Depositing of dredged material in the Baltic Sea

Key message

- The total amount of material deposited at the Baltic Sea is highly variable between years, depending on the large-scale capital dredging operations carried out by counties in particular years. Total amount of material deposited in 2019 was a bit more than 13 million tonnes which is 3 million tonnes more than in 2018. Dredged material was deposited at 100 depositing sites.

- In 2019, the amount of material deposited at sea originating from capital dredging operation was almost three times higher than originating from maintenance operations. Capital dredging produced almost 9,5 million tonnes of the deposited material, which constitutes 72% of all dredged material deposited at sea in 2019. This amount remarkable exceeds the volume produced by capital dredging in 2016-2018 but remains much lower than the amounts reported in 2014-15. Most of the capital dredging in 2019 was reported by Denmark, Latvia and Lithuania.

- Maintenance dredging in 2019 produced 3,7 million tonnes of dredged material, which constitutes about 28% of all dredged material deposited at the Baltic Sea. This is almost a million tonnes less than in 2018 and this is the smallest amount reported in the last 5 year. The main contributors in 2019 were Russia, Lithuania and Latvia.

- 87% (11.5 million tonnes) of the material deposited at sea in 2019 was delivered from harbours and river estuaries and only 13% (1.66 million tonnes) originates from dredging operations at sea. This distribution is similar to the 2018 but differs from 2017, 2015 and 2014 demonstrating revers picture. A small amount, less than 2000 t, of dredged material of unknown origin was reported by Germany. Most of the material originating from harbours and rivers was reported by Denmark, Latvia and Lithuania, while dredging at sea mainly reported by Russia.

- There were six major contaminants reported by countries in 2019: four heavy metals (mercury, lead, cadmium and copper), tributyltin and polyaromatic hydrocarbons. More than 85% of contaminants originate from sediments transported from harbours and rivers.

- Large amount of dredge material in the Baltic Sea was utilized for various construction purposes including beach nourishment, coastal protection, land reclamation and other needs. Totally 6.6 million tonnes of dredged material were reported as for beneficial use at 14 sites. This is almost 2 million tonnes less than the amount reported in 2018. Most of that material 5,4 million tonnes was utilized by Poland in Gdansk bay. Also, beneficial use of dredged material was reported by Estonia, Germany and Sweden. The sites where dredged material was used are indicated on figure 1 but not included in the analysis.

Results and assessment

Relevance of the BSEFS for describing developments in the environment

The depositing 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/depositing 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 deposited material.

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 deposited in the Baltic Sea Area. Data on depositing 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 HELCOM Brussels Ministerial declaration (2018) states the importance of preventing physical damage of the seabed and to mitigate the effect of hazardous substances in marine environment. Both aspects mentioned in the declaration are of high relevance to the management of dredged material.

Regarding hazardous substances the declaration, among other things, states that “WE AGREE to re-examine the effectiveness of measures and recommendations for legacy pollutants and to identify the scale of problems of contaminants of emerging concern, including micro-pollutants in coastal and marine waters and, based on this knowledge, to consider possible cost-effective mitigation.”

And regarding seabed damage and disturbance that “WE AGREE, based on best available scientific advice, to work together to elaborate regional and national actions aiming at delivering the necessary reductions in adverse effects of physical disturbance caused by human activities.”

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 depositing 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 2019 data

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 2019 were reported by all countries. As agreed by PRESSURE 5-2016 (Outcome, para 5.9), analysis of reported data have been made to illustrate deposition of dredged material and also the distribution of input of selected contaminants associated with it to the Baltic Sea marine environment.

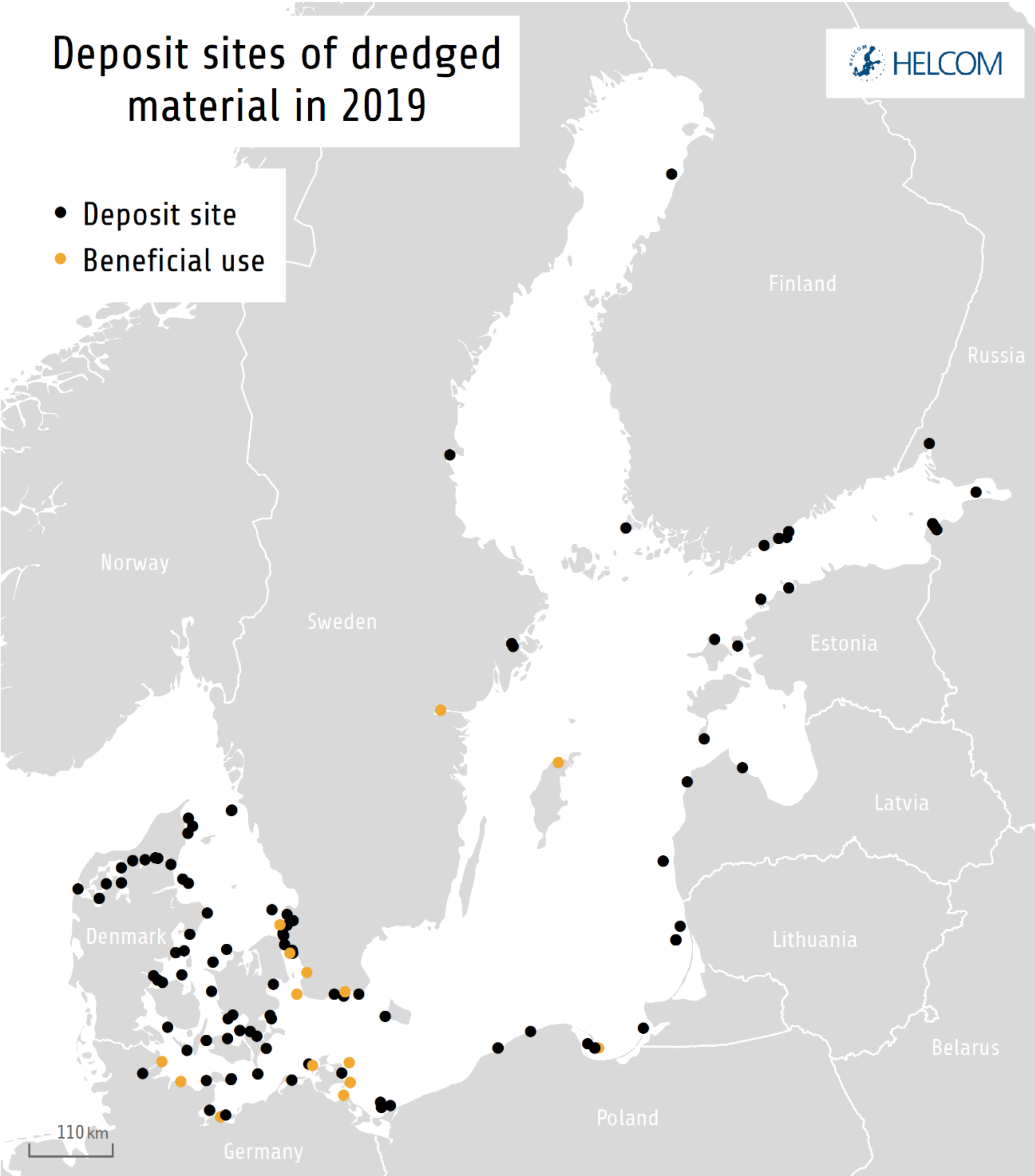

Figure 1. Location of depositing sites of dredged material in 2019 as well as locations where dredged material has been used for beneficial use.

Fig. 1 illustrates the distribution of 100 locations where depositing of dredged material took place in 2019. The map also includes 14 locations where dredged material has been used for beneficial purposes, such as beach nourishment and land reclamation. As it can be seen from the map, the density of depositing sites is higher in the southern than northern Baltic Sea.

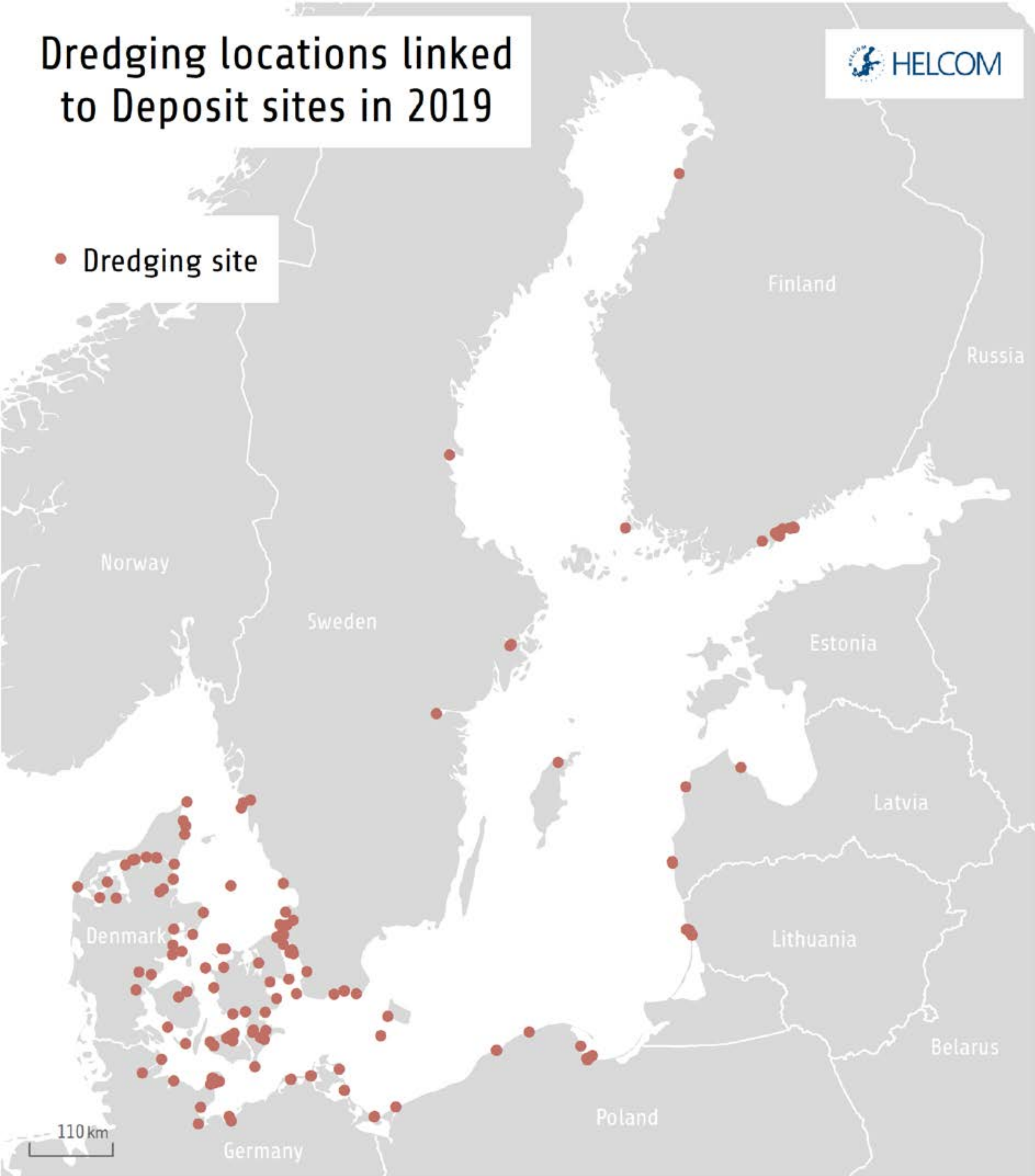

Figure 2. Location of dredging sites that are linked to depositing sites reported for 2019. Reporting of dredging sites is optional in HELCOM guidelines, and therefore not all dredging sites are reported and indicated on the map. Please also note that only dredging sites that are linked to depositing operations are reflected and 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 deposited. Fig. 2 illustrates the distribution of 186 sites of dredging operations in the Baltic Sea in 2019 according to the information reported by the Contracting Parties. Reporting of dredging is optional according to HELCOM Guidelines.

Deposited material originated from maintenance and capital dredging operations

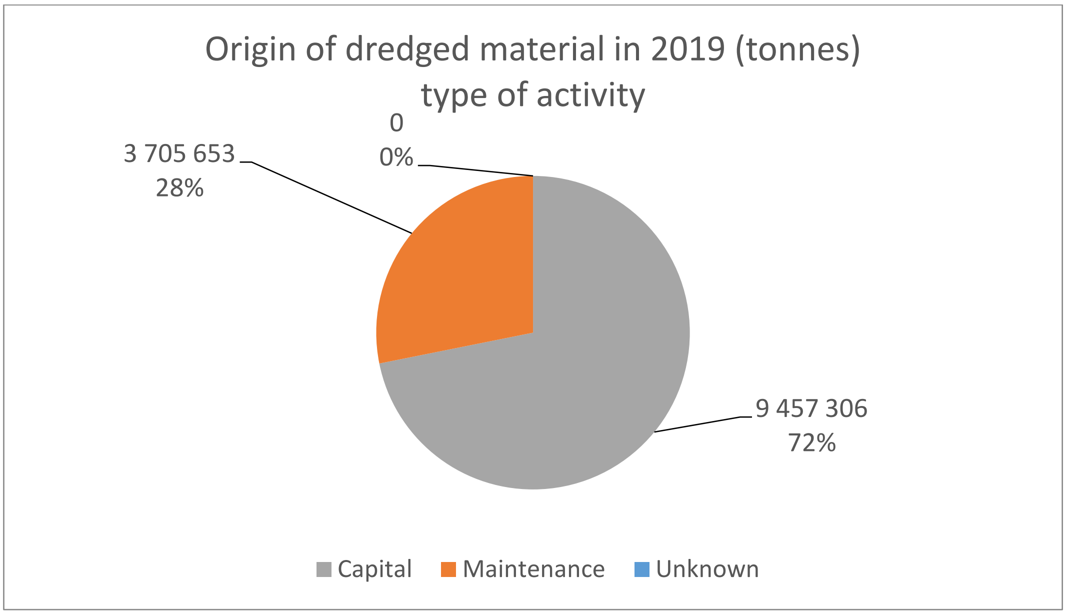

Figure 3. Proportions of material originating from maintenance dredging, capital dredging, and unknown operations in the total amount of dredged material deposited at the Baltic Sea in 2019.

Figure 4. Amount of the material originating from maintenance dredging, capital dredging, and unknown operations in total of the amount of dredged material deposited at the Baltic Sea in the period from 2013 to 2019.

Most material (72%) deposited at sea in 2019 originates from capital dredging which is slightly more than the proportion reported in 2018. Meanwhile the proportion of maintenance dredging in 2019 constitutes only 28%. Prevailing of capital dredging over maintenance is a typical picture in the region except for the year 2016 when capital dredging activities were minimal (Fig. 4). In 2013-14 the material of unknown origin constituted a remarkable part but since 2015 the percentage of the material of unknown origin reported by countries has been negligible (Fig. 4).

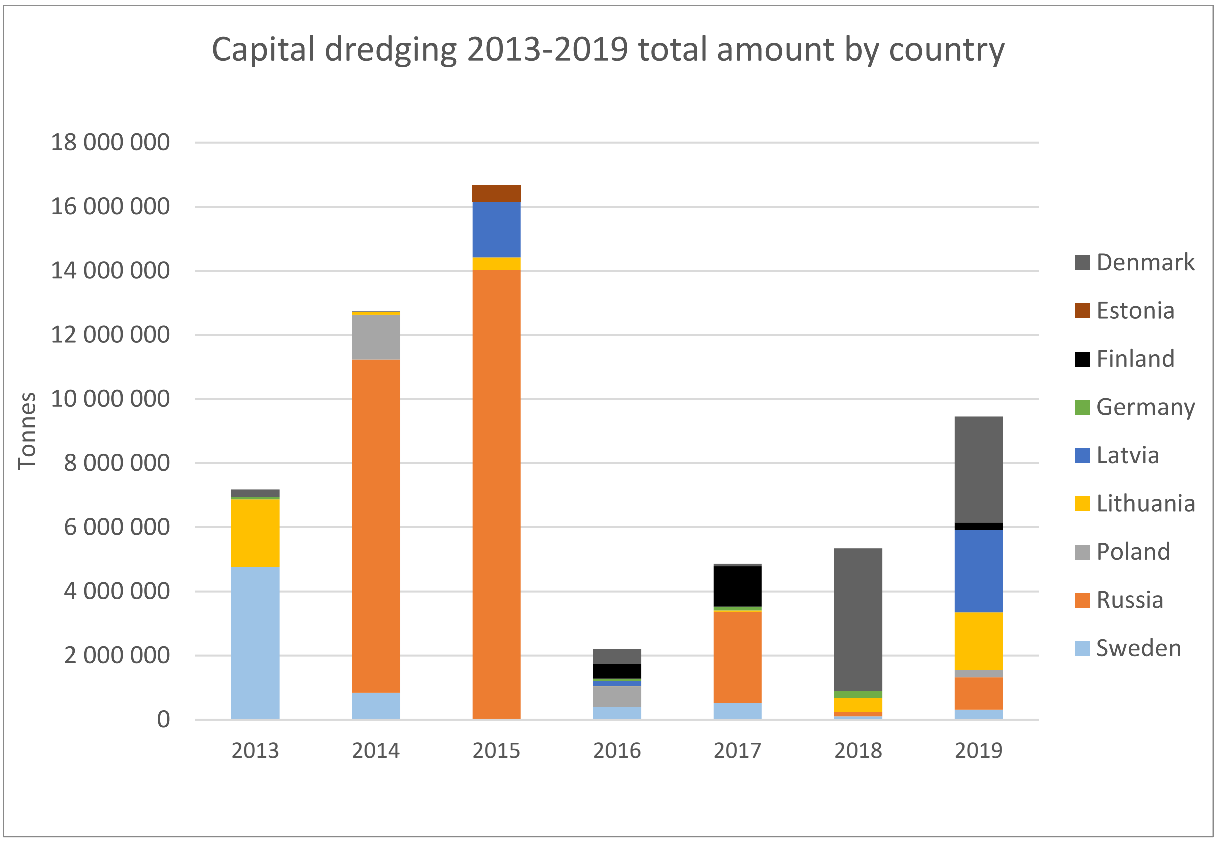

Figure 5. Deposition of material from capital dredging operations by country for the period 2013-2019.

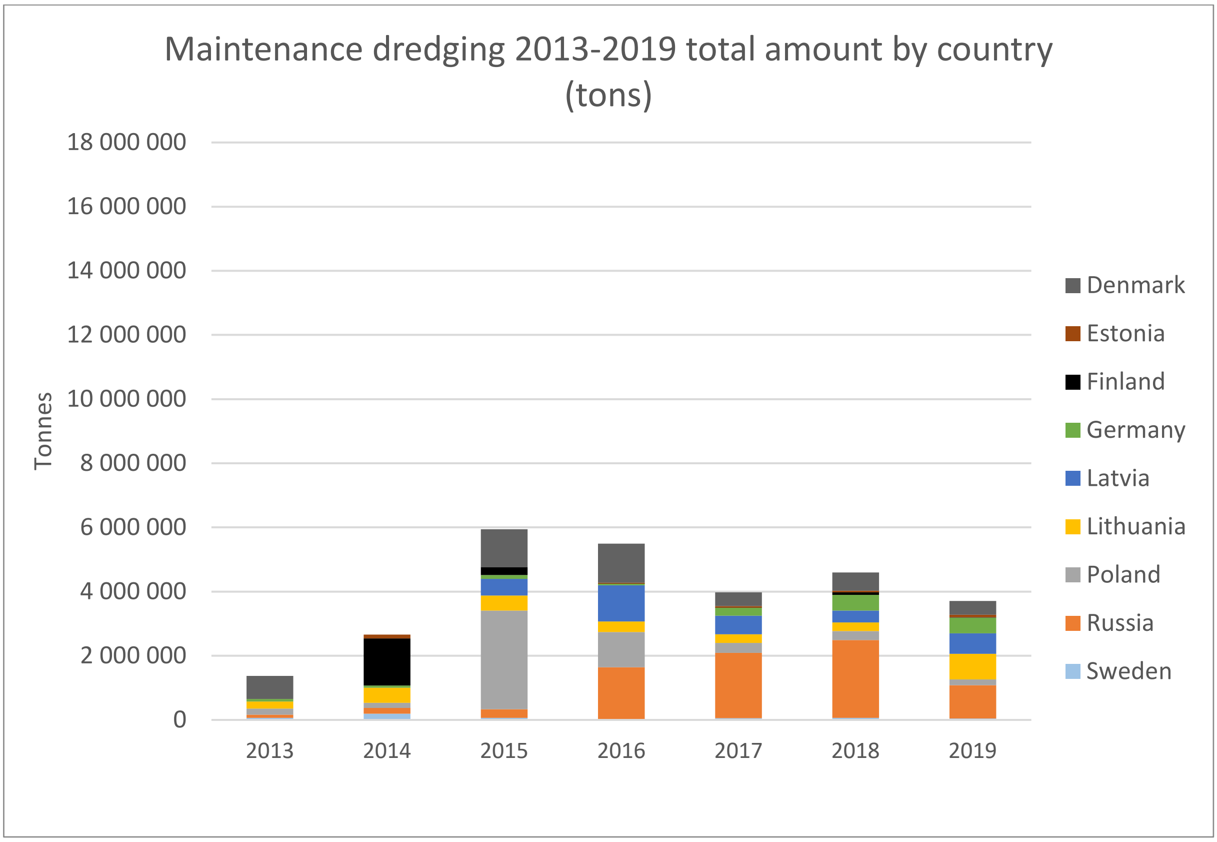

Figure 6. Amount of material deposited from maintenance dredging operations by country for the period 2013-2019.

The bar diagrams (Fig. 5 and Fig. 6) illustrate the depositing of material produced by capital and maintenance dredging activities per country. The diagrams show that a large amount of dredged material deposited at sea in 2019 was produced by capital dredging in Denmark, Latvia and Lithuania. As regard to maintenance dredging the largest volume of deposited material was produced by Russia, Lithuania and Latvia.

Total amount of dredged material deposited

In 2019 more than 13 million tonnes of dredged material were disposed at in the Baltic Sea which is about 3 million tonnes more than in 2018 (Fig. 4). In addition, 6.6 million tonnes of dredged material were used for construction purposes (beneficial use). In the given assessment period, the total amounts of deposited material varied between 7 000 000 and 23 000 000 tonnes. Such a large variation is caused by the large amount of depositing reported by Russia in 2014-2015. Completeness of the data reporting in the last 5 years is 100% (Fig. 7).

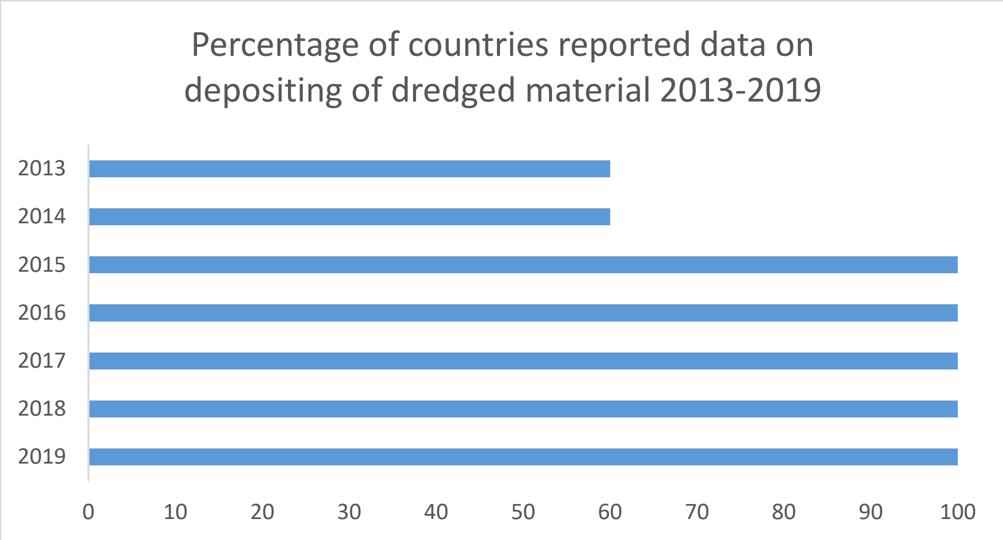

Figure 7. Completeness of reporting by the Contracting Parties in 2013-2019.

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

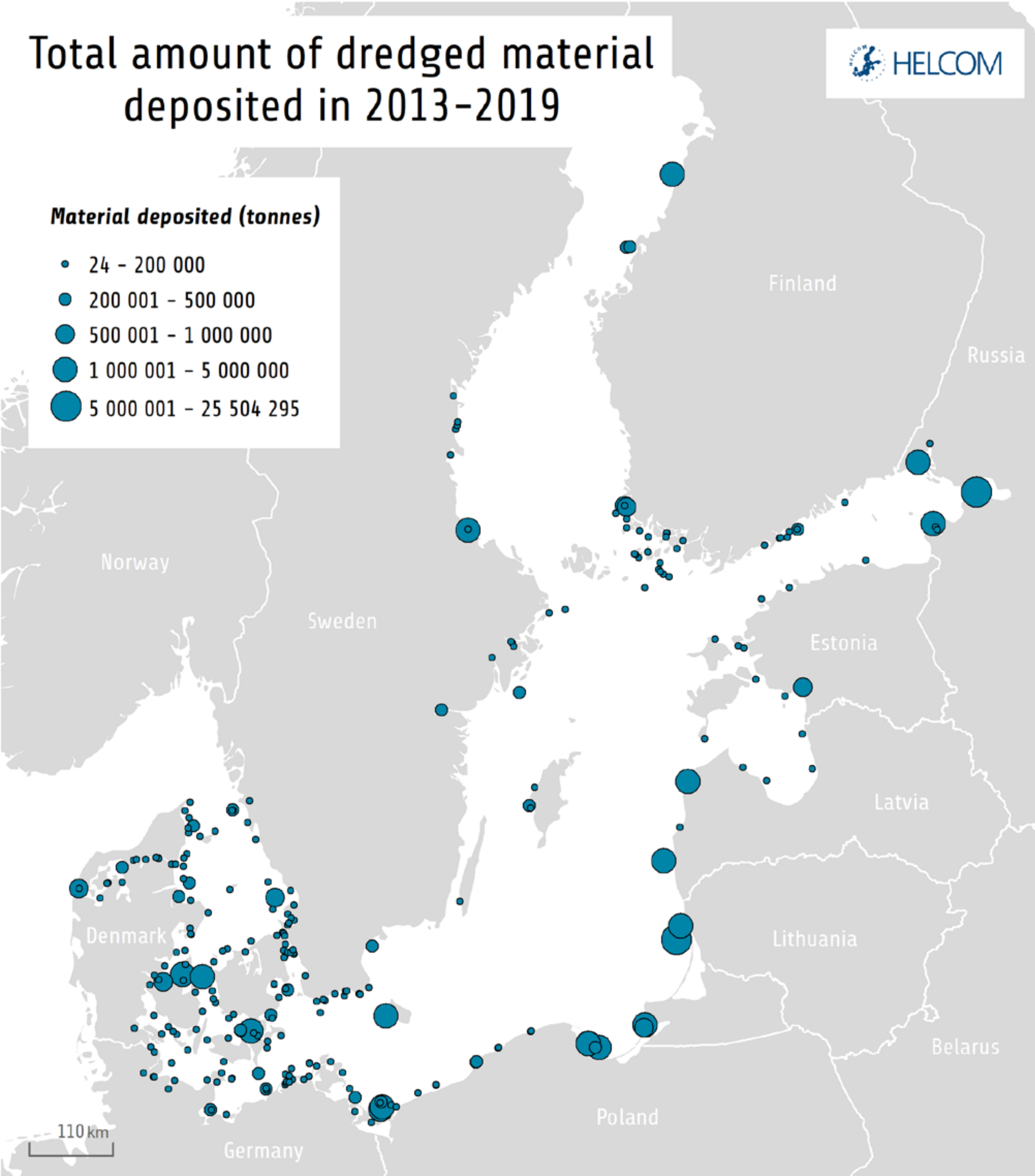

Figure 8. Total amount of dredged material deposited during the observation period 2013-2019.

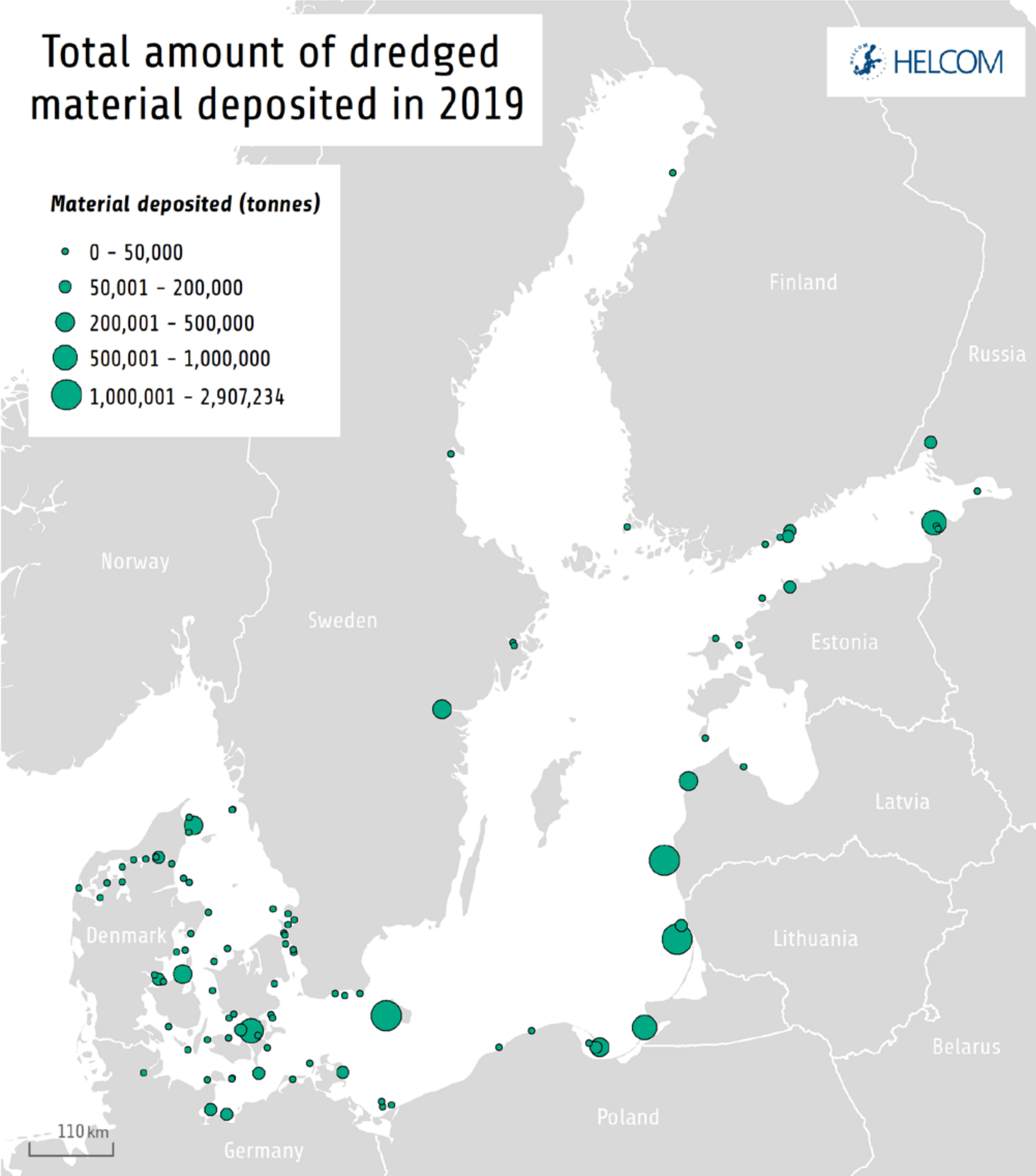

Figure 9. Total amount of dredged material deposited in 2019.

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

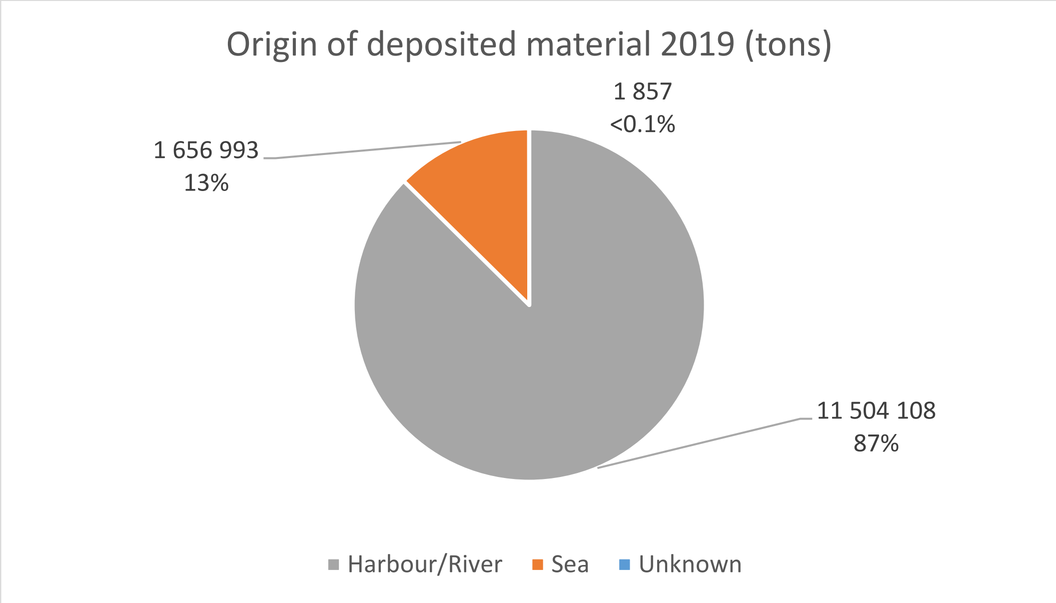

Figure 10. Proportions of the material originating from harbour/river, sea and unknown sources in total amount of dredged material deposited at the Baltic Sea in 2019.

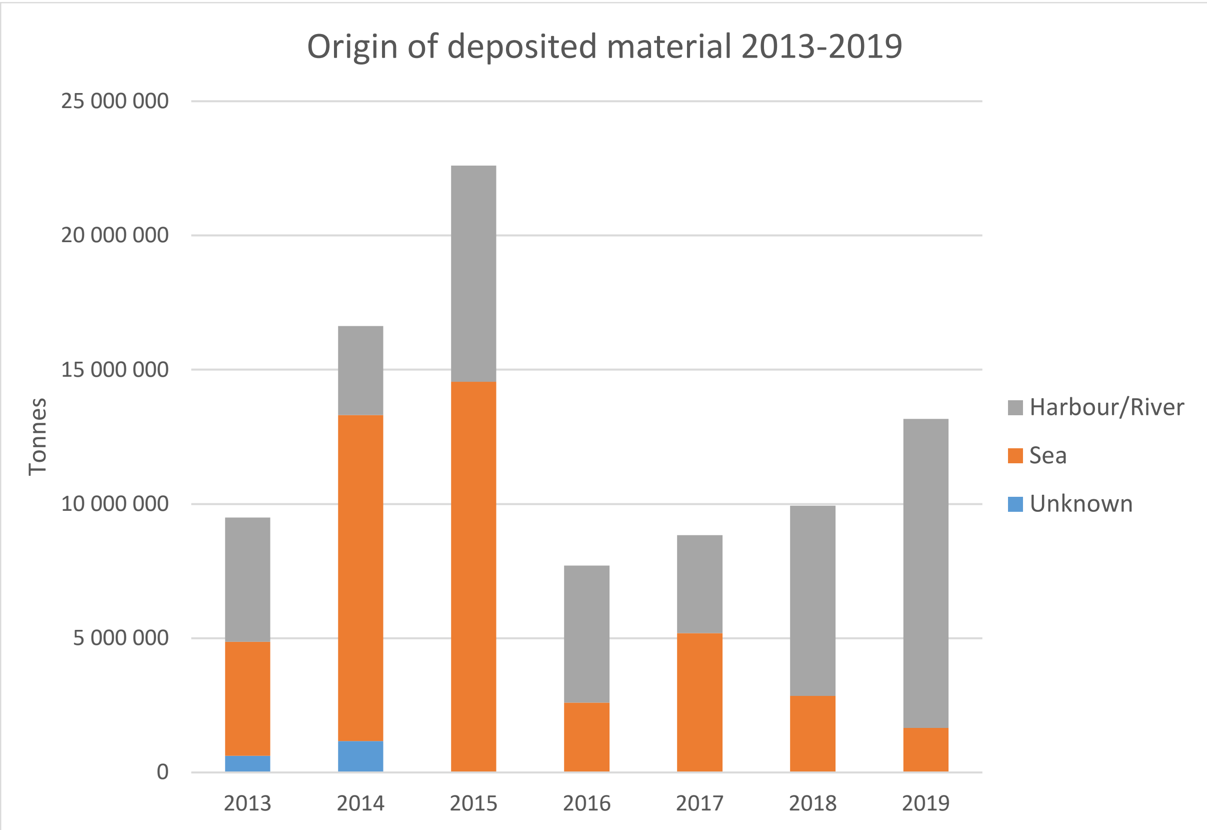

Figure 11. Proportions of the material originating from harbour/river, Sea and unknown locations in total amount of dredged material deposited at the Baltic Sea in the period from 2013 to 2019.

Figures 10 and 11 illustrate the amount of deposited 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.

Almost four thirds of dredged material deposited in the Baltic Sea in 2019 were transported to the sea from dredging at harbors and rivers. Slightly more than a quarter of the reported amounts originate from dredging operations at sea. The distribution repeats one in 2018 but differ from the pattern observed in 2013-2015 and 2017 when most of the deposited material was originating from sea.

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

In 2019 Russia was the country reporting the highest amount of deposited material originating from the sea. Russia remains the country reporting the highest amount of deposited material with sea origin since 2014. Denmark, Latvia and Lithuania are the main contributors to the deposition of the material originating from rivers and harbors in 2019.

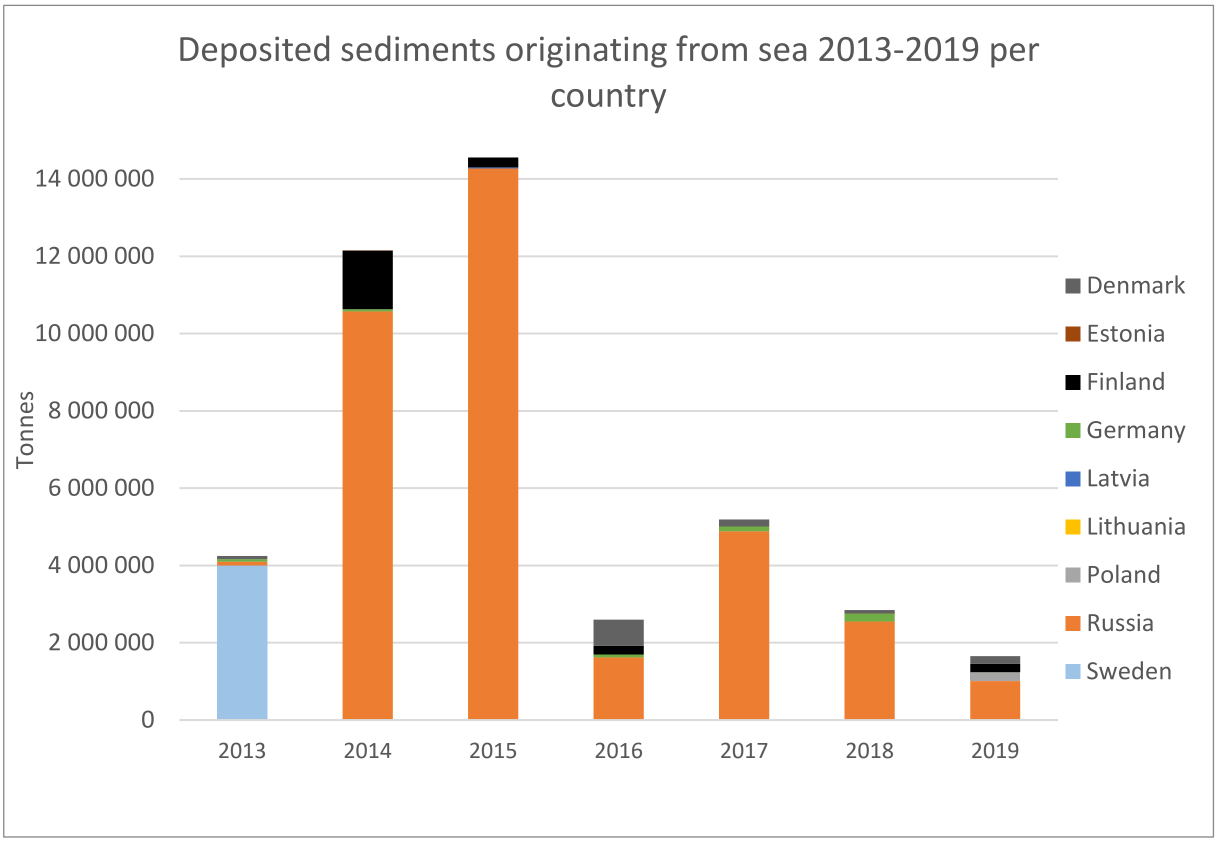

Figure 12. Amount of material originating from sea by country for the period 2013-2019.

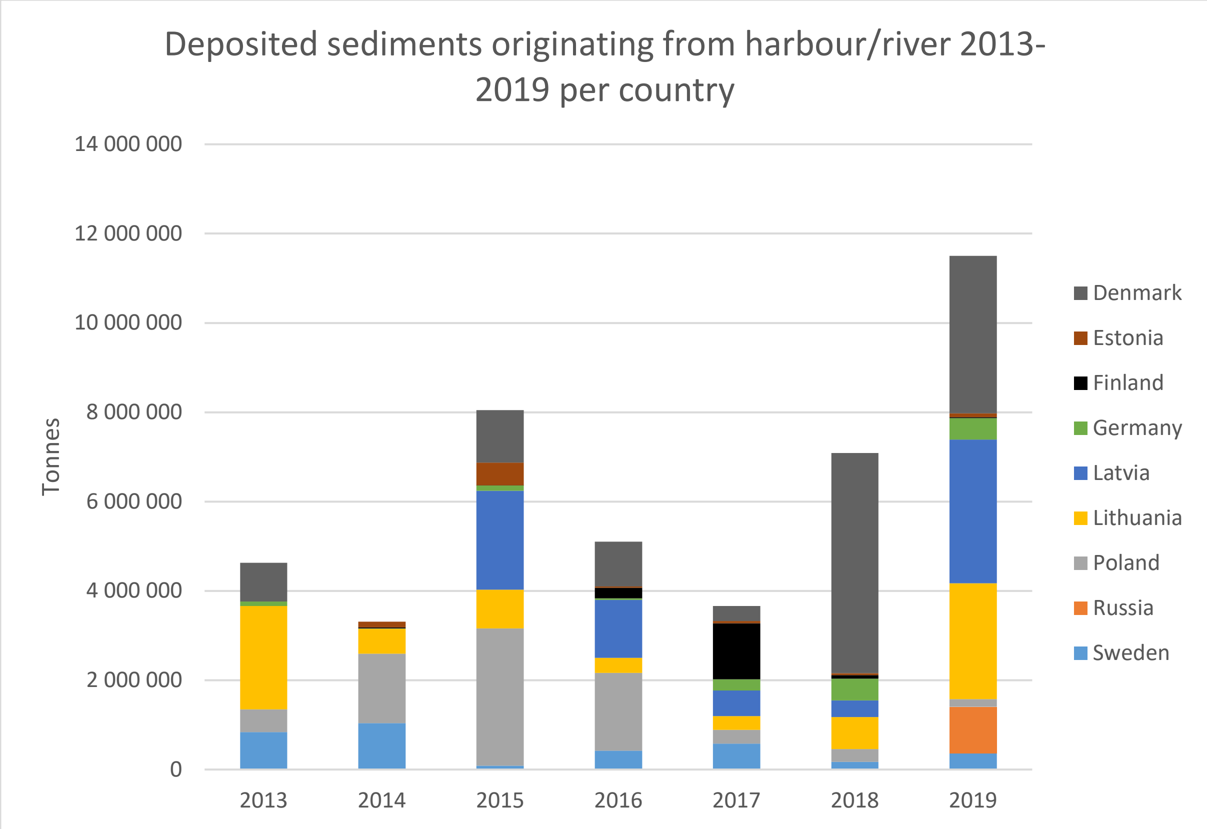

Figure 13. Amount of material originating from harbour/river environments by country for the period 2013-2019.

Country-specific values

Figures 14-31 illustrate the character of dredged material deposited in 2013-2019 per country. The upper figure illustrates the amount of material originating from different dredging operations and the lower figure illustrates sources of deposited material. Please note that the scale on the y-axis (amount material deposited in tonnes) is different for each country.

Denmark

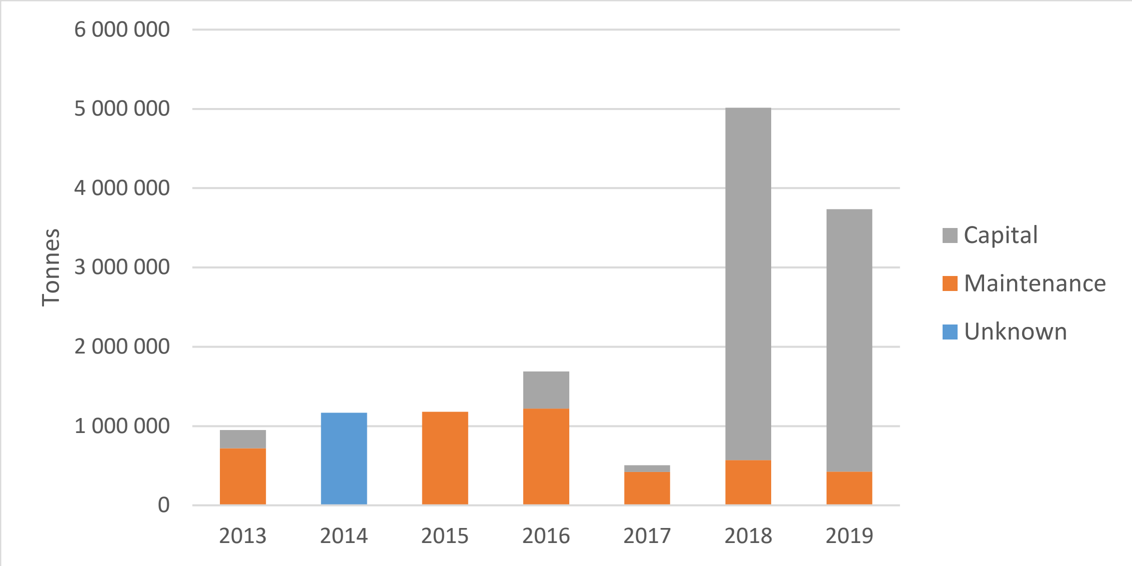

Figure 14. Amount of material originating from different dredging operations.

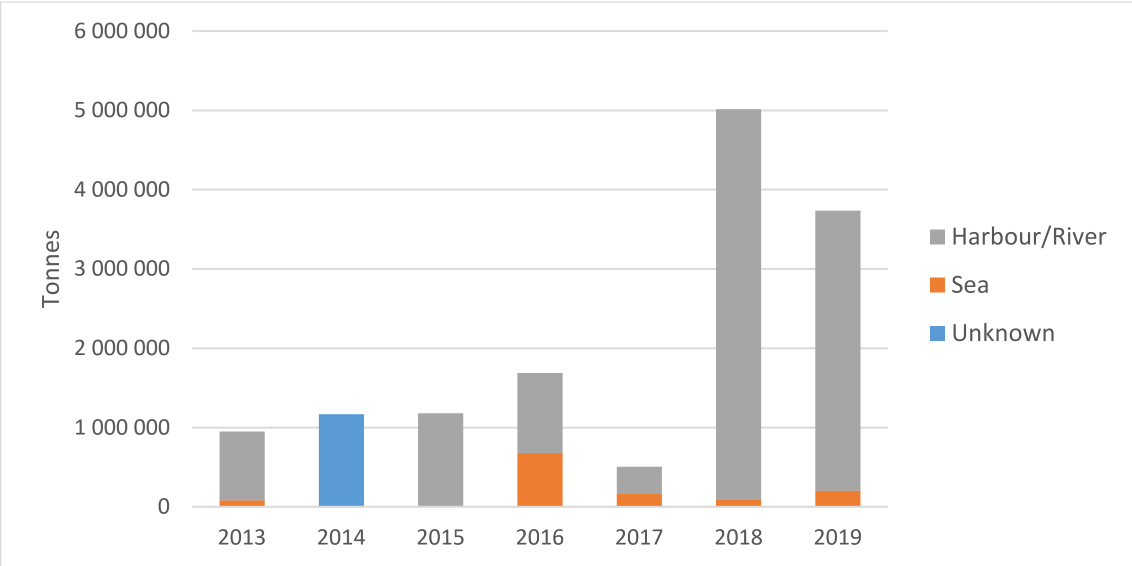

Figure 15. Sources of deposited material.

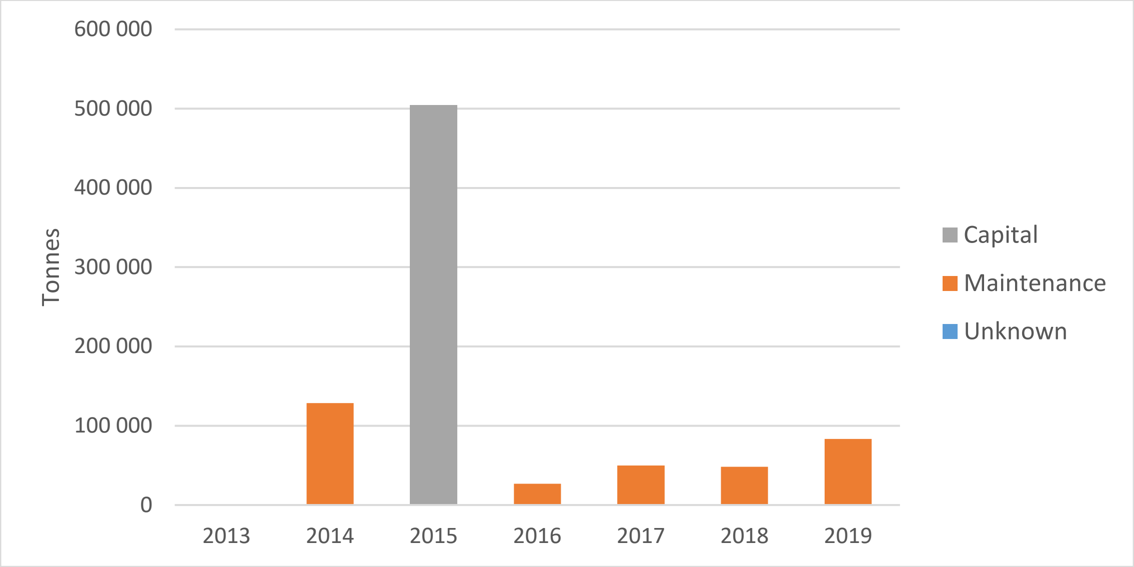

Figure 16. Amount of material originating from different dredging operations.

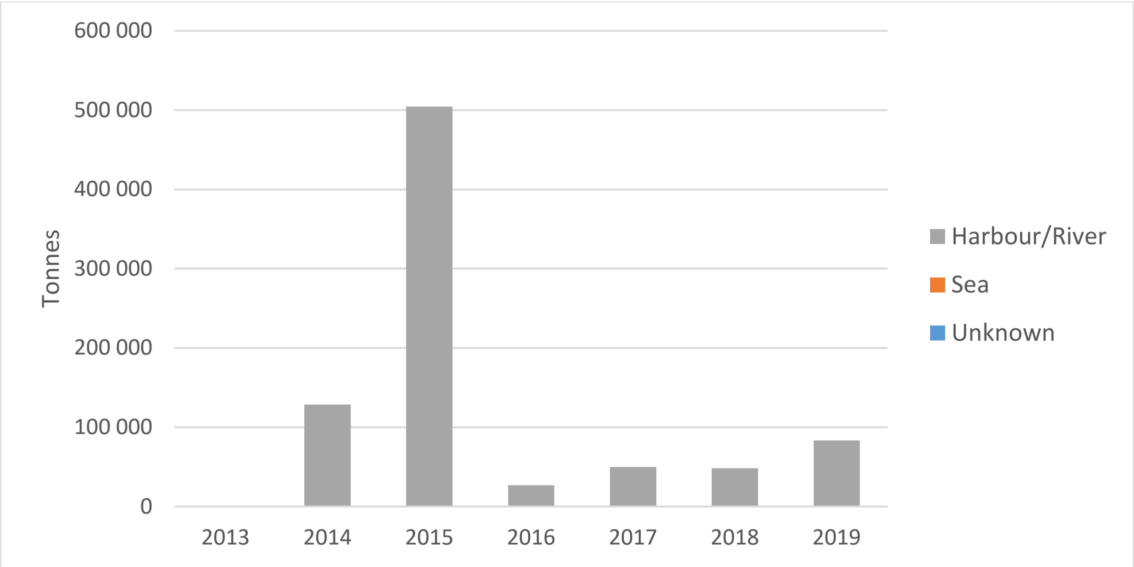

Figure 17. Sources of deposited material.

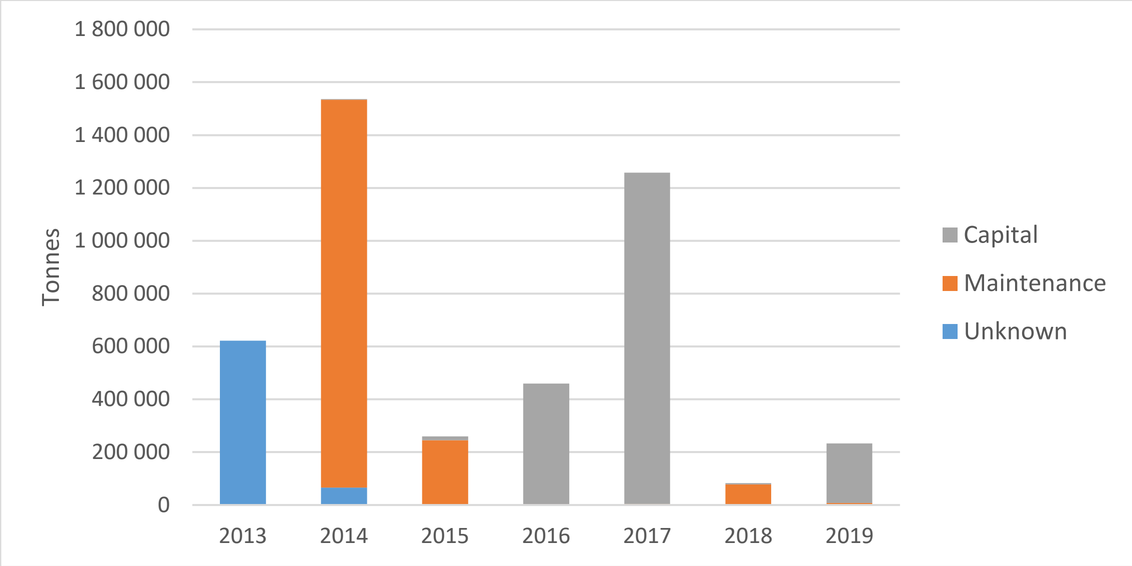

Figure 18. Amount of material originating from different dredging operations.

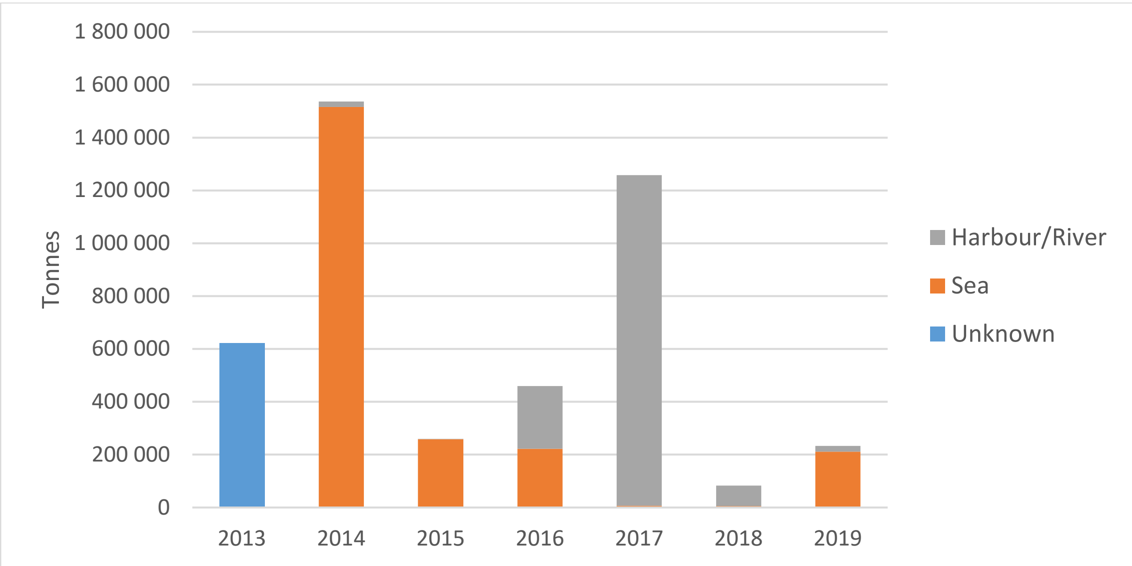

Figure 19. Sources of deposited material.

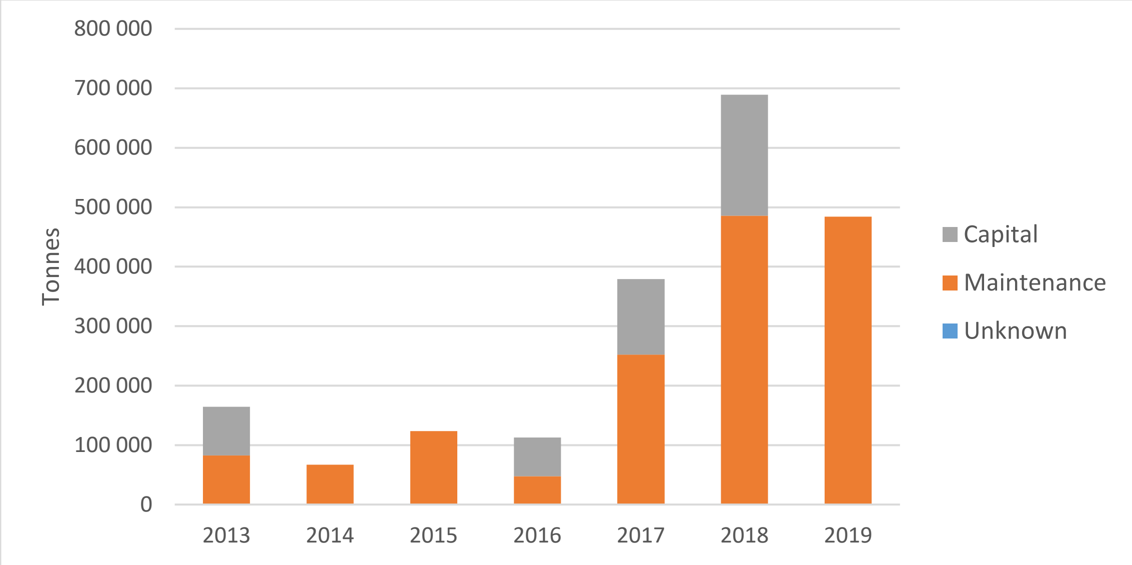

Figure 20. Amount of material originating from different dredging operations.

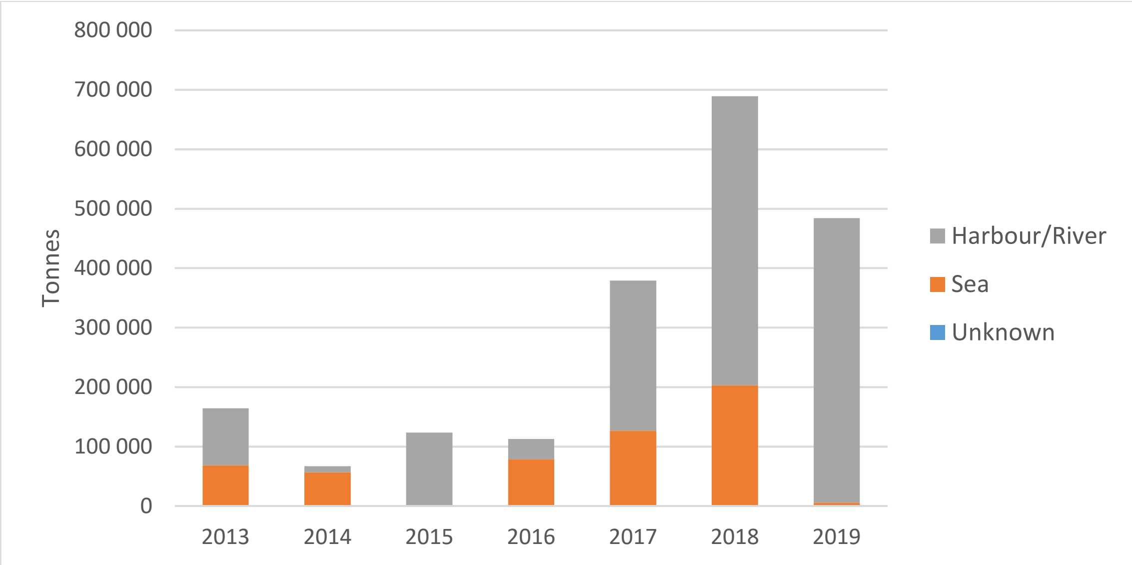

Figure 21. Sources of deposited material.

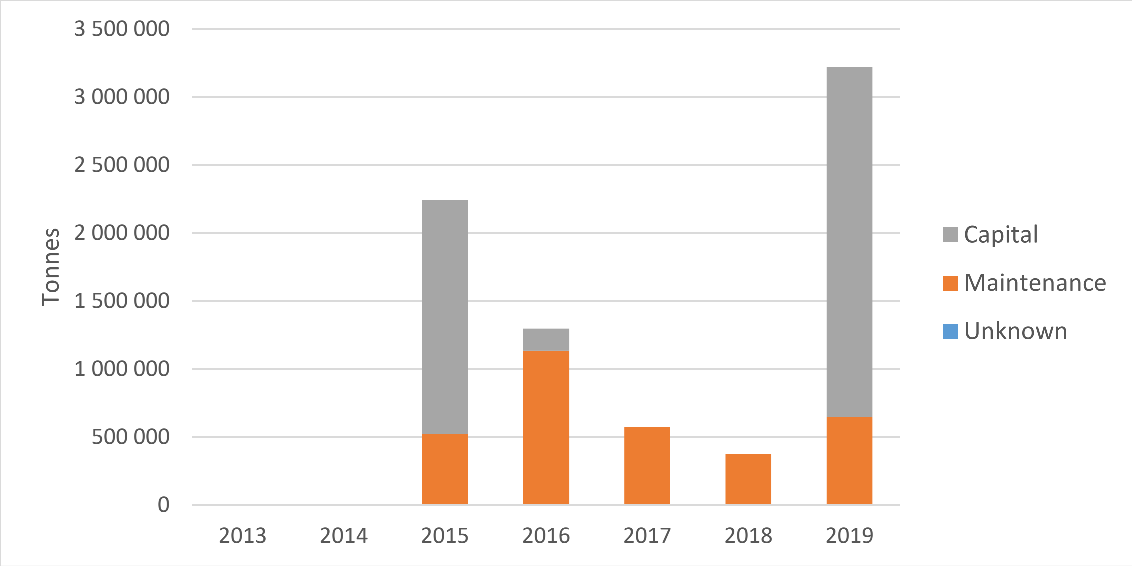

Figure 22. Amount of material originating from different dredging operations.

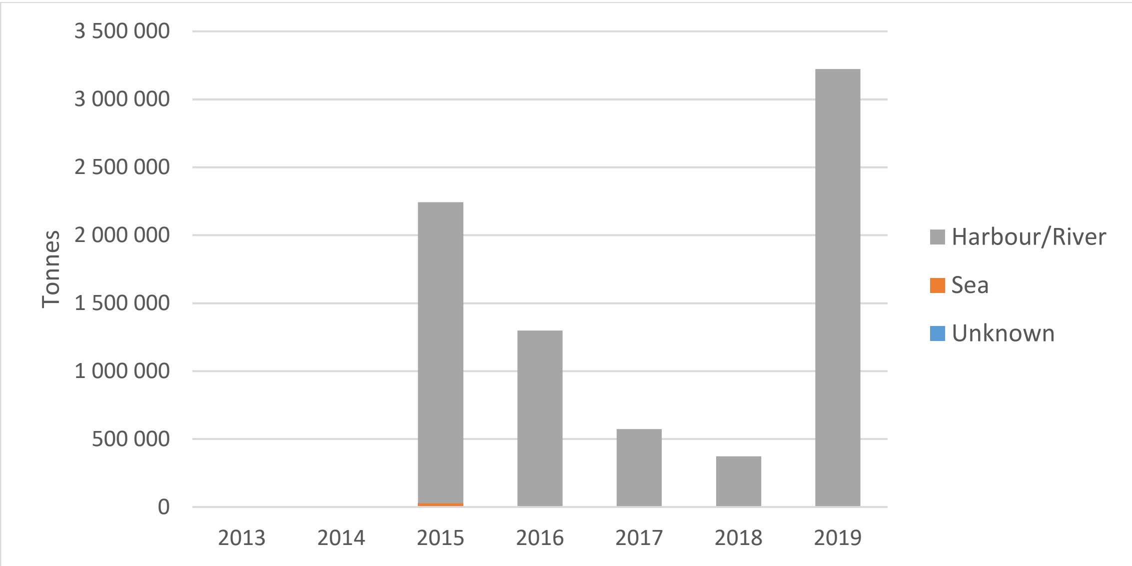

Figure 23. Sources of deposited material.

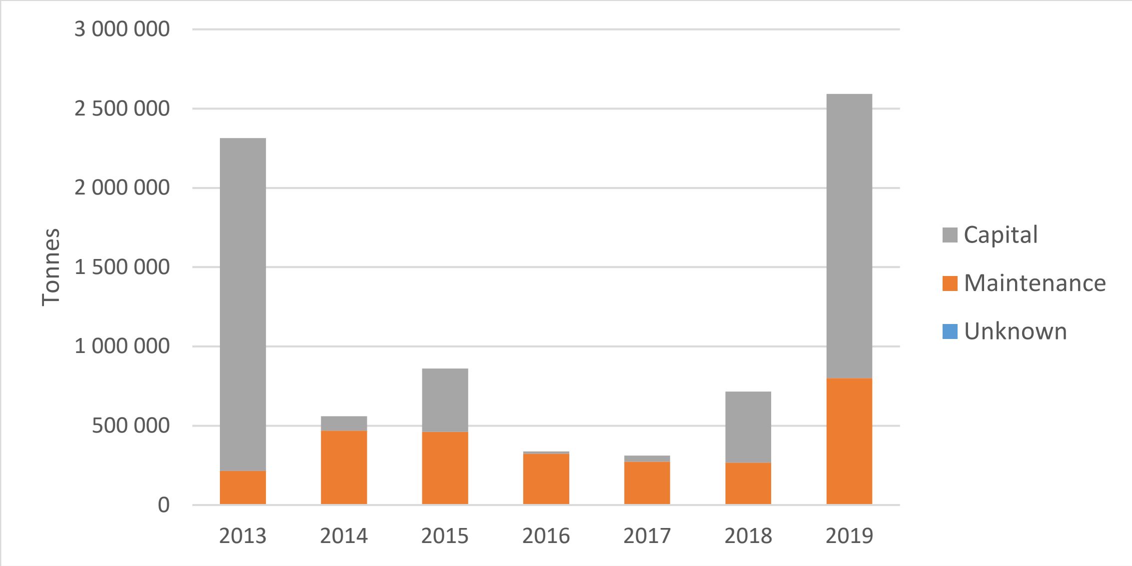

Figure 24. Amount of material originating from different dredging operations.

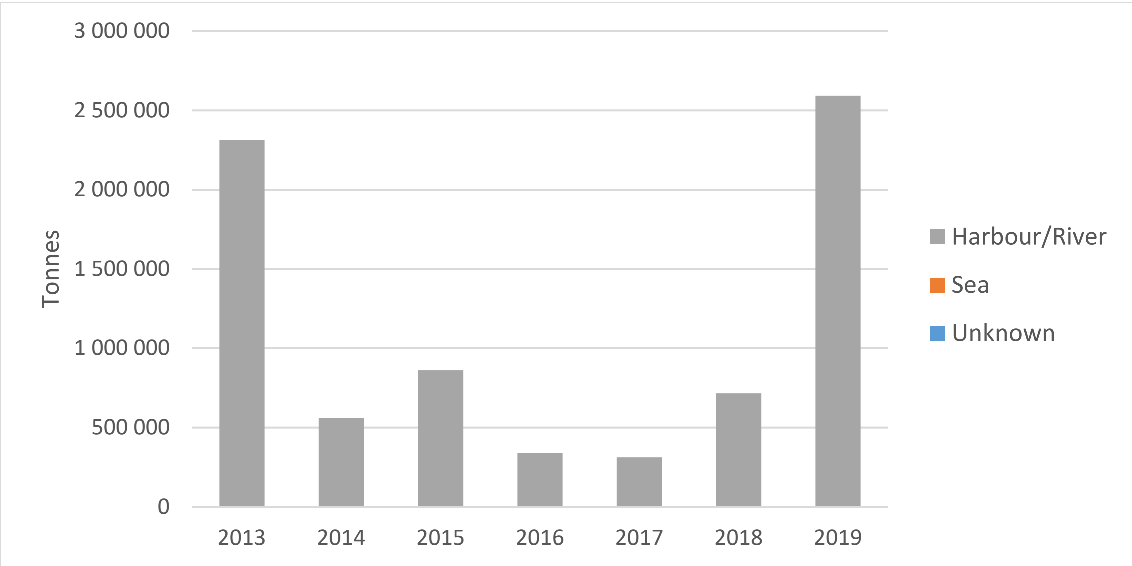

Figure 25. Sources of deposited material.

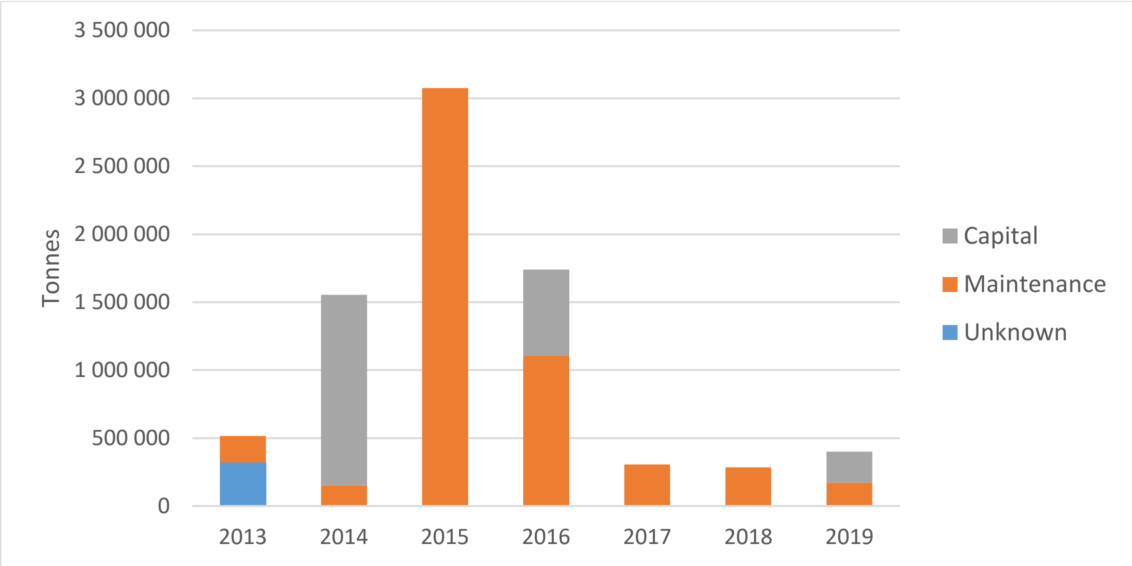

Figure 26. Amount of material originating from different dredging operations.

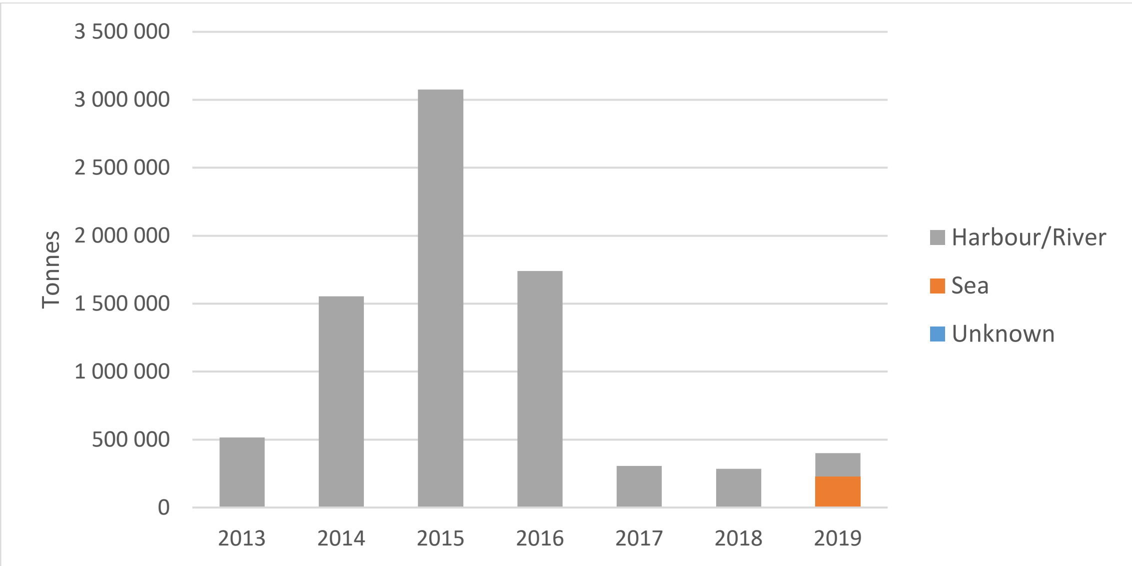

Figure 27. Sources of deposited material.

Russia

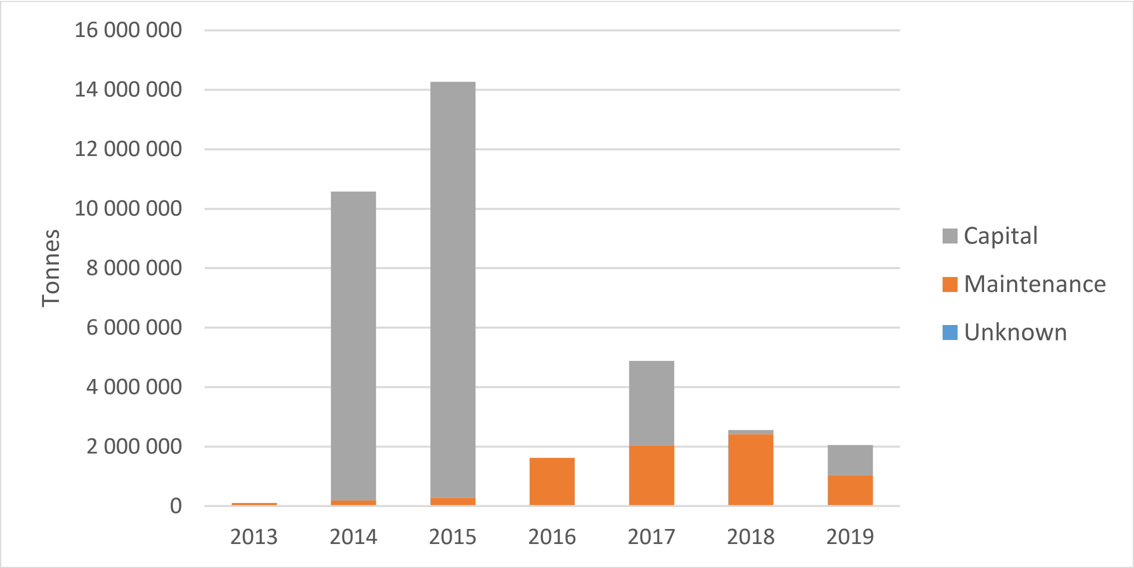

Figure 28. Amount of material originating from different dredging operations.

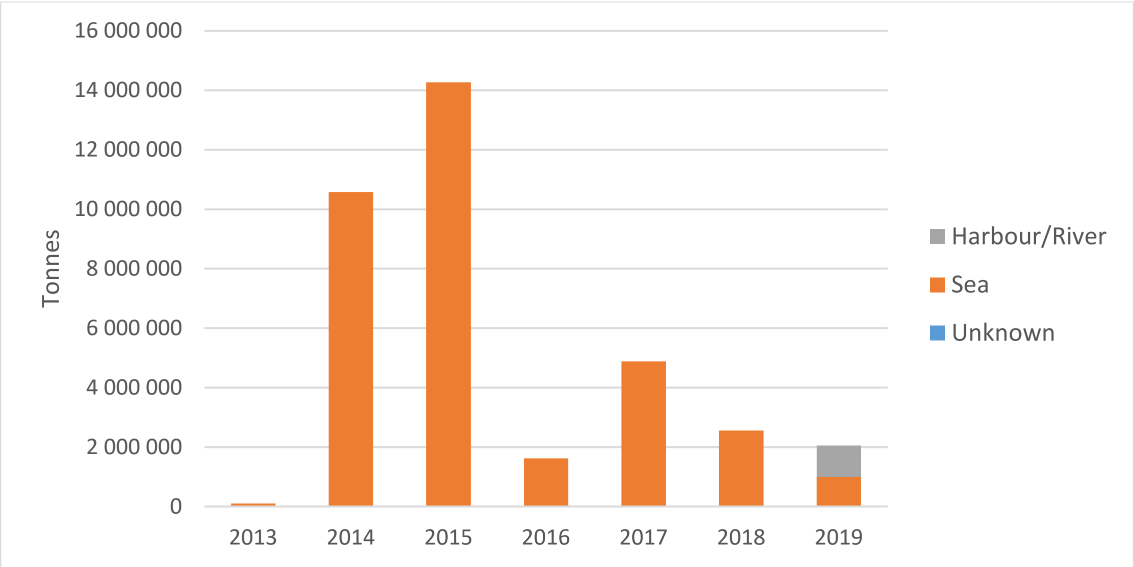

Figure 29. Sources of deposited material.

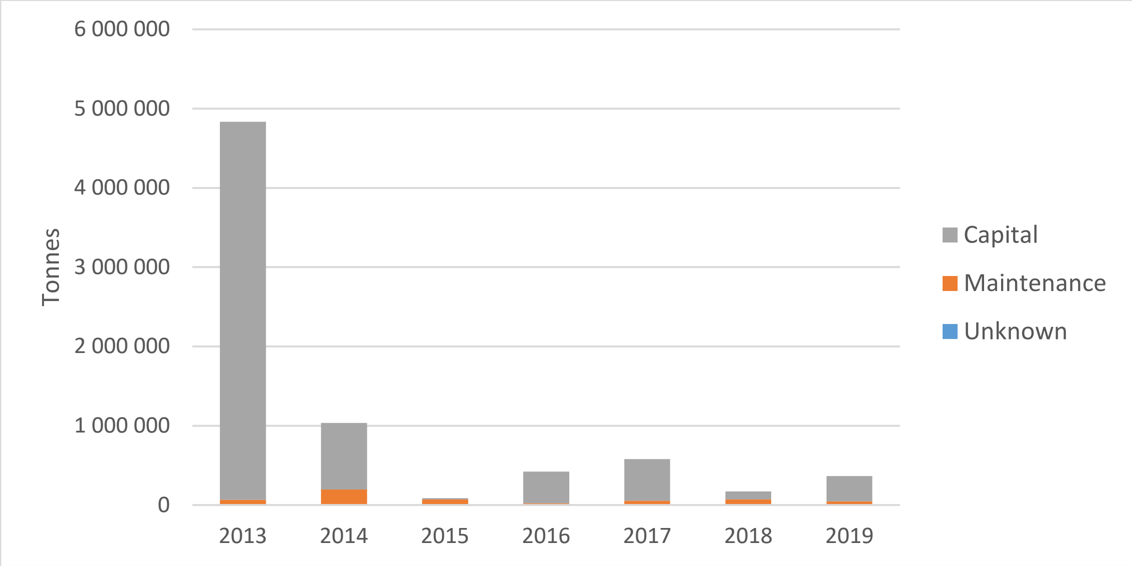

Figure 30. Amount of material originating from different dredging operations.

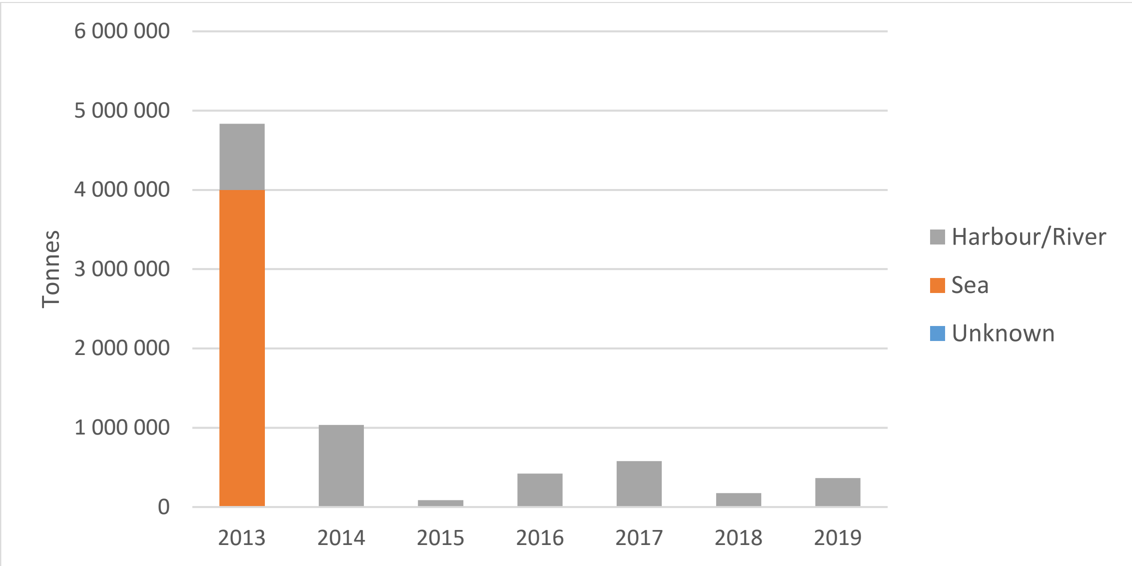

Figure 31. Sources of deposited material.

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 total amount and percentage of priority pollutants transported to the marine environment with sediments dredged in harbor/river and relocated during dredging/depositing operations at sea. Figure 33 illustrates proportions of pollutants in dredged material of different origin averaged for the period 2013-2019. Cd and Hg are two heavy metals identified as priority pollutants by HELCOM Recommendation 31E/1. Most of heavy metals entered the Baltic Sea marine environment in 2019 with dredged material transported from harbors and rivers. However, the percentage of mercury and copper originating from sea sediments is a bit higher than of led and cadmium. Proportion of heavy metals in dredged material originating from sea and harbors/rivers in 2019 differs from previous years. In previously observed years, most of the copper and mercury is relocated with sea sediments, while led and cadmium tended to be introduced into the marine environment with sediments dredged in harbors and rivers. Nonetheless, on average for the last 6 years sea sediments remain the main source for Cu and Hg while Pb and Cd originates mainly from harbor/river sediments.

Harbors/rivers remain dominating source of TBT and PAH in 2019 which is typical for the whole reported period.

Figures 34-39 illustrate total amount of priority pollutants in dredged material deposited at sea in 2013-2019 per country. Figures 40-45 illustrate spatial distribution of input of contaminants (harbor/river origin) in 2019.

Table 1. Total input of contaminants in the Baltic Sea in 2019, originating from harbour/river, sea and unknown environments.

Contaminant	Harbour/river	Sea	Unkown	Harbour/river (%)	Sea (%)	Unknown (%)
PAH (t)	2,009	0,292	0,006	87,1	12,6	0,3
TBT (kg)	61,894	2,534	0,293	95,6	3,9	0,5
Pb (t)	131,616	10,914	0,044	92,3	7,7	0,0
Cu (t)	124,468	23,359	0,109	84,1	15,8	0,1
Hg (t)	0,531	0,087	0,000	85,9	14,1	0,0
Cd (t)	2,749	0,235	0,001	92,1	7,9	0,0

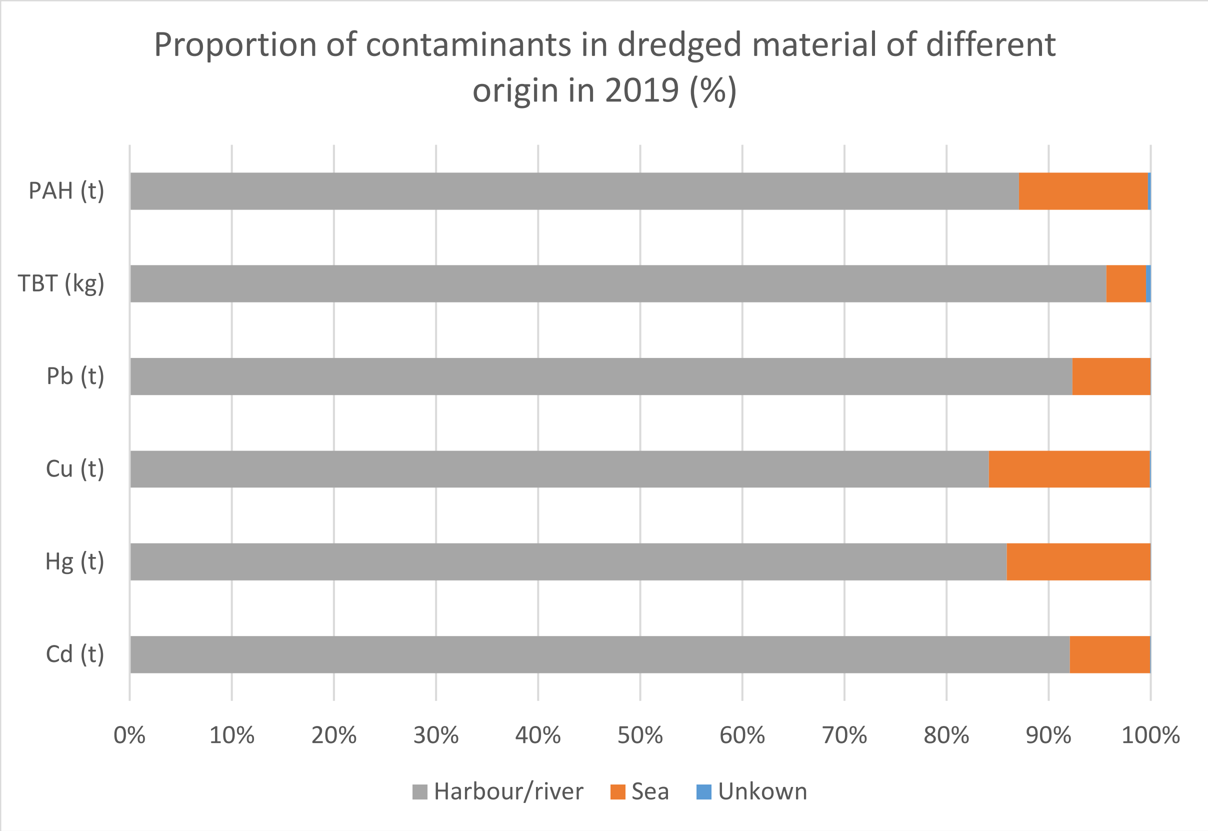

Figure 32. Proportion of contaminants originating from harbor/river, sea and unknown areas in 2019.

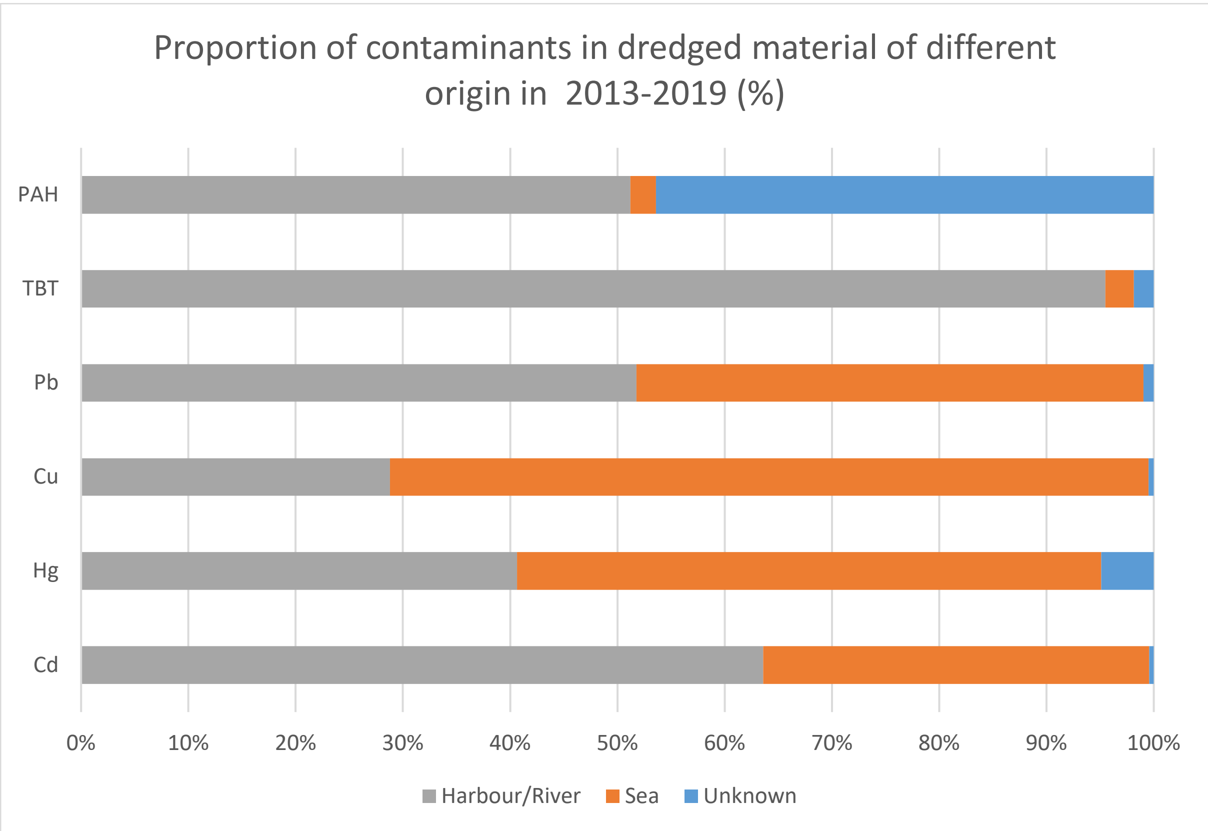

Figure 33. Proportion of contaminants originating from harbour/river, sea and unknown locations for the period 2013-2019.

Figures 34-39 illustrate total amount of priority pollutants in deposited material of all origins for 2013-2019 per country in tonnes (TBT in kilograms).

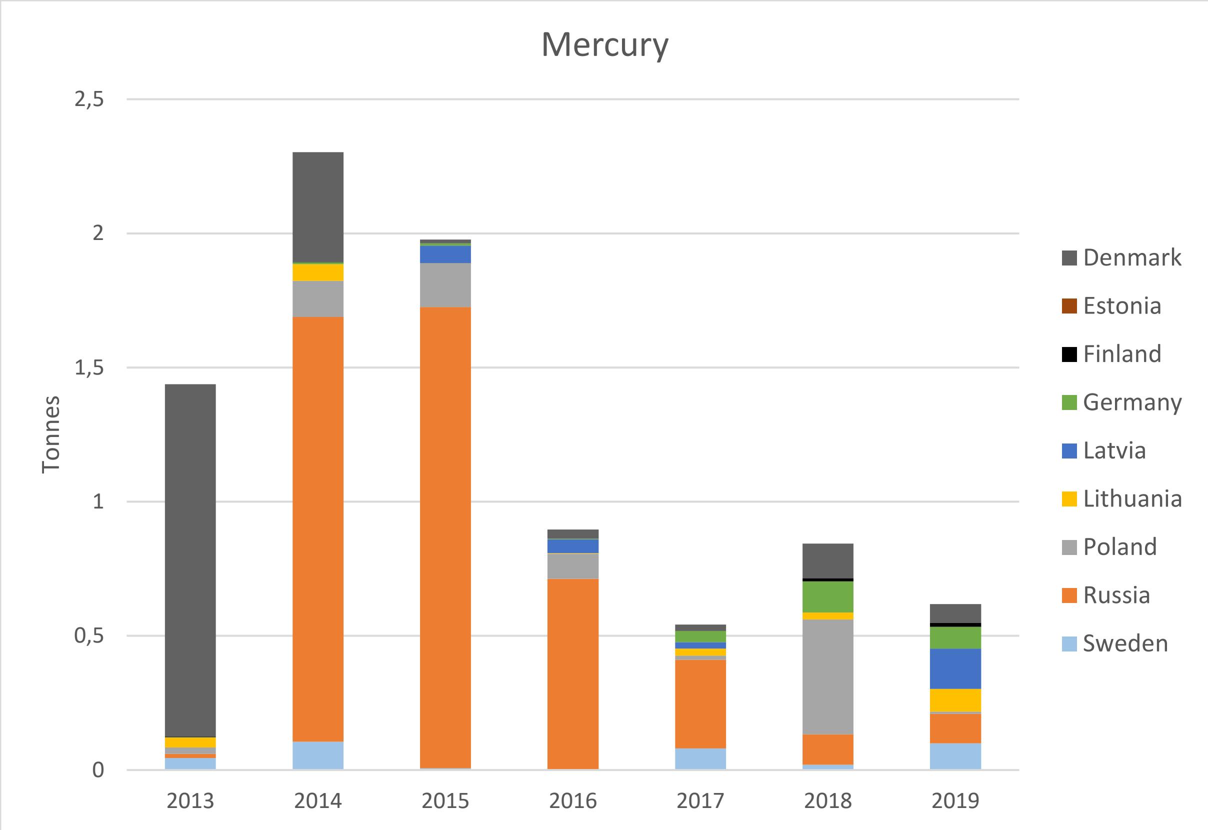

Figure 34. Total amount of mercury in dredged material deposited at sea in 2013-2019.

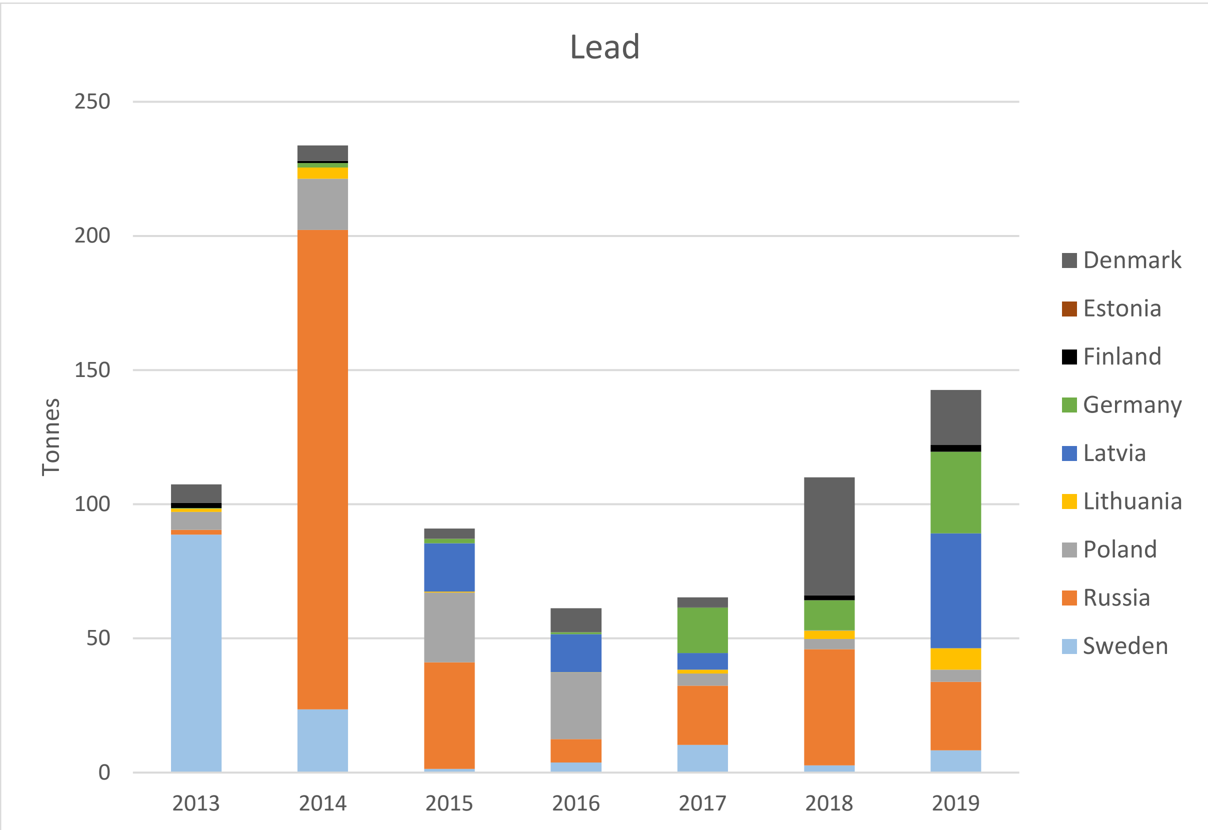

Figure 35. Total amount of lead in dredged material deposited at sea in 2013-2019.

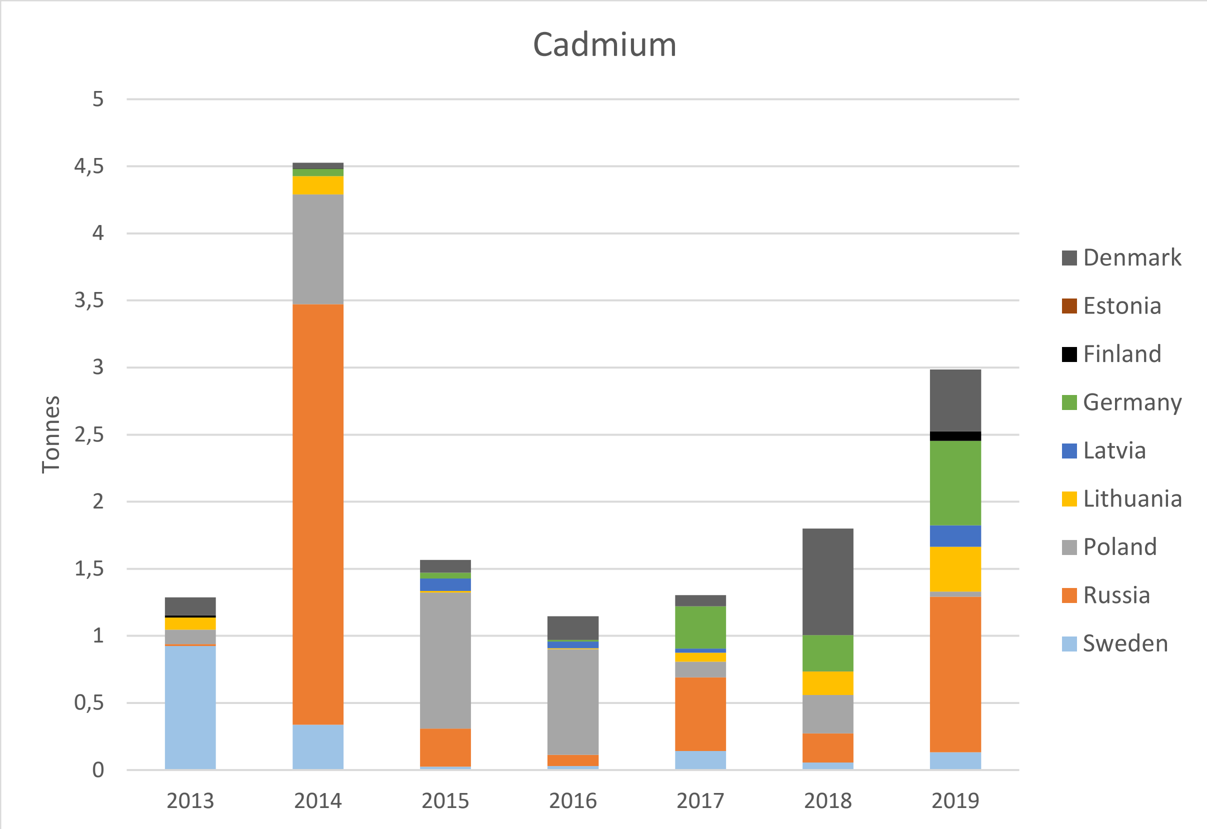

Figure 36. Total amount of cadmium in dredged material deposited at sea in 2013-2019.

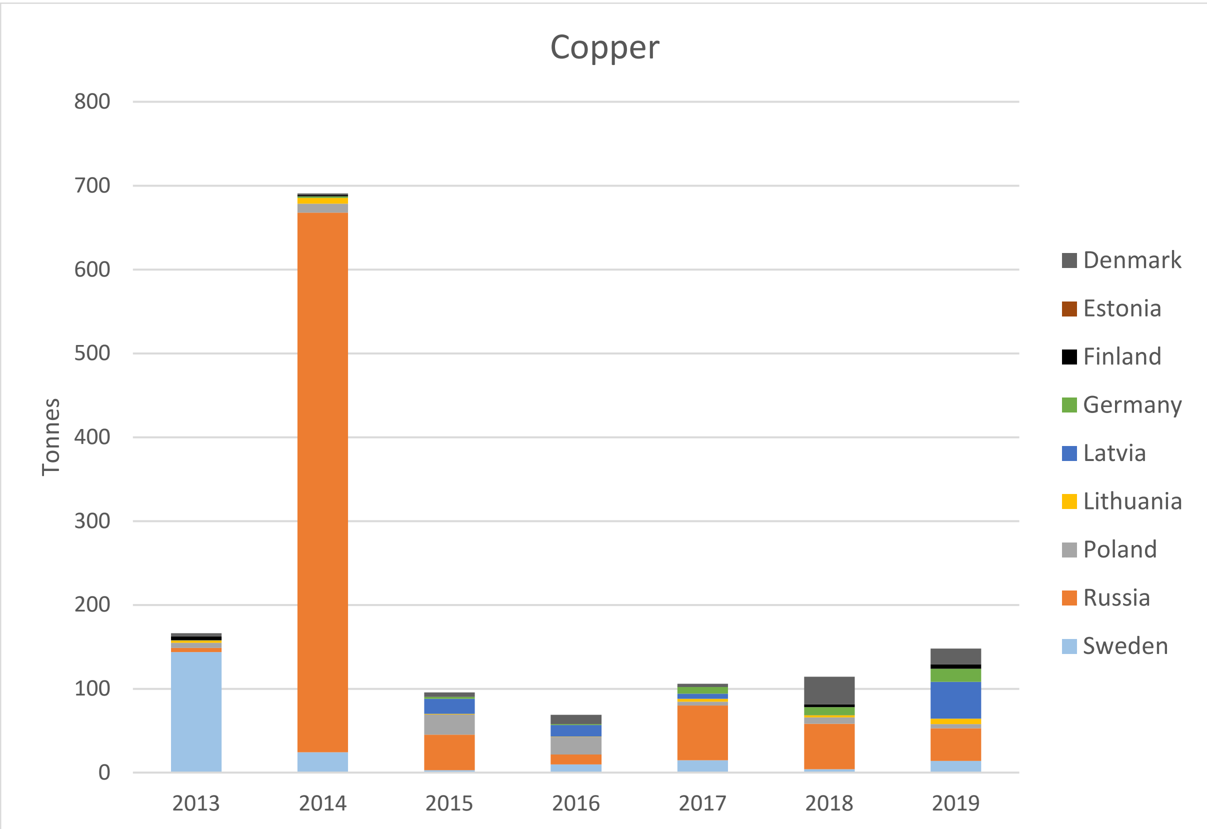

Figure 37. Total amount of copper in dredged material deposited at sea in 2013-2019.

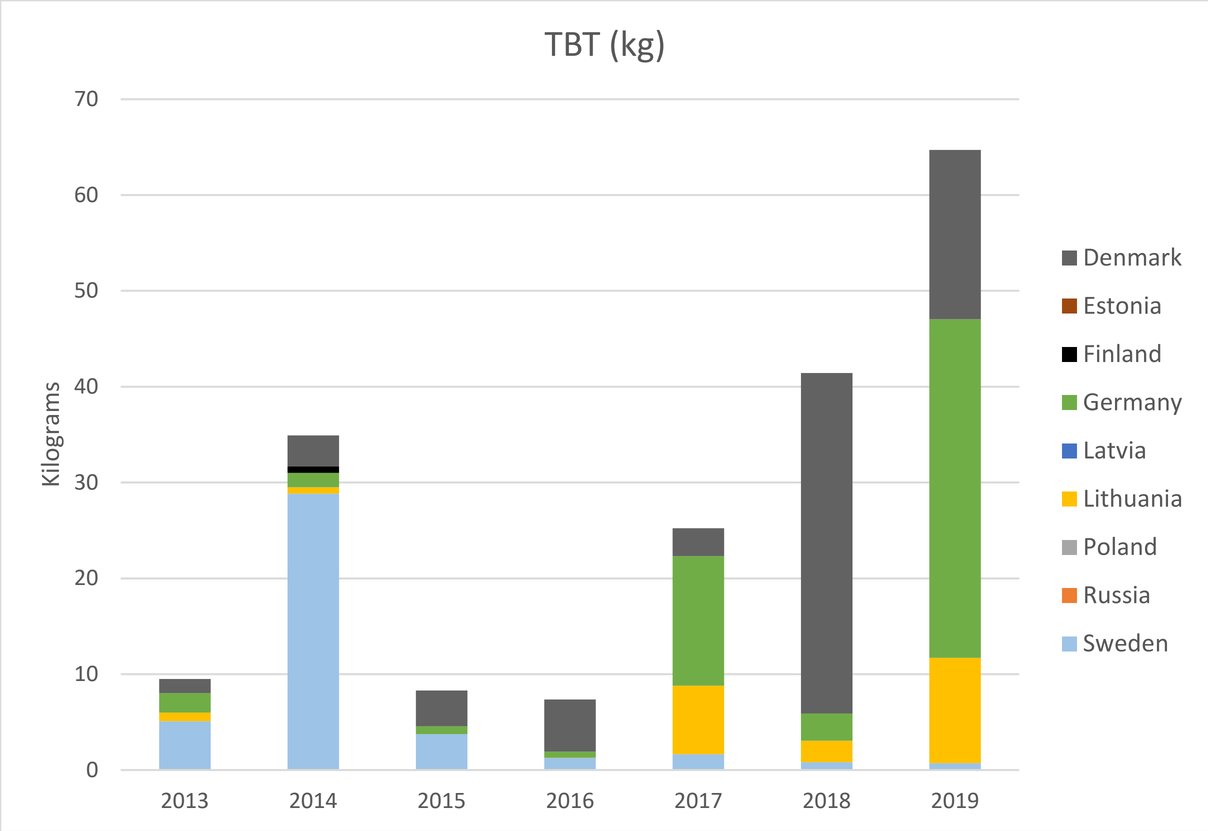

Figure 38. Total amount of TBT in dredged material deposited at sea in 2013-2019.

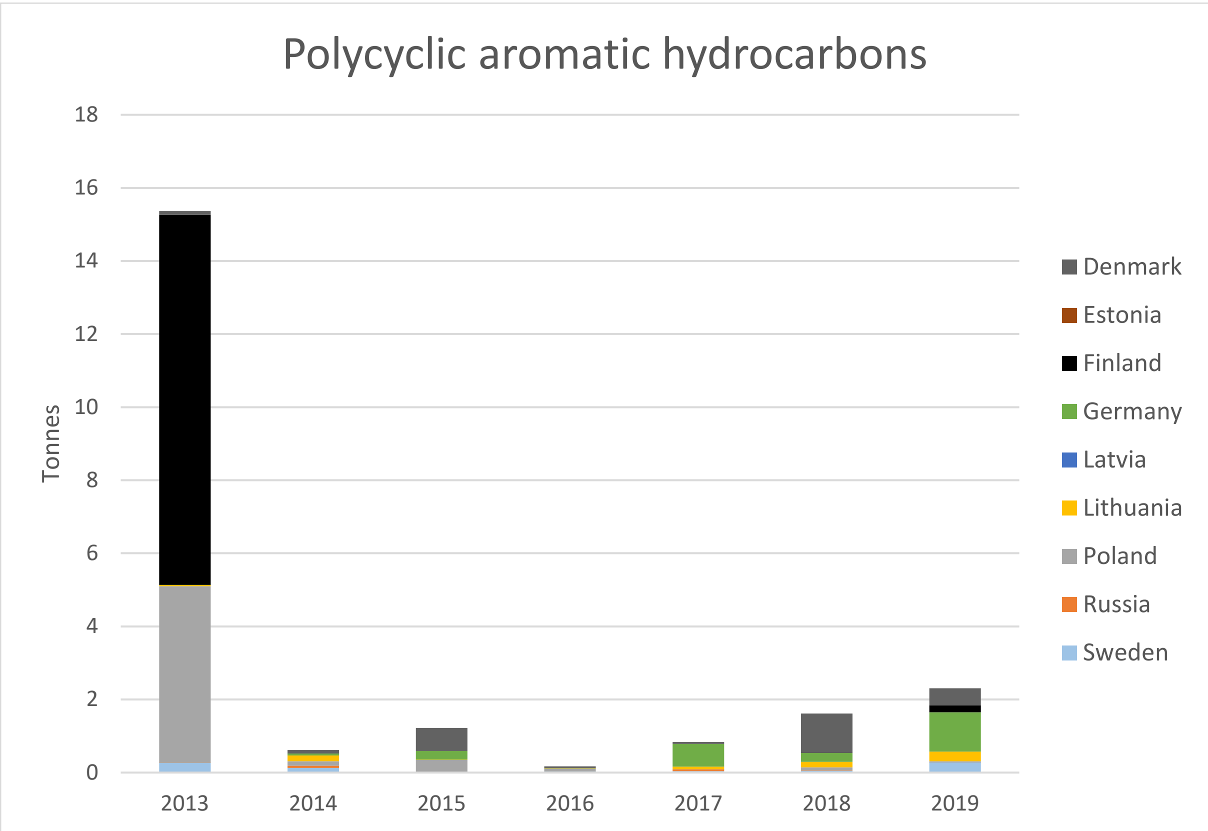

Figure 39. Total amount of polycyclic aromatic hydrocarbons in dredged material deposited at sea in 2013-2019.

Input of contaminants in 2019

Figures 40-45 illustrate spatial distribution of priority pollutants' input to the sea with dredged material originating from harbors/rivers in 2019. 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.

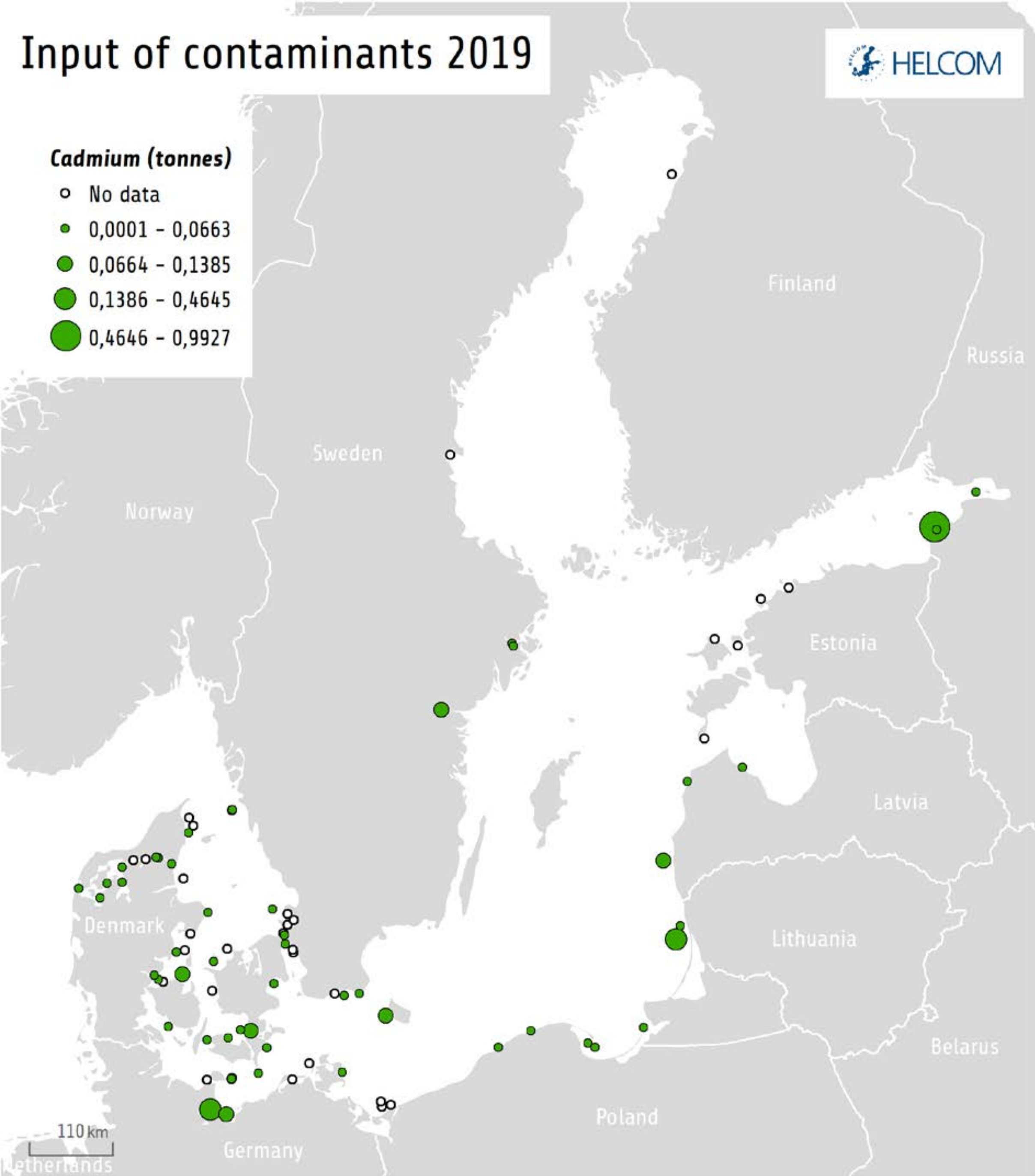

Figure 40. Input of Cadmium from harbors/river in 2019. "No data" can result from no data reported, concentrations below detection limit or material exempted from characterisation.

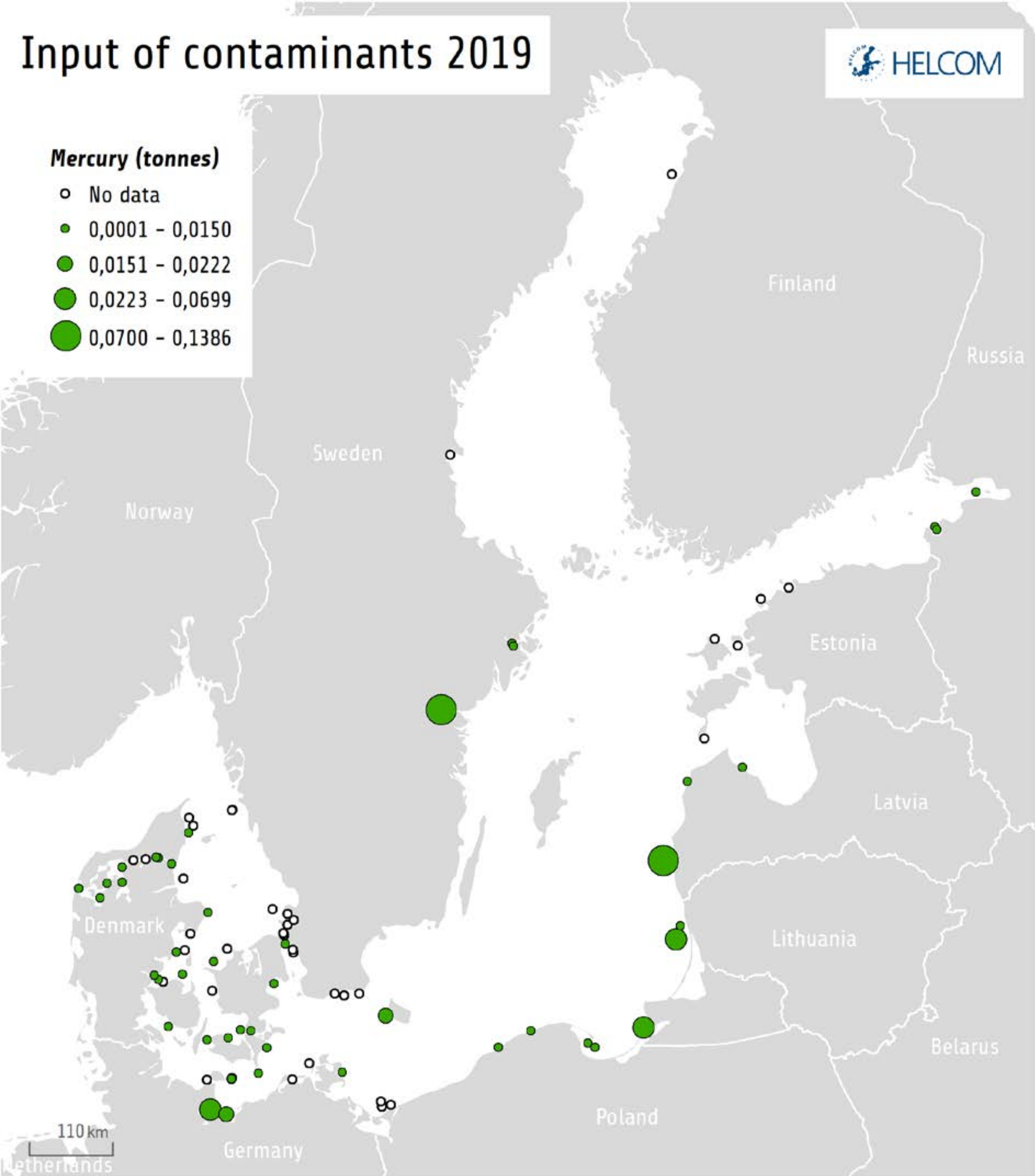

Figure 41. Input of Mercury from harbors/river in 2019. “No data” can result from no data reported, concentrations below detection limit or material exempted from characterisation.

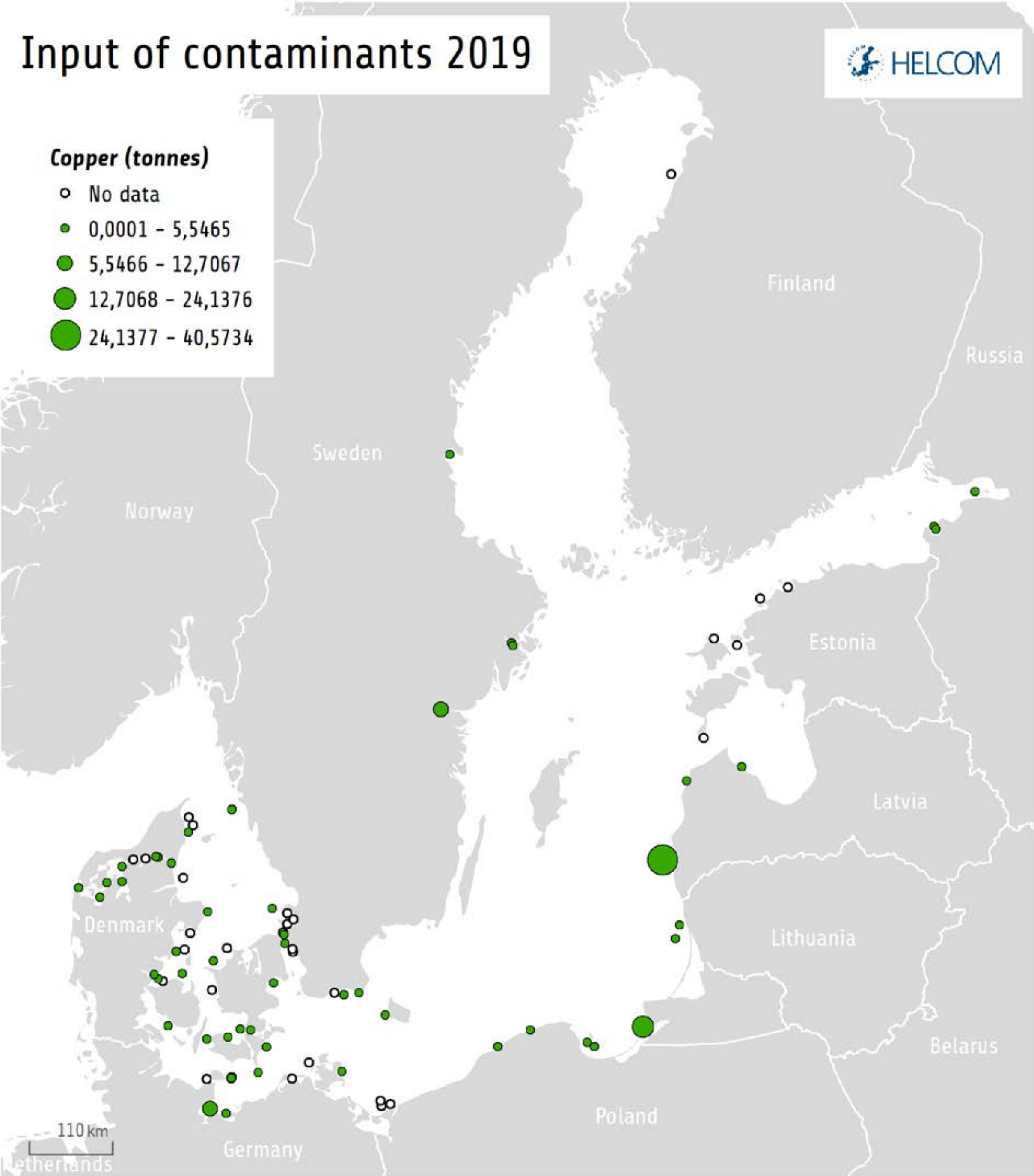

Figure 42. Input of Copper from harbors/river in 2019. “No data” can result from no data reported, concentrations below detection limit or material exempted from characterisation.

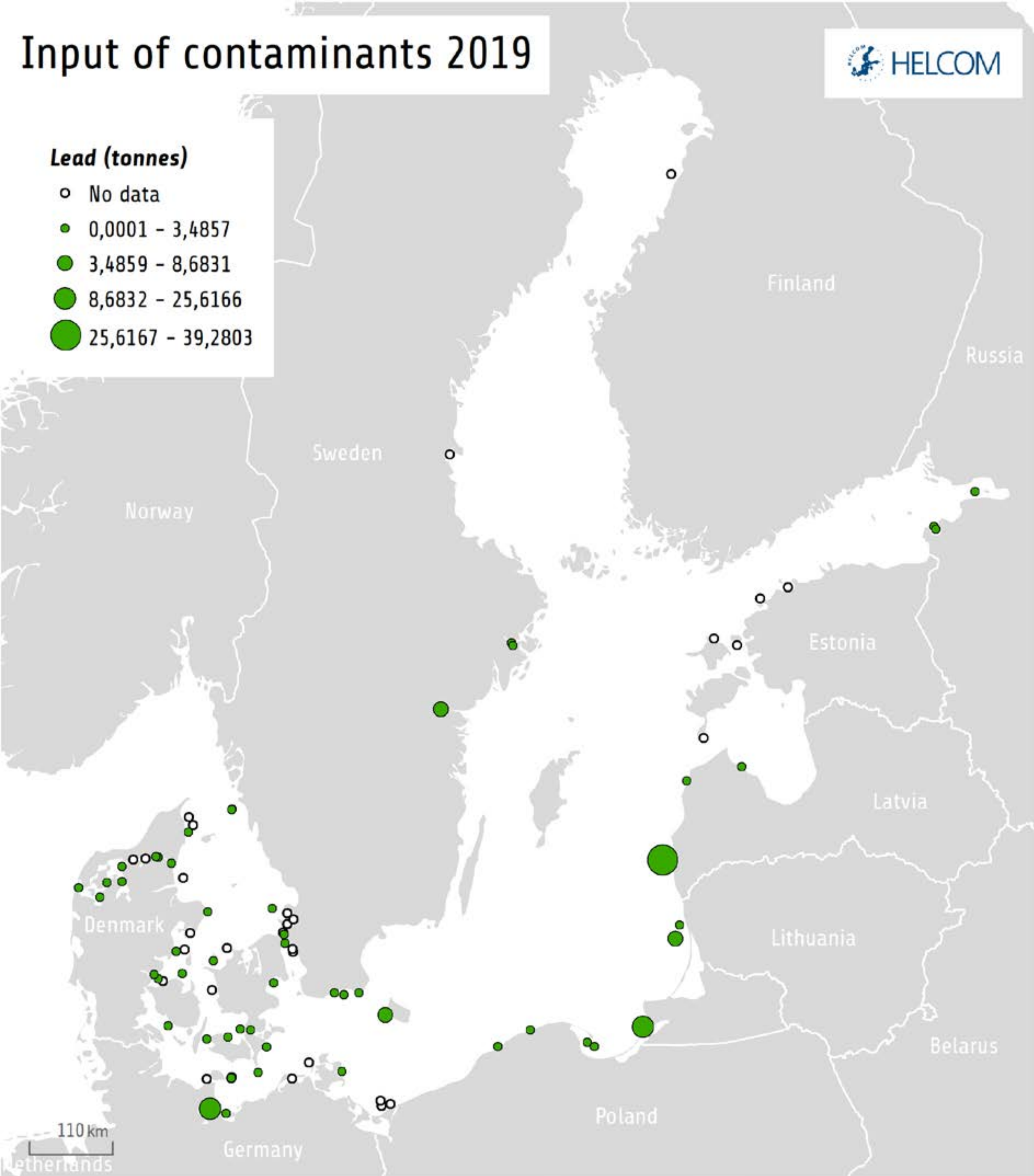

Figure 43. Input of Lead from harbors/river in 2019. “No data” can result from no data reported, concentrations below detection limit or material exempted from characterisation.

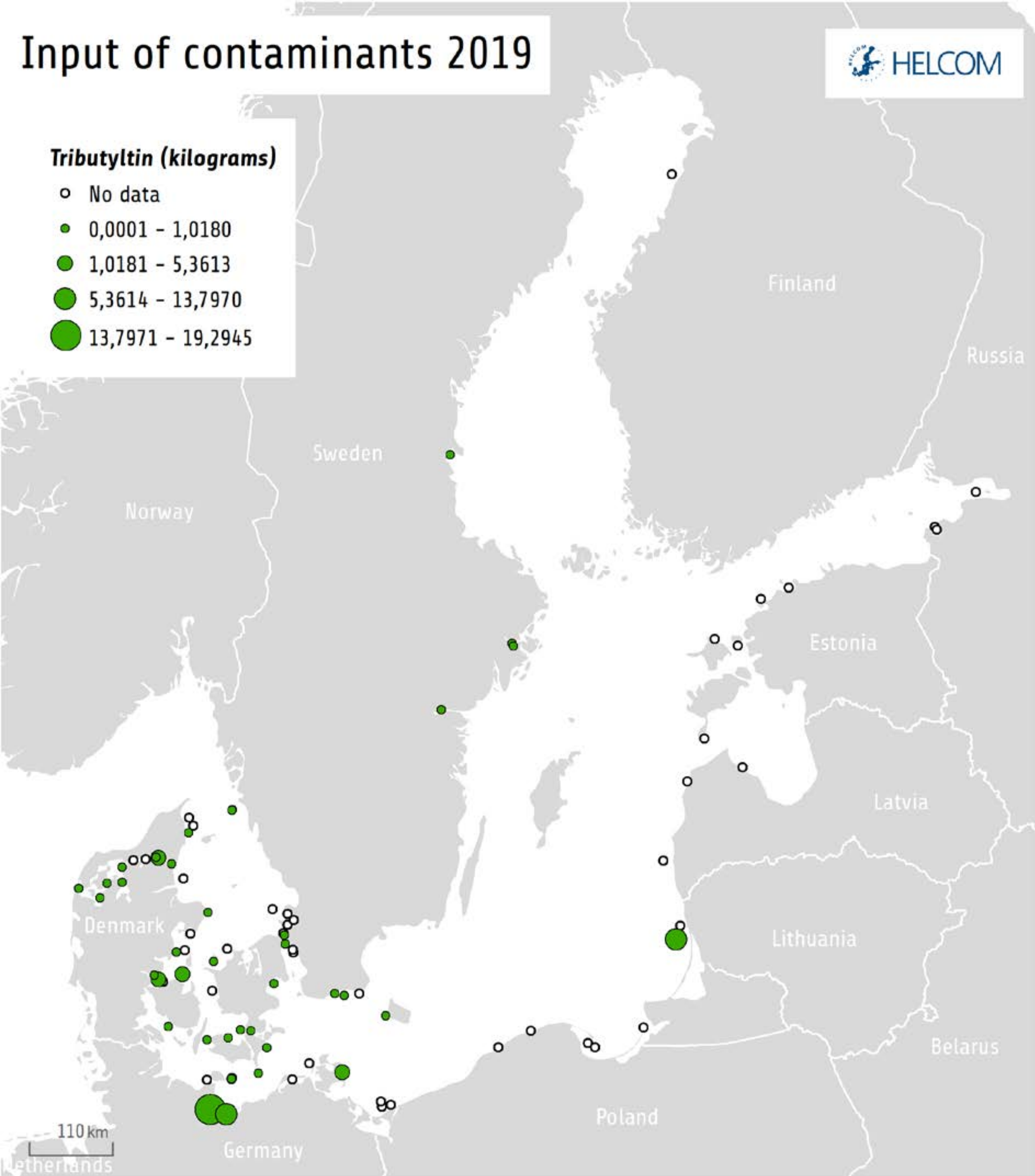

Figure 44. Input of Tributyltin from harbors/river in 2019. "No data" can result from no data reported, concentrations below detection limit or material exempted from characterisation.

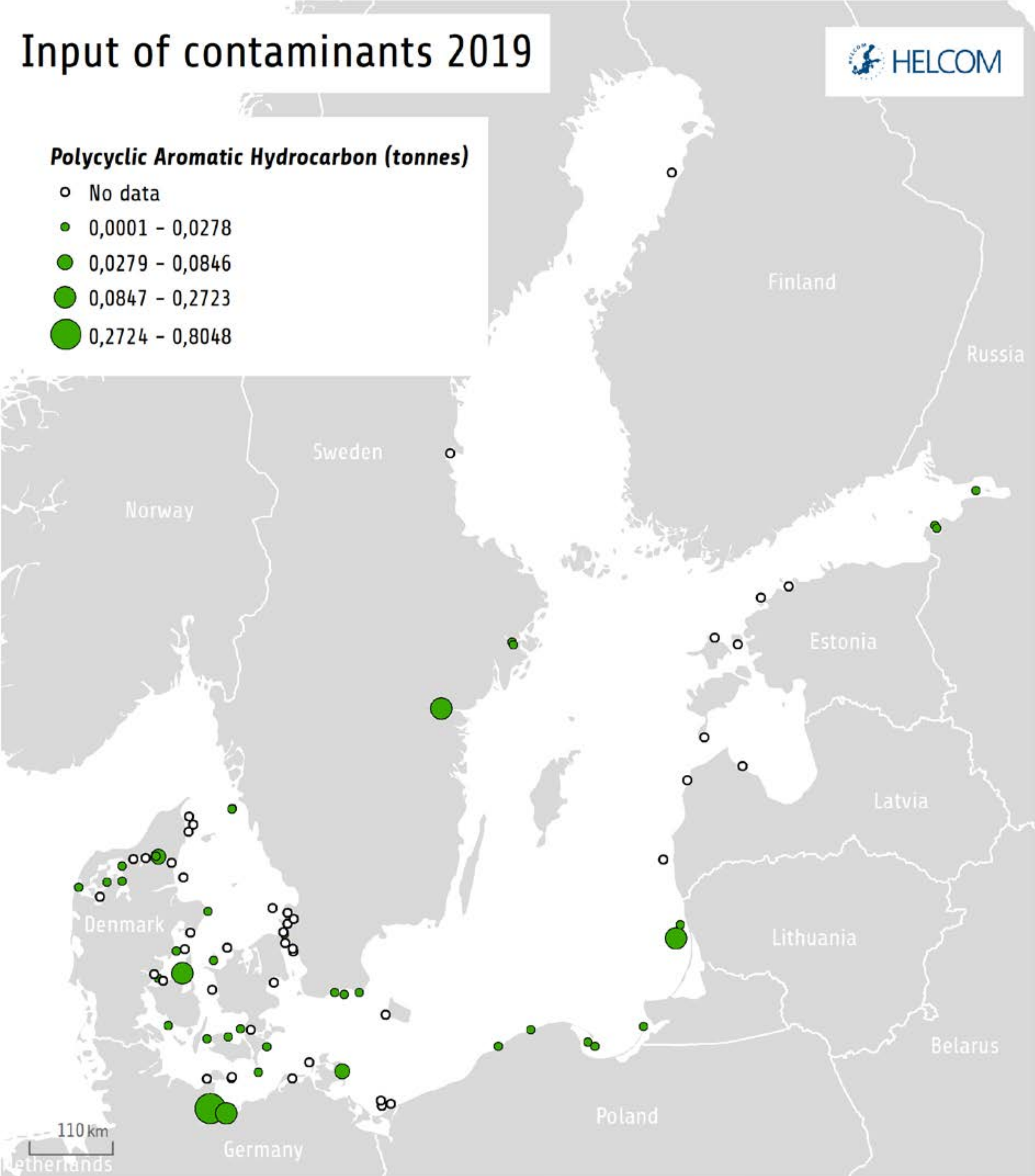

Figure 45. Input of Polycyclic Aromatic Hydrocarbon from harbors/river in 2019. "No data" can result from no data reported, concentrations below detection limit or material exempted from characterisation.

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.