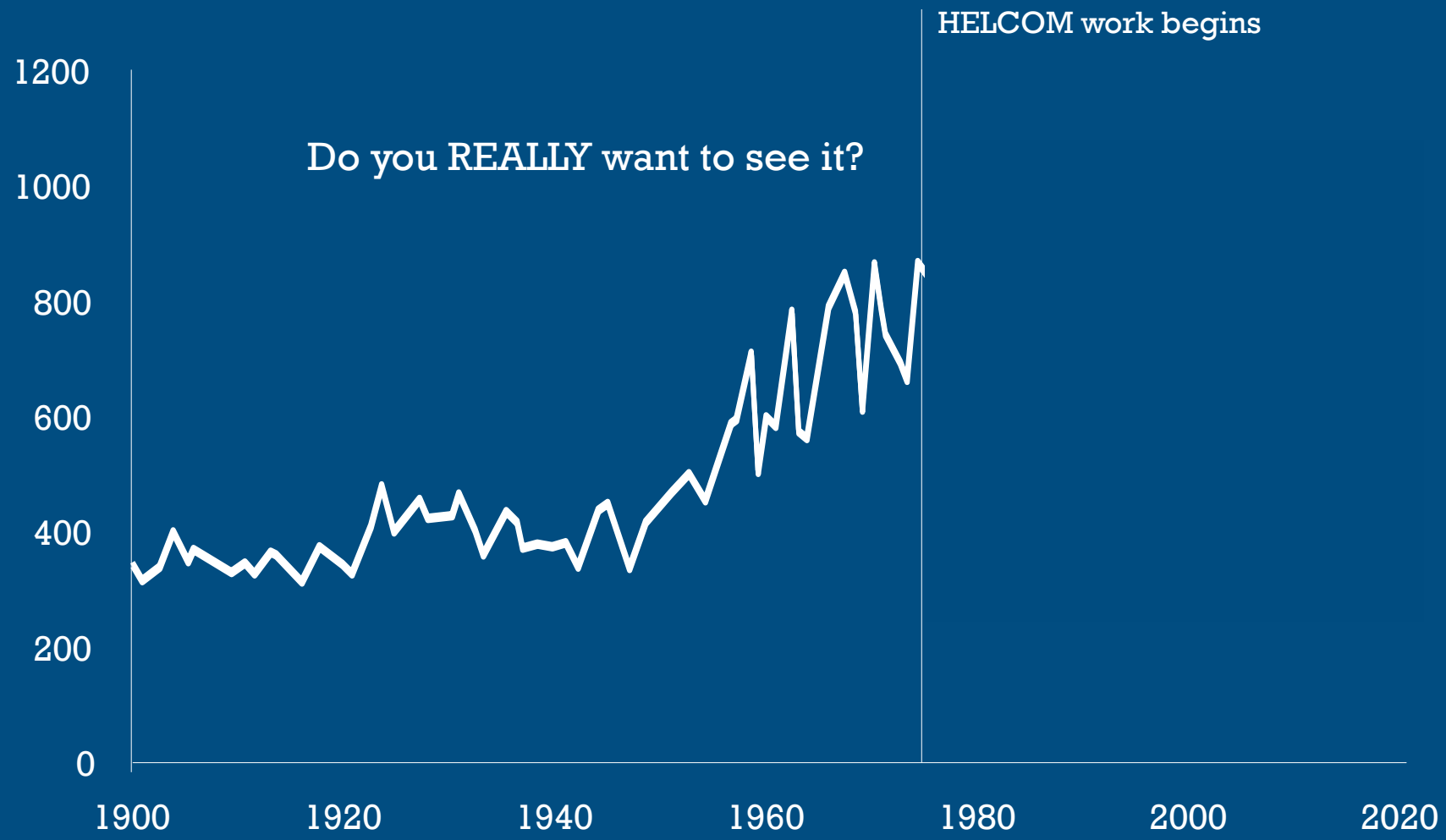
NITROGEN waterborne inputs via waterways

Tons per year (t/a) in .000



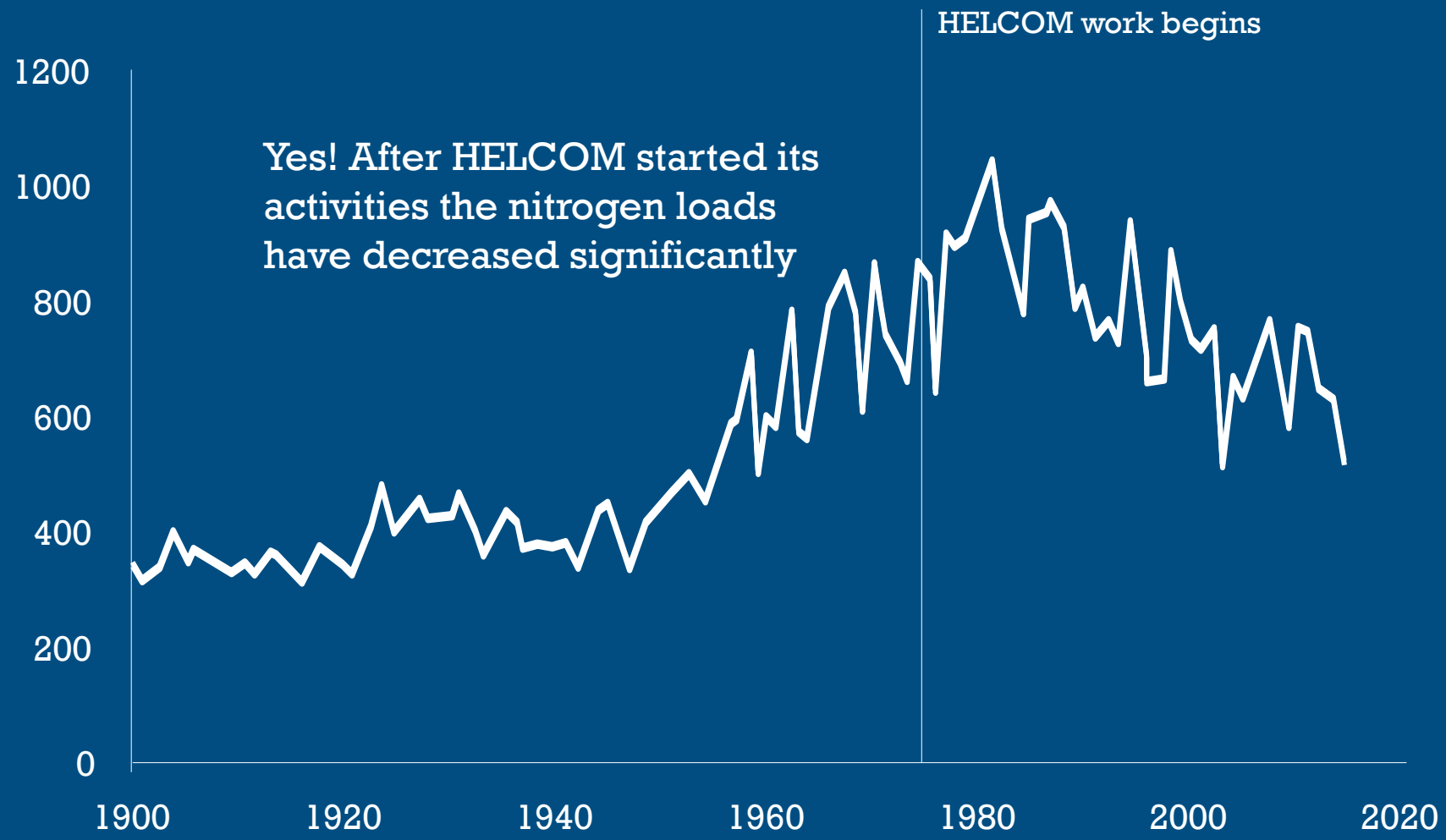
NITROGEN waterborne inputs via waterways

Tons per year (t/a) in .000



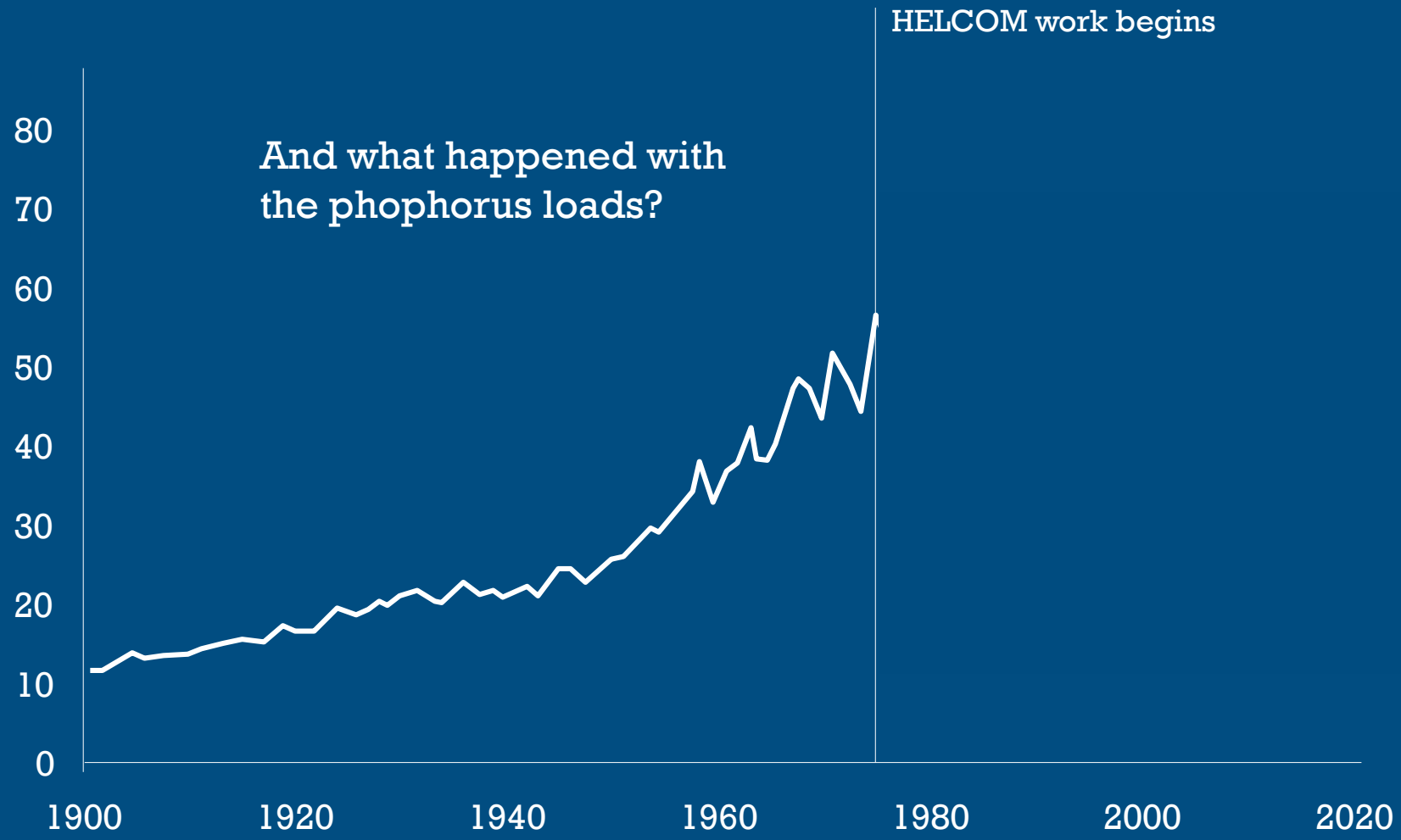
NITROGEN waterborne inputs via waterways

Tons per year (t/a) in .000



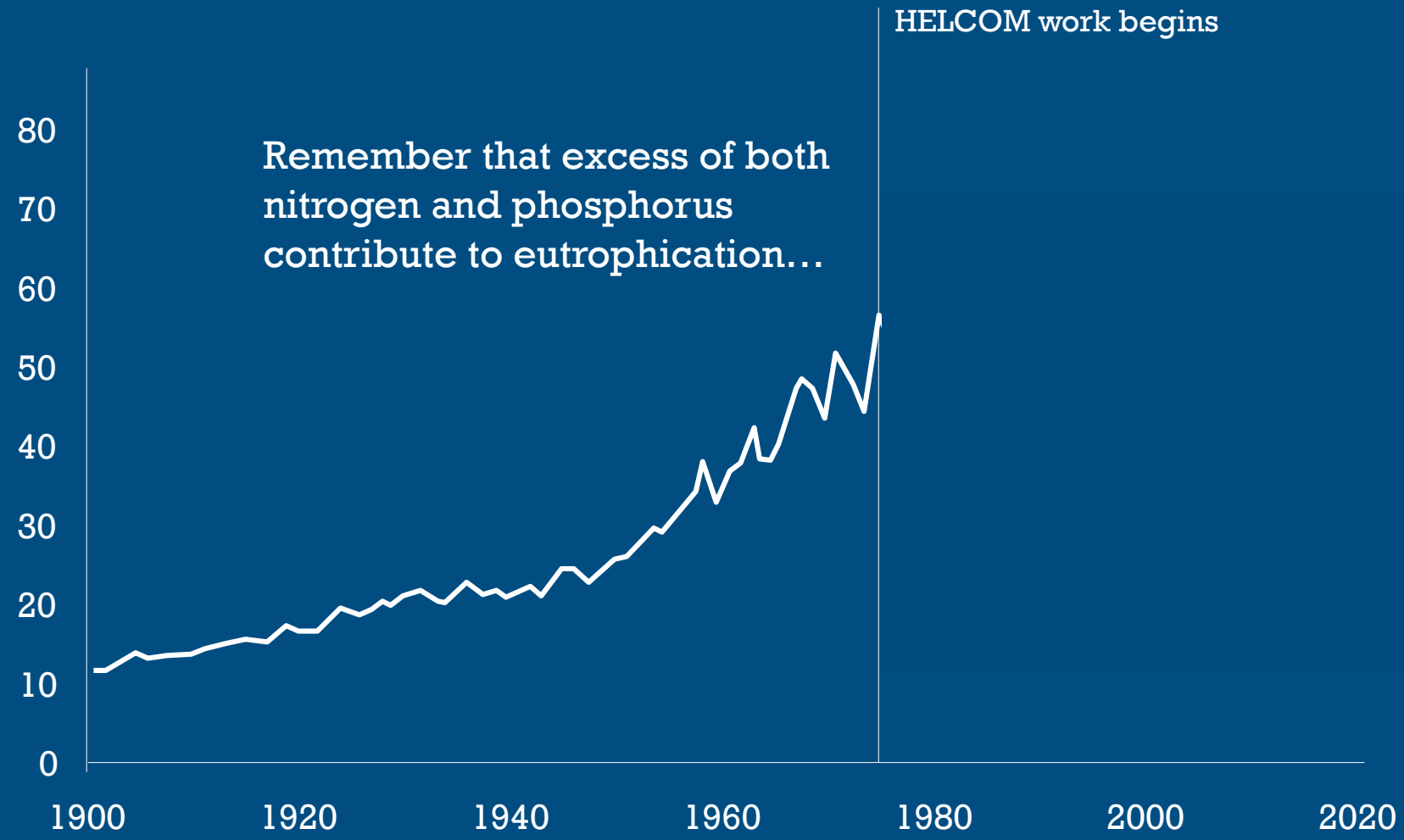
PHOSPHORUS waterborne inputs via waterways

Tons per year (t/a) in .000



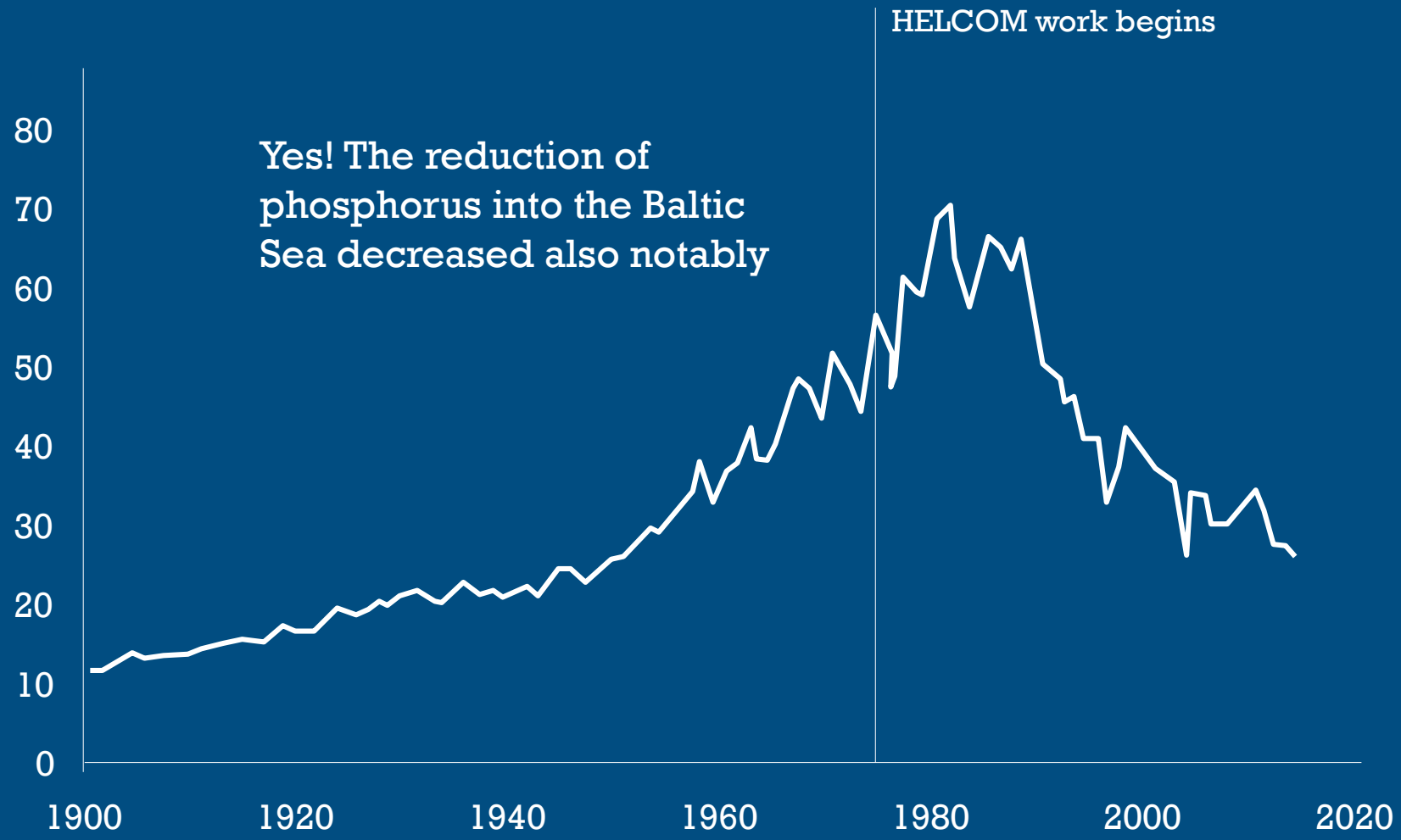
PHOSPHORUS waterborne inputs via waterways

Tons per year (t/a) in .000



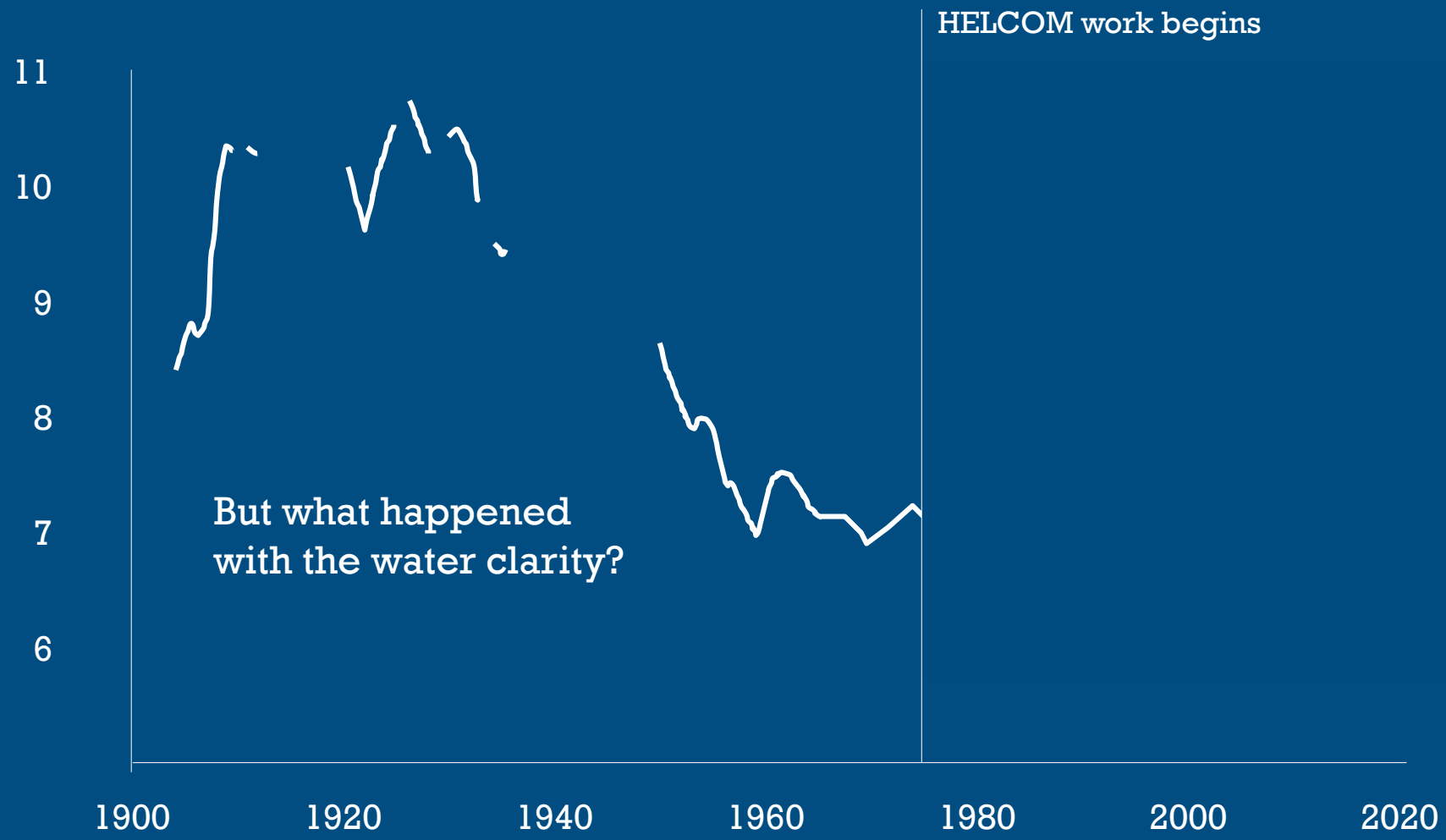
PHOSPHORUS waterborne inputs via waterways

Tons per year (t/a) in .000



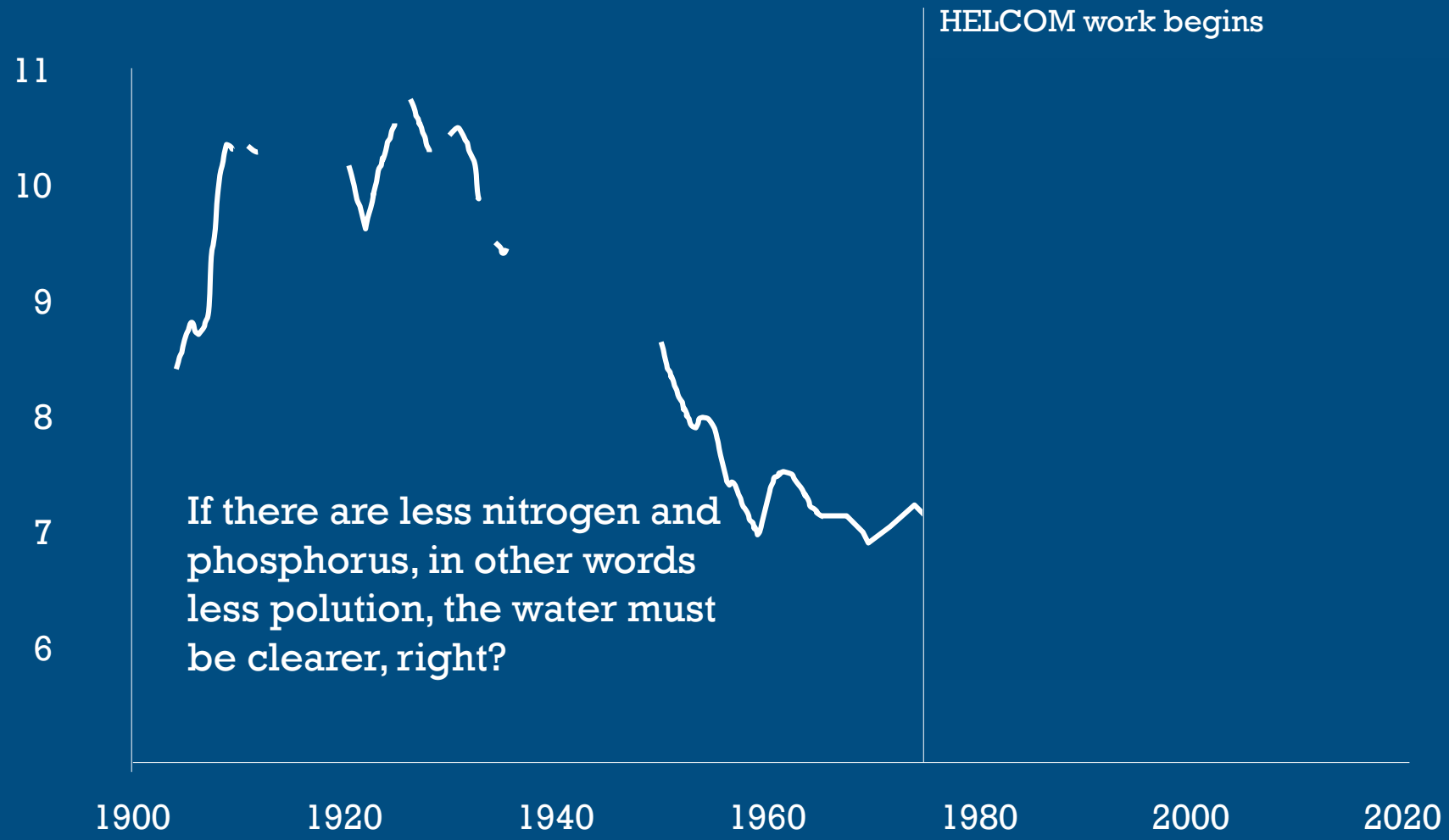
WATER CLARITY summer Secchi depth

In meters



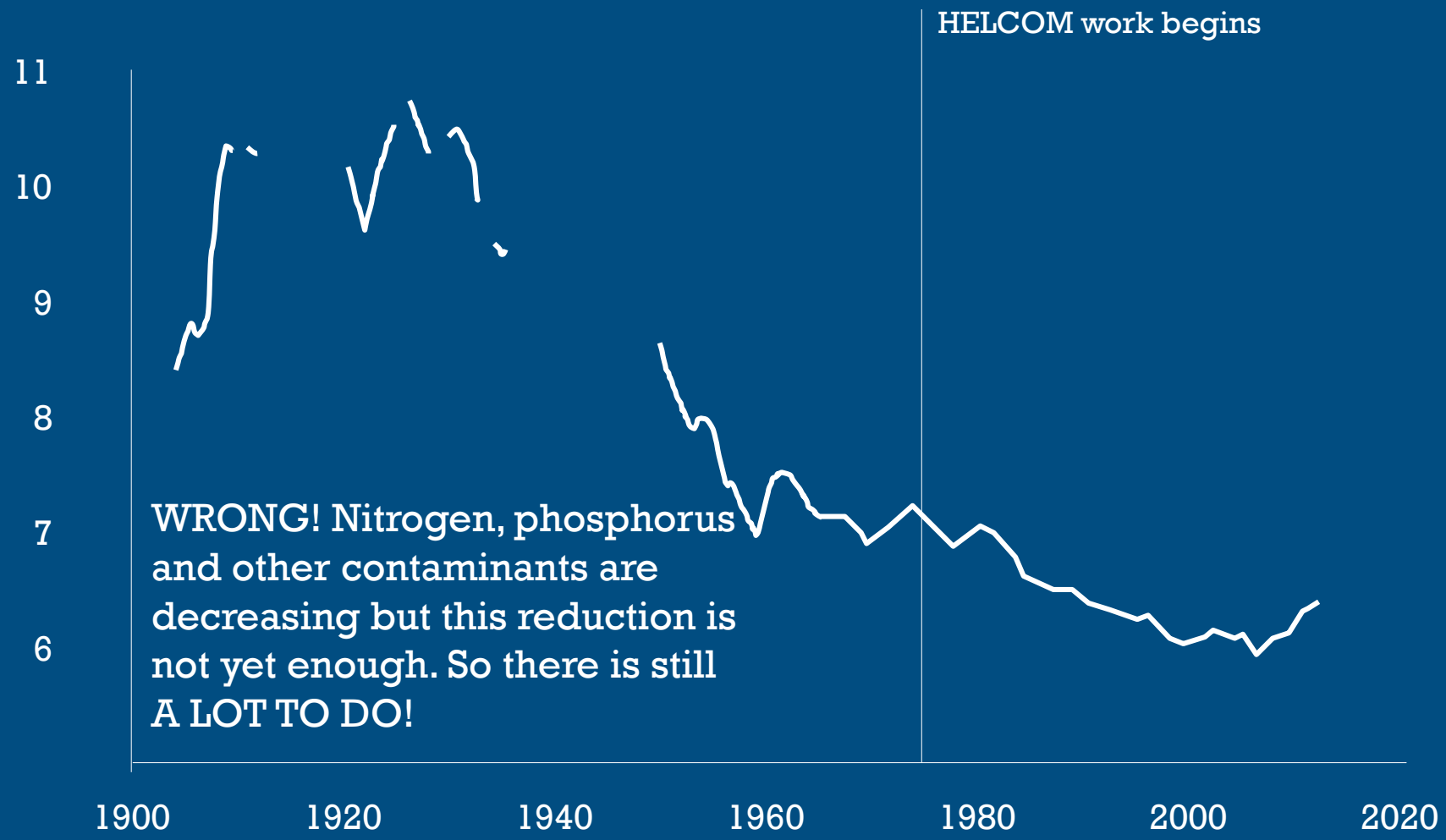
WATER CLARITY summer Secchi depth

In meters



WATER CLARITY summer Secchi depth

In meters



In this report you can see that there is really a lot to do still. The state of the Baltic Sea can be summarized in 3 messages



STATE OF THE BALTIC SEA

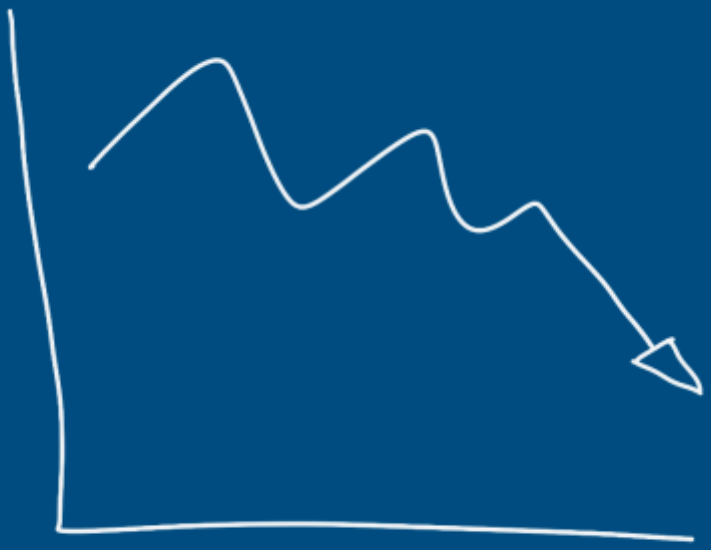
– HOLISTIC ASSESSMENT –

First version 2017

http://stateofthebalticsea.helcom.fi/

1

Inputs of nutrients from land have decreased but effects are not yet reflected in the status of all sub-basins.



2

Levels of contaminants are elevated, but the trend is improving.



3

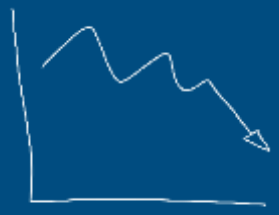
Many species groups and habitats in the Baltic Sea have inadequate status.



And the main message is that progress has been made

And the main message is that progress has been made

but





And the main message is that
progress has been made

but

there is still

a lot of work to do



That's all folks!
Hope you enjoyed!







Baltic Marine Environment Protection Commission