Disposal of dredged material in the Baltic Sea

Key message

- The total amount of material disposed in the Baltic Sea is highly variable between years, depending on the large-scale capital dredging operations carried out by counties in particular years. The total amount of material disposed in 2022 was a bit less than 12 million tonnes which is almost 4 million tonnes more than in 2021. Dredged material was disposed at 105 disposal sites.
- In 2022, the amount of material disposed at sea originating from capital dredging (78%) operations was higher than from maintenance operations (22%) and the share was the highest for the whole time series. Capital dredging produced 9.3 million tonnes of the disposed material, which constitutes 78% of all dredged material disposed at sea in 2022. This amount is the highest since 2019 (9.5 million tonnes) for capital dredging, and the fourth highest for the whole assessment period. Most of the capital dredging in 2022 was reported by Lithuania, Finland and Russia.
- Maintenance dredging in 2022 produced 2.6 million tonnes of dredged material, which constitutes about 22% of all dredged material disposed in the Baltic Sea. The amount is smaller than previous years, as the amount originating from maintenance dredging has been relatively stable from 2017 onwards, being around 4 million tonnes. The main contributors in 2022 were Latvia, Lithuania and Russia. A small amount (5813 tonnes) of dredged material is originating from unknown sources for 2022.
- 78% (9.3 million tonnes) of the material disposed at sea in 2022 was delivered from harbours and river estuaries and 22% (2.7 million tonnes) originates from dredging operations at sea. This distribution is similar to previous years, but differs from 2017, 2015 and 2014 demonstrating a reverse picture. Most of the material originating from harbours and rivers was reported by Lithuania and Russia, while dredging at sea was mainly reported by Finland.
- There were six major contaminants reported by countries in 2022: four heavy metals (mercury, lead, cadmium and copper), tributyltin and polycyclic aromatic hydrocarbons. For most contaminants the main source were the harbour/river environments (for PAH the share was 89% and for heavy metals approximately 95%), but for TBT the main source were the offshore areas, with an 88% share.
- Some of the dredged material originating from the Baltic Sea was utilized for various beneficial purposes including beach nourishment and construction. Totally 0.2 million tonnes of dredged material were reported as for beneficial use, at 13 sites. This is less than for 2021, when the amount was 0.9 million tonnes. The sites where dredged material were used for beneficial purposes are indicated on figure 1, but not included in the data used for any other graph, table or map in this documents.[1]

Results and assessment

Relevance of the BSEFS for describing developments in the environment

The disposal of dredged material fact sheet is relevant for seabed integrity and input of hazardous substances to the marine environment. The fact sheet enables to assess the level of physical disturbance to the marine environment caused by dredging/disposal operations at sea, as well as the level of contamination of marine and costal sediments and the amount of priority pollutants entering the marine environment or resuspended in the marine environment with disposed material.

[1] National practices on how beneficial use is regulated and reported varies among the Contracting Parties, and the annual reporting to HELCOM is not giving a comprehensive picture of beneficial usage in the Baltic Sea region. Further, as the data on dredged material is stored in a spatial database at HELCOM, only beneficial events that have spatial component are stored, and the figures in the BSEFS only cover those events.

Policy relevance and policy references

There is a general prohibition of dumping in the Baltic Sea according to the Helsinki Convention, except for dredged material; however, dumping of dredged material containing harmful substances is only permitted according to HELCOM Guidelines for Management of Dredged Material at Sea. The Contracting Parties are obliged to regulate and report about the material that has been disposed in the Baltic Sea Area. Data on disposal of dredged material is to be reported annually by the end of September of the year following the year the activities have been taken place.

The updated HELCOM Baltic Sea Action Plan, adopted at the 2021 HELCOM Lübeck Ministerial Meeting, states that the management objective on minimizing loss and disturbance to seabed habitats is to be met in order to reach the desired state where activities affecting seabed habitats do not threaten the viability of species' populations and communities. Activities causing disturbance to the seabed also contribute to the potential release of harmful substances.

Activities such as mineral extraction and dredging but also installation of offshore wind farms, other forms of marine energy production, and laying of underwater cables and pipelines have negative effects on the marine environment. One of the effects from these activities is physical disturbance and loss of the seabed. About 40% of the Baltic Sea seabed is estimated to be potentially disturbed, with many underwater biotopes and species in unfavourable conservation status. Under the sea-based activities segment of the 2021 BSAP the theme on seabed loss and disturbance includes five actions addressing this.

The majority of HELCOM Contracting Parties are also parties to the global "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972", the "London Convention" for short. Its objective is to promote the effective control of all sources of marine pollution and to take all practicable steps to prevent pollution of the sea by dumping of wastes and other matter. London Convention is also collecting information on the disposal activities of its Contracting Parties, and HELCOM started a trial with 2017 data to perform consolidated reporting to the London Convention on behalf of HELCOM Contracting Parties.

Assessment

Reported data in 2022

HELCOM Recommendation 36/2 recommends that the Contracting Parties follow the HELCOM Guidelines for Management of Dredged Material at Sea, and that the Contracting Parties annually report national data on management of dredged material according to the Reporting Format of the HELCOM Guidelines. Data from 2022 were reported by all countries except Russia. As agreed by PRESSURE 5-2016 (Outcome, para 5.9), analysis of reported data have been made to illustrate disposal of dredged material and also the distribution of input of selected contaminants associated with it to the Baltic Sea marine environment.

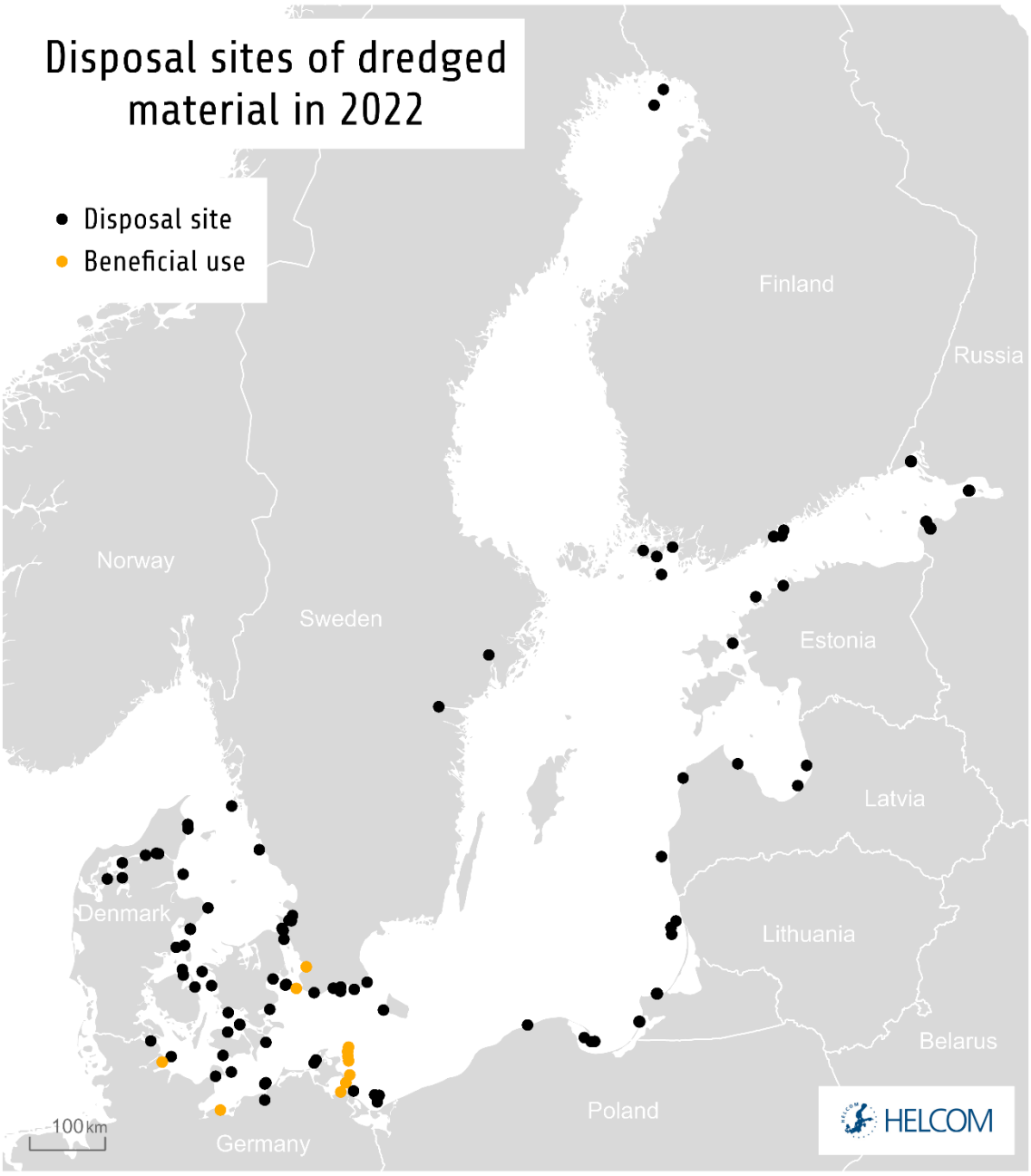

Figure 1. Location of disposal sites of dredged material in 2022 as well as locations where dredged material has been used for beneficial use.[2]

[2] National practices on how beneficial use is regulated and reported varies among the Contracting Parties, and the annual reporting to HELCOM is not giving a comprehensive picture of beneficial usage in the Baltic Sea region. Further, as the data on dredged material is stored in a spatial database at HELCOM, only beneficial events that have spatial component are stored, and the figures in the BSEFS only cover those events.

Figure 1 illustrates the distribution of 105 locations where disposal of dredged material took place in 2022. The map also includes 13 locations where dredged material has been used for beneficial purposes, such as beach nourishment and habitat generation. As it can be seen from the map, the density of disposal sites is higher in the southern than northern Baltic Sea.

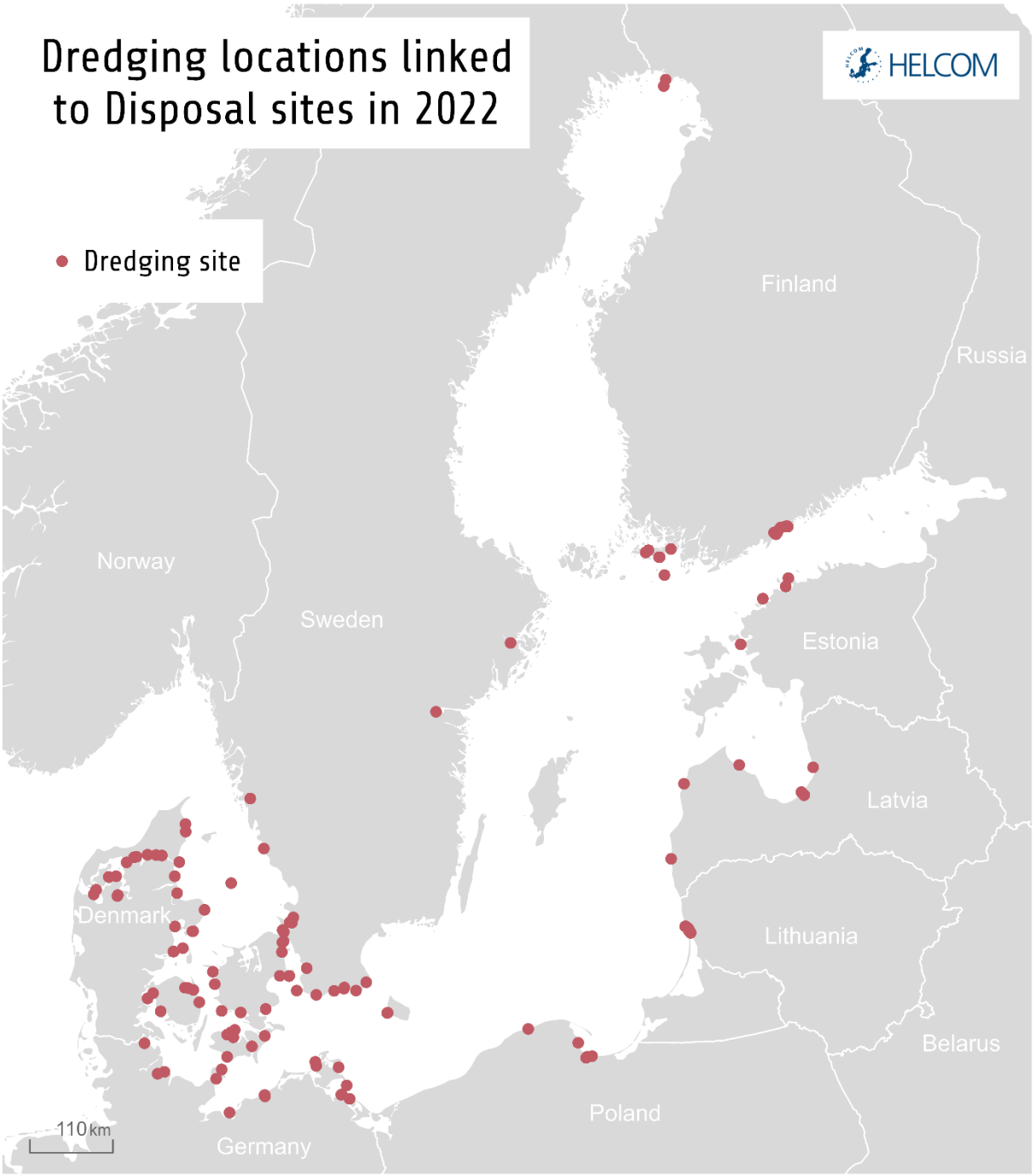

Figure 2. Location of dredging sites that are linked to disposal sites reported for 2022. Reporting of dredging sites is optional in HELCOM guidelines, and therefore not all dredging sites are reported and indicated on the map. Please also note that only dredging sites that are linked to disposal operations are reflected and information from small-scale dredging is not always reported or included in the map. Thus, the data doesn't give a comprehensive picture of dredging in the Baltic Sea.

The reporting format also includes information on dredging areas in the Baltic Sea and their link to the areas where dredged material was disposed. Figure 2 illustrates the distribution of 149 sites of dredging operations in the Baltic Sea in 2022 according to the information reported by the Contracting Parties. Reporting of dredging is optional according to HELCOM Guidelines. Also there are different permitting schemes for dredging operations in the different Contracting Parties. The number of dredging operations and amount of

dredged material may therefore not be directly comparable between the contracting parties, as not all report in the same way.

Disposed material originated from maintenance and capital dredging operations

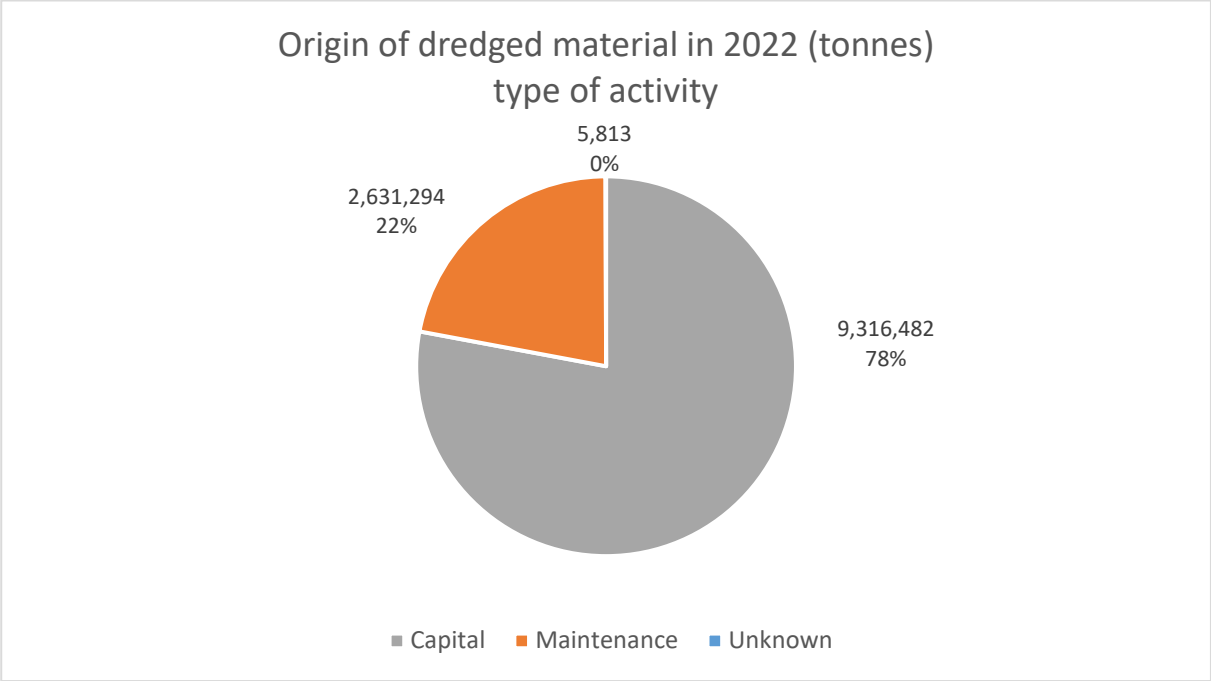

Figure 3. Proportions of material originating from maintenance dredging, capital dredging, and unknown operations in the total amount of dredged material disposed in the Baltic Sea in 2022.

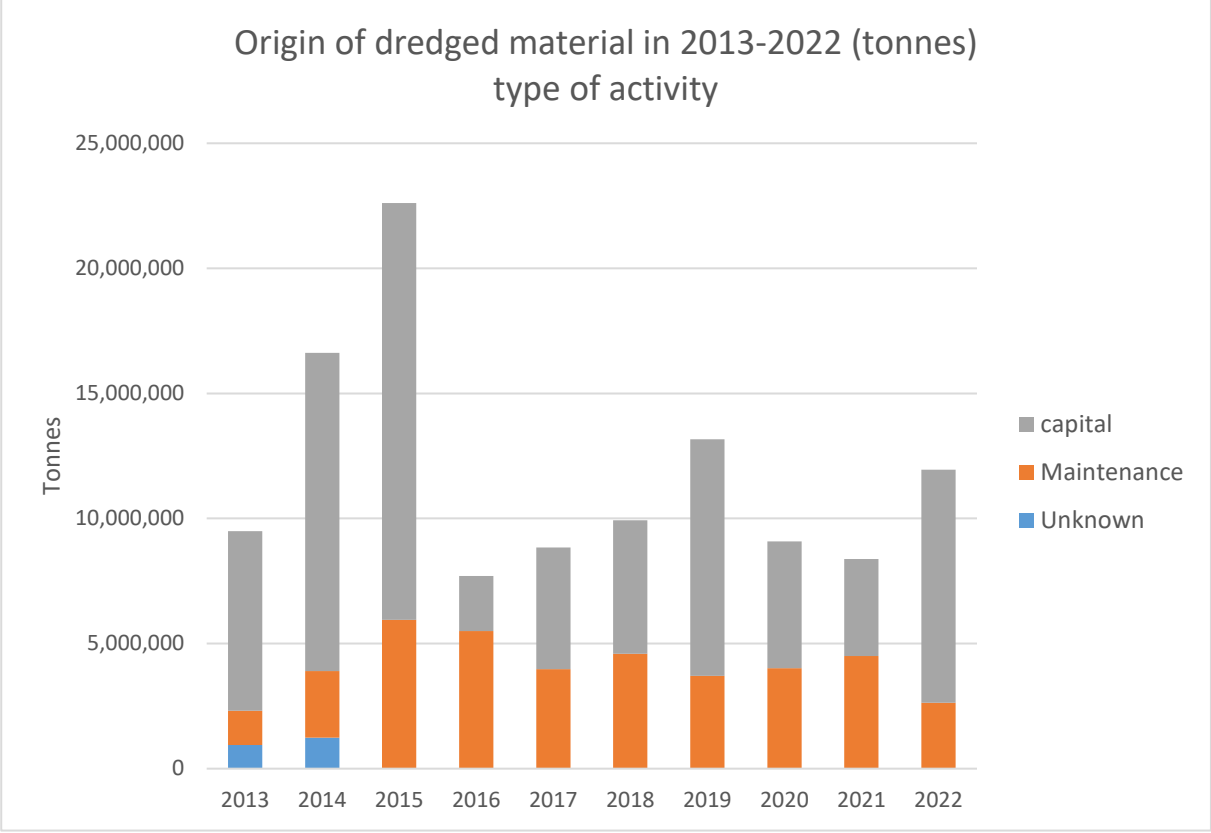

Figure 4. Amount of the material originating from maintenance dredging, capital dredging, and unknown operations in total of the amount of dredged material disposed in the Baltic Sea in the period from 2013 to 2022.

Most material (78%) disposed of at sea in 2022 originates from capital dredging which exceeds the share of the previous year where 54% originated from capital dredging. The share of capital dredging is the highest in the whole time series. Meanwhile the proportion of maintenance dredging in 2022 constitutes 22%. Prevailing of capital dredging over maintenance is a typical picture in the region except for the year 2016 when capital dredging activities were minimal (Figure 4). In 2013-14 the material of unknown origin constituted a remarkable part, since 2015 the percentage of the material of unknown origin reported by countries has been negligible (Fig. 4).

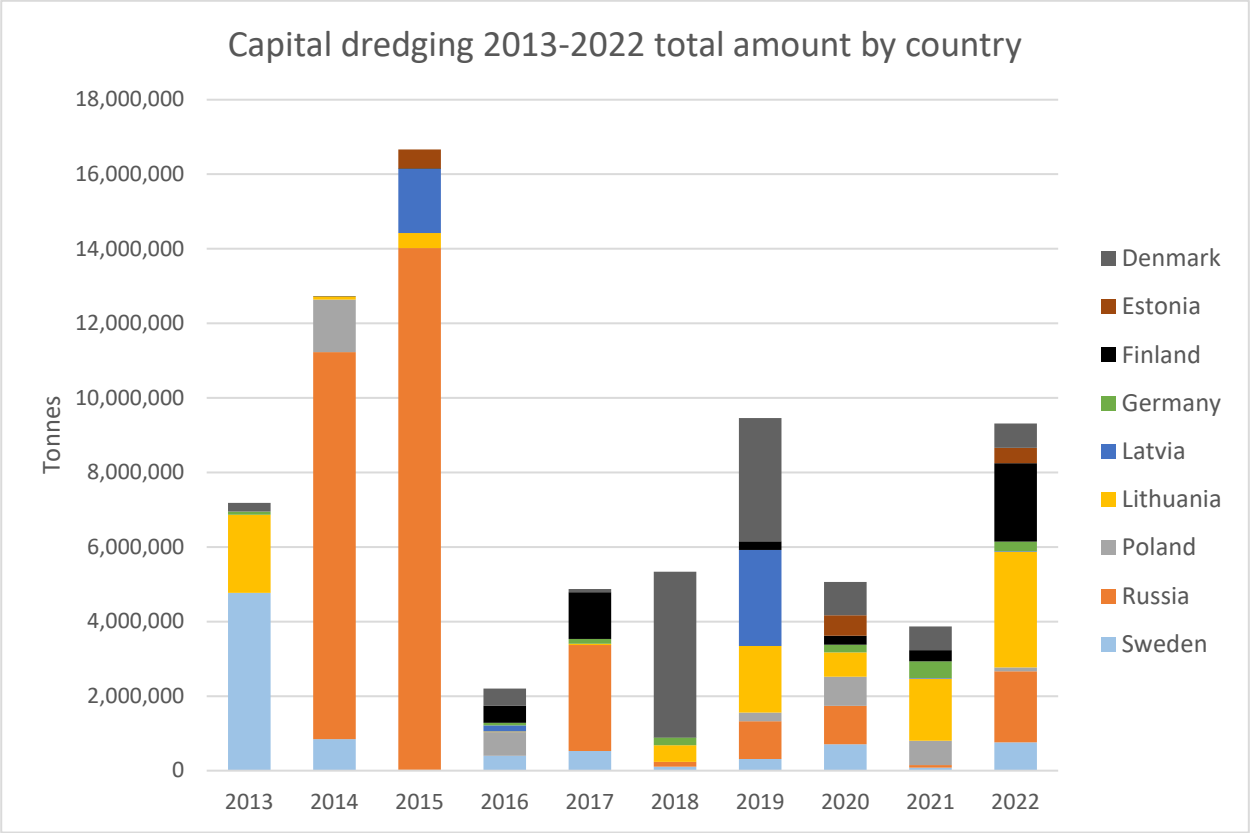

Figure 5. Disposal of material from capital dredging operations by country for the period 2013-2022.

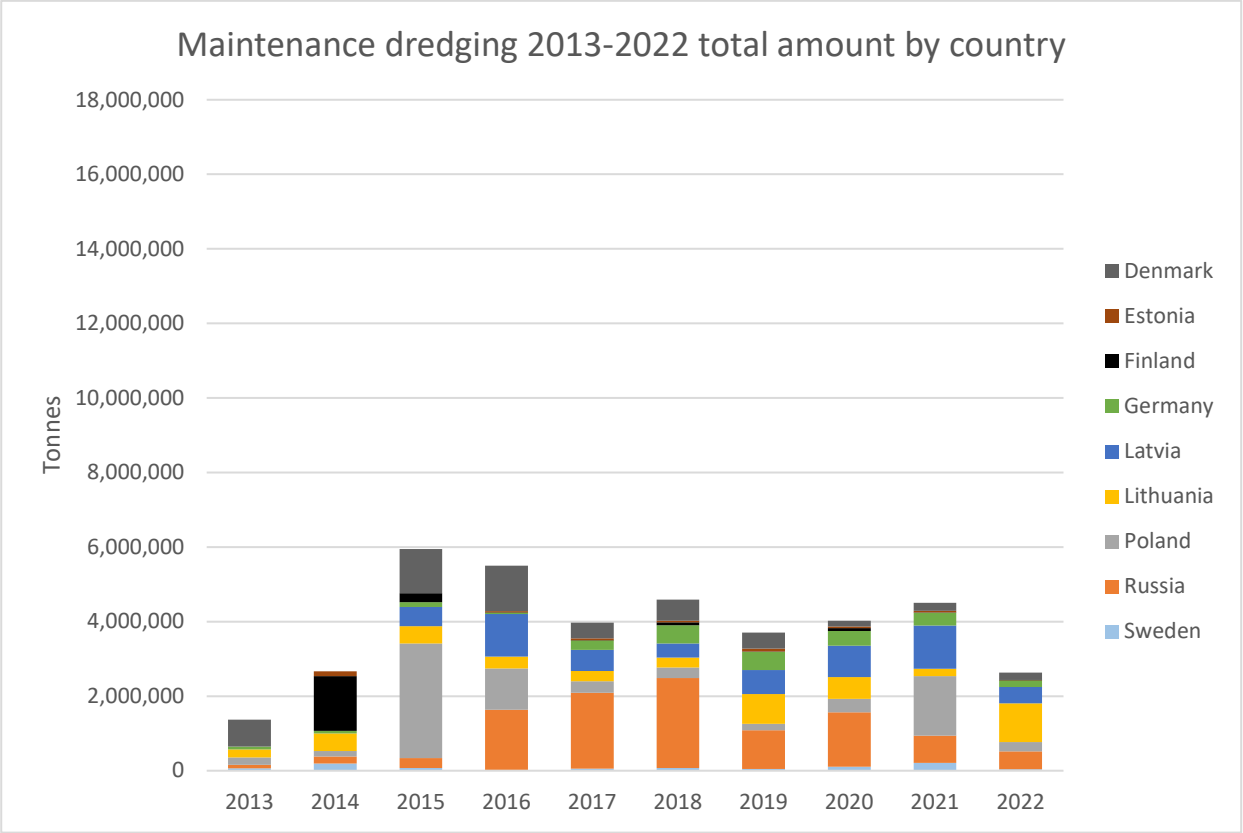

Figure 6. Amount of material disposed from maintenance dredging operations by country for the period 2013-2022.

The bar diagrams (Figures 5 and 6) illustrate the disposal of material produced by capital and maintenance dredging activities per country. The diagrams show that a large amount of dredged material disposed at sea in 2022 was produced by capital dredging in Lithuania, Finland and Russia. As regard to maintenance dredging the largest volume of disposed material was produced by Latvia, Lithuania and Russia.

Total amount of dredged material disposed

In 2022 a bit less than 12 million tonnes of dredged material were disposed in the Baltic Sea which is almost 4 million tonnes more than in 2021 (Fig. 4). In addition, 0.24 million tonnes of dredged material were used for construction purposes and other beneficial uses. In the given assessment period, the total amounts of disposed material varied between 7 000 000 and 23 000 000 tonnes. Such a large variation is caused by the large amount of disposal reported by Russia in 2014-2015. Completeness of the data reporting was 100% in 2022 (Figure 7).

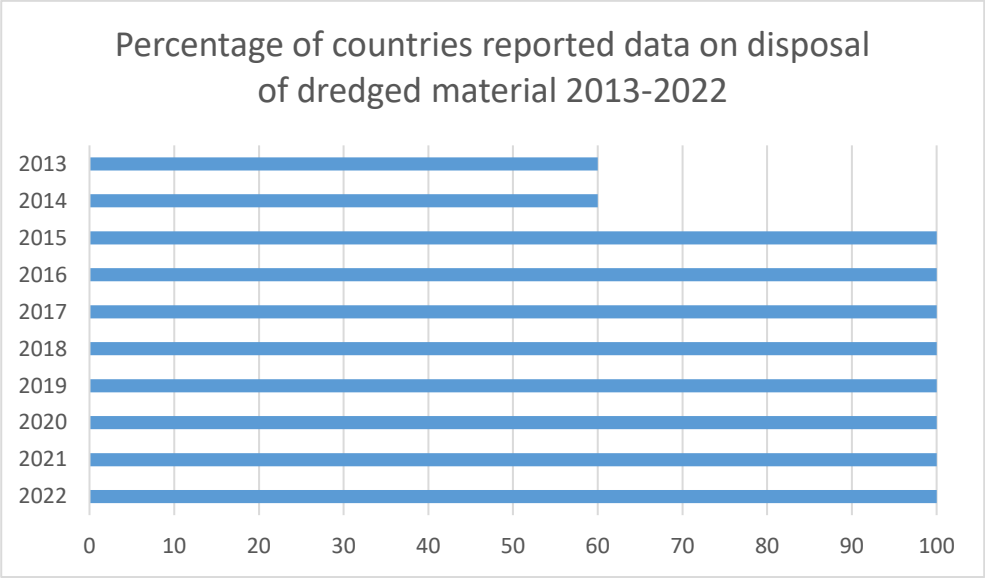

Figure 7. Completeness of reporting by the Contracting Parties in 2013-2022.

Spatial distribution of disposal sites is illustrated by Figures 8 and 9. Density of disposal sites is higher in the south-west part of the Sea. There are fewer disposal sites in the eastern Baltic Sea. The amount of dredged material disposed at these sites is rather high which indicates intensive dredging operations there. This spatial distribution of disposal sites is characteristic for the Baltic Sea area and is observed throughout the whole observation period since 2013.

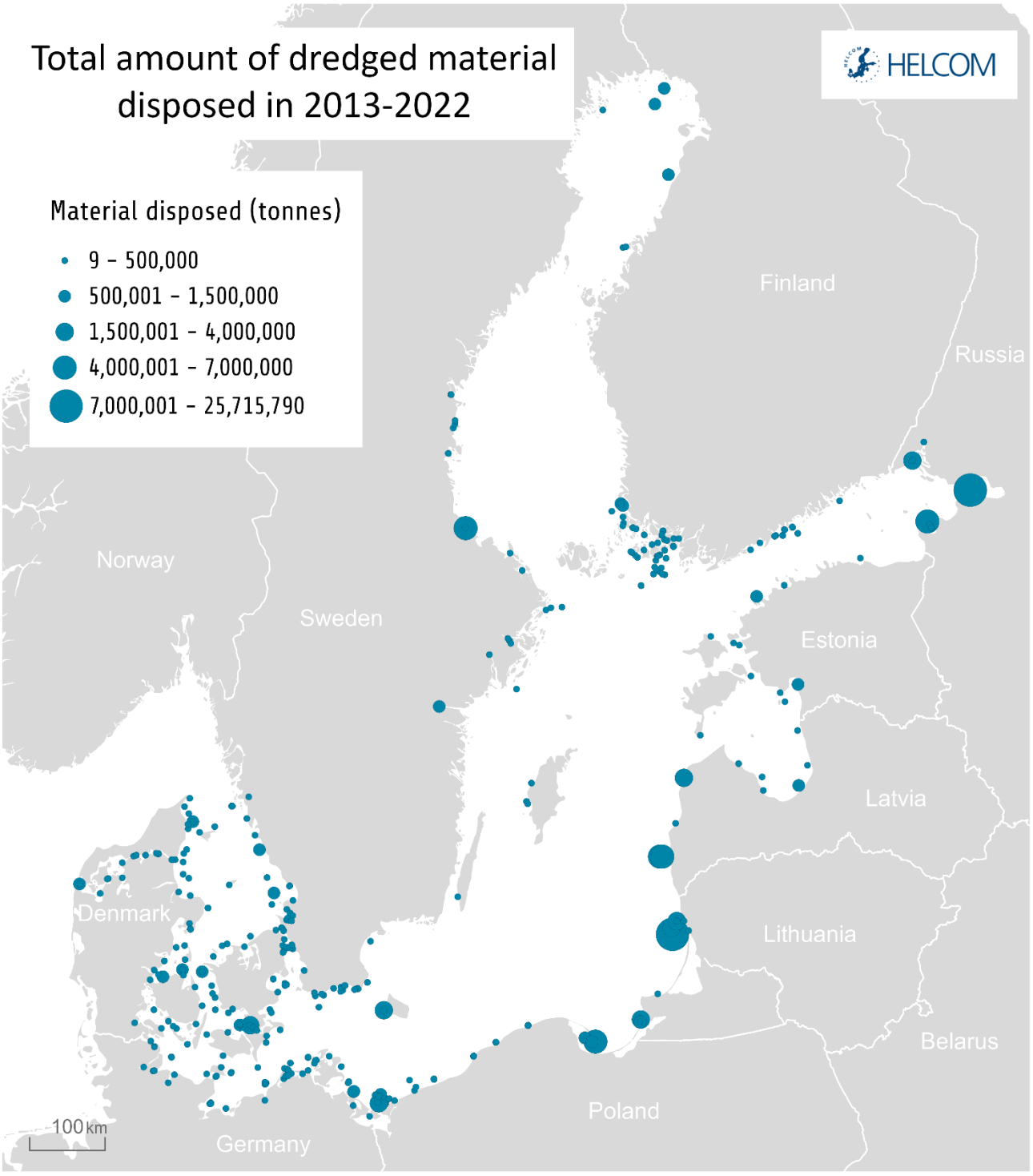

Figure 8. Total amount of dredged material disposed during the observation period 2013-2022.

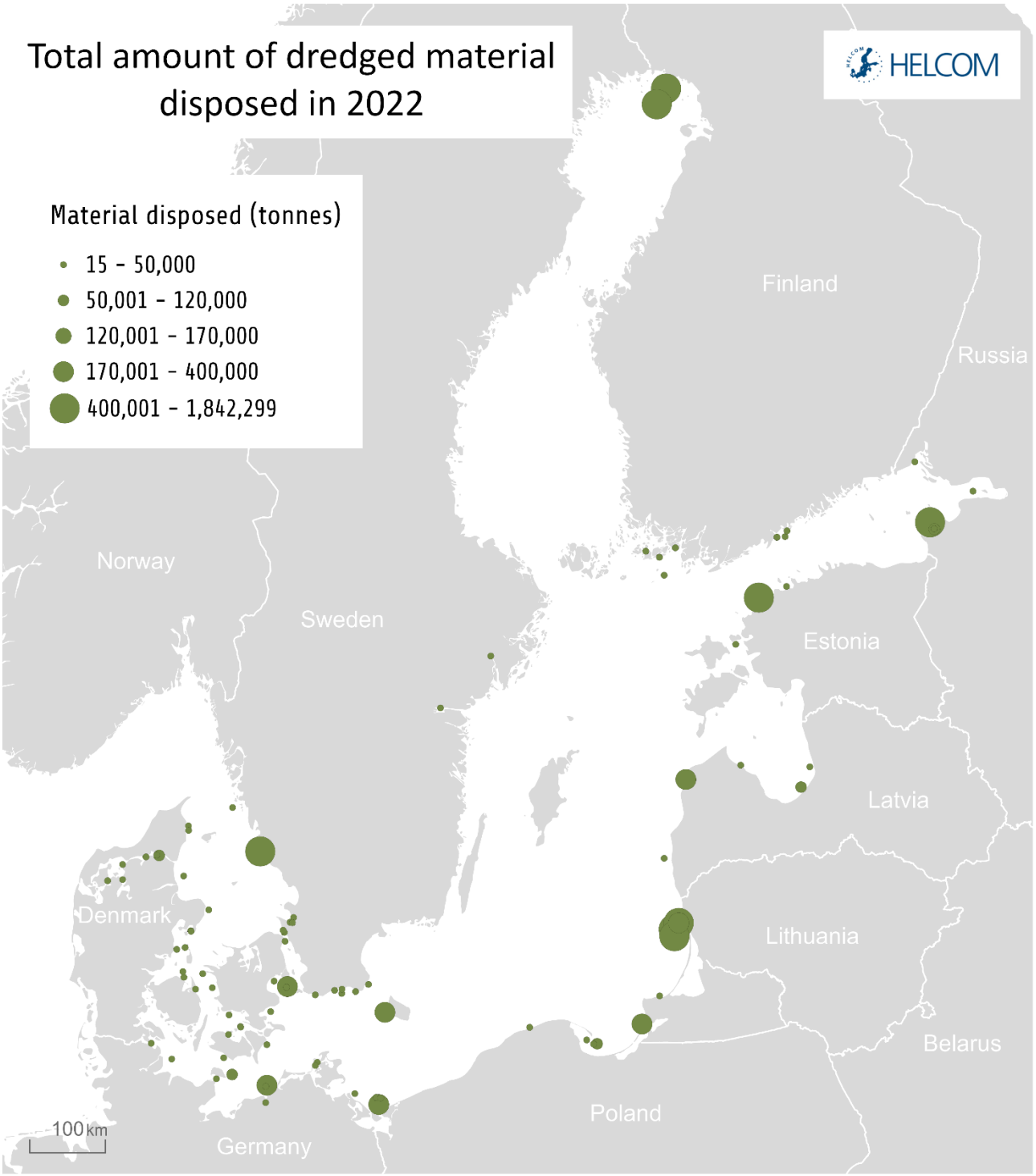

Figure 9. Total amount of dredged material disposed in 2022.

Disposed material originating from operations at sea or coastal and river waters.

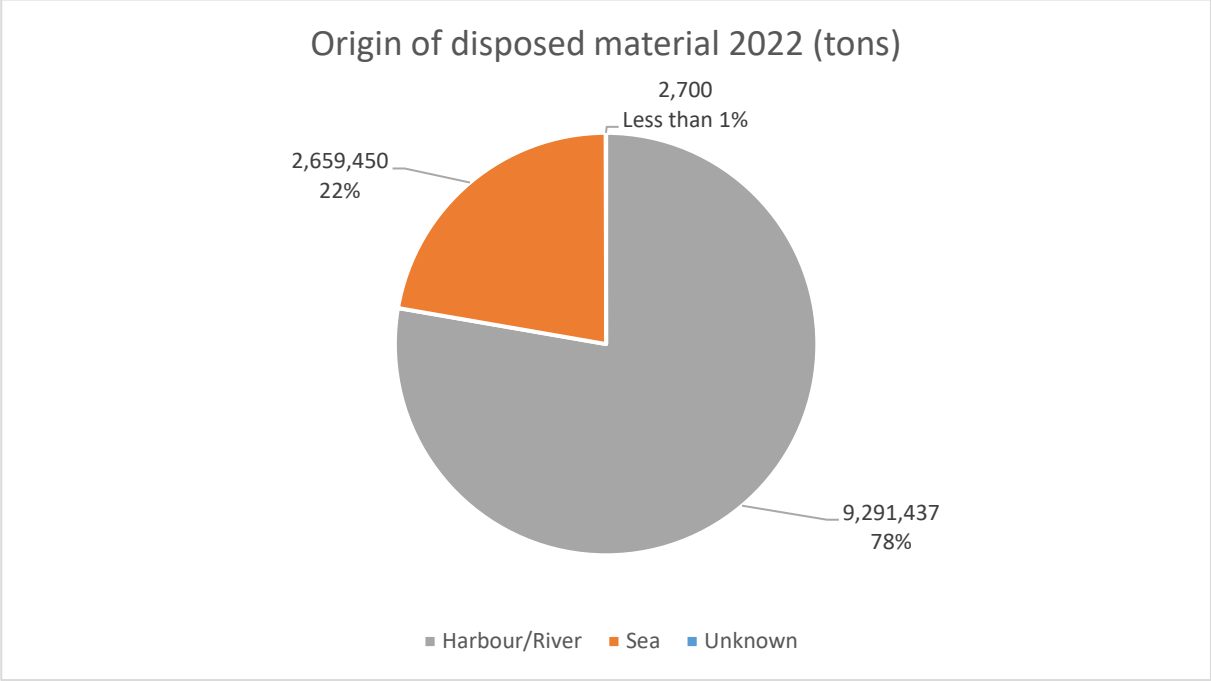

Figure 10. Proportions of the material originating from harbour/river, sea and unknown sources in total amount of dredged material disposed in the Baltic Sea in 2022.

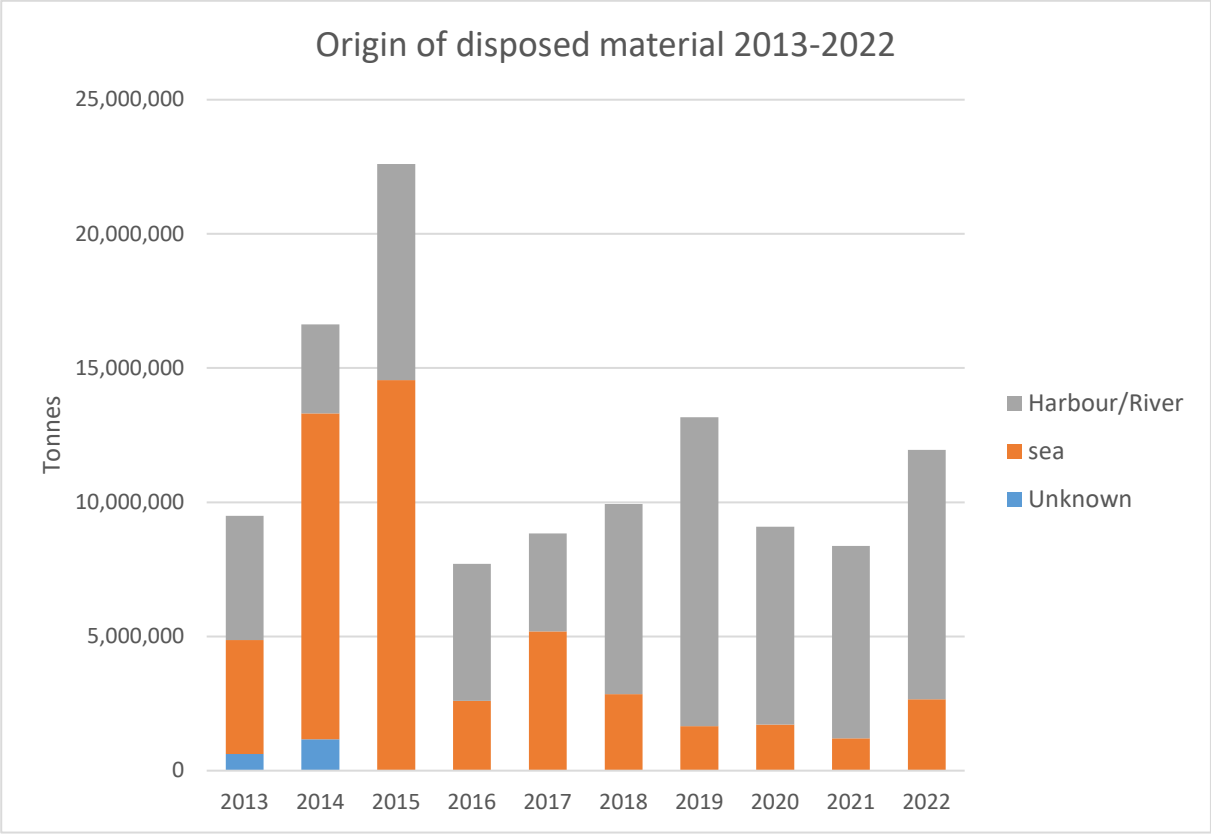

Figure 11. Proportions of the material originating from harbour/river, Sea and unknown locations in total amount of dredged material disposed in the Baltic Sea in the period from 2013 to 2022.

Figures 10 and 11 illustrate the amount of disposed material originating from sea and harbour/river environments in the last reported year and in the entire reporting period, respectively. The term "harbour/river" includes all dredged material which was transported to the sea from harbors, estuaries and inland waterways. The term "sea" includes all areas outside harbours, i.e. in open, coastal and offshore areas.

A bit more than three quarters (78%) of dredged material disposed in the Baltic Sea in 2022 originated from dredging at harbors and rivers. A bit less than one quarter (22%) of the reported amounts originate from dredging operations at sea. The distribution is similar to last years but differ from the pattern observed in 2013-2015 and 2017 when most of the disposed material was originating from sea.

Figures 12 and 13 illustrate the amount of material disposed at sea originating from sea and harbour/river environments for the whole reporting period per country.

In 2022 the highest amount of disposed material originating from the sea was in Finland. This differs from the earlier years, as the highest amount that originates from the sea has been disposed by Russia for the years 2014-2020. Lithuania and Russia are the main contributors to the disposal of the material originating from rivers and harbors in 2022.

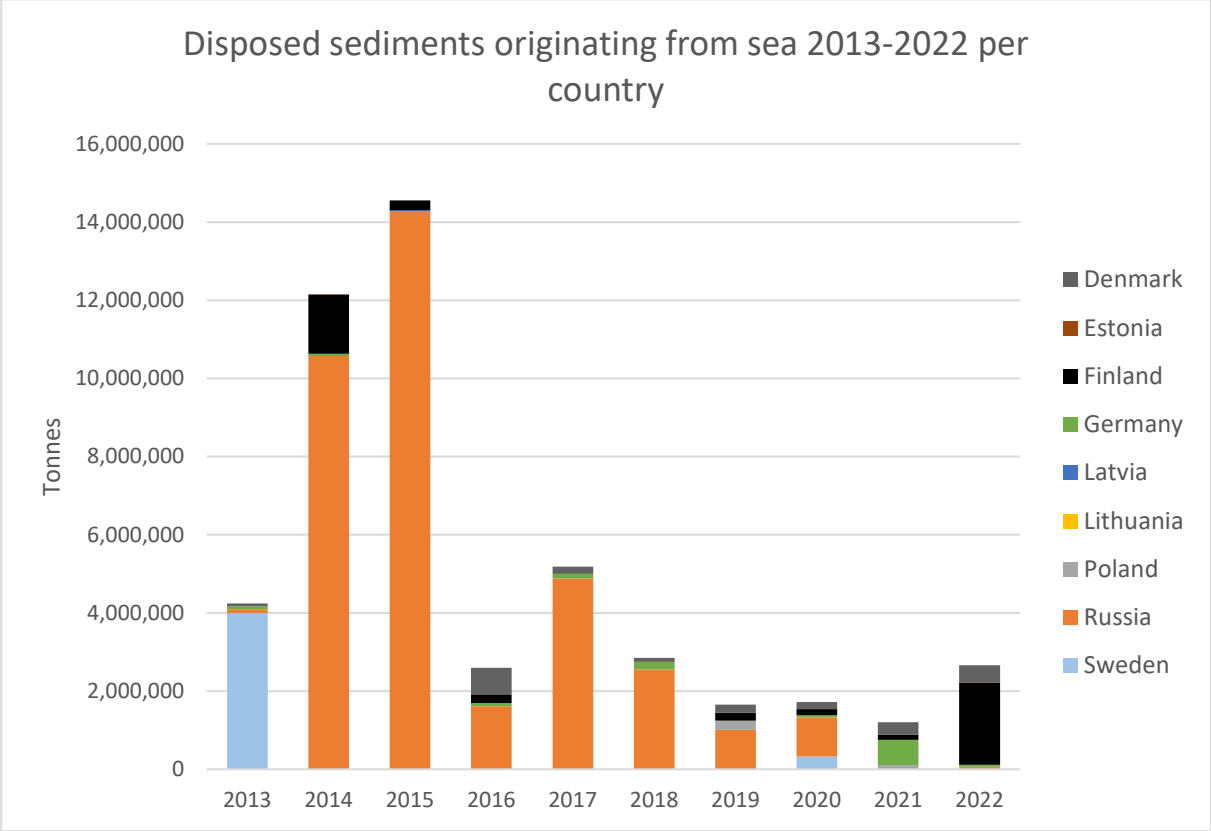

Figure 12. Amount of material originating from sea by country for the period 2013-2022.

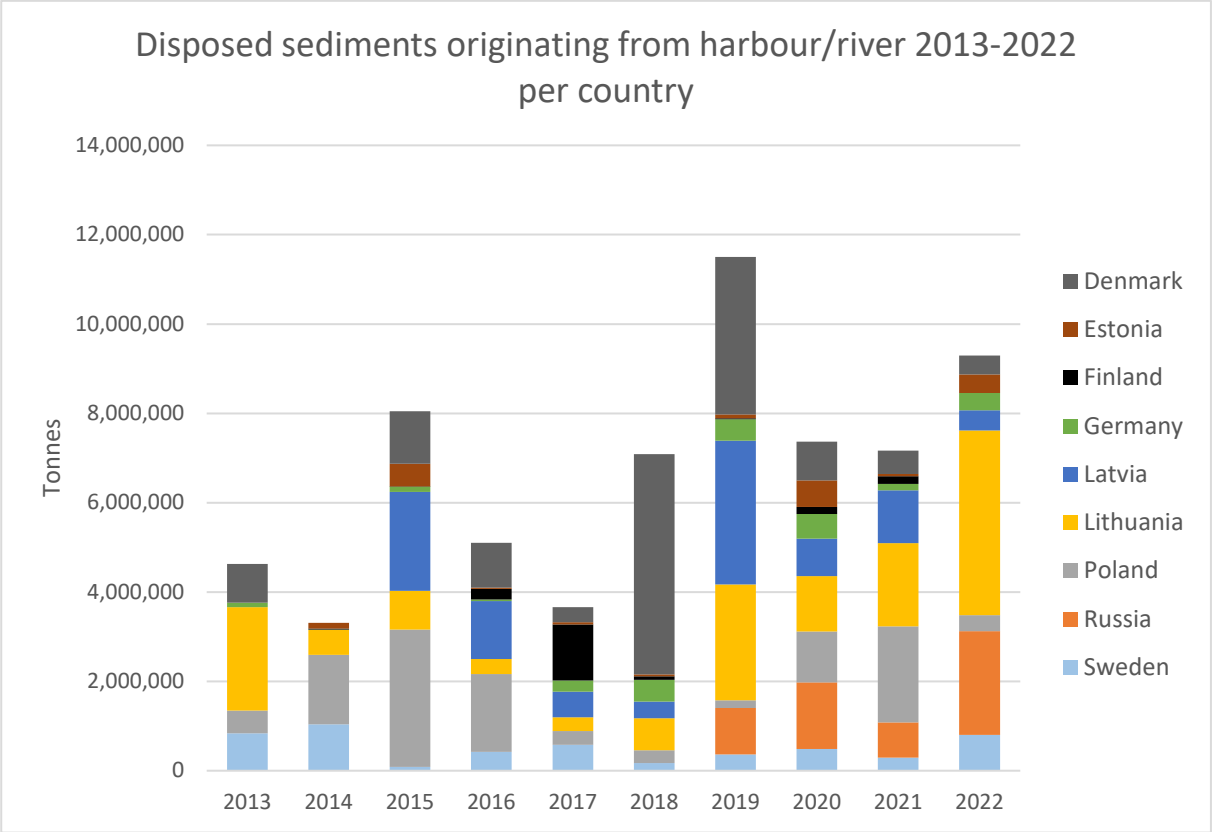

Figure 13. Amount of material originating from harbour/river environments by country for the period 2013-2022.

Country-specific values

Figures 14-31 illustrate the characteristics of dredged material disposed in 2013-2022 per country. The upper figure illustrates the amount of material originating from different dredging operations and the lower figure illustrates sources of disposed material. Please note that the scale on the y-axis (amount material disposed in tonnes) is different for each country.

Denmark

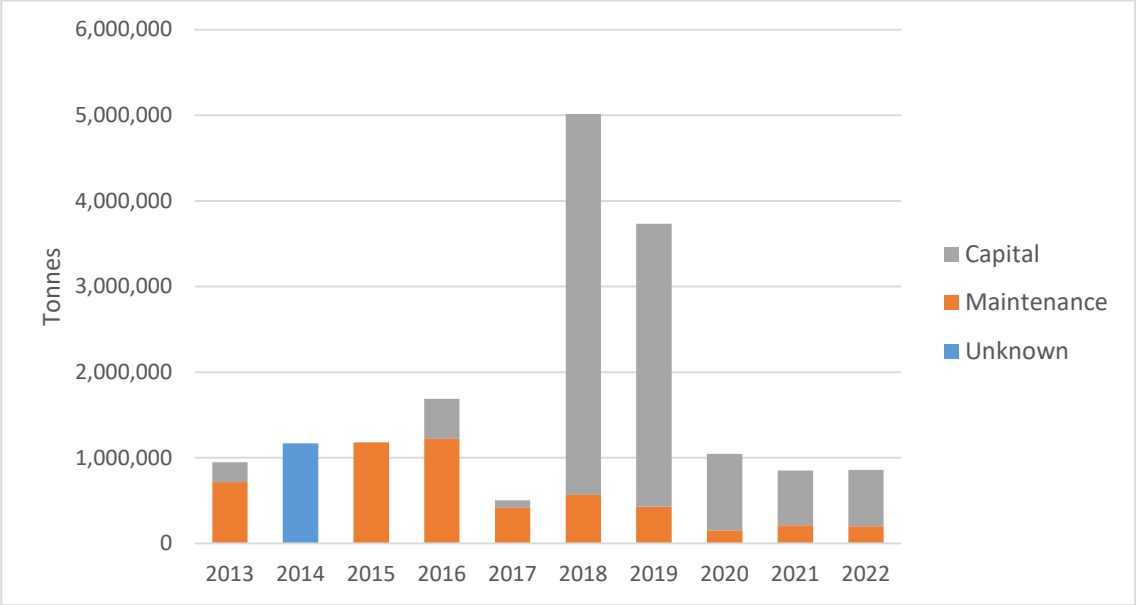

Figure 14. Amount of material originating from different dredging operations.

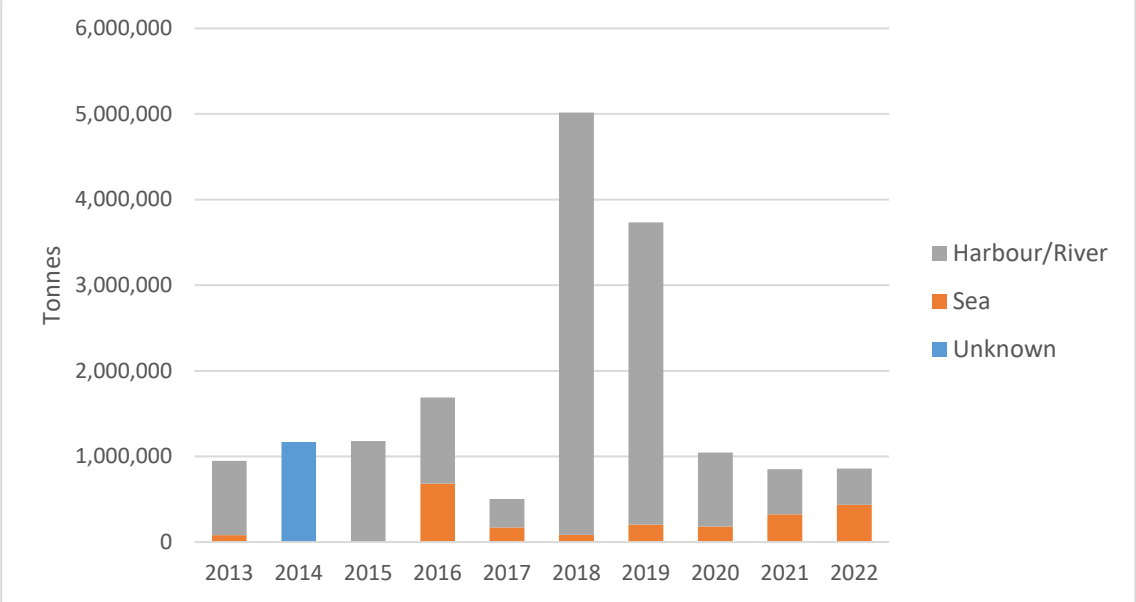

Figure 15. Sources of disposed material.

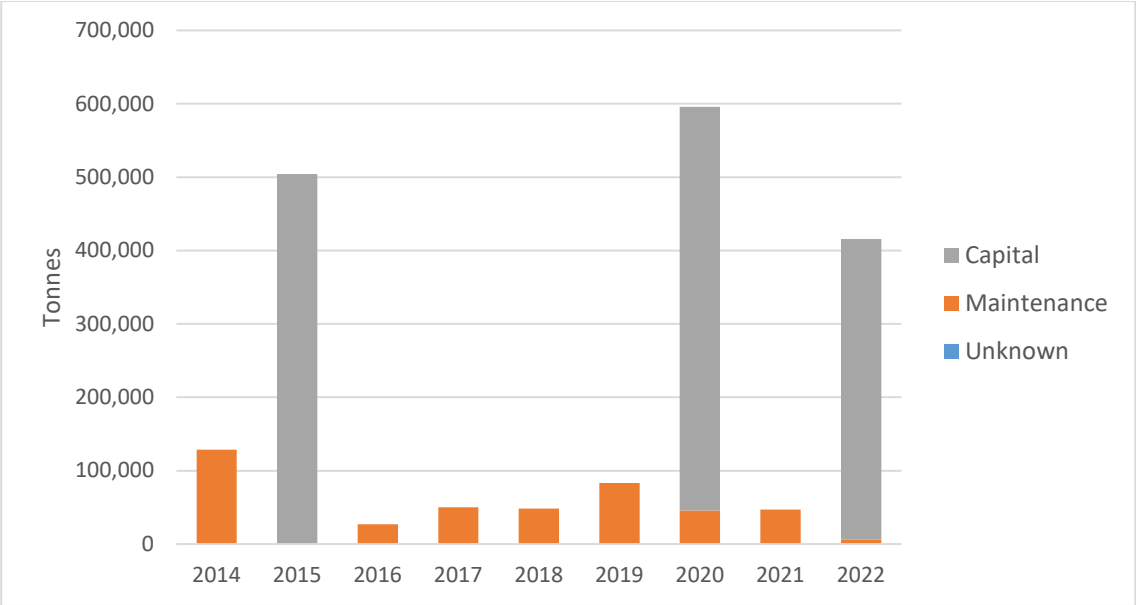

Figure 16. Amount of material originating from different dredging operations.

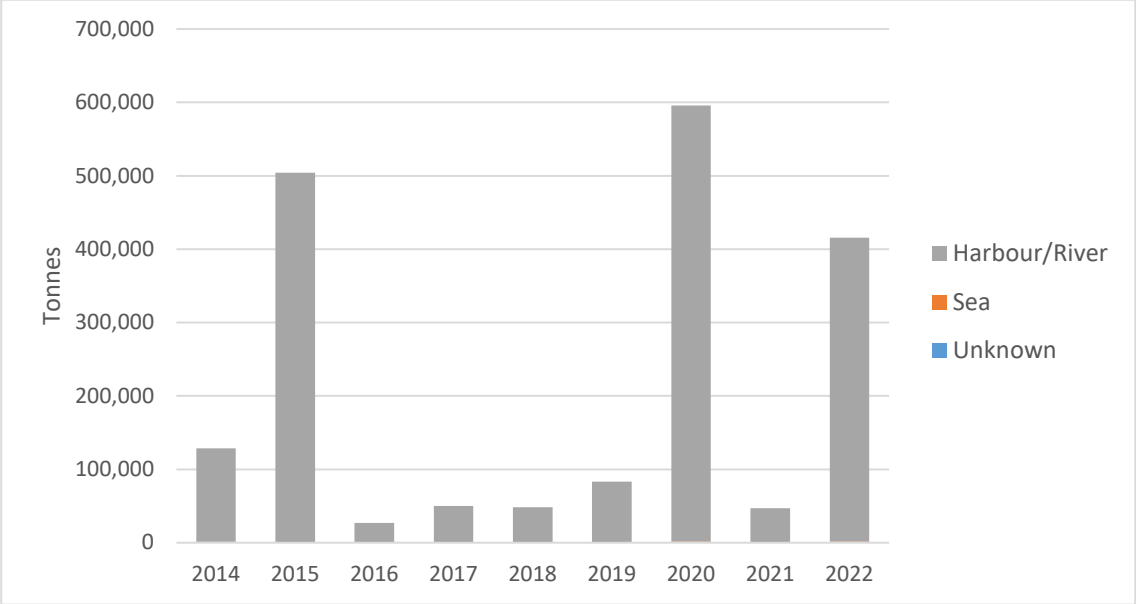

Figure 17. Sources of disposed material.

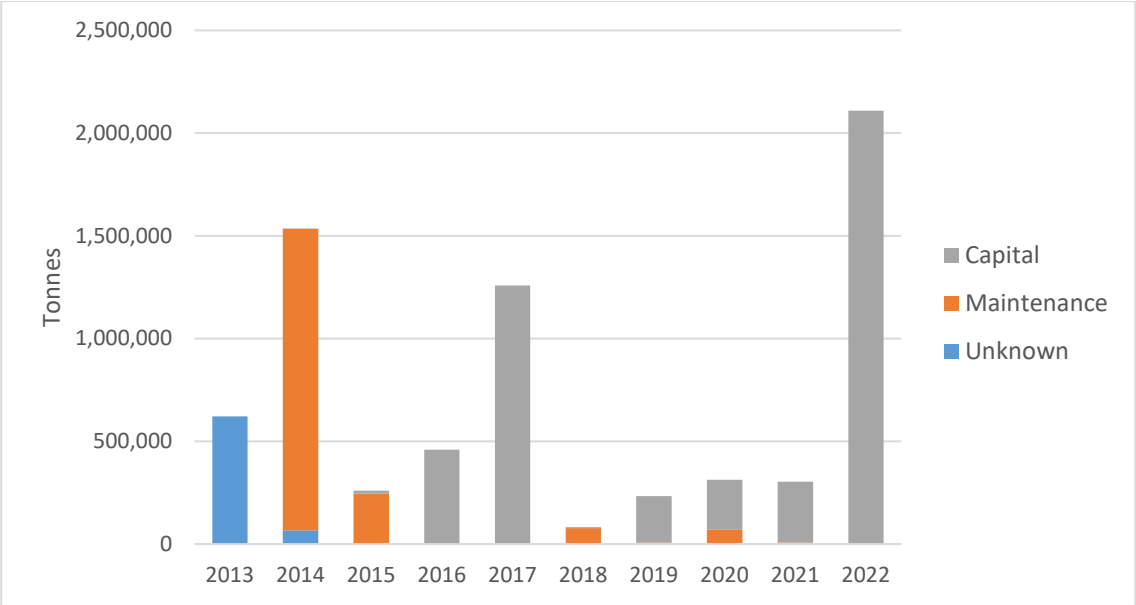

Figure 18. Amount of material originating from different dredging operations.

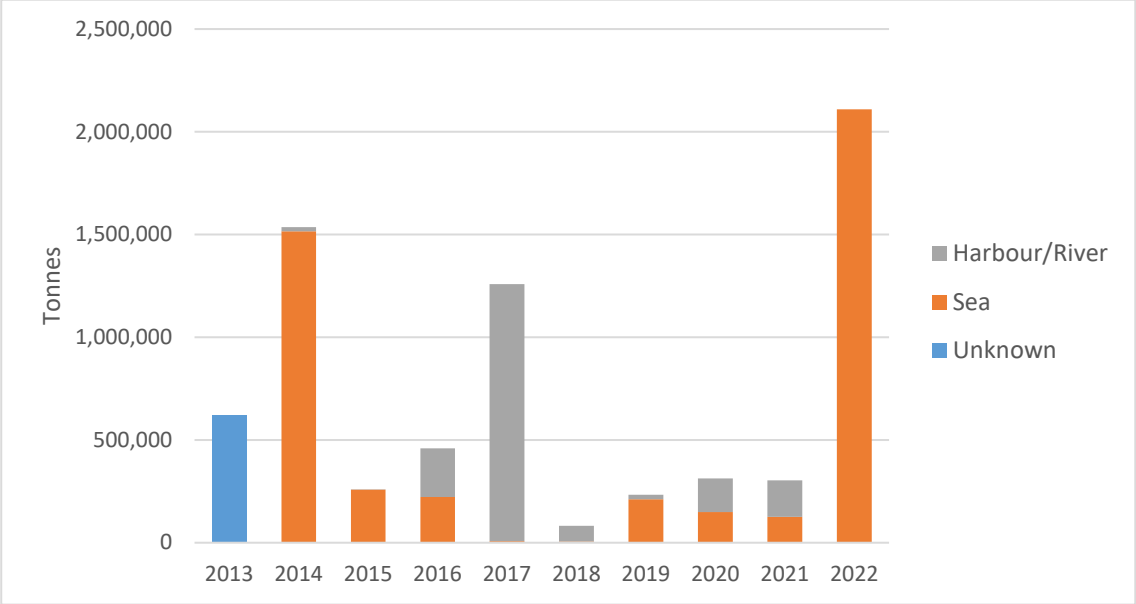

Figure 19. Sources of disposed material.

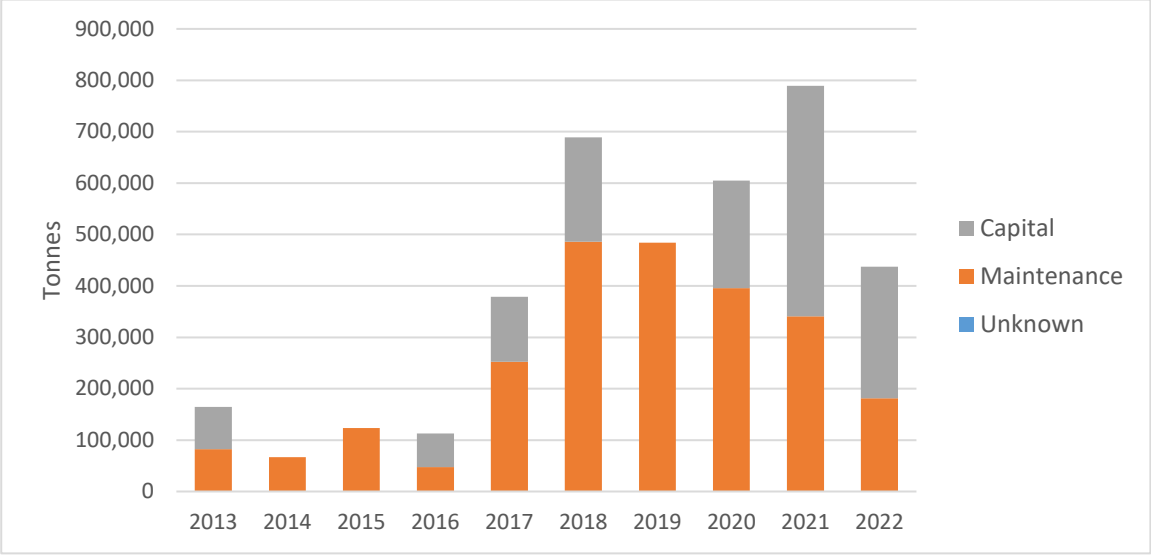

Figure 20. Amount of material originating from different dredging operations.

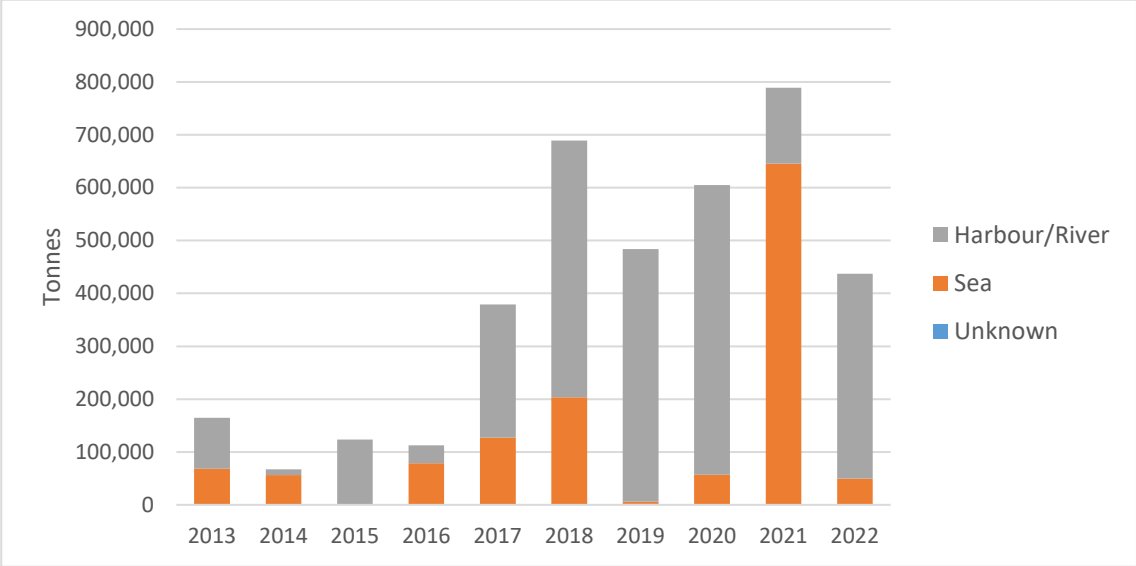

Figure 21. Sources of disposed material.

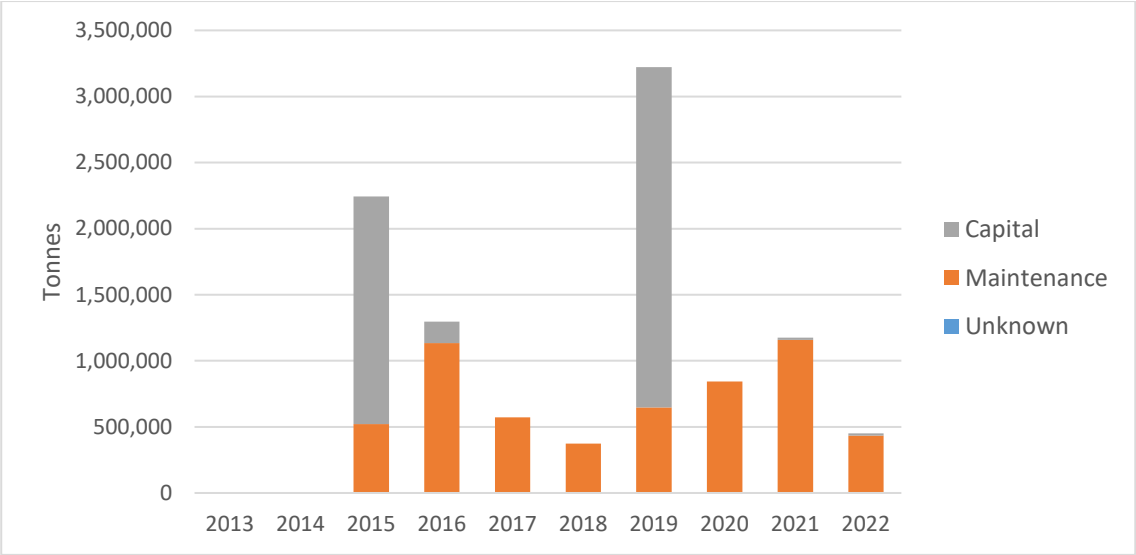

Figure 22. Amount of material originating from different dredging operations.

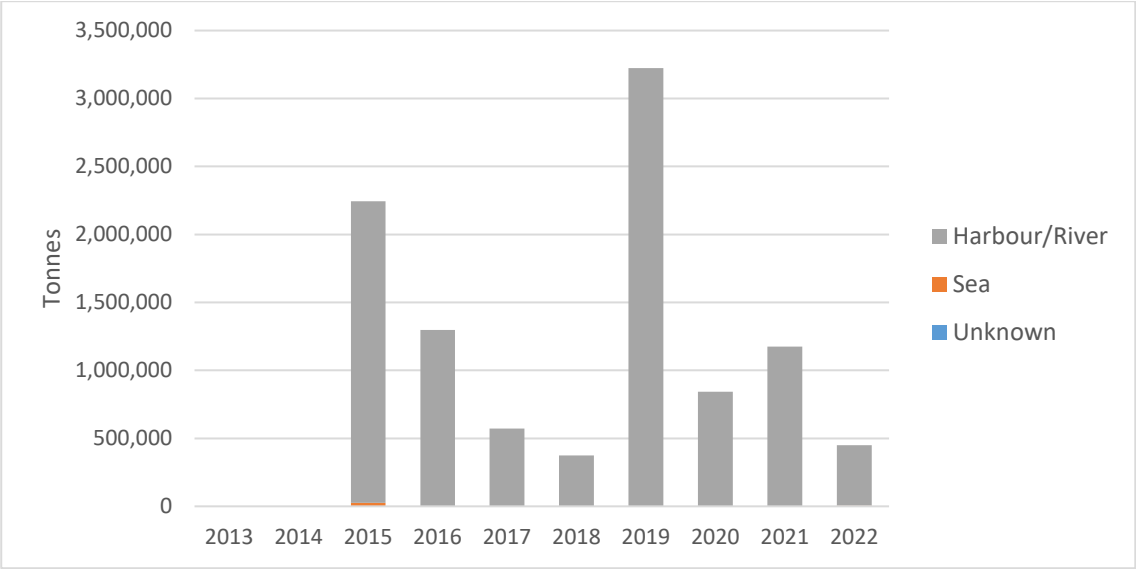

Figure 23. Sources of disposed material.

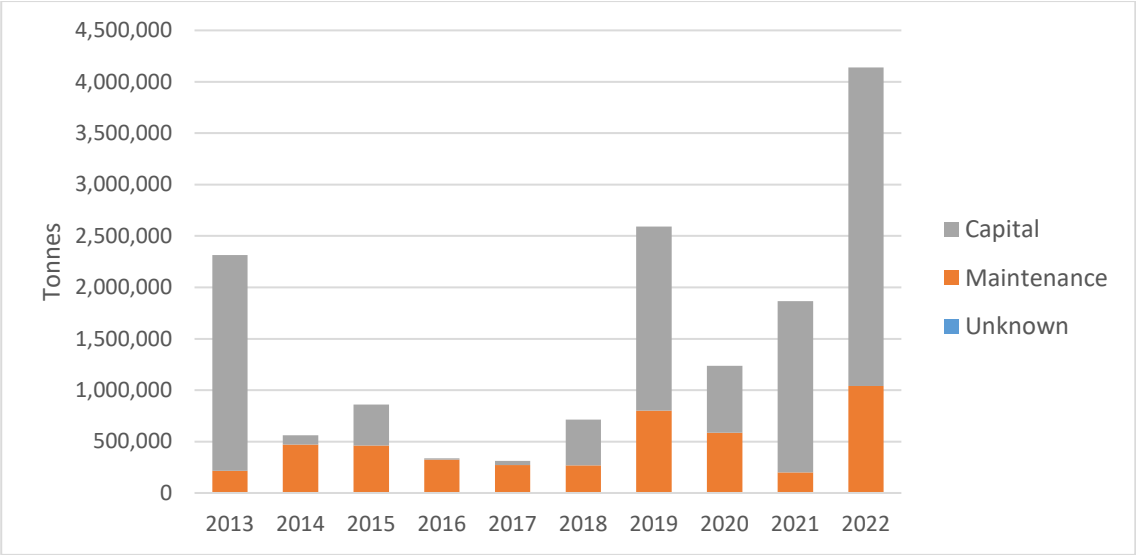

Figure 24. Amount of material originating from different dredging operations.

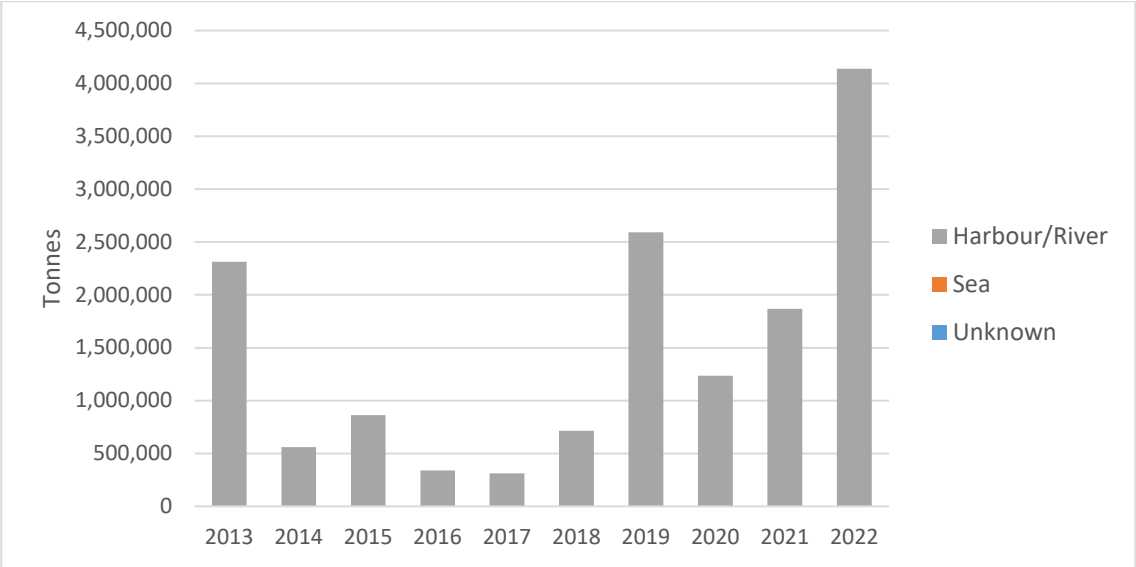

Figure 25. Sources of disposed material.

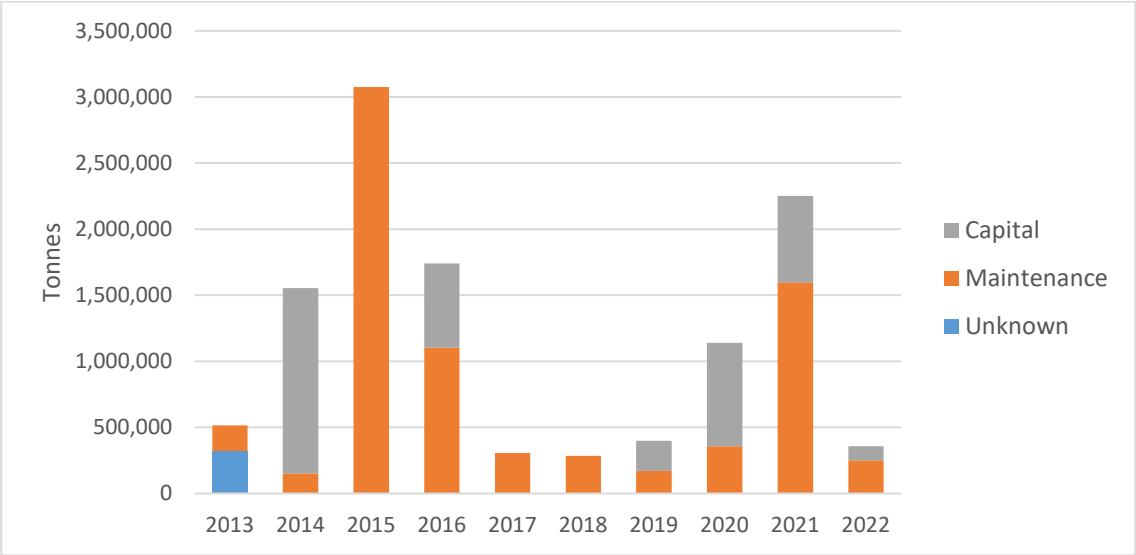

Figure 26. Amount of material originating from different dredging operations.

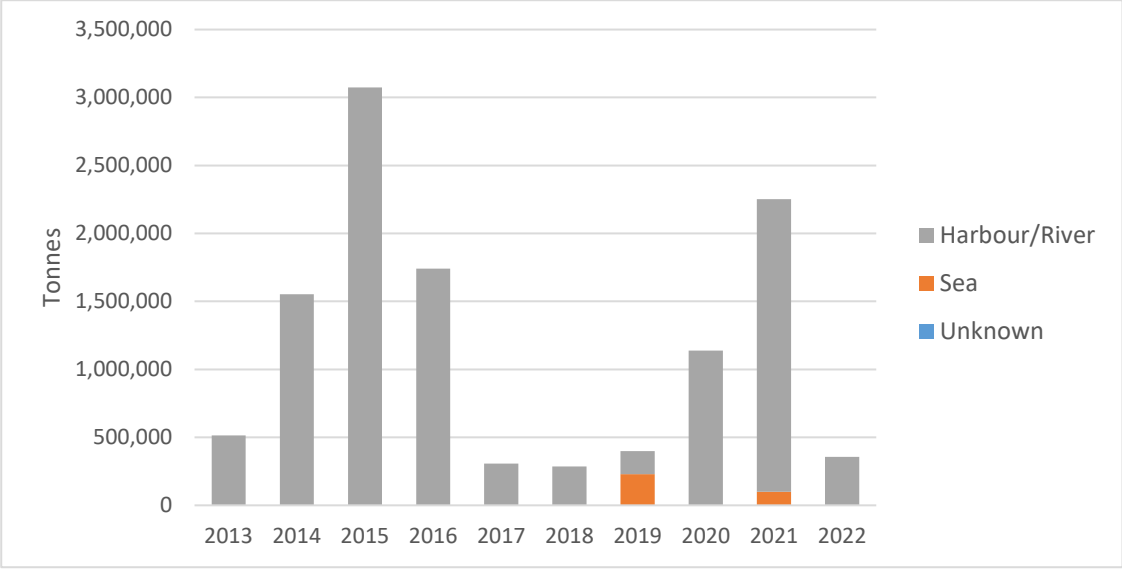

Figure 27. Sources of disposed material.

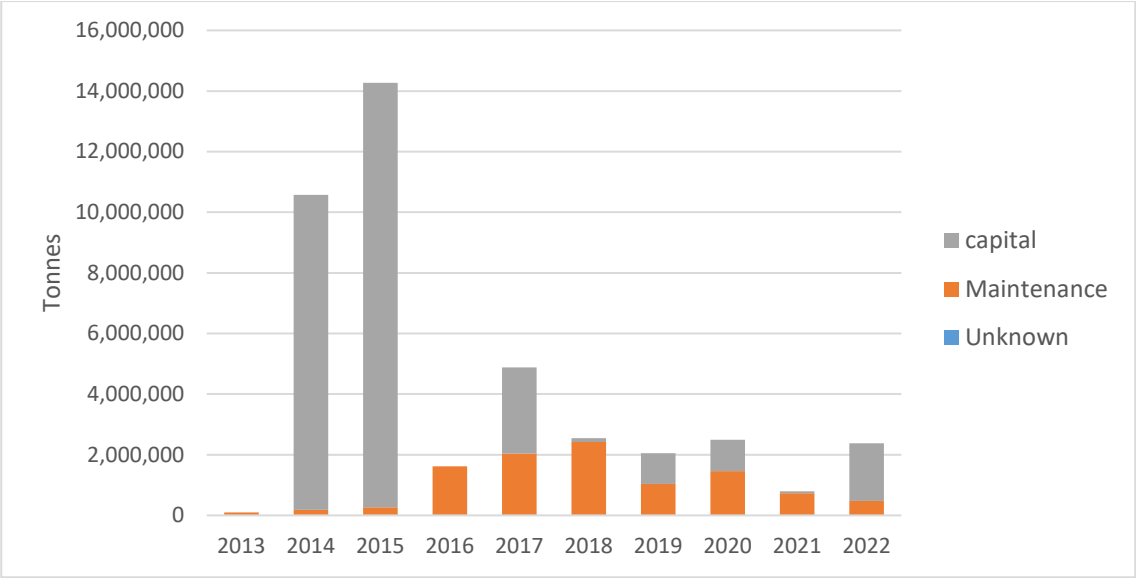

Figure 28. Amount of material originating from different dredging operations.

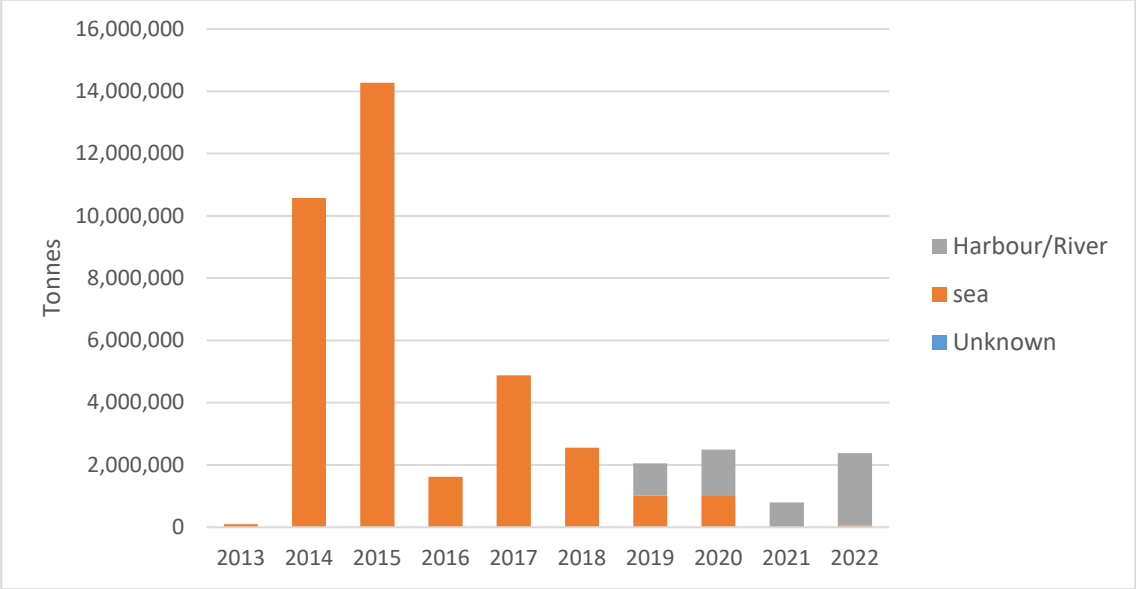

Figure 29. Sources of disposed material.

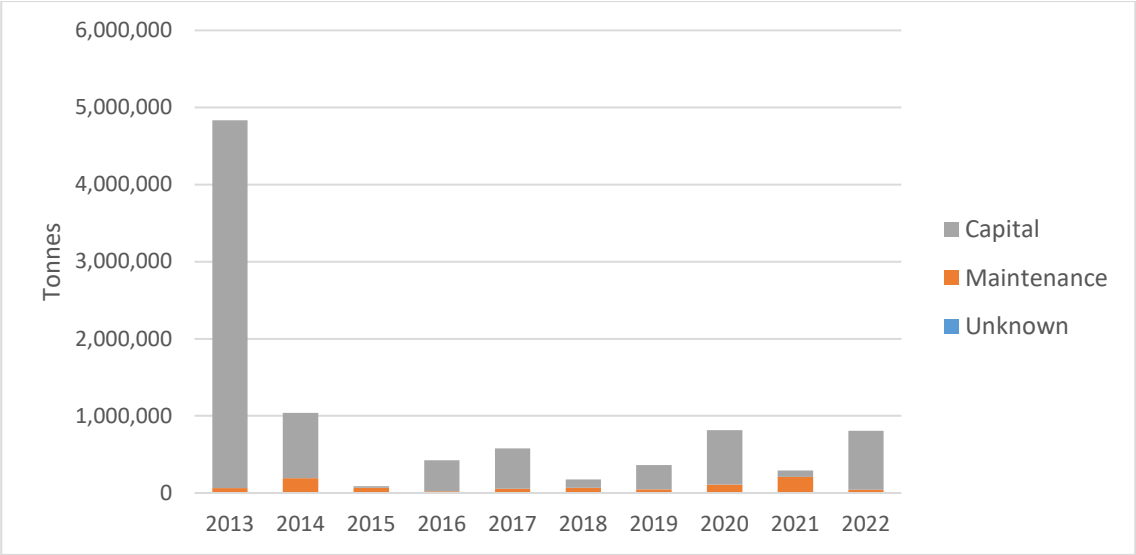

Figure 30. Amount of material originating from different dredging operations.

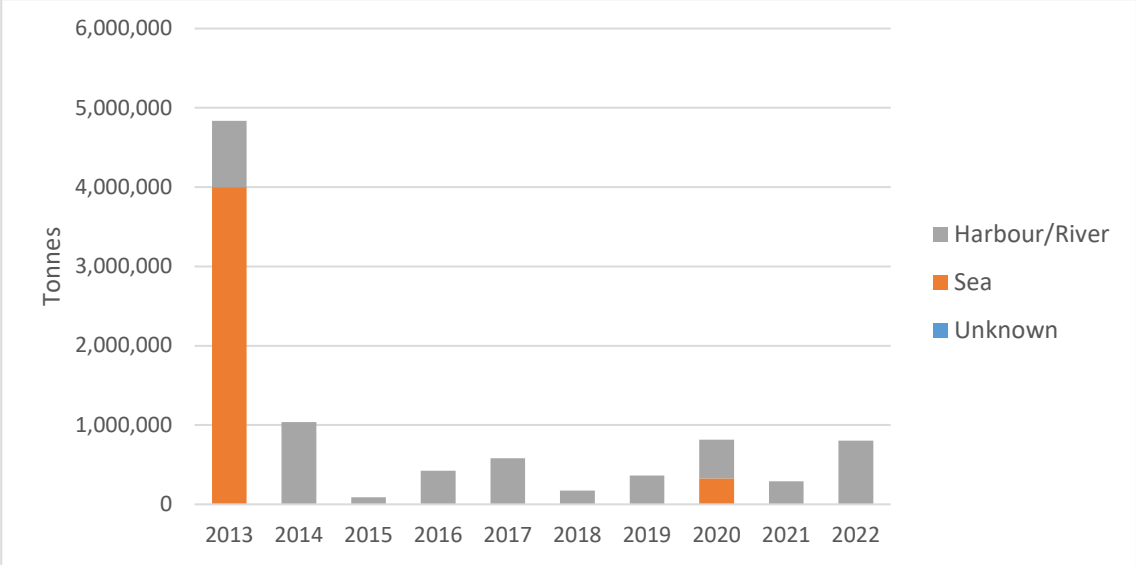

Figure 31. Sources of disposed material.

Contaminant loads

For the purposes of this assessment, transportation of contaminants with dredged material originating from harbors and river estuaries is considered as their input to the marine environment. In cases where dredged material is produced by dredging operations at sea, pollutants contained by this material are only relocated elsewhere within the marine environment.

Table 1 and Figure 32 illustrate the total amount and percentage of priority pollutants transported to the marine environment with sediments dredged in harbor/river and relocated during dredging/disposal operations at sea in 2022. Figure 33 illustrates proportions of pollutants in dredged material of different origin averaged for the period 2013-2022. Cadmium (Cd) and mercury (Hg) are two heavy metals identified as priority pollutants by HELCOM Recommendation 31E/1. Most heavy metals related to dredging and disposal entered the Baltic Sea marine environment in 2022 with dredged material originated from harbors and rivers. However, the percentage of copper (Cu) originating from sea sediments is a bit higher than other heavy metals.

The proportion of heavy metals in dredged material originating from sea and harbors/rivers in 2022 differs from previous years, with harbors/rivers clearly dominating as the source of contaminants in dredged material (Figures 32 and 33). In previously observed years, most of the copper and mercury was relocated with sea sediments, while lead and cadmium tended to be introduced into the marine environment with sediments dredged in harbors and rivers.

Harbors/rivers remain the dominating source of PAH in 2022 which is typical for the whole reported period. However, the pattern for TBT differs greatly from previous years as the dominating sources are the offshore areas in the most recent reporting, while the dominating source on average has been the harbor/river environment for the whole time series.

Not all contaminants are reported by all Contracting Parties, thus the graphs, figures and maps on the following pages do not necessarily give a complete picture of the contaminants disposed. The share of contaminants originating from different environments and from different Contracting Parties are based on the reported data, and thus providing the best available information of their characteristics, but gaps in the data are however possible. The contaminant concentrations in the dredged sediments are regulated nationally and do not exceed national limits defined for the sediments which are allowed to be disposed of at sea. It should also be noted that there is always some degree of uncertainty in using concentrations of the samples to calculate the total amounts of contaminants in the disposed material.

Table 1. Total input of contaminants in the Baltic Sea in 2022, originating from harbour/river, sea and unknown environments.

Contaminant	Harbour/river	Sea	Unknown	Harbour/river (%)	Sea (%)	Unknown (%)
PAH (t)	0,782	0,097	0	88,9	11,1	0
TBT (kg)	9,974	69,665	0	12,5	87,5	0
Pb (t)	40,068	1,278	0	96,9	3,1	0
Cu (t)	44,475	2,300	0	95,1	4,9	0
Hg (t)	0,131	0,010	0	92,8	7,2	0
Cd (t)	3,020	0,043	0	98,6	1,4	0

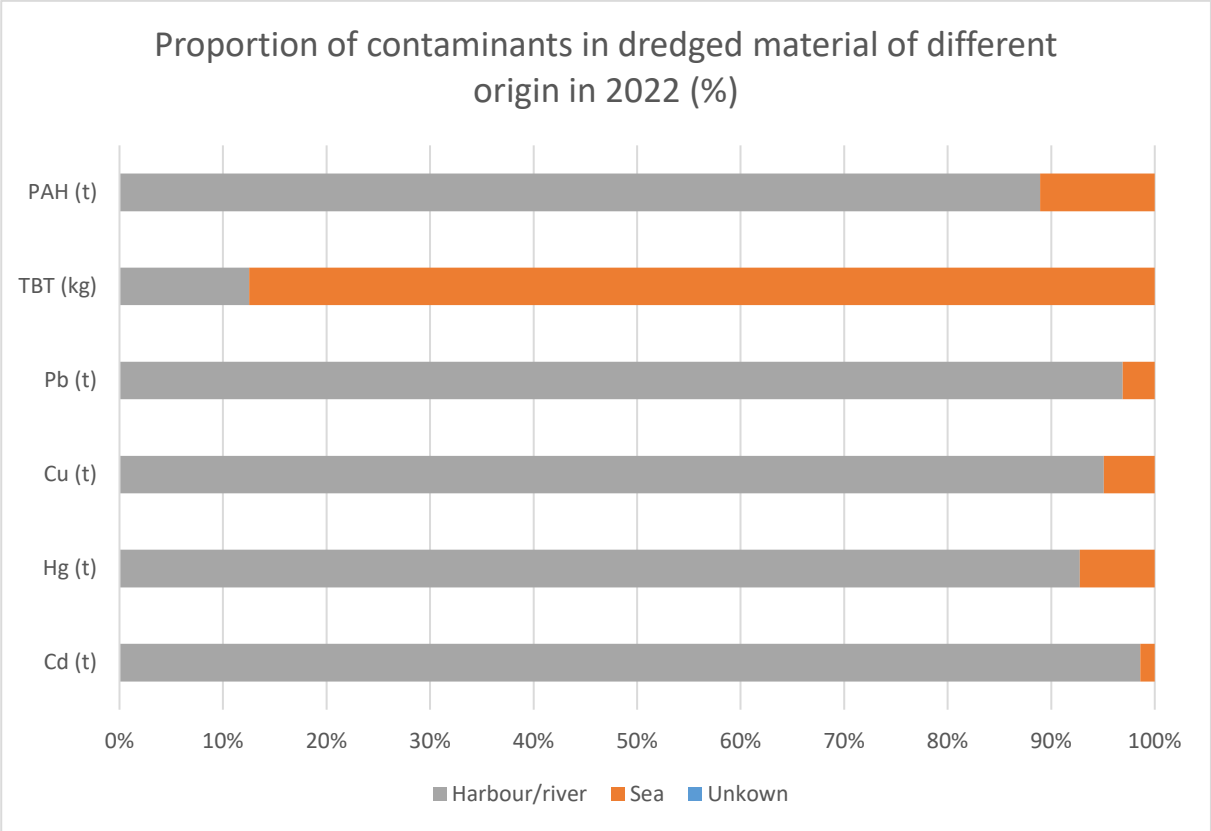

Figure 32. Proportion of contaminants originating from harbor/river, sea and unknown areas in 2022.

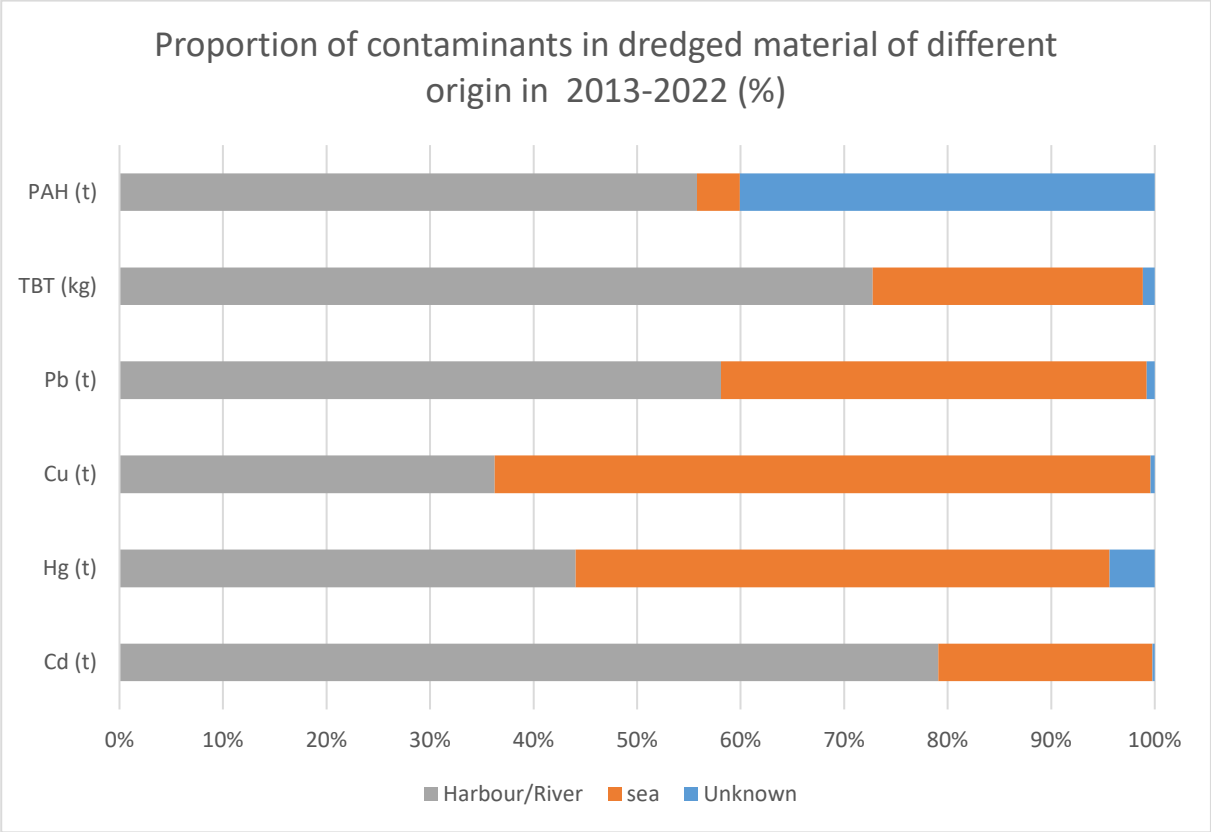

Figure 33. Proportion of contaminants originating from harbour/river, sea and unknown locations for the period 2013-2022.

Figures 34-39 illustrate total amount of priority pollutants in dredged material disposed at sea in 2013-2022 per country in tonnes (TBT in kilograms).

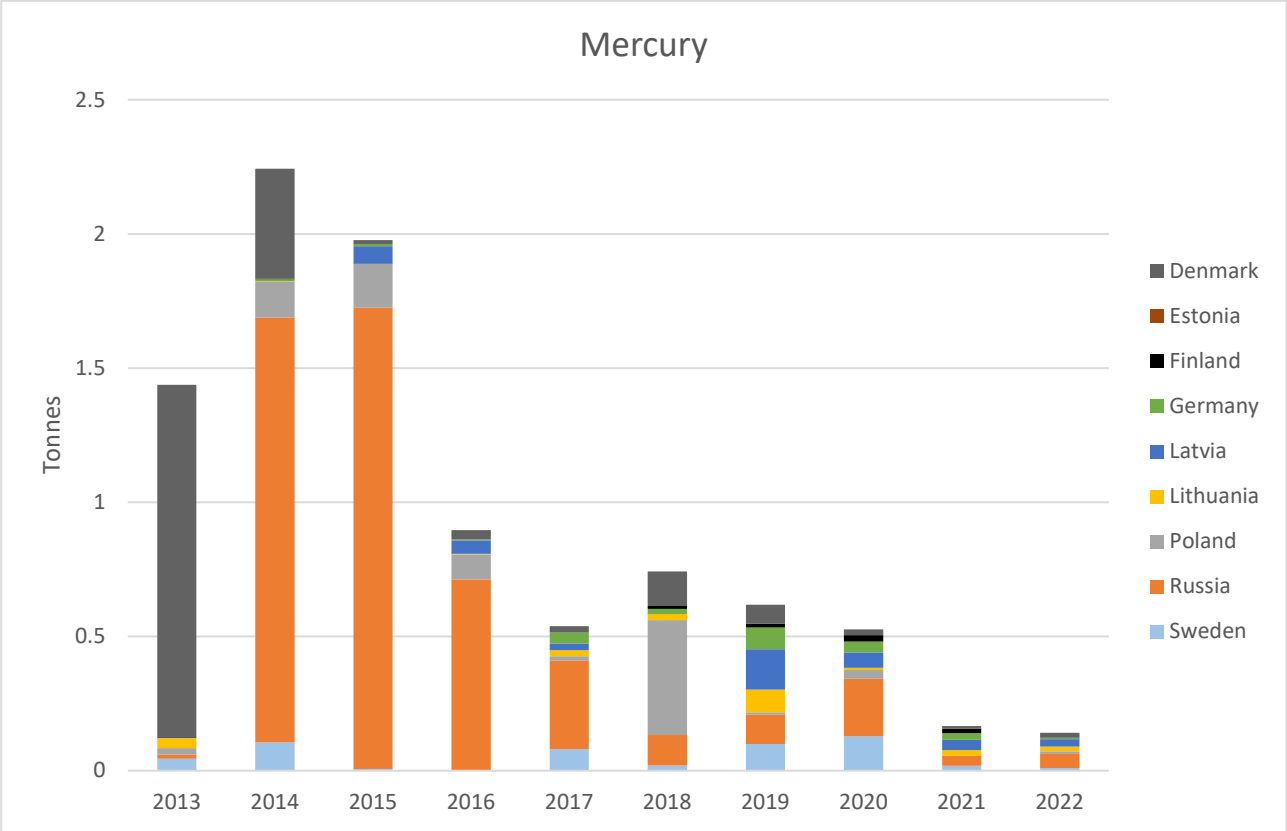

Figure 34. Total amount of mercury in dredged material disposed at sea in 2013-2022.

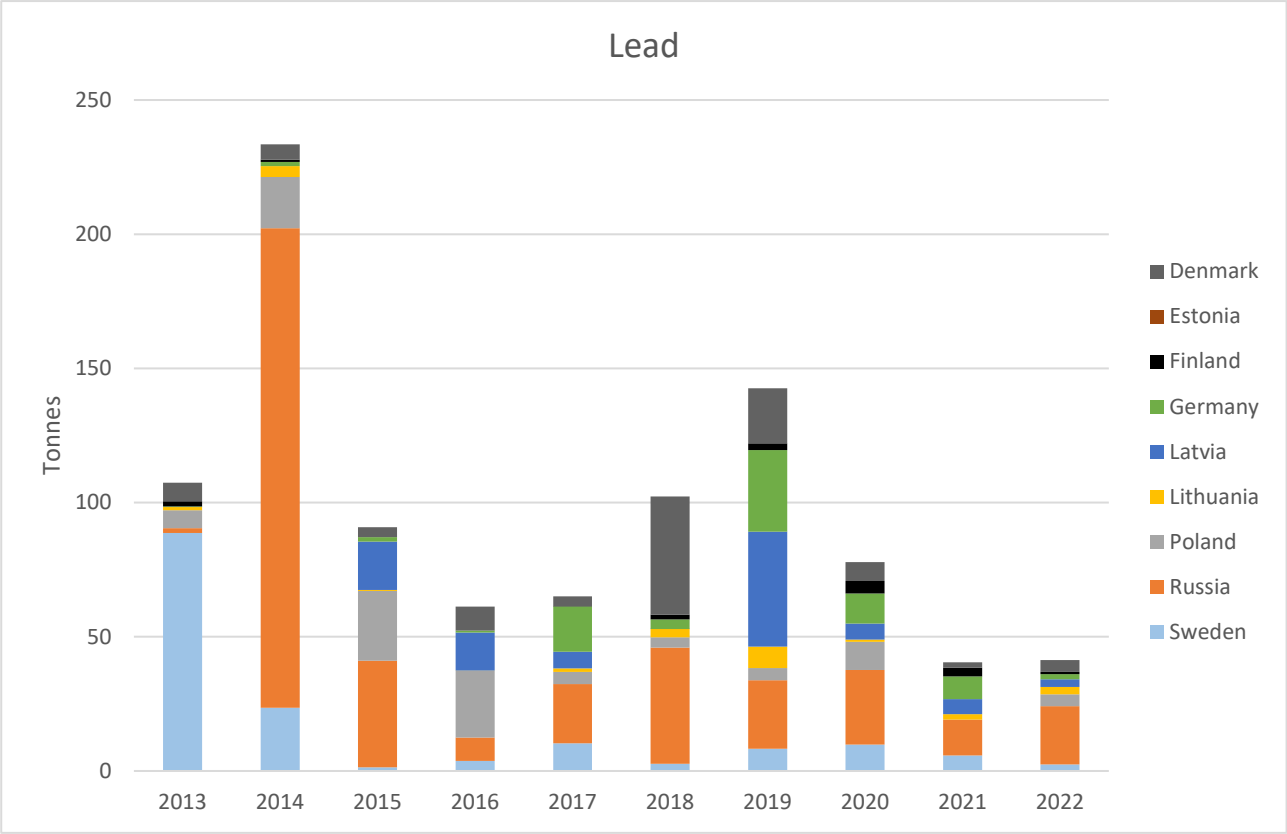

Figure 35. Total amount of lead in dredged material disposed at sea in 2013-2022.

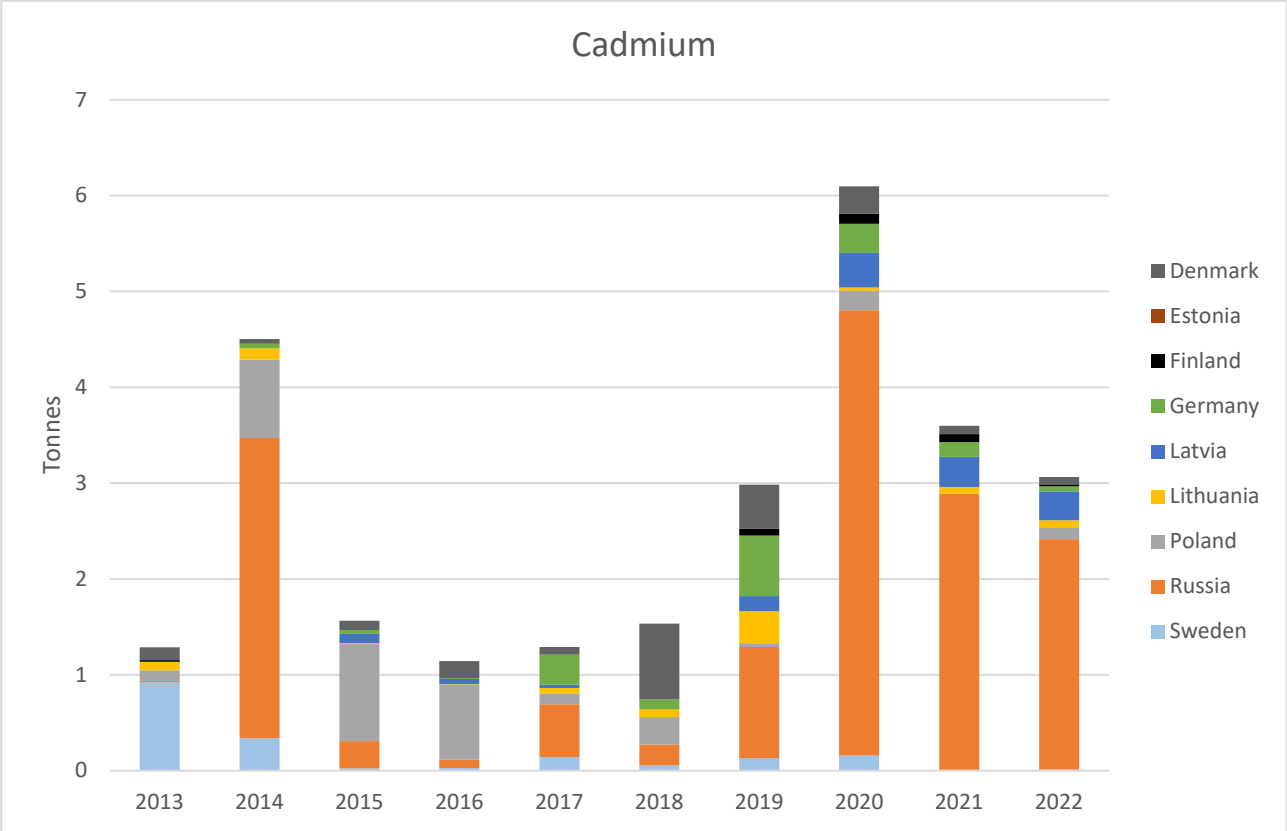

Figure 36. Total amount of cadmium in dredged material disposed at sea in 2013-2022.

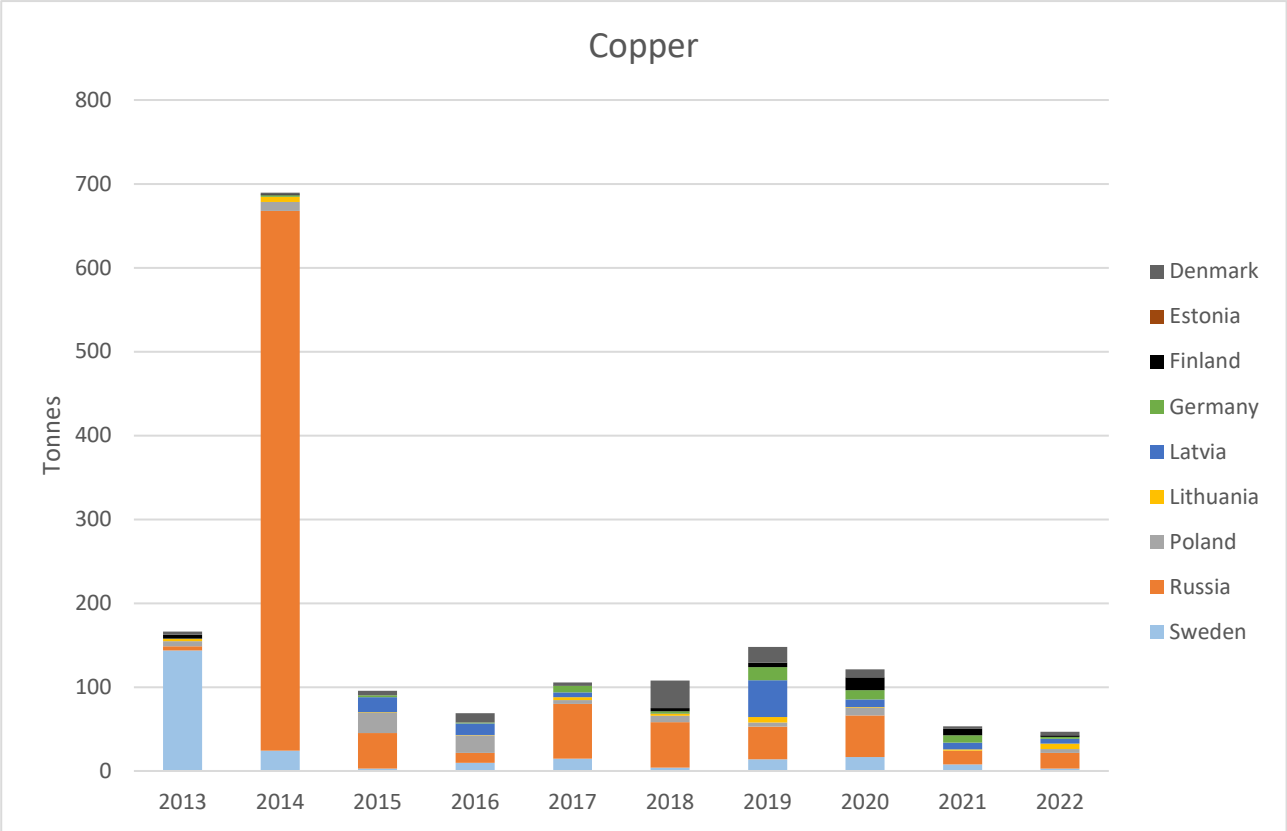

Figure 37. Total amount of copper in dredged material disposed at sea in 2013-2022.

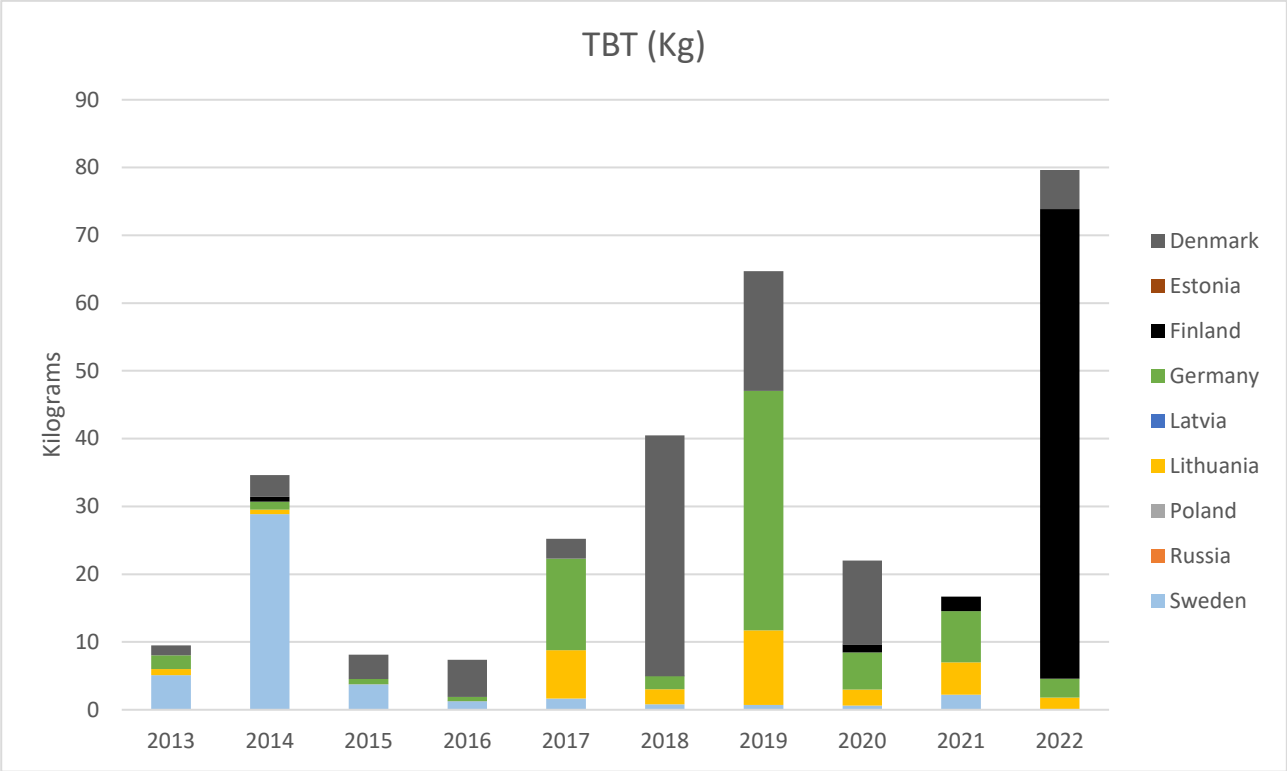

Figure 38. Total amount of TBT in dredged material disposed at sea in 2013-2022.

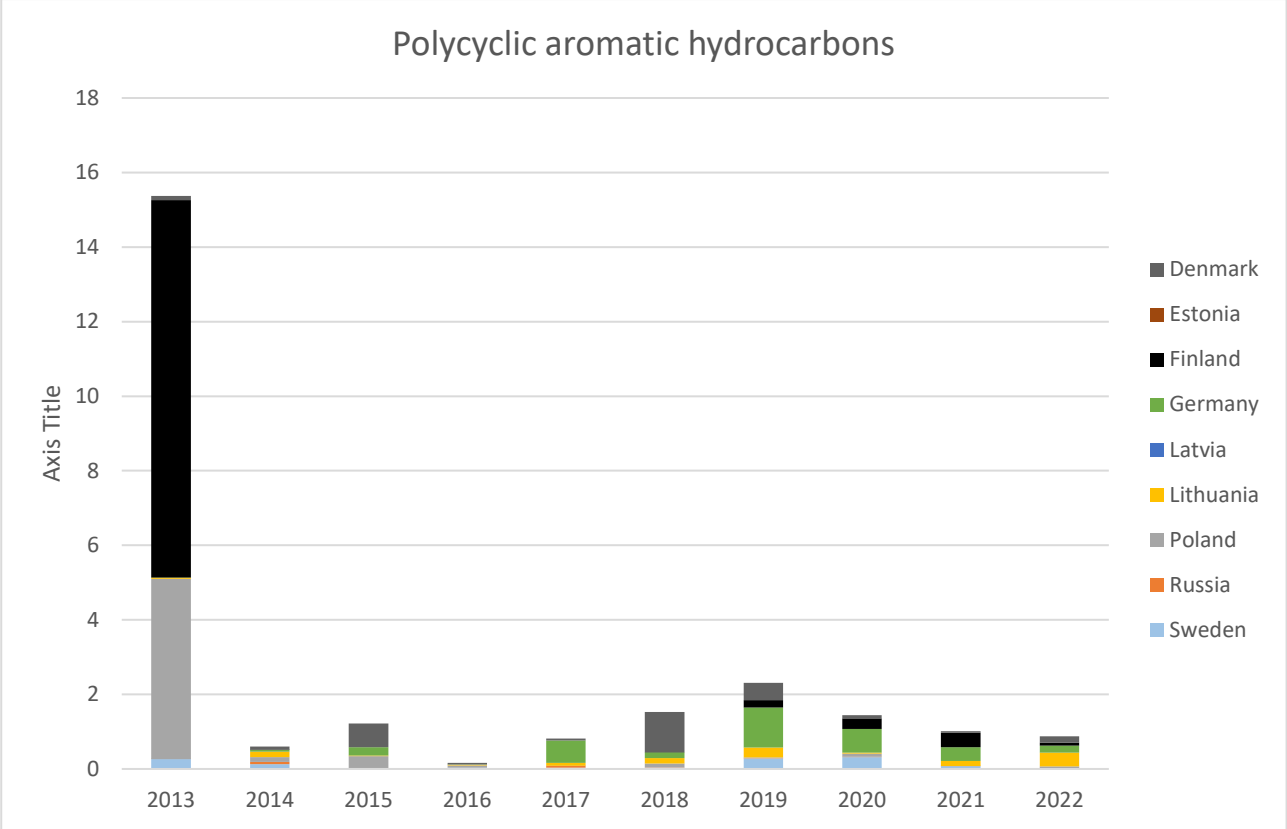

Figure 39. Total amount of polycyclic aromatic hydrocarbons in dredged material disposed at sea in 2013-2022.

Input of contaminants in 2022

Figures 40-45 illustrate spatial distribution of priority pollutants' input to the sea with dredged material originating from harbors/rivers in 2022. Contaminant load originating from sea is not included. "No data" in figures 40-45 can result from no data reported, concentrations below detection limit or that the material has been exempted from analyses according to the HELCOM Guidelines for the Management of Dredged Material at Sea.

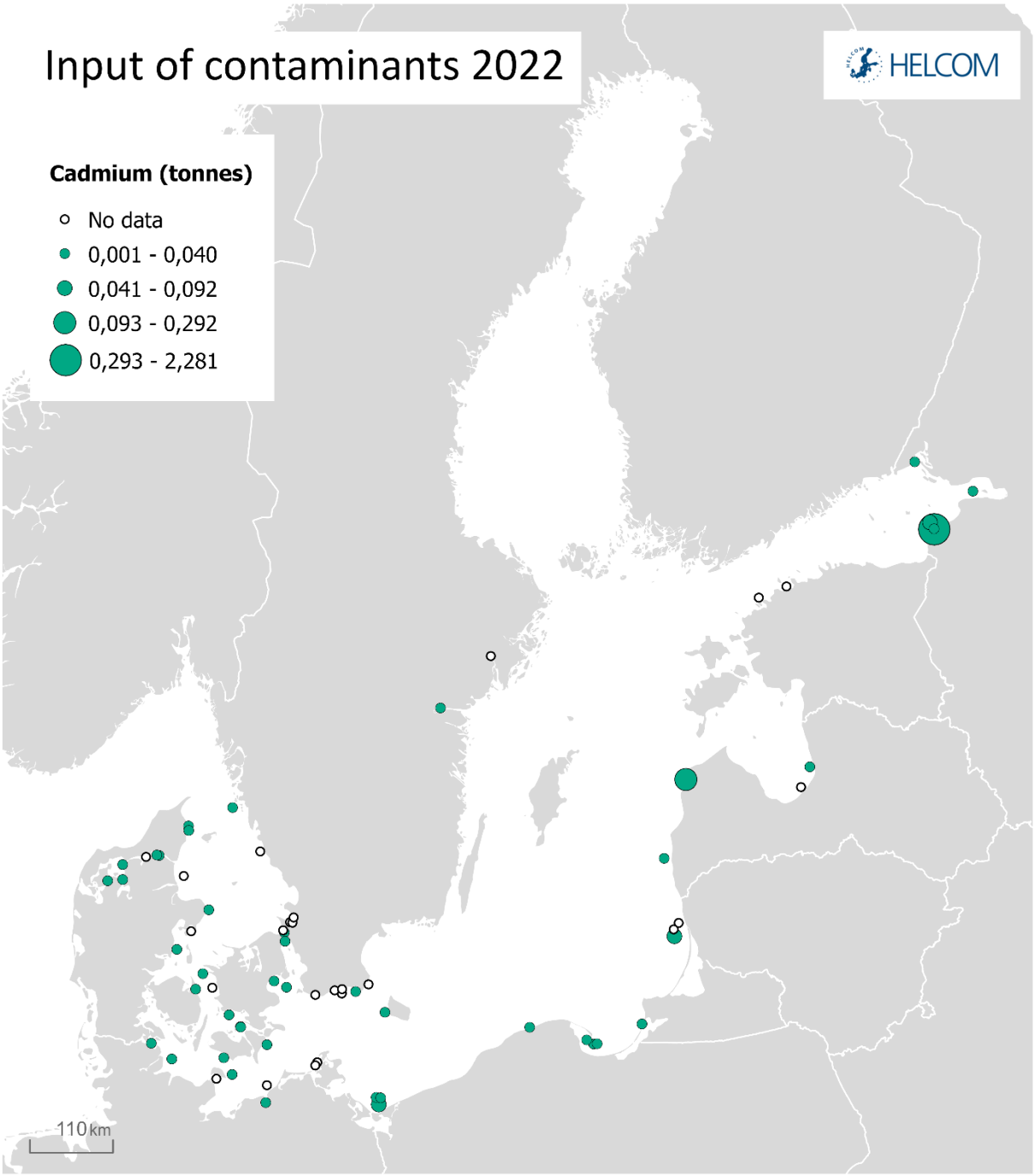

Figure 40. Input of cadmium from harbours/river in 2022. "No data" can result from no data reported, concentrations below detection limit or material exempted from characterisation.

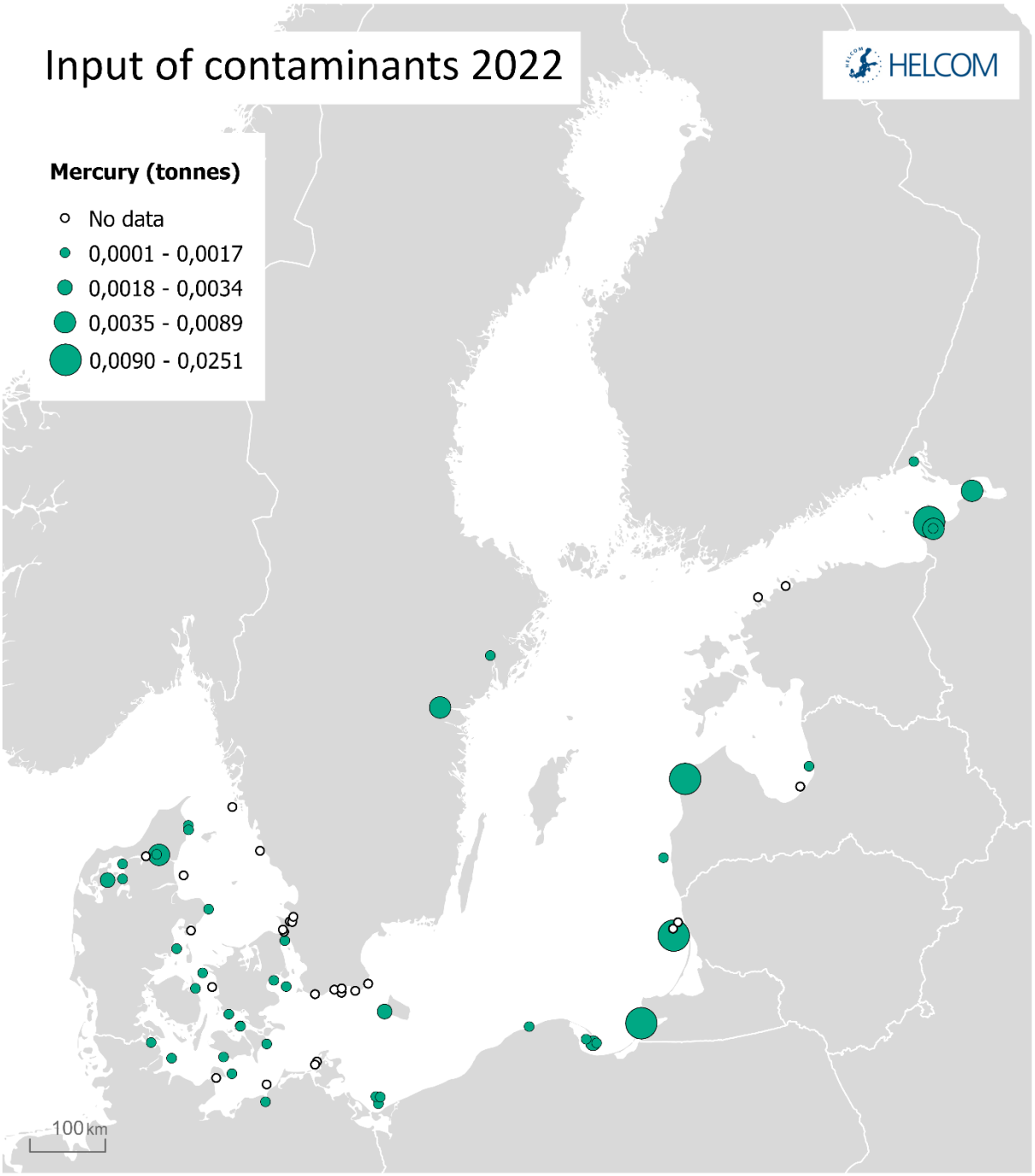

Figure 41. Input of mercury from harbours/river in 2022. “No data” can result from no data reported, concentrations below detection limit or material exempted from characterisation.

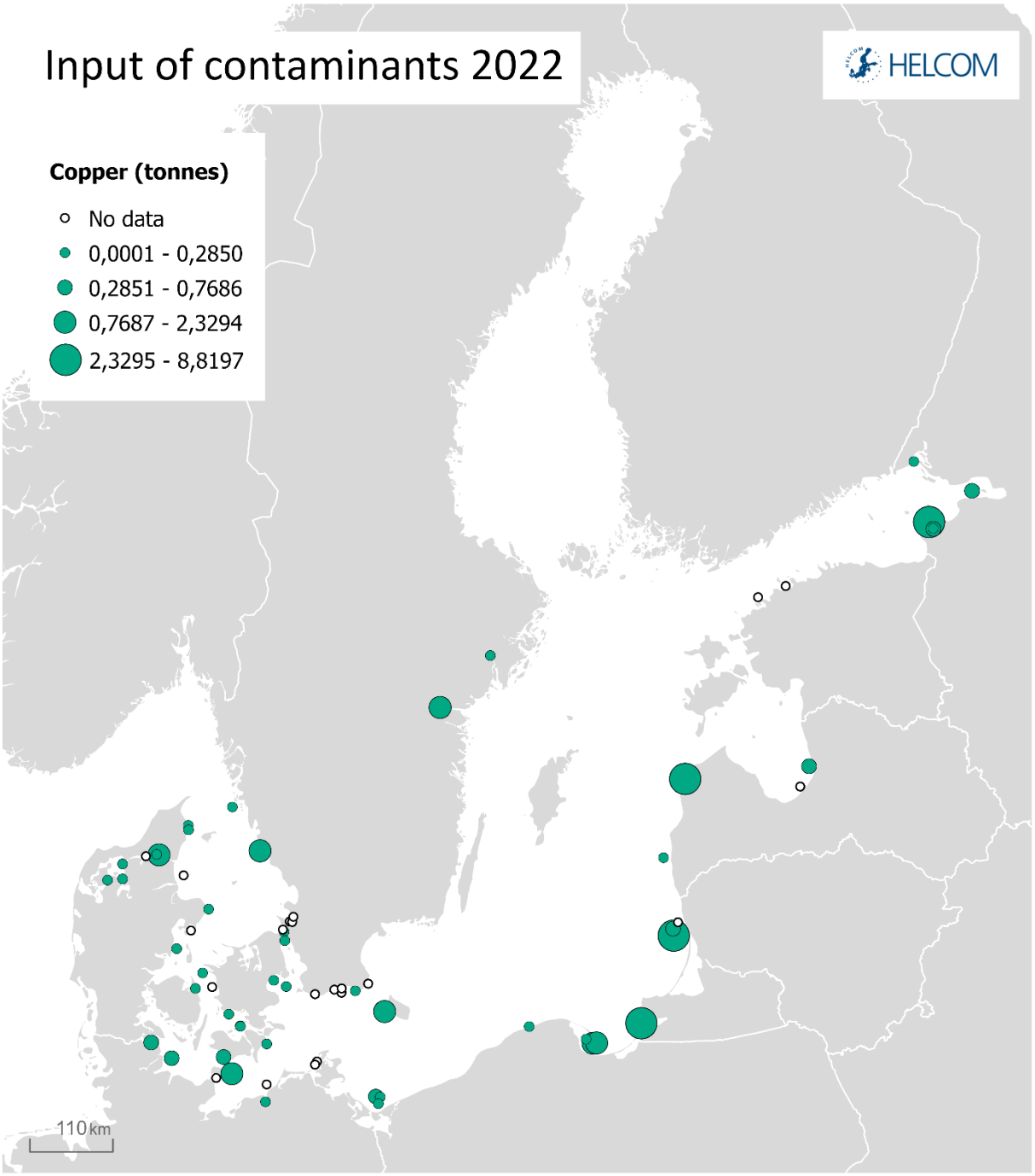

Figure 42. Input of copper from harbours/river in 2022. “No data” can result from no data reported, concentrations below detection limit or material exempted from characterisation.

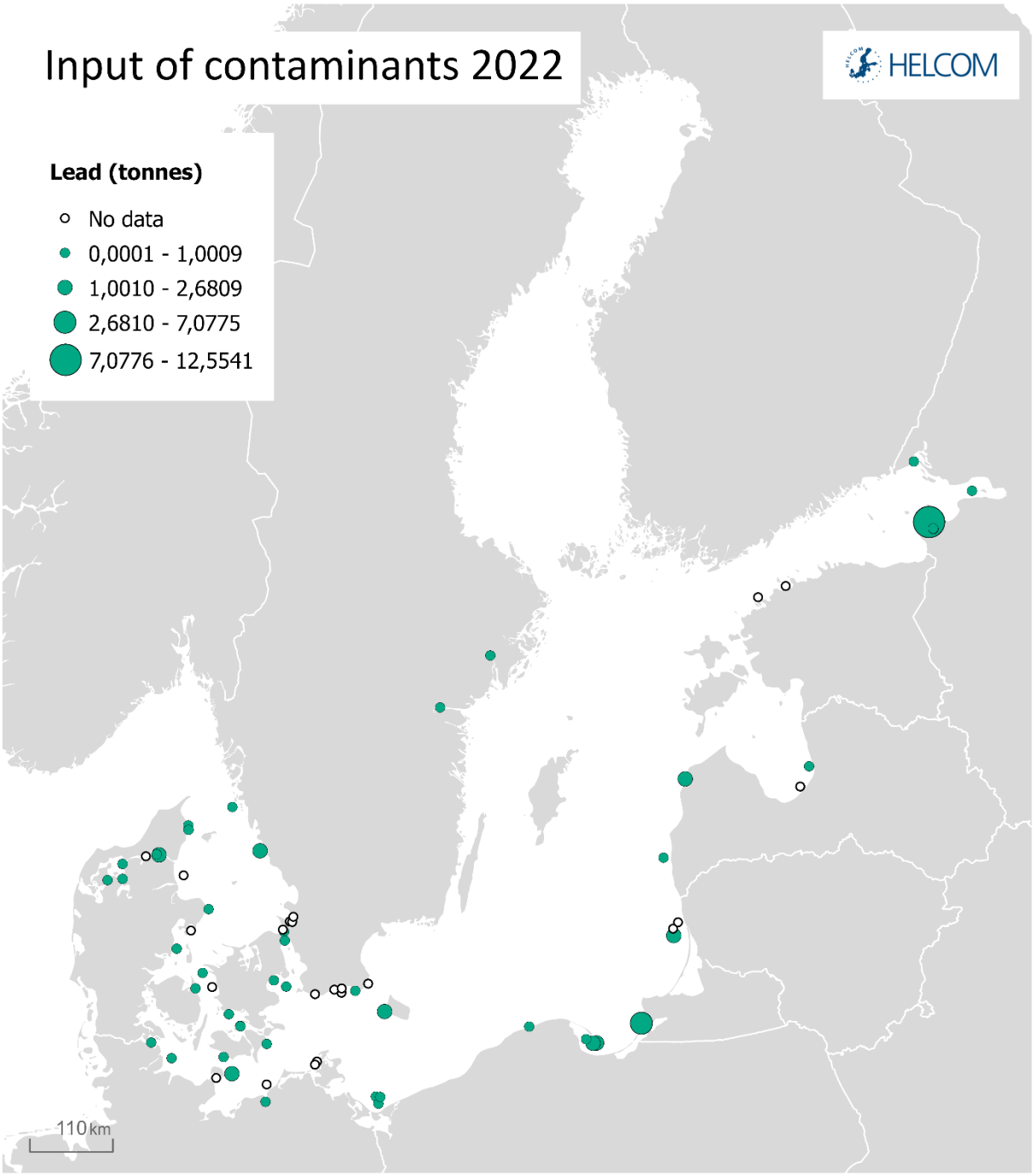

Figure 43. Input of lead from harbours/river in 2022. “No data” can result from no data reported, concentrations below detection limit or material exempted from characterisation.

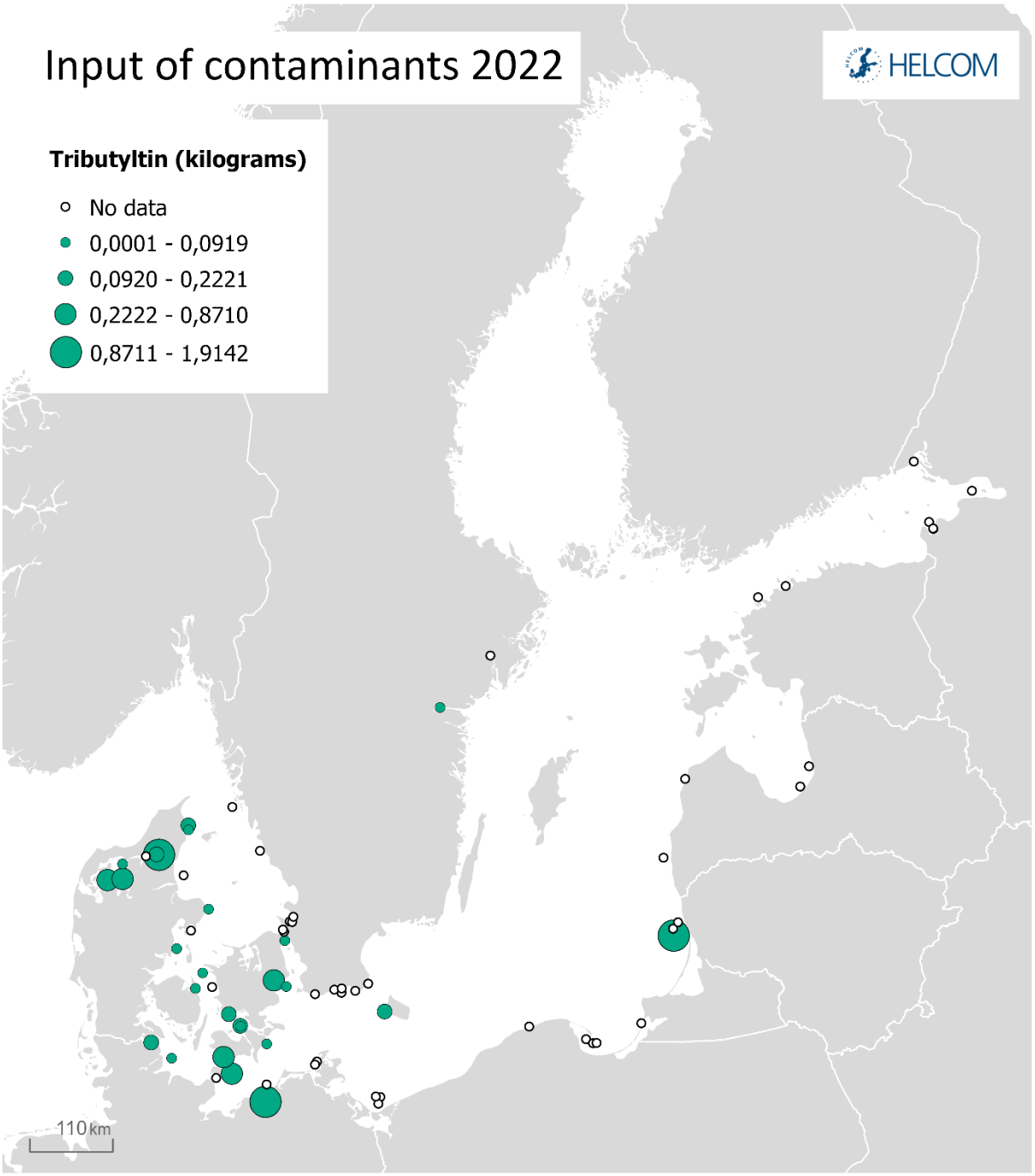

Figure 44. Input of tributyltin from harbours/river in 2022. “No data” can result from no data reported, concentrations below detection limit or material exempted from characterisation.

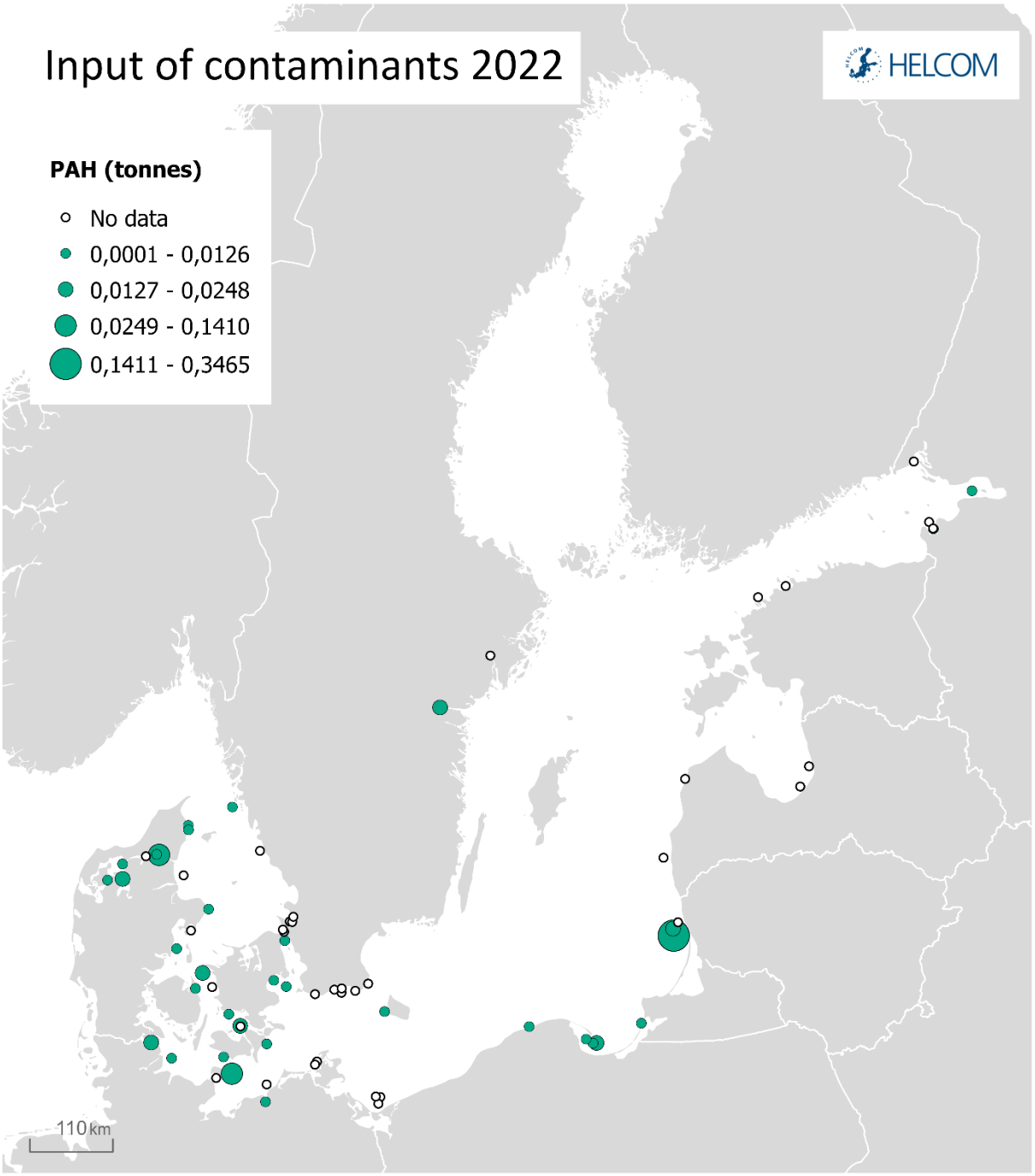

Figure 45. Input of polycyclic aromatic hydrocarbons from harbours/river in 2022. “No data” can result from no data reported, concentrations below detection limit or material exempted from characterisation.

Metadata

The data used in this assessment is originating from the reporting by Contracting Parties under HELCOM Recommendation 36/2 and the HELCOM Guidelines for Management of Dredged Material at Sea. The Contracting Parties report annually on the national data on management of dredged material according to the Reporting Format of the HELCOM Guidelines.

HELCOM compiles the nationally reported data, sends the harmonized datasets back to the Contracting Parties for verification, and publishes the data in HELCOM Map and Data Service (MADS). The underlying data for this assessment can be viewed and downloaded from HELCOM MADS.