Depositing of dredged material in the Baltic Sea

Key message

- The total amount of material deposited at Baltic Sea area is highly variable between years, depending widely on the occurrence of larger capital dredging operations. Total amount of material deposited in 2017 was around 9 million tonnes which is 2 million tonnes more than in 2016. This is mainly due to increase in capital dredging operations, as there were 1,5 million tonnes less maintenance dredging than in 2016. Dredged material was deposited at 108 depositing sites.

- In 2017 the amount of material deposited at sea originated from capital dredging slightly prevailed over the maintenance operations. Capital dredging produced 4.9 million tonnes of the deposited material, which constitutes 55% of all dredged material deposited at sea in 2017. This amount slightly exceeds the volume produced by capital dredging in 2016 but remains much lower than the amounts reported in 2013-15. Most of the capital dredging in 2017 was reported by Russia and Finland.

- Maintenance dredging in 2017 contributed slightly less than 4 million tonnes, which constitutes about 45% of all dredged material deposited at the Baltic Sea. This amount is slightly less than what was reported two previous years but a bit higher than 2013-14. The main contributors in 2017 were Russia, Latvia and Denmark.

- 59% (5.2 million tonnes) of the material deposited at sea in 2017 originates from sea, 27 % (2.4 million tonnes) from harbours or river estuaries and about 14% was reported as of unknown origin.

- There were six major contaminants reported by countries in 2017: four heavy metals (mercury, lead, cadmium and copper), tributyltin and polyaromatic hydrocarbons. The proportion of TBT and PAHs in sediments from harbours/rivers is about 99% and 89% of total amount respectively. Most of the copper and mercury in dredged material originates from operations at sea (64% and 63%) while lead and cadmium are mainly from harbour/river sediments (64% and 55%).

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 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 2017 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 2017 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.

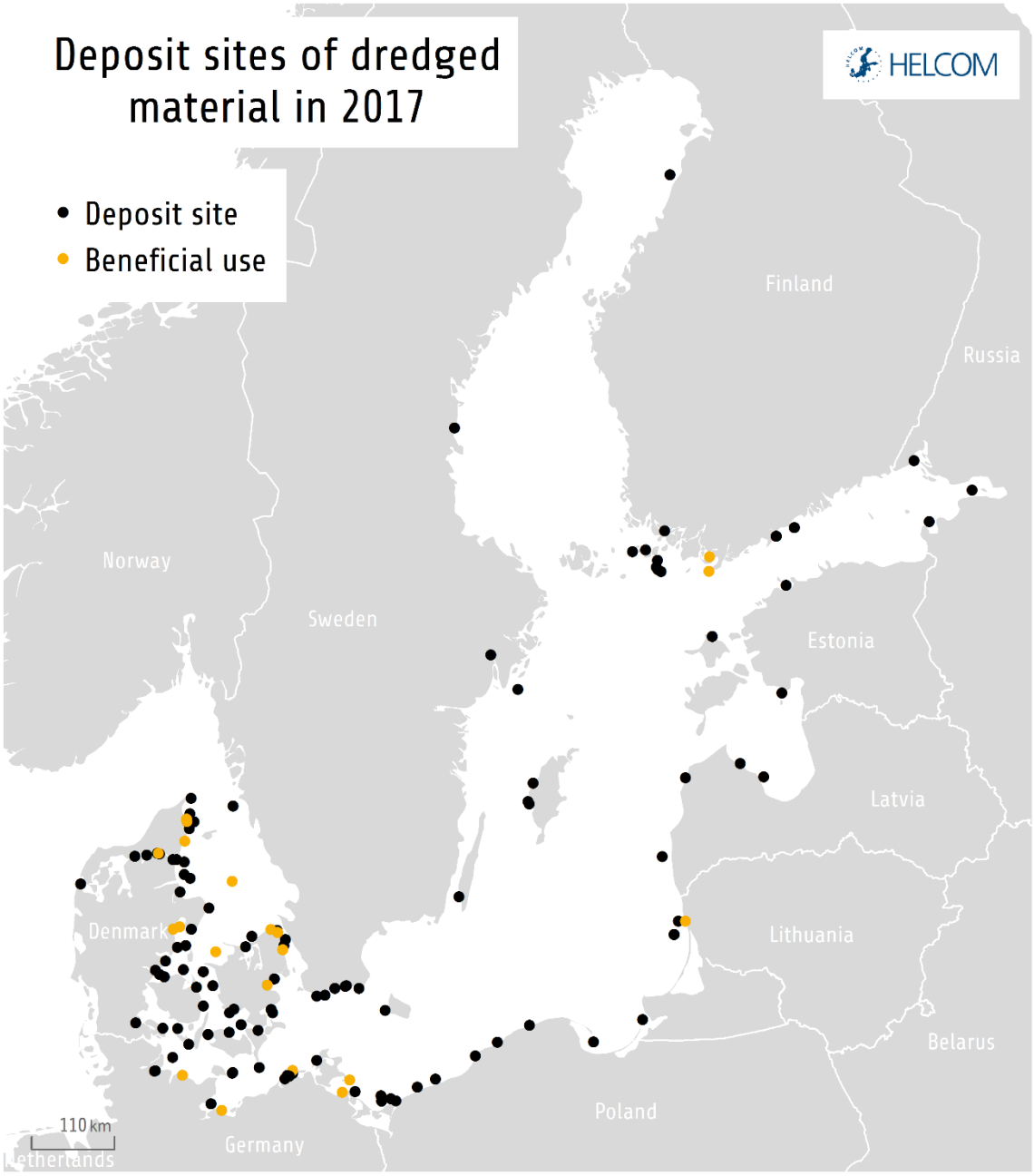


Figure 1. Location of depositing sites of dredged material in 2017 as well as locations where dredged material has been used for beneficial use.

The use of the updated data reporting format was tested in reporting of 2016 data. Fig. 1 illustrates the distribution of 108 areas for depositing of dredged material in 2017. The map also includes 20 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.

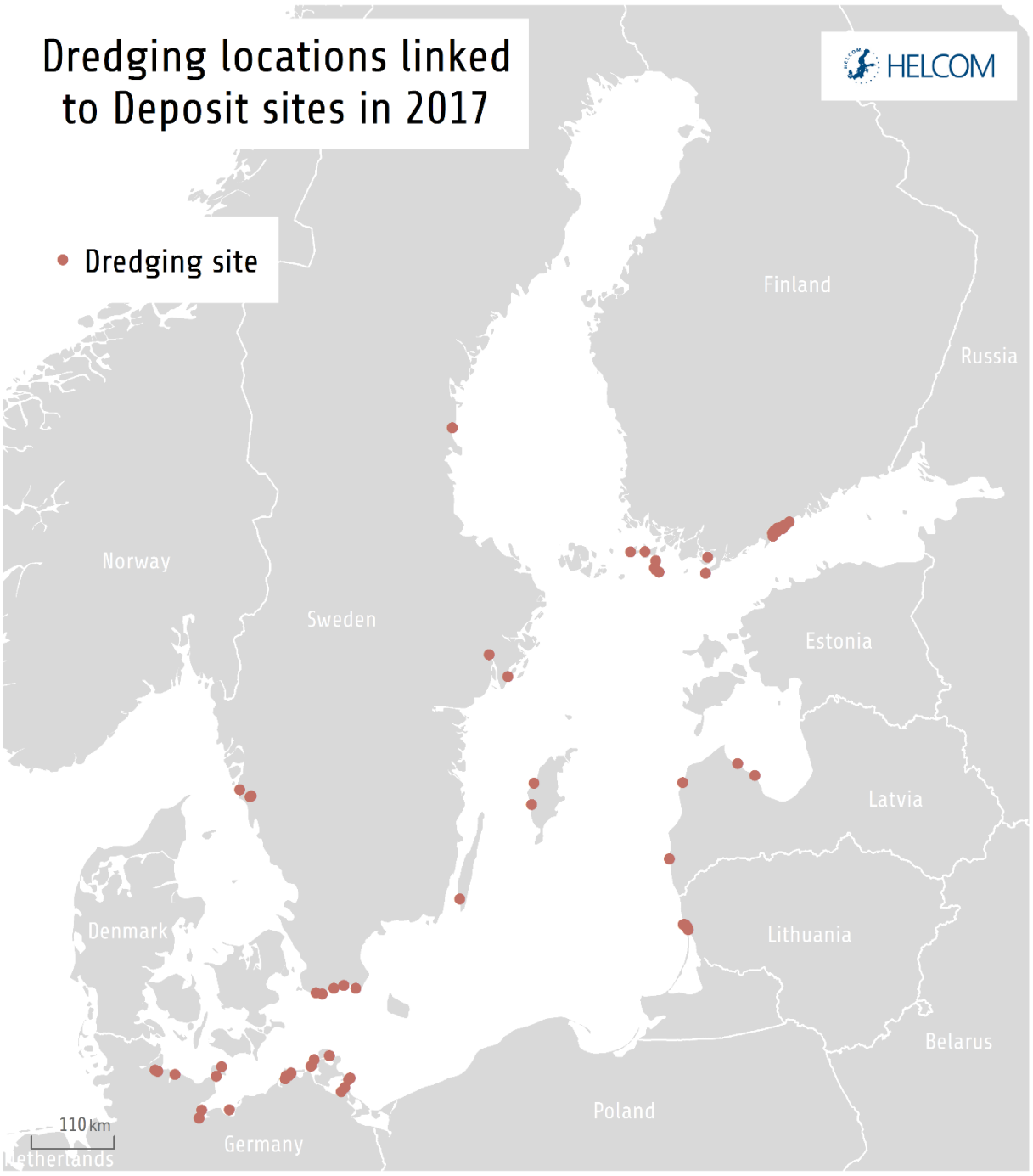


Figure 2. Location of dredging sites that are linked to depositing sites reported in 2017. Reporting of dredging sites is optional in HELCOM guidelines, and therefore not all dredging sites are reported and indicated on the map. Please also note that only dredging sites that are linked to depositing operations are reflected and the data doesn't give a comprehensive picture of dredging in the Baltic Sea.

The updated 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 95 sites of dredging operations in the Baltic Sea in 2017 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

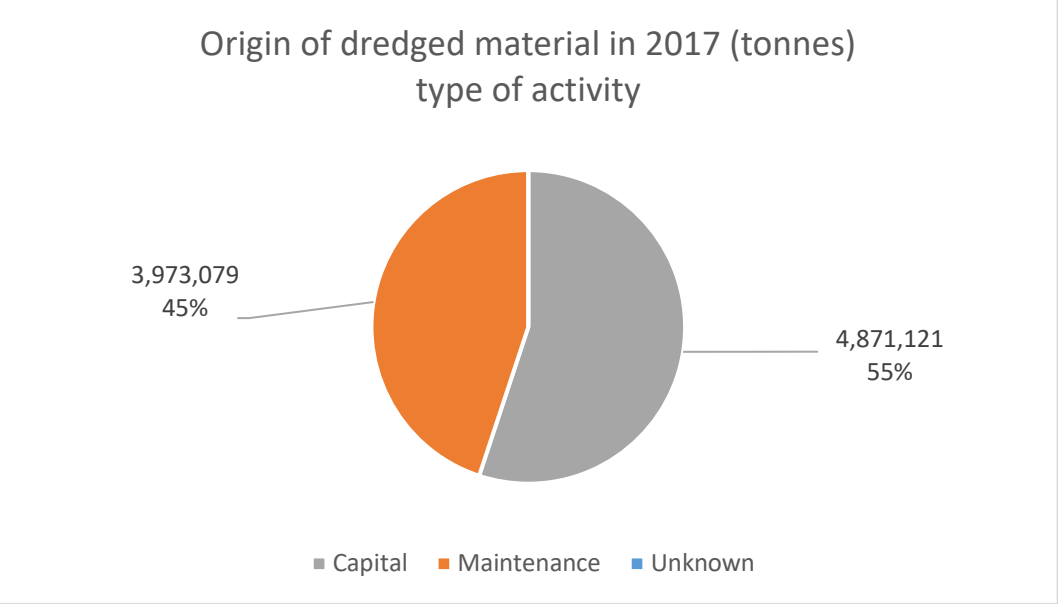


Figure 3. Proportions of material originating from maintenance dredging, capital dredging, and unknown operations in the total amount of dredged material deposited at the Baltic Sea in 2017.

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 2017.

Slightly more than a half of the material (55%) deposited at sea in 2017 originates from capital dredging which differs from the proportions reported in 2016 when maintenance dredging produced the most. This situation repeats the pattern typical for the years 2013-2015 when capital dredging produced the main part of the material deposited at sea (Fig. 4). There was no material originating from unknown sources reported in 2017 as well as in 2016. 2015 the amount of material with unknown origin constituted a few percent. (Fig. 4).

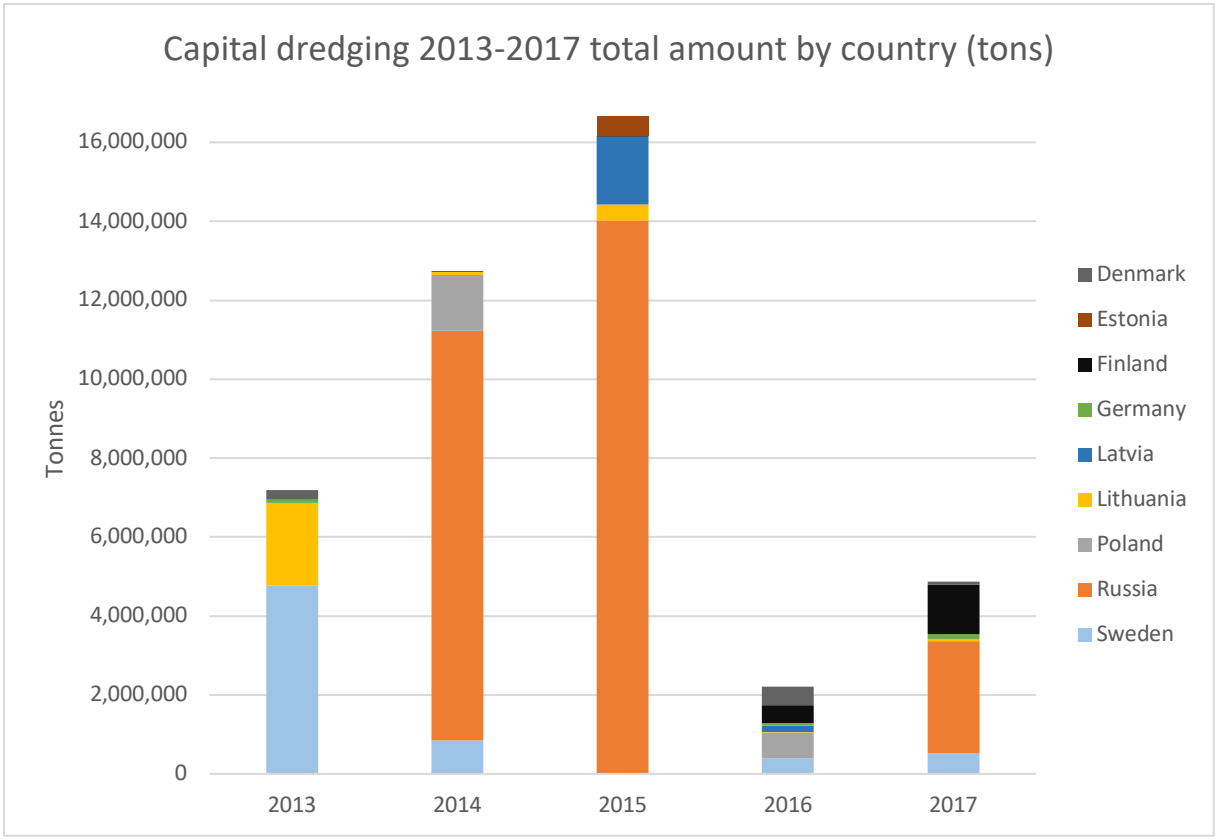


Figure 5. Deposition of material from capital dredging operations by country for the period 2013-2017.

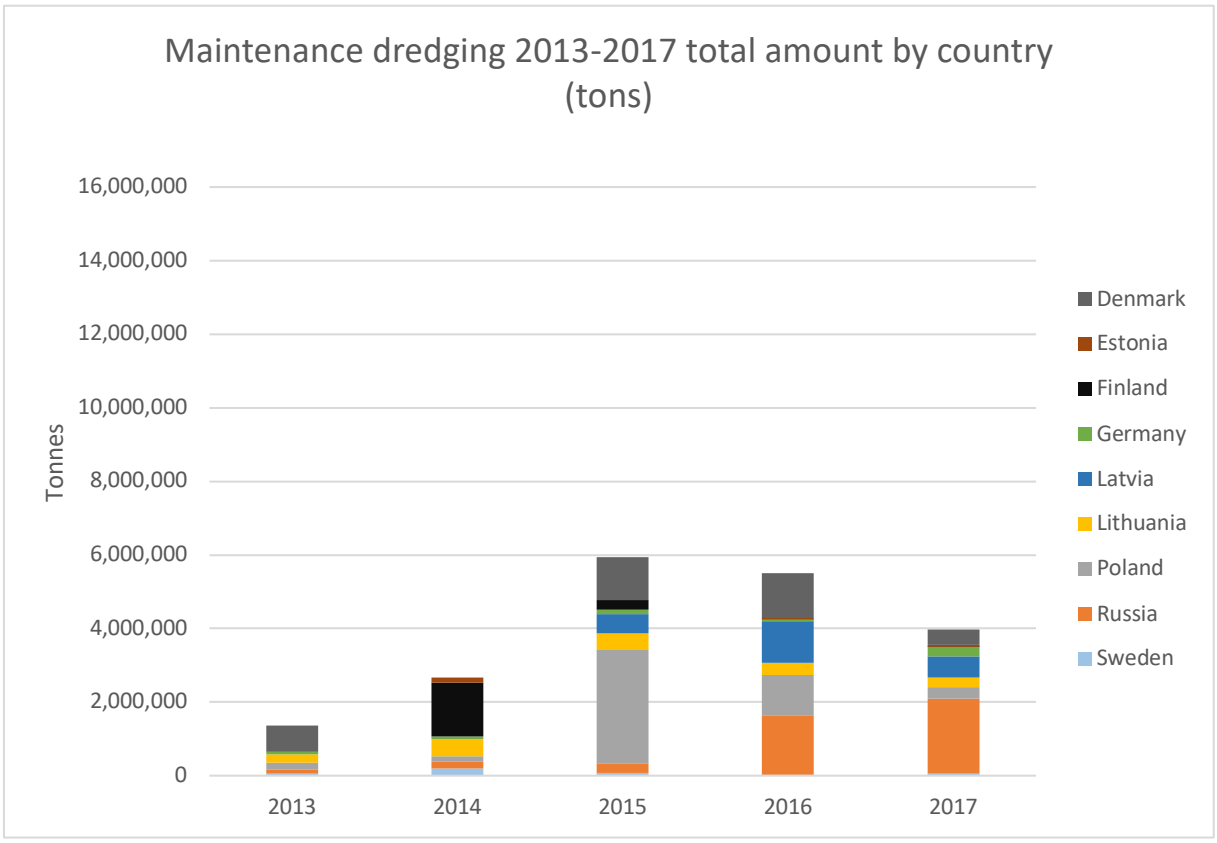


Figure 6. Amount of material deposited from maintenance dredging operations by country for the period 2013-2017.

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 2017 was produced by capital dredging in Russia, Finland and Sweden. As regard to maintenance dredging the largest volume of deposited material was produced by Russia, Latvia and Denmark.

Total amount of dredged material deposited

In 2017 around 9 million tonnes of material was deposited at sea, which is 2 million tons more than in 2016 but still much less than the amounts reported in 2014-15 (Fig. 4). In the given assessment period, the total amounts varied between 7 000 000 and 23 000 000 tonnes. Such a large variation in the amounts of deposited material is caused by the large amount of depositing reported by Russia in 2014-2015. In addition, it has to be pointed out that the completeness of reporting in the last 3 years is 100% which was not the case previously (Fig. 7).

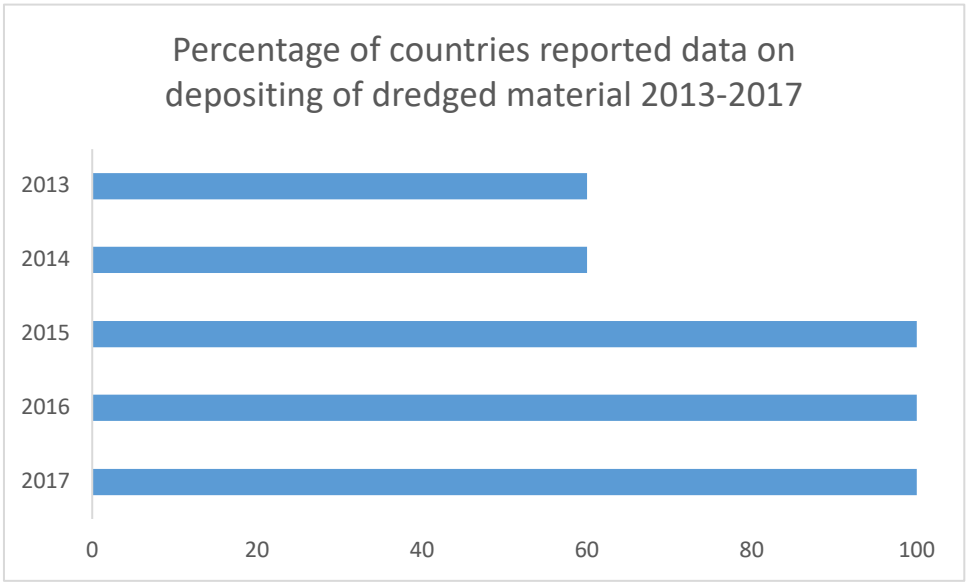


Figure 7. Completeness of reporting by the Contracting Parties in 2013-2017.

Spatial distribution of depositing sites is illustrated by Figures 8 and 9. The density of depositing sites is higher in the south-west part of the Sea. The vast amount of dredged material deposited at sites in the eastern parts of the Sea indicates that dredging operations are also rather intensive in these parts, but the depositing practices might differ. Such a character of spatial distribution is valid either for the total depositing in the period 2013-2017 or specifically for 2017.

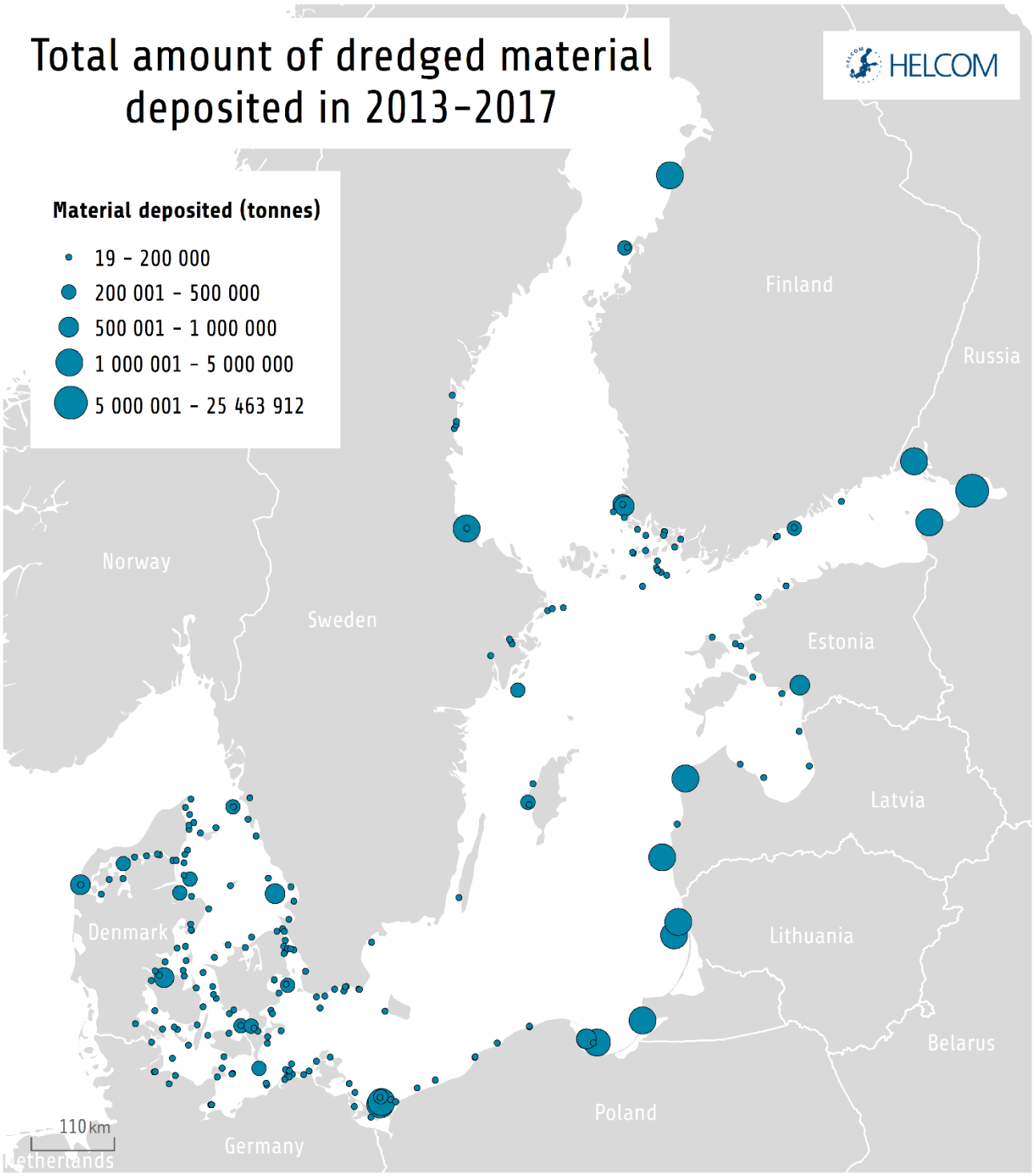


Figure 8. Total amount of dredged material deposited in 2013-2017.

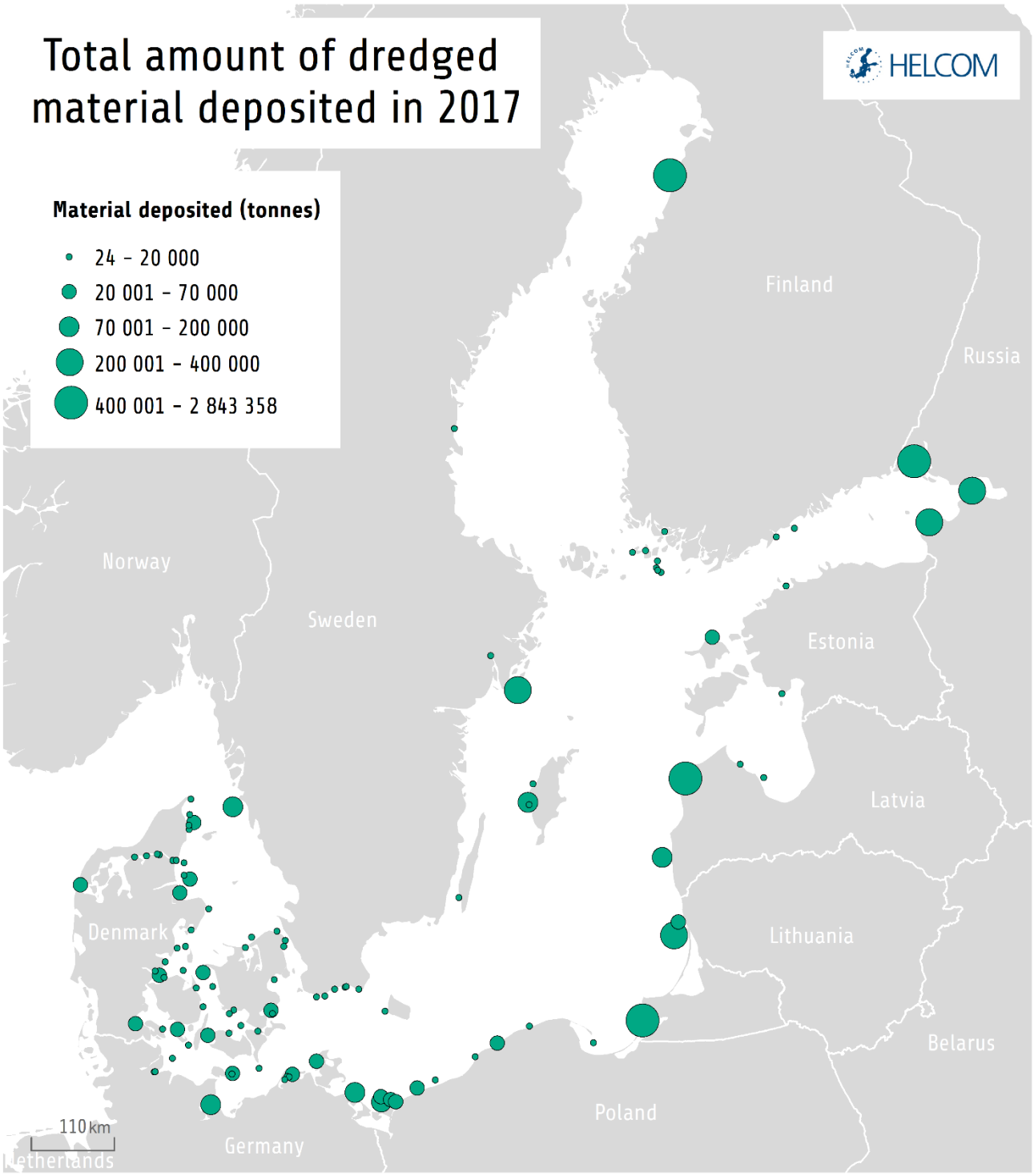


Figure 9. Total amount of dredged material deposited in 2017.

Deposited material originated from operations at sea or coastal and river waters

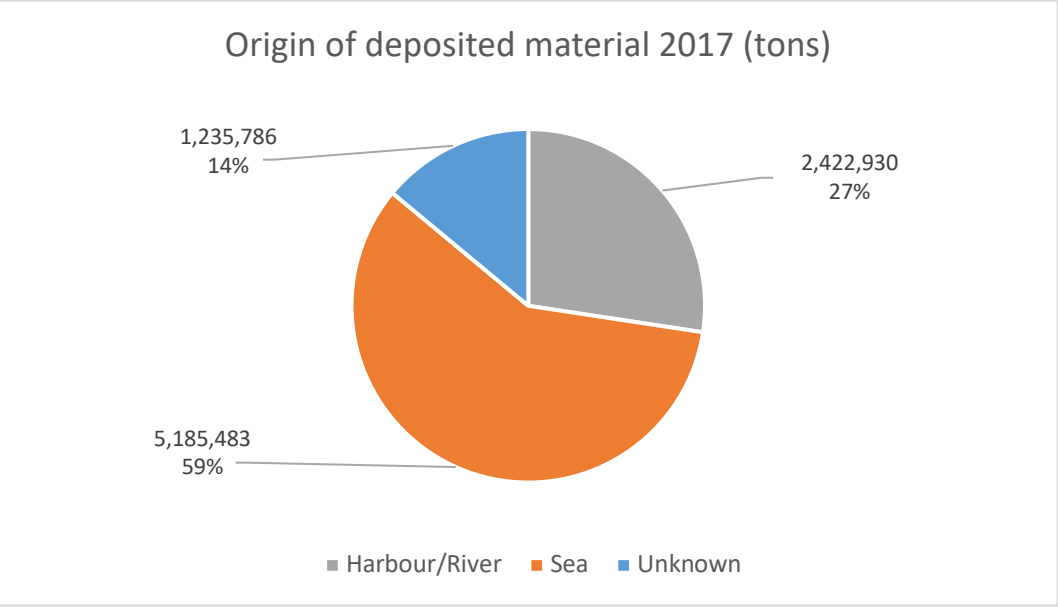


Figure 10. Proportions of the material originating from harbour/river, sea and unknown sources in total amount of dredged material deposited at the Baltic Sea in 2017.

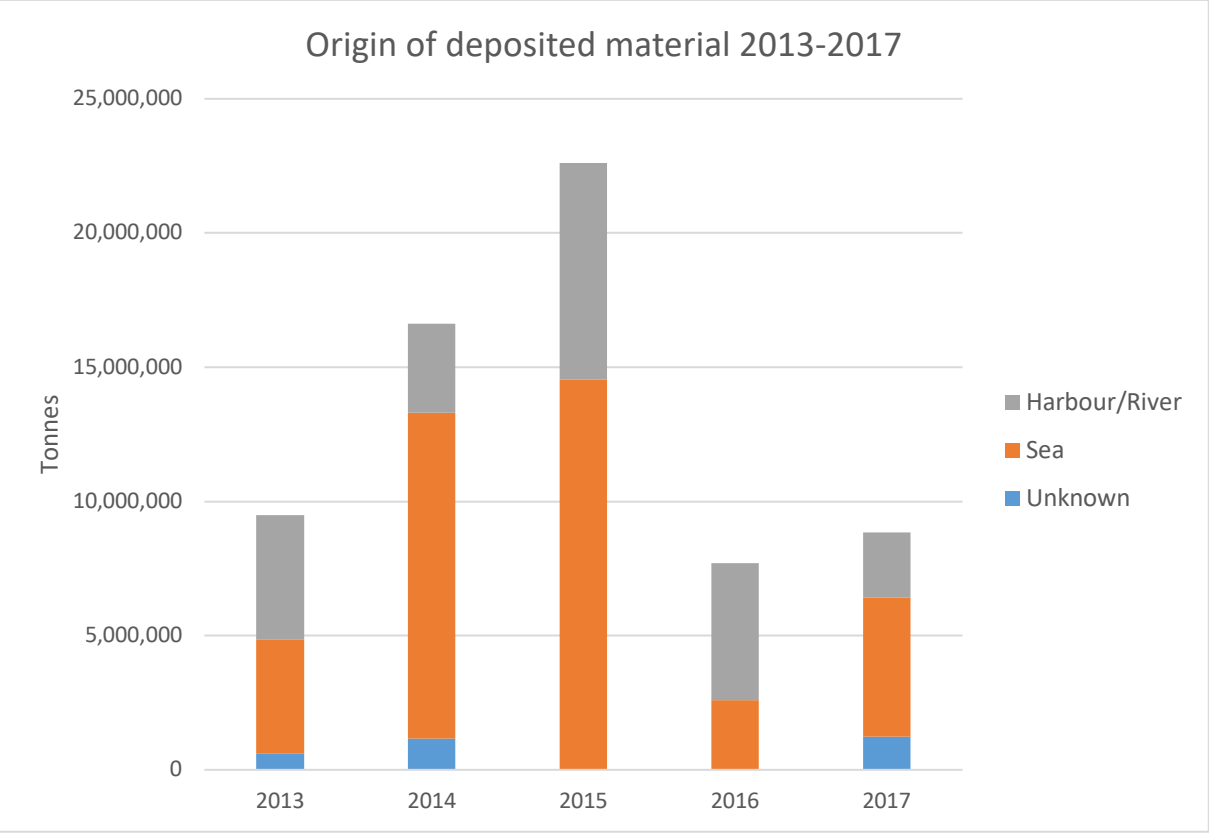


Figure 11. Proportions of the material originating from harbour/river, Sea and unknown locations in total amount of dredged material deposited at the Baltic Sea in the period from 2013 to 2017.

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 two thirds of the dredged material deposited in the Baltic Sea in 2017 originate from dredging at sea. Slightly more than a quarter of the reported amounts were transported to the sea from rivers and harbors. And about 14% has unknown origin. The pattern differs from the one observed in 2016 with

domination of the material originated from harbors and rivers resembling what was reported in the years 2013-2015.

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.

Most of the sea-based material was reported by Russia in 2017. Russia remains the main country reporting depositing of the material with sea origin since 2014. Sweden, Latvia and Denmark are the main contributors to the deposition of the material originating from rivers and harbors in 2017. This differs from previously reported data when Poland was one of the major contributors (2014-16) as well as Lithuania (2013). All material of unknown origin in 2017 was reported by Finland.

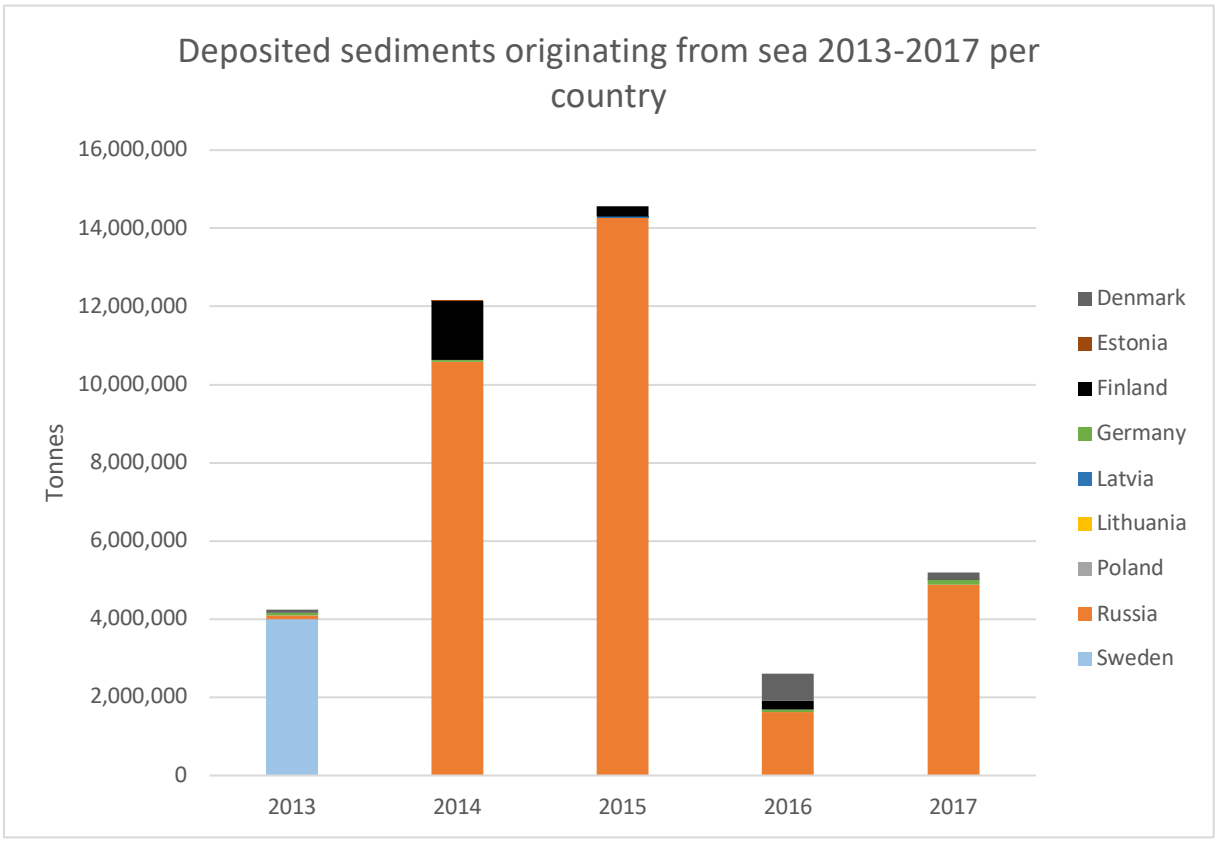


Figure 12. Amount of material originating from sea by country for the period 2013-2017.

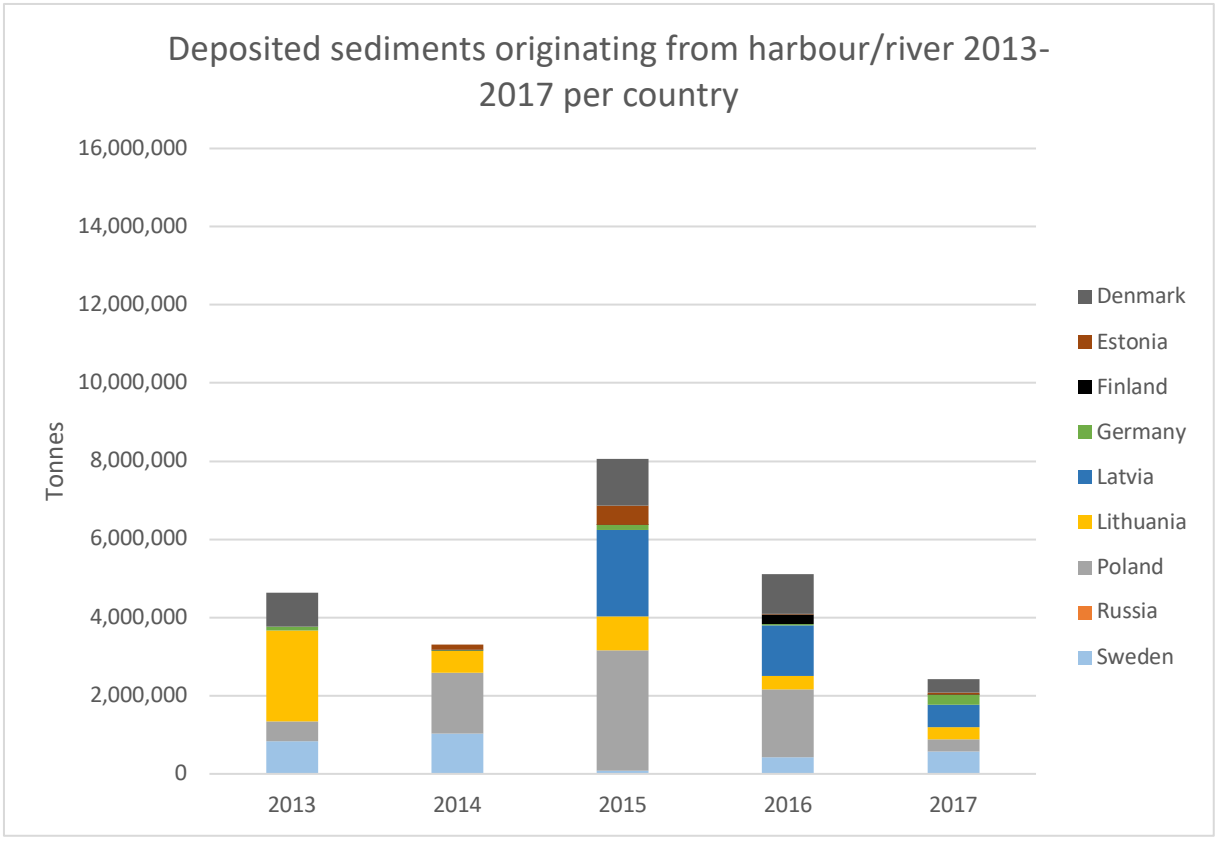
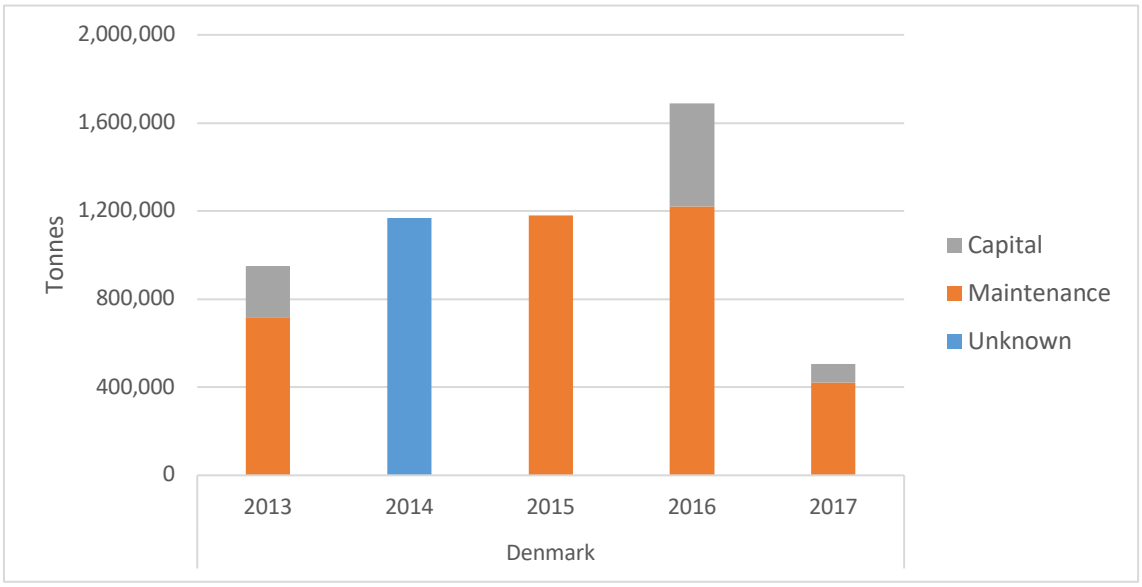


Figure 13. Amount of material originating from harbour/river environments by country for the period 2013-2017.

Country-specific values

Figures 14-31 illustrate the character of dredged material deposited in 2013-2017 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



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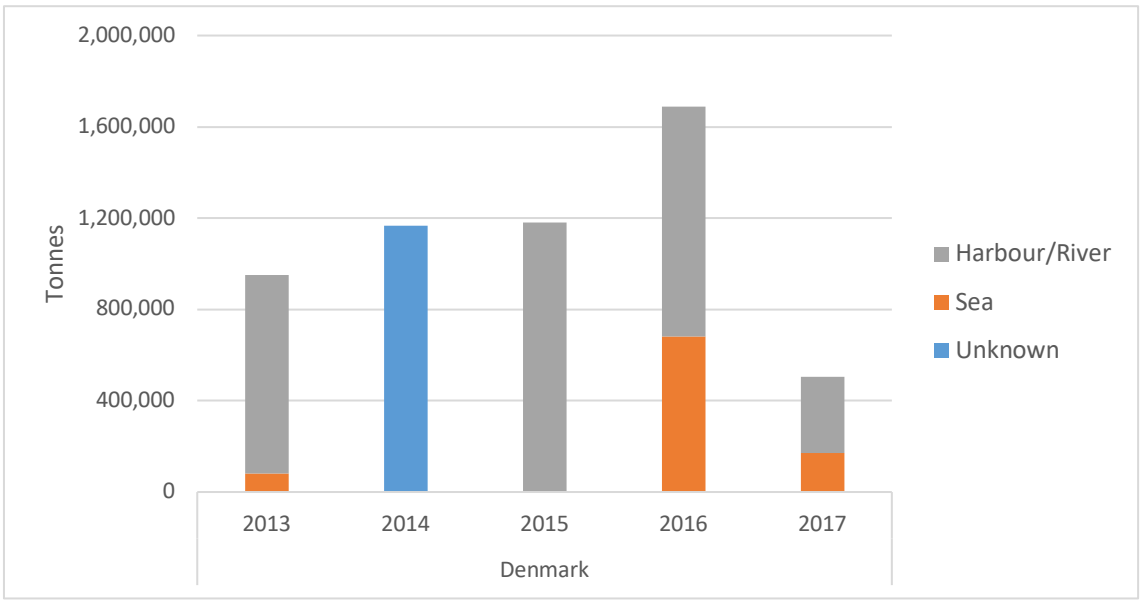
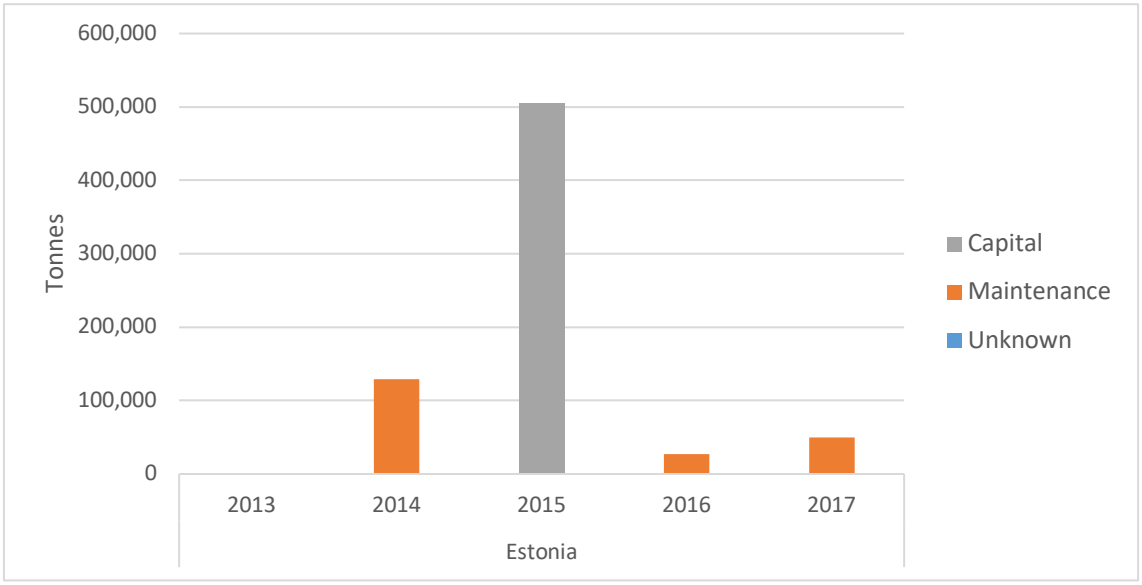


Figure 15.

Estonia



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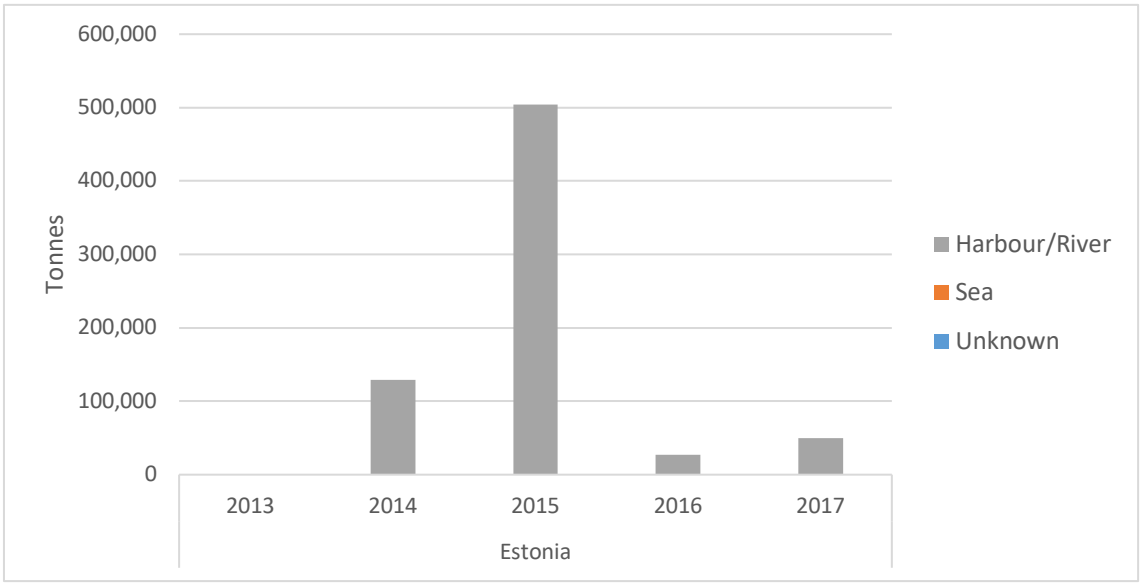

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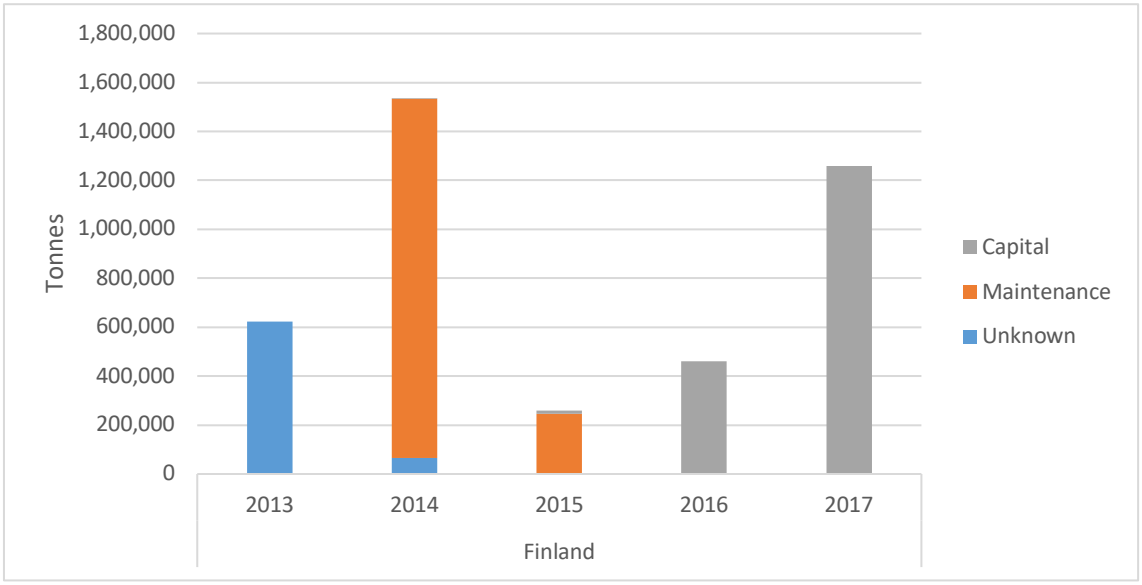

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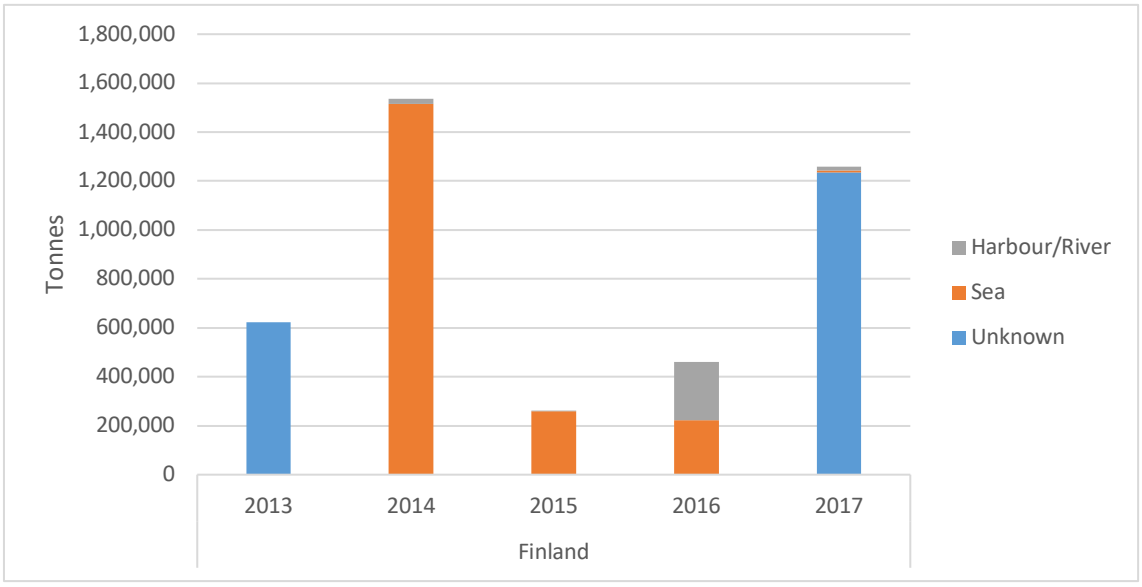


Figure 19.

Germany

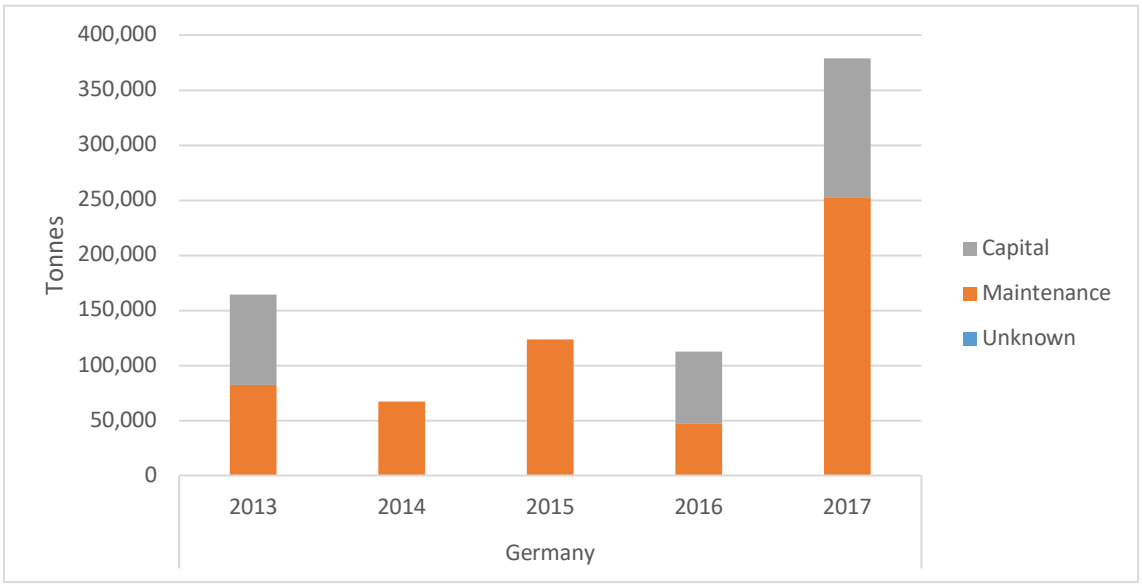
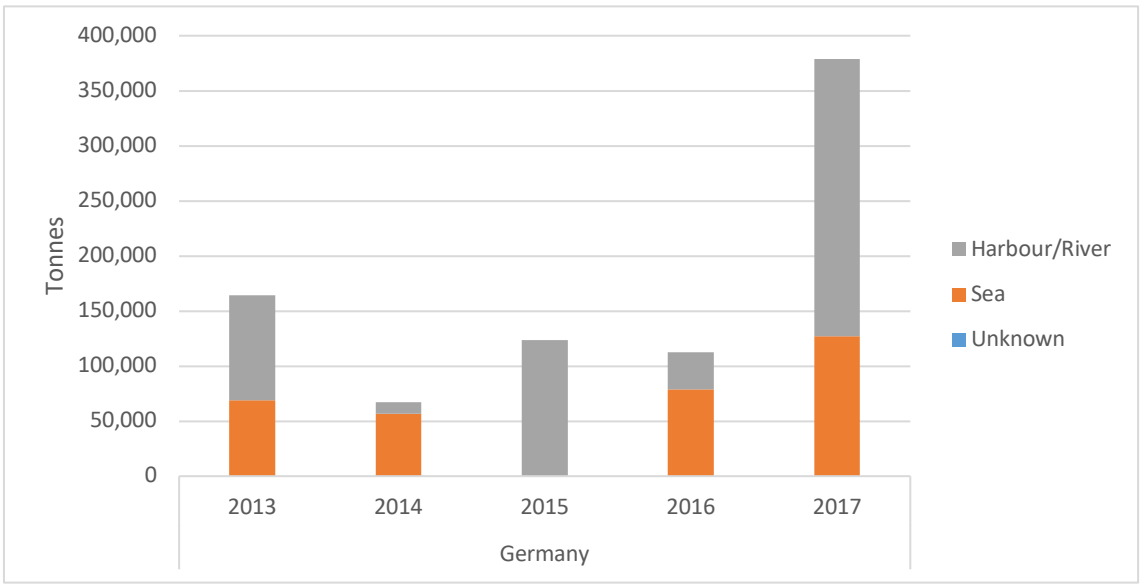


Figure 20.



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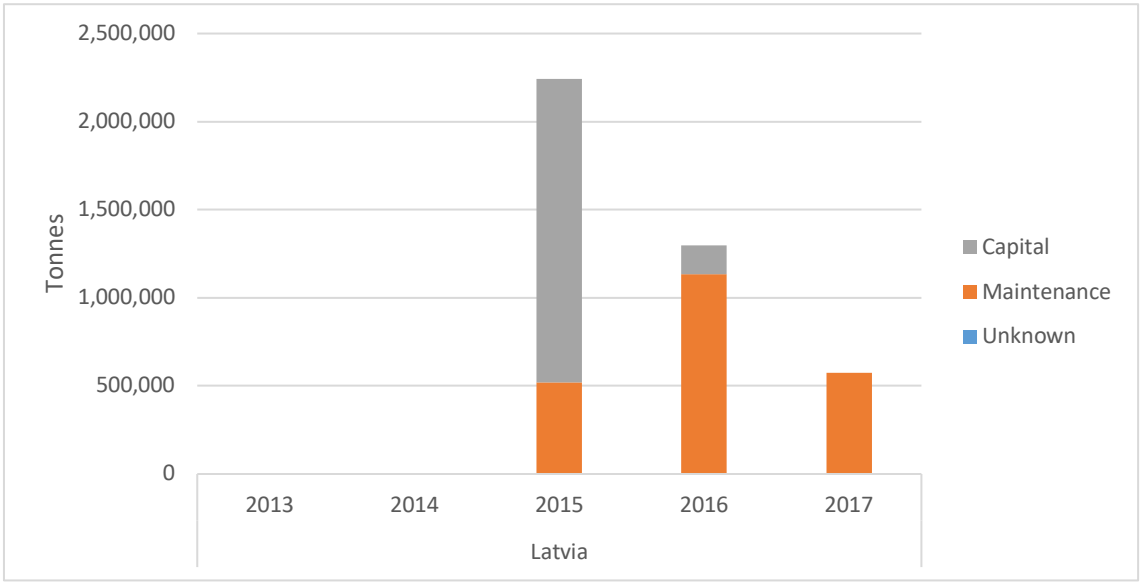

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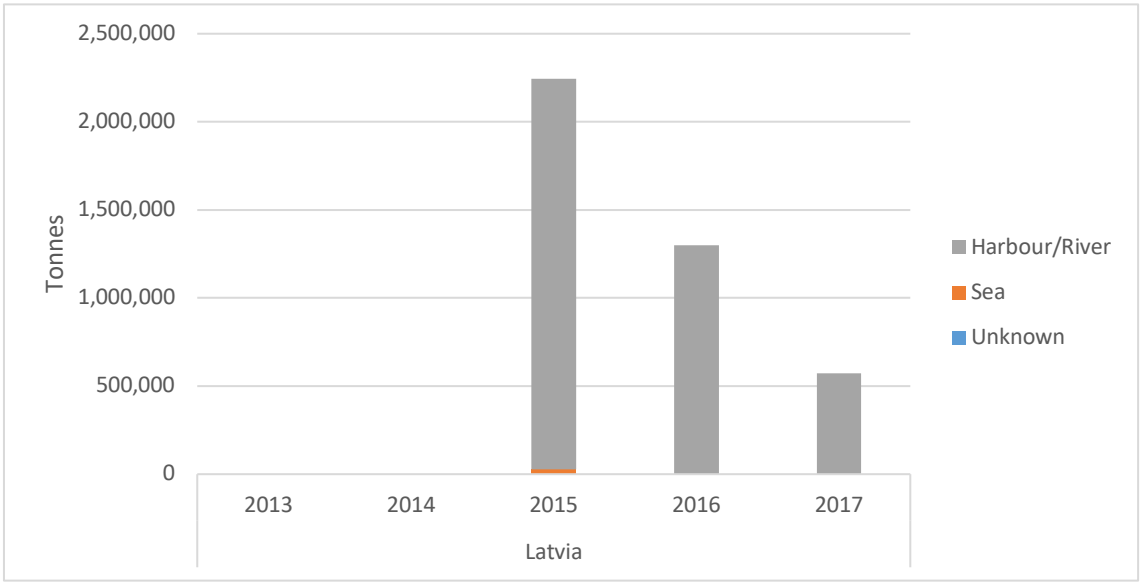

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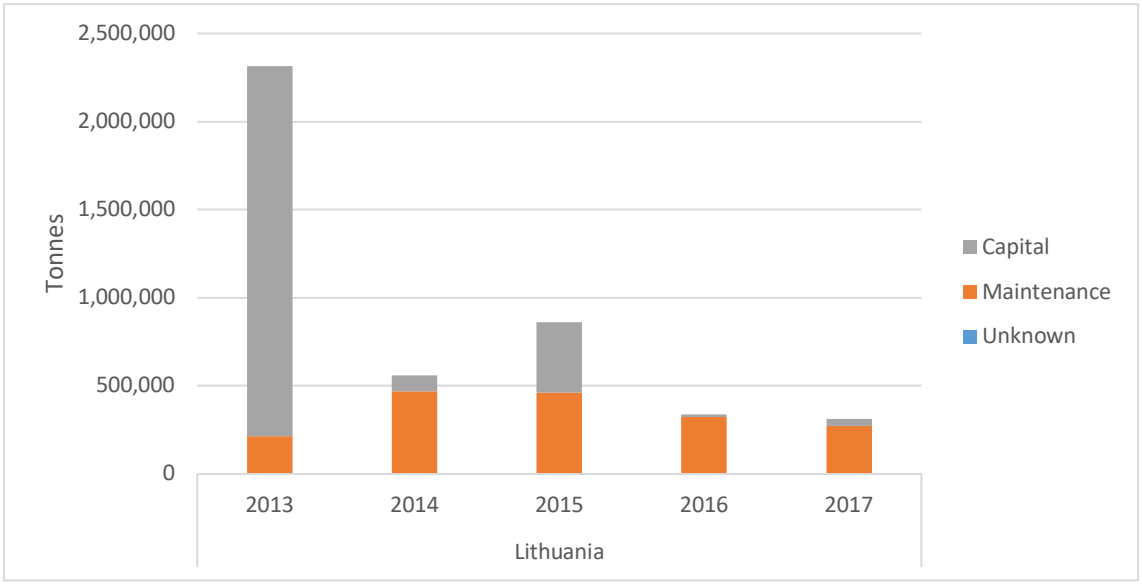
Lithuania



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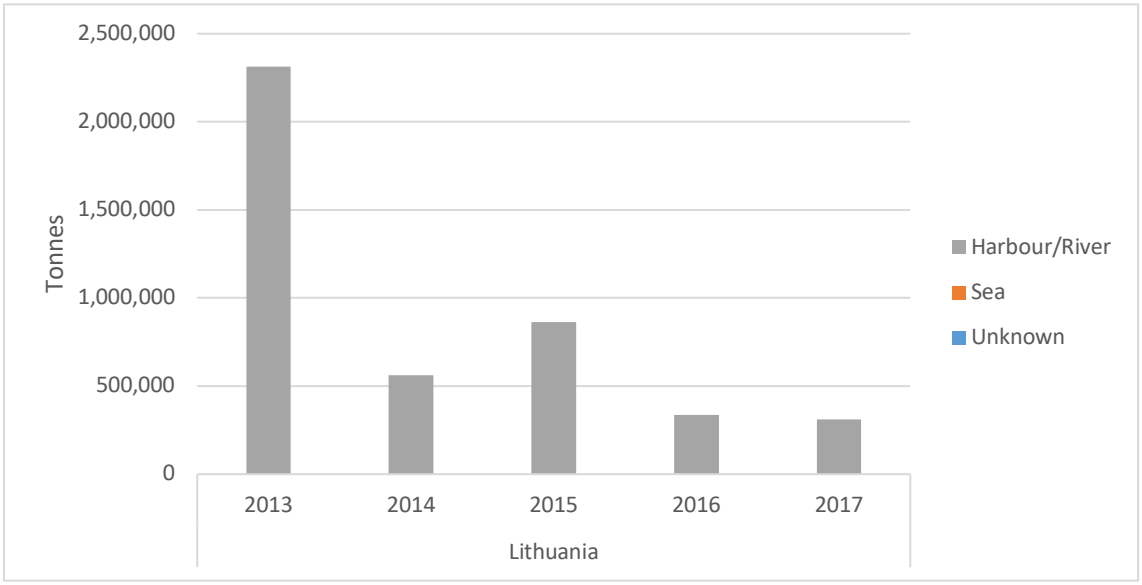

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Poland

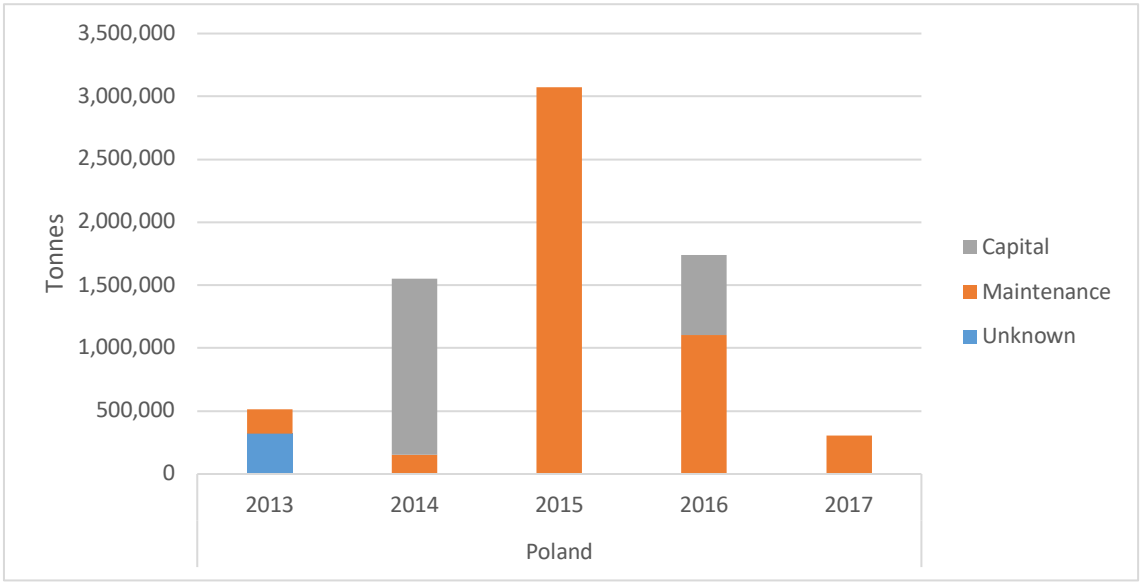


Figure 26 .

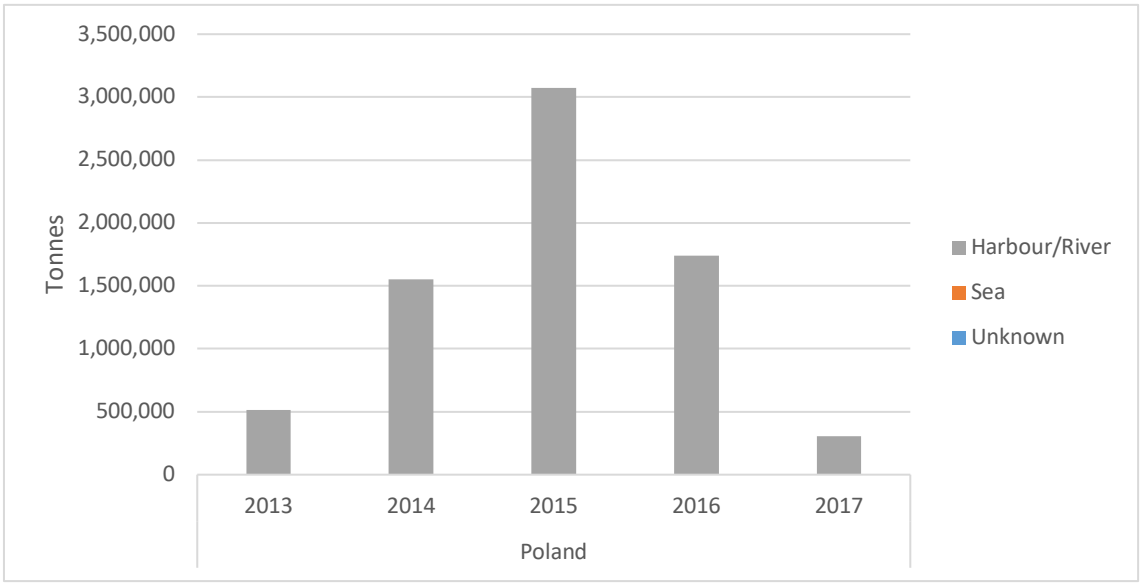
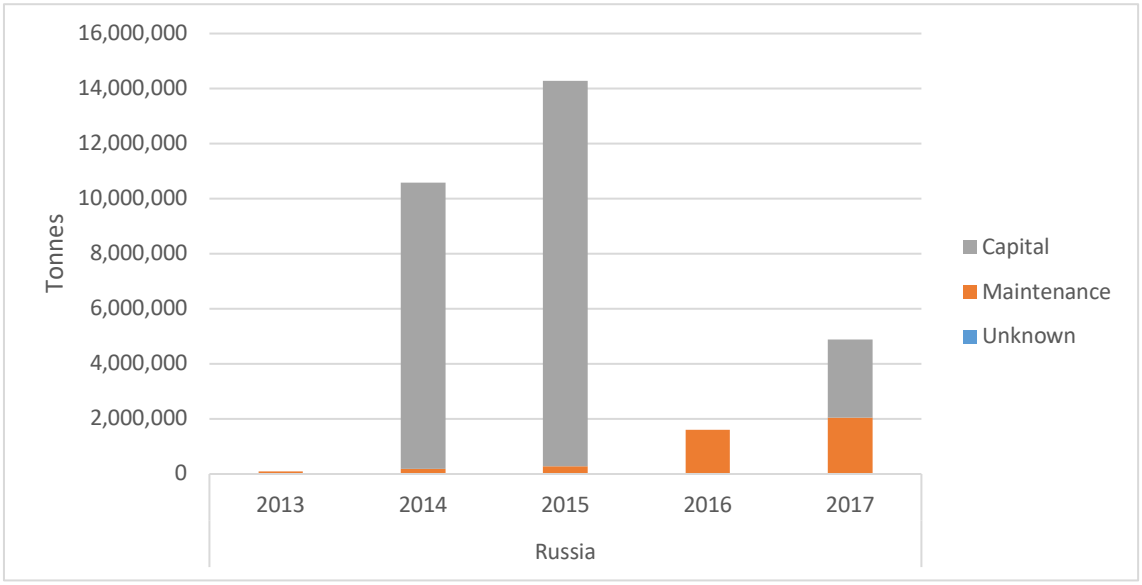


Figure 27.

Russia



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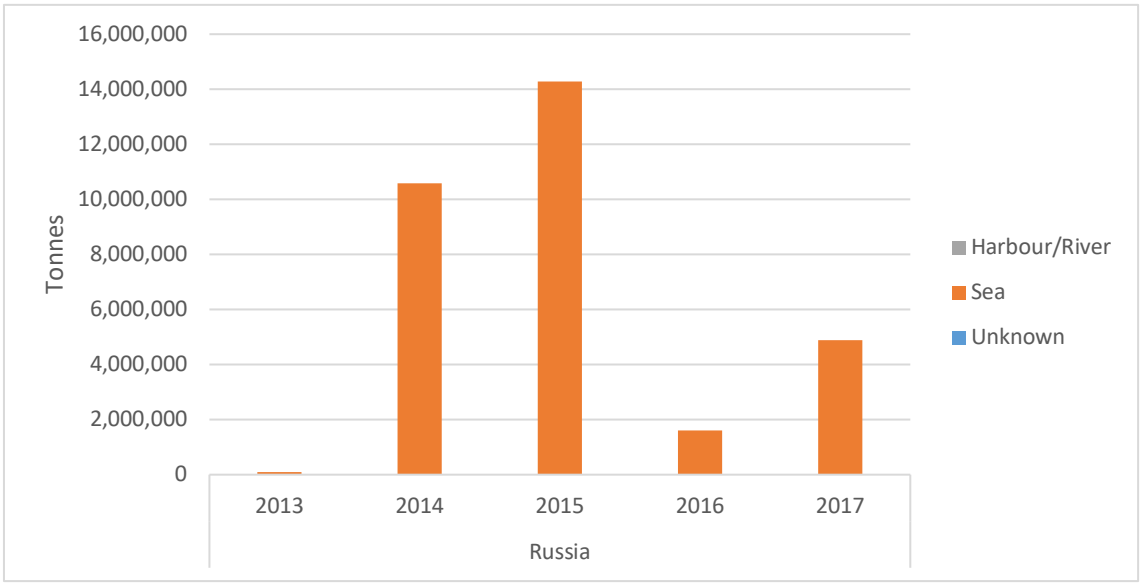


Figure 29.

Sweden

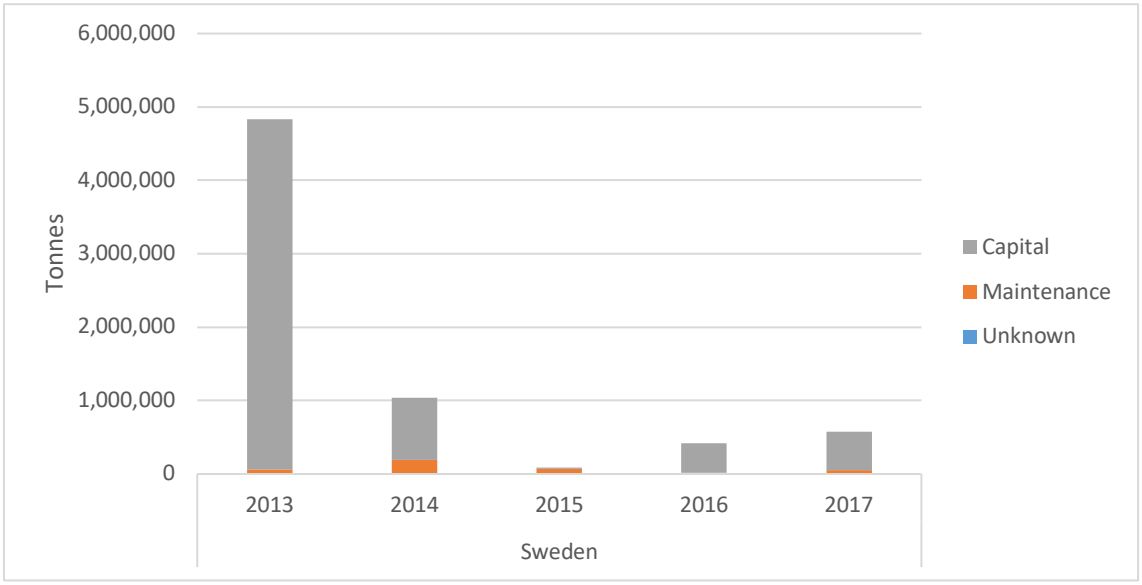


Figure 30.

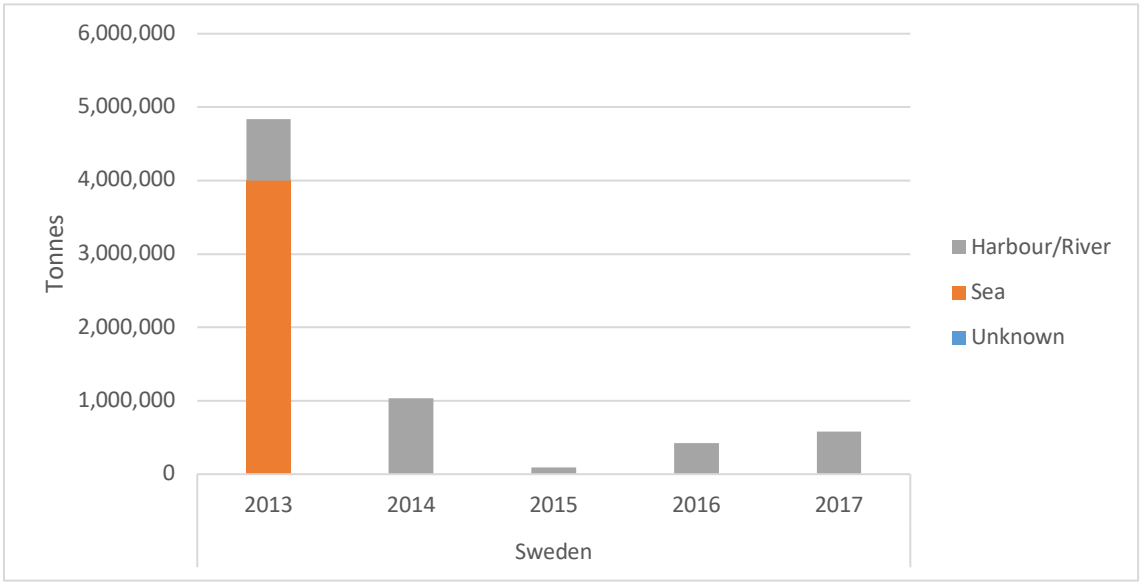


Figure 31.

Contaminant loads

In accordance with the definitions proposed in the methodology for analyses of environmental impact caused by depositing of dredged material at sea, the input of pollutants into the marine environment is the transportation of them with dredged material originating from coastal areas. In case the dredged material originates from sea, the pollutants contained by this material are only relocated elsewhere within the marine environment.

Table 1 and Figure 32 illustrate the amount and percentage of priority pollutants in the marine environment in 2017, originating from harbor/river and sea environments and Figure 33 illustrates the proportions of pollutants in the dredged material of different origin averaged for the period 2013-2017. Cd and Hg are the heavy metals identified as priority pollutants by HELCOM Recommendation 31E/1. Origin of heavy metals relocated in the marine environment with dredged material in 2017 slightly differ from what was observed in 2016. Though, most of copper still transported with sediments originated from sea while cadmium comes from harbors and rivers the same way as in previous years. Share of Pb originating from harbors and rivers constitutes of about two thirds while for mercury the picture is the opposite and two thirds of mercury originate the sea. Nonetheless, on average for the last 5 years the main sources of sea sediments is the main source for Cu, Hg and Pb while Cd originates mainly from harbor/river sediments.

Harbors/rivers remain dominating source of TB and PAH remains in 2017 which is typical for the whole reported period.

Figures 34-39 illustrate the total amount of priority pollutants contained by deposited material in 2013-2017 per country, including loads originating from both harbour/river and sea environments. Figures 40-45 illustrate the spatial distribution of input of contaminants (harbour/river origin) in 2017.

Table 1. Total input of contaminants in the Baltic Sea in 2017, originating from harbour/river and sea environments.

Contaminant	Harbour/river	Sea	Harbour/river (%)	Sea (%)
PAH (t)	0,7209	0,0871	89,2	10,8
TBT (kg)	24,9296	0,3025	98,8	1,2
Pb (t)	41,5202	23,5839	63,8	36,2
Cu (t)	38,5173	67,1864	36,4	63,6
Hg (t)	0,1989	0,3395	36,9	63,1
Cd (t)	0,7134	0,5785	55,2	44,8

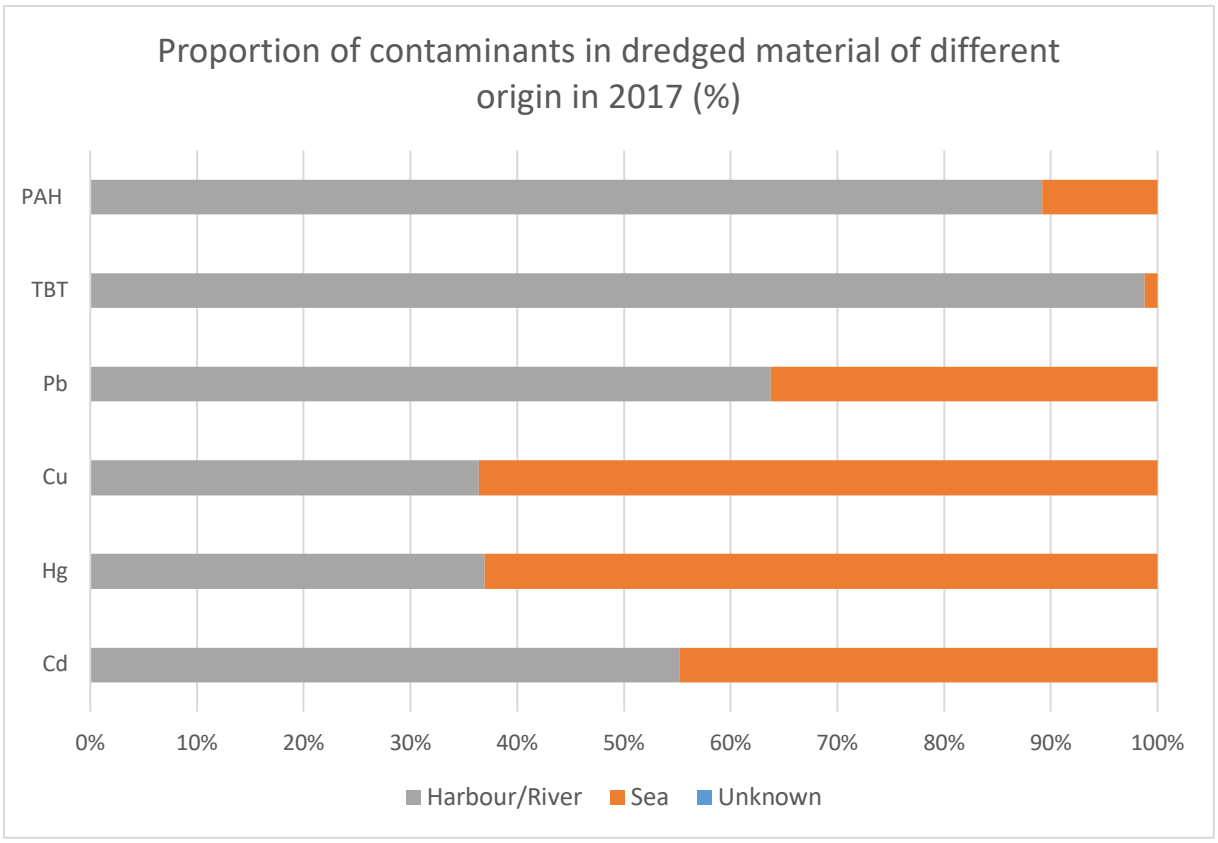


Figure 32. Proportion of contaminants originating from harbor/river and sea areas in 2017.

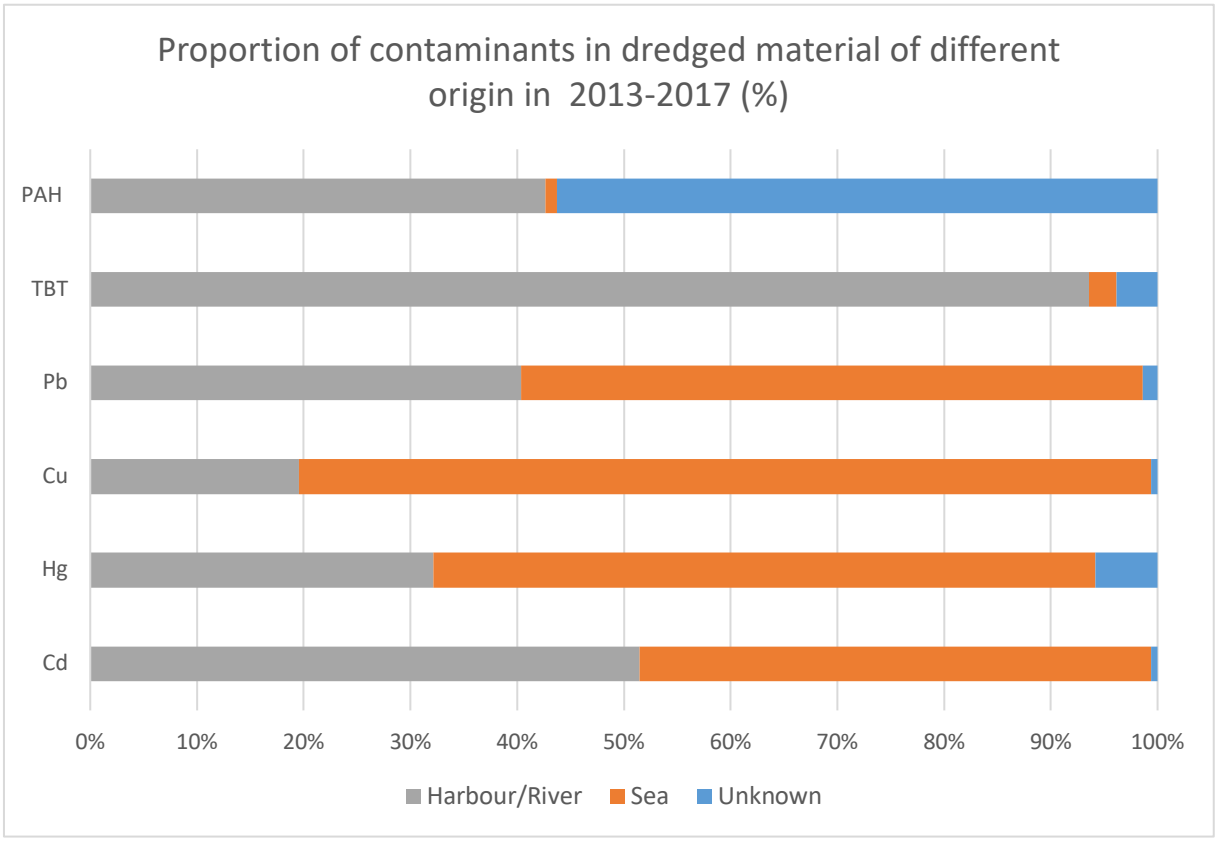
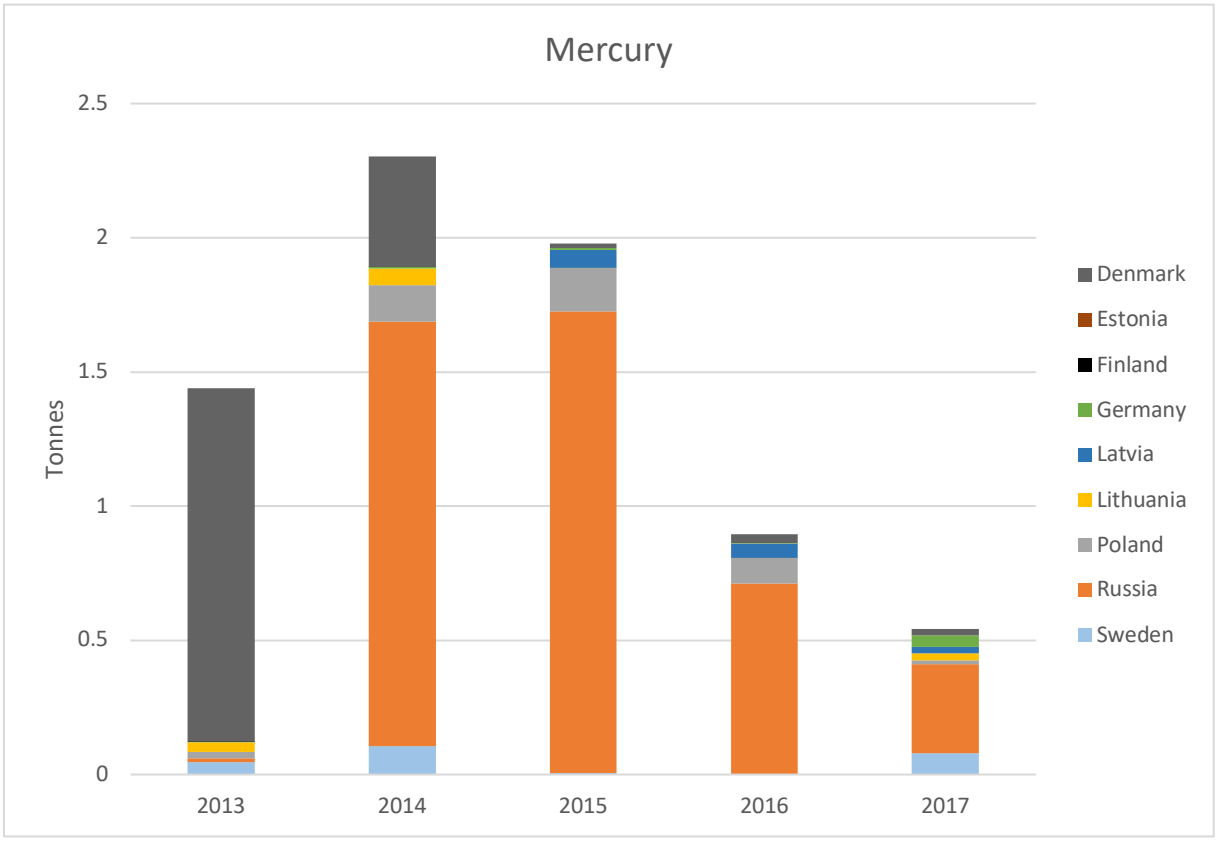


Figure 33. Proportion of contaminants originating from harbour/river, sea and unknown locations for the period 2013-2017.

Figures 34-39 illustrate total amount of priority pollutants in deposited material of all origins for 2013-2017 per country in tonnes (TBT in kilograms).



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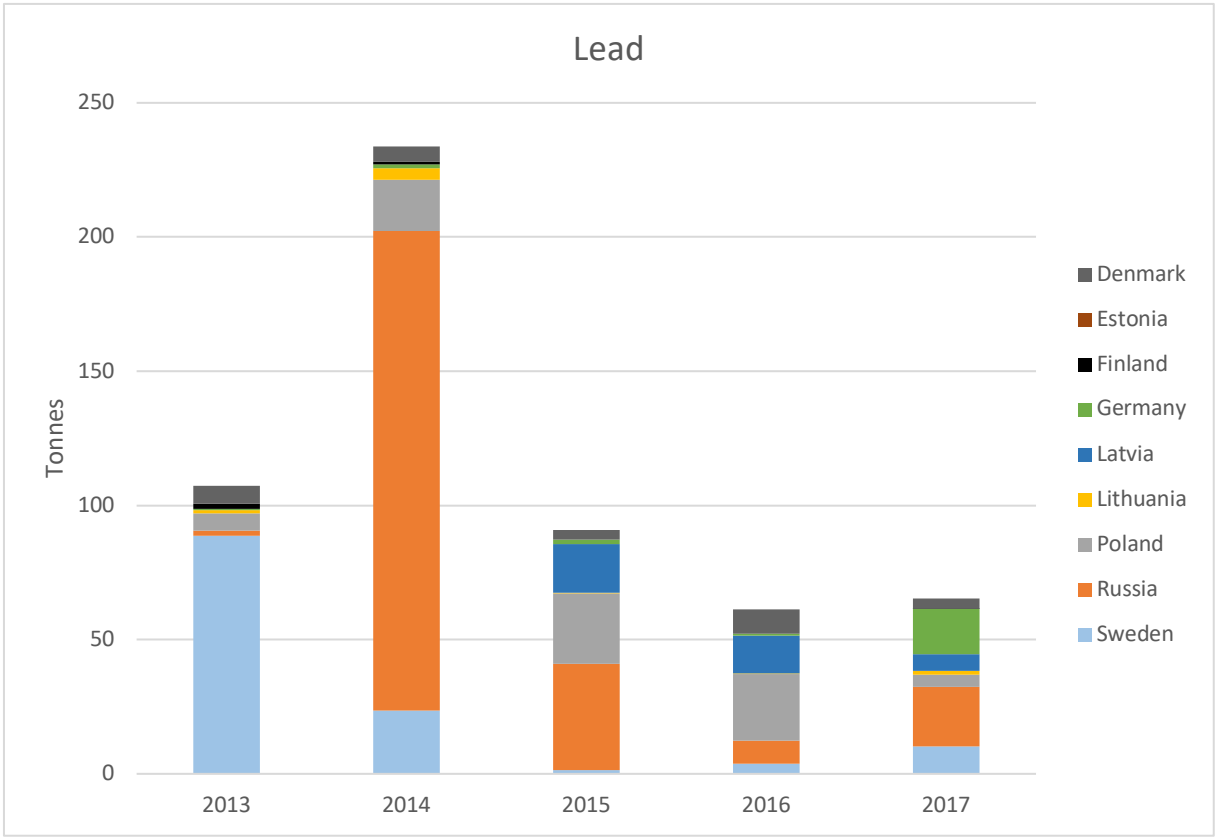
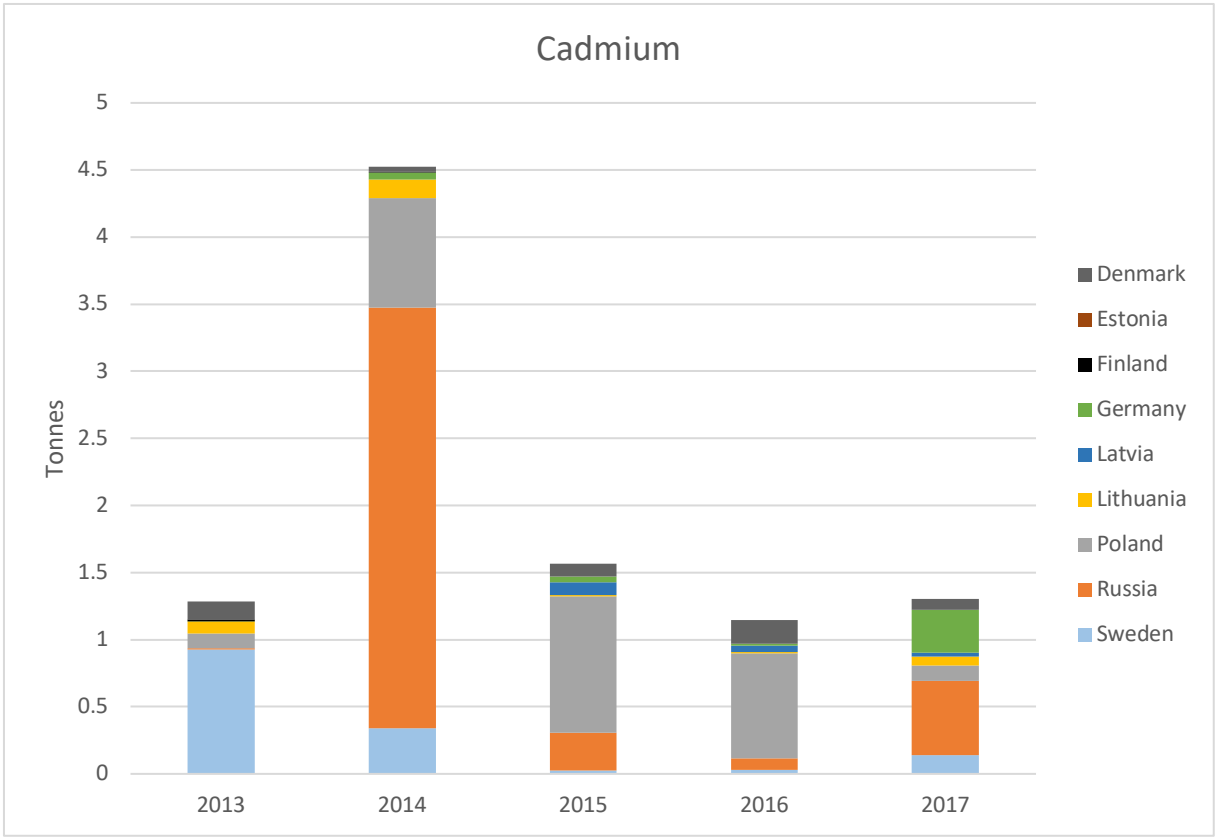


Figure 35.



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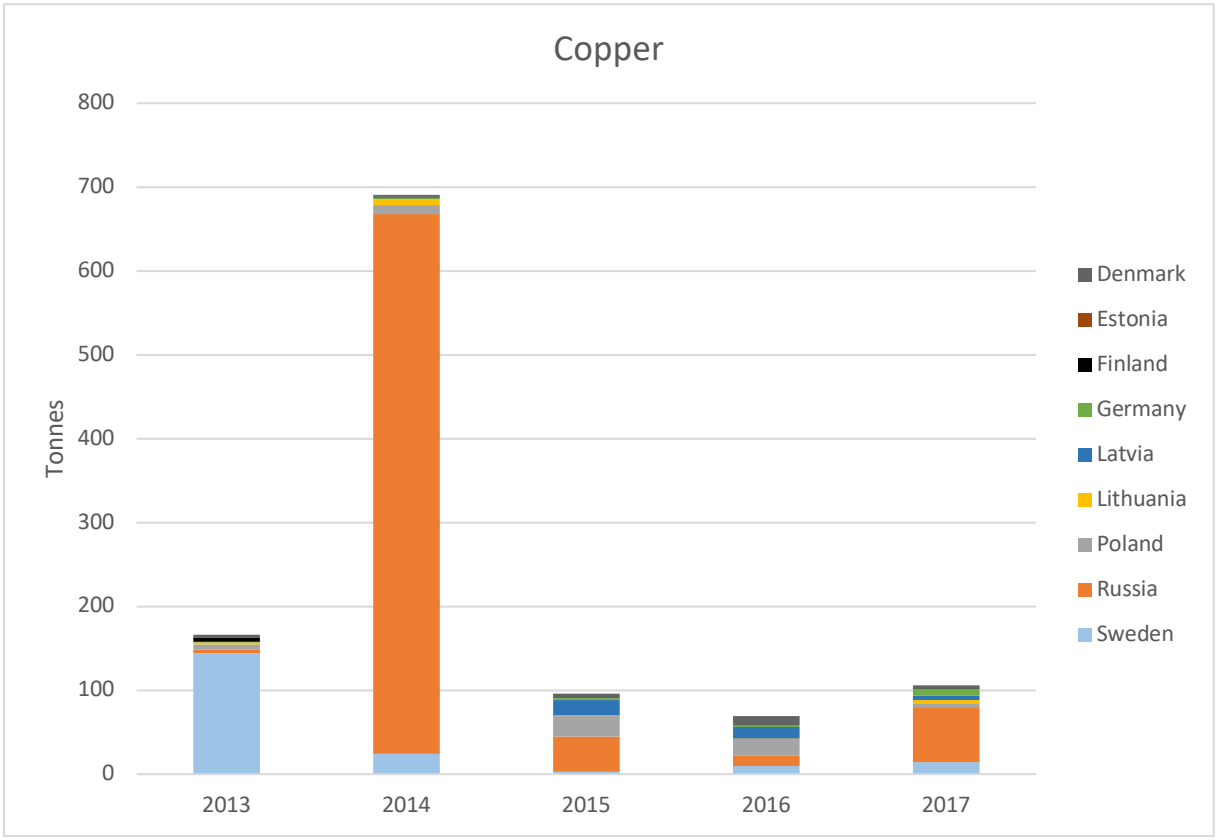

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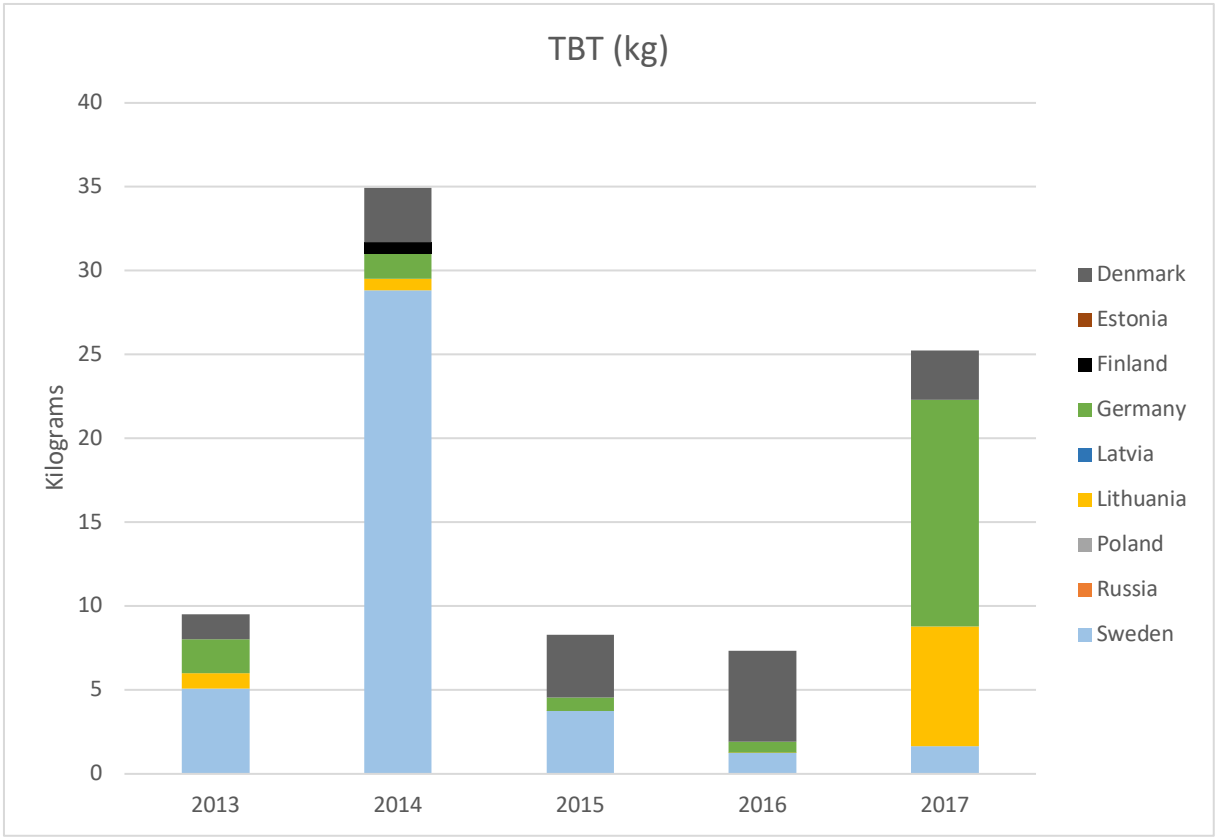

Figure 38.

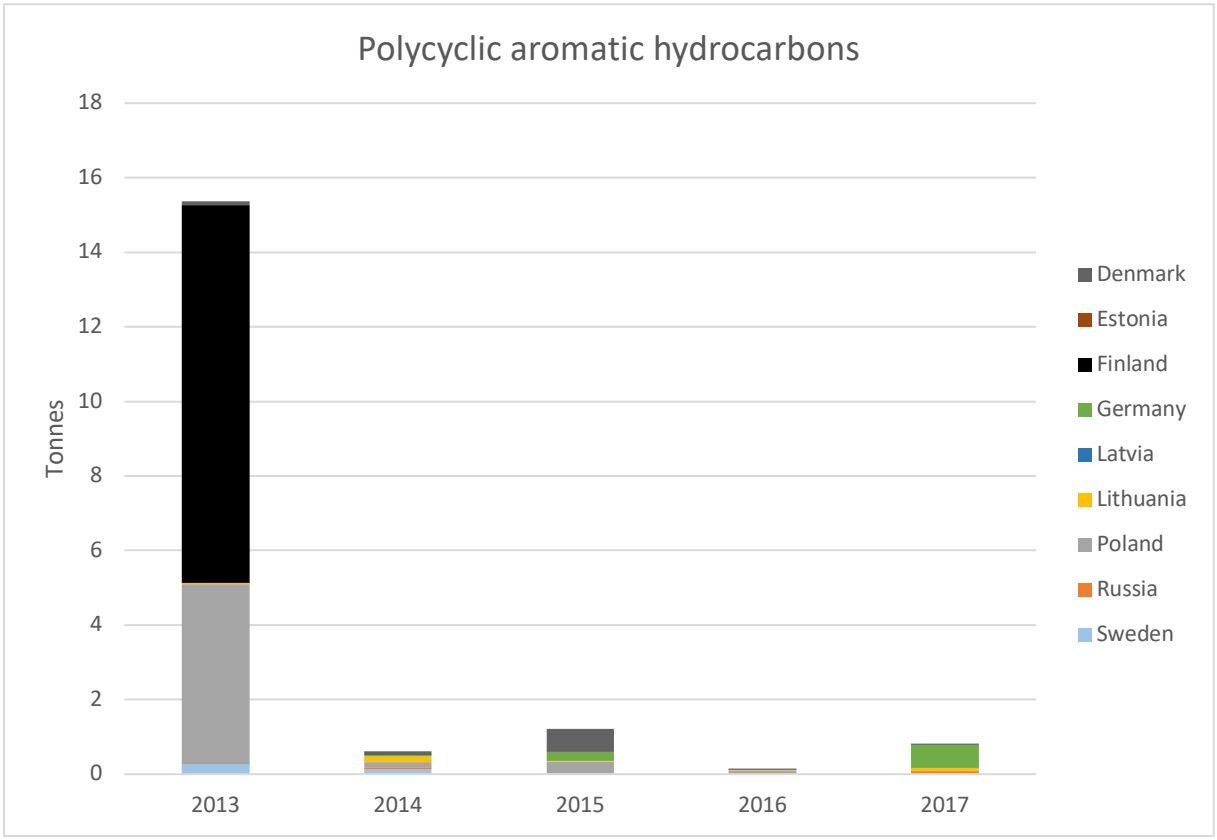

Figure 39.

Input of contaminants in 2017

Figures 40-45 illustrate the spatial distribution of priority pollutants' input to the sea with dredged material originating from harbors/rivers in 2017. Contaminant load originating from sea is not included. "No data" category in figures 40-45 indicates either not reported data or concentrations below detection limit.

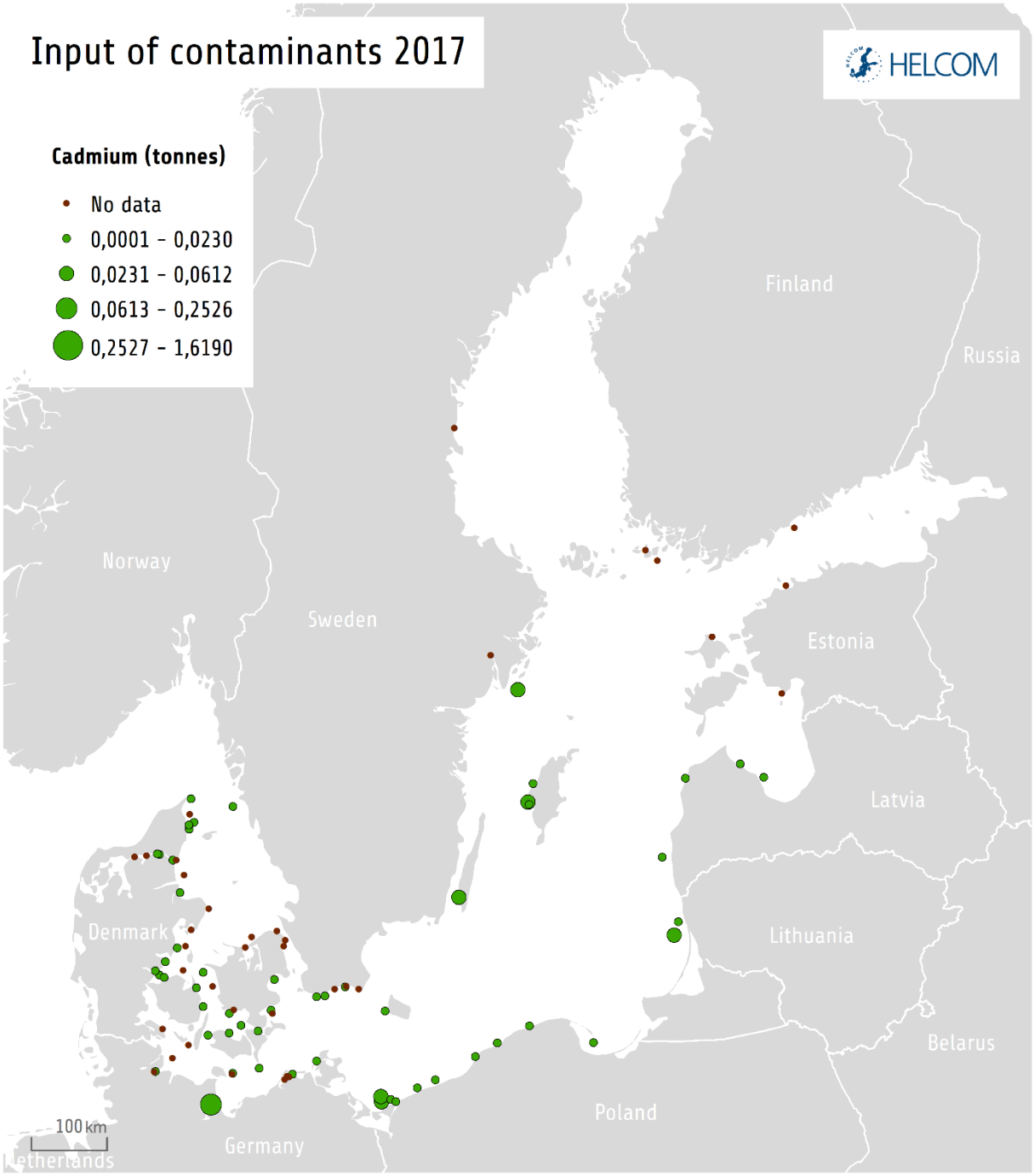

Figure 40.

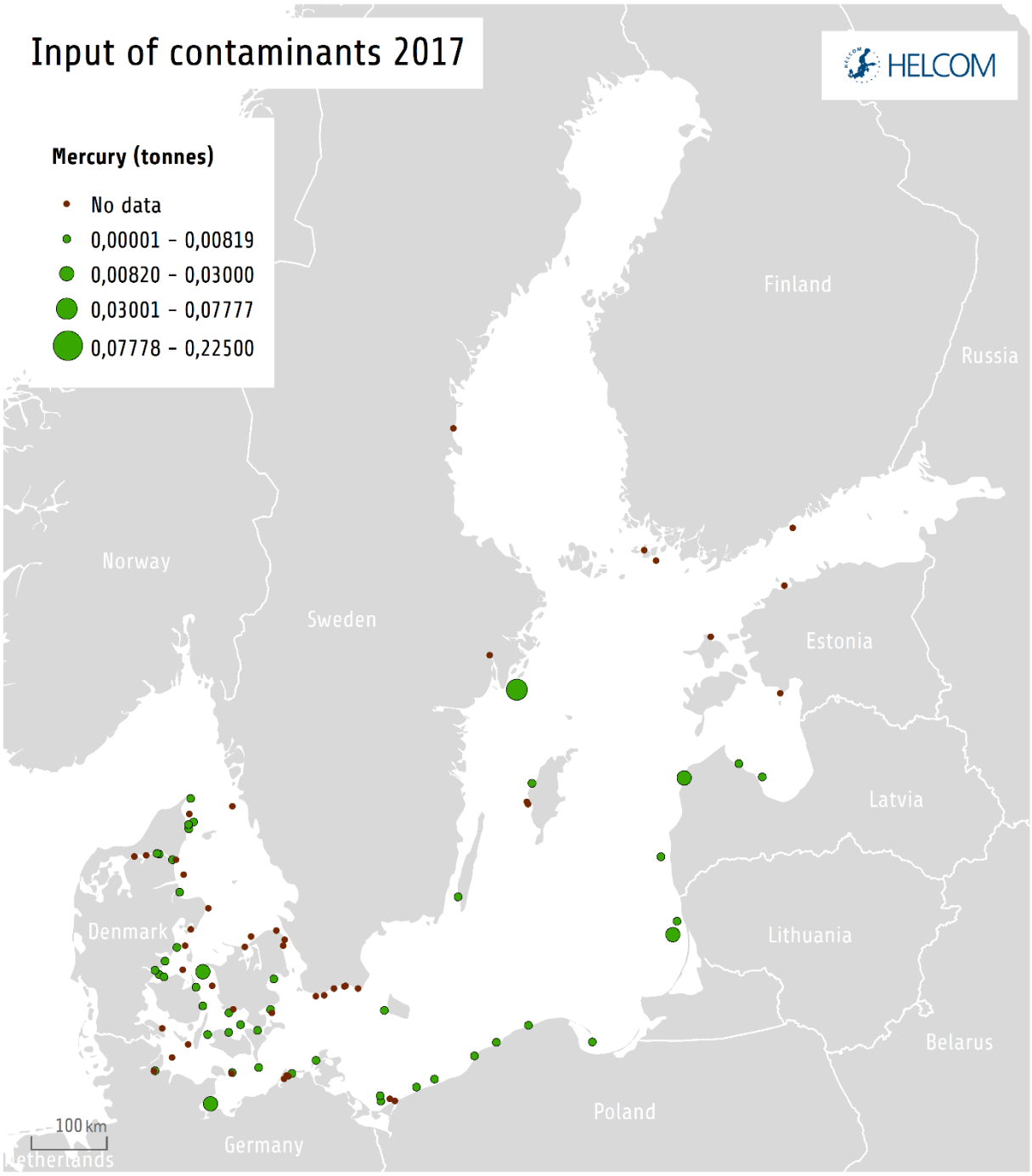
Input of contaminants 2017
HELCOM
Mercury (tonnes)
No data
0,00001 - 0,00819
0,00820 - 0,03000
0,03001 - 0,07777
0,07778 - 0,22500
Finland
Russia
Norway
Sweden
Estonia
Latvia
Lithuania
Belarus
Denmark
Poland
Germany
Netherlands
100 km

Figure 41.

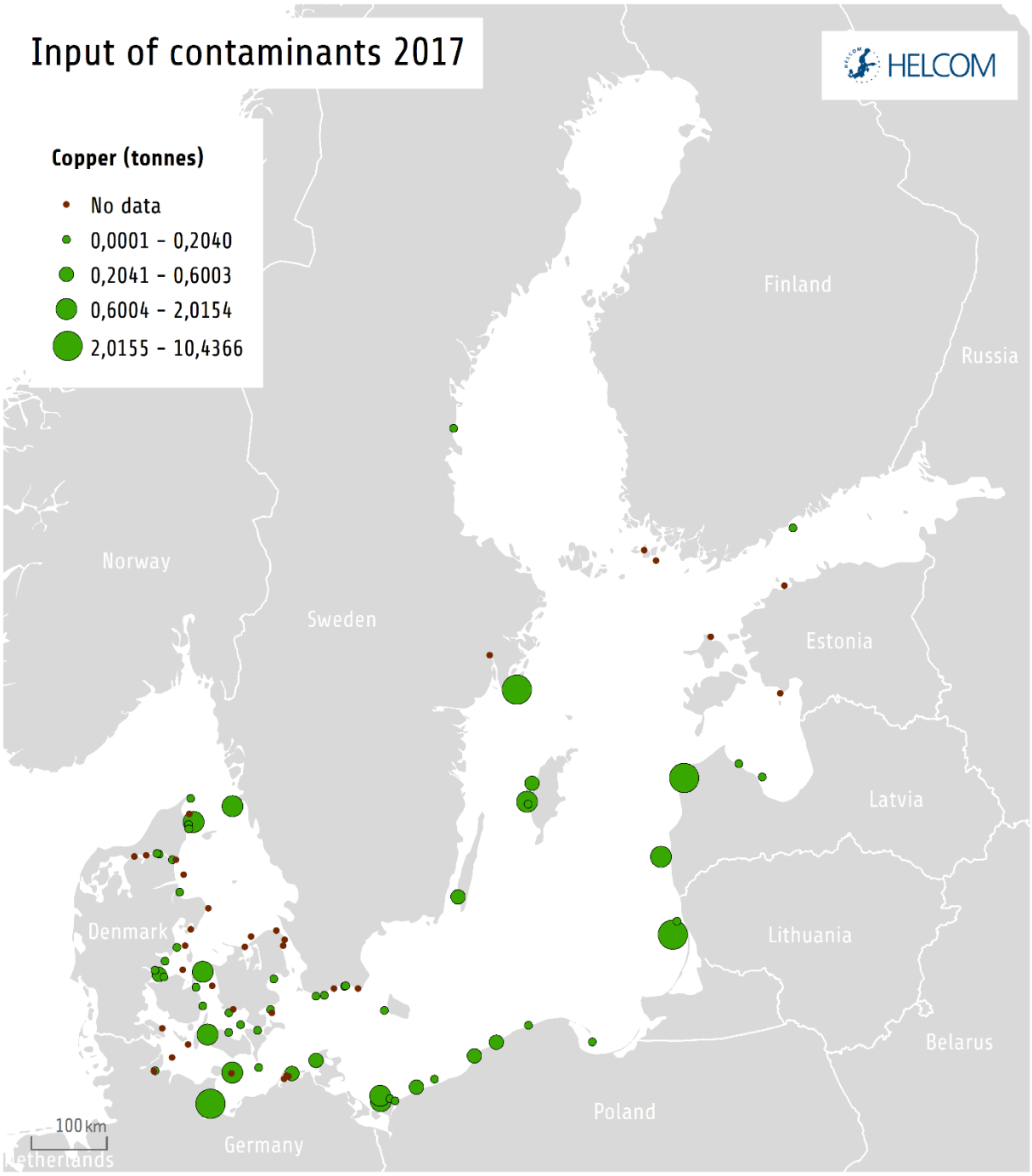
Input of contaminants 2017
HELCOM
Copper (tonnes)
No data
0,0001 - 0,2040
0,2041 - 0,6003
0,6004 - 2,0154
2,0155 - 10,4366
Finland
Russia
Norway
Sweden
Estonia
Latvia
Lithuania
Belarus
Denmark
Poland
Germany
Netherlands
100 km

Figure 42.

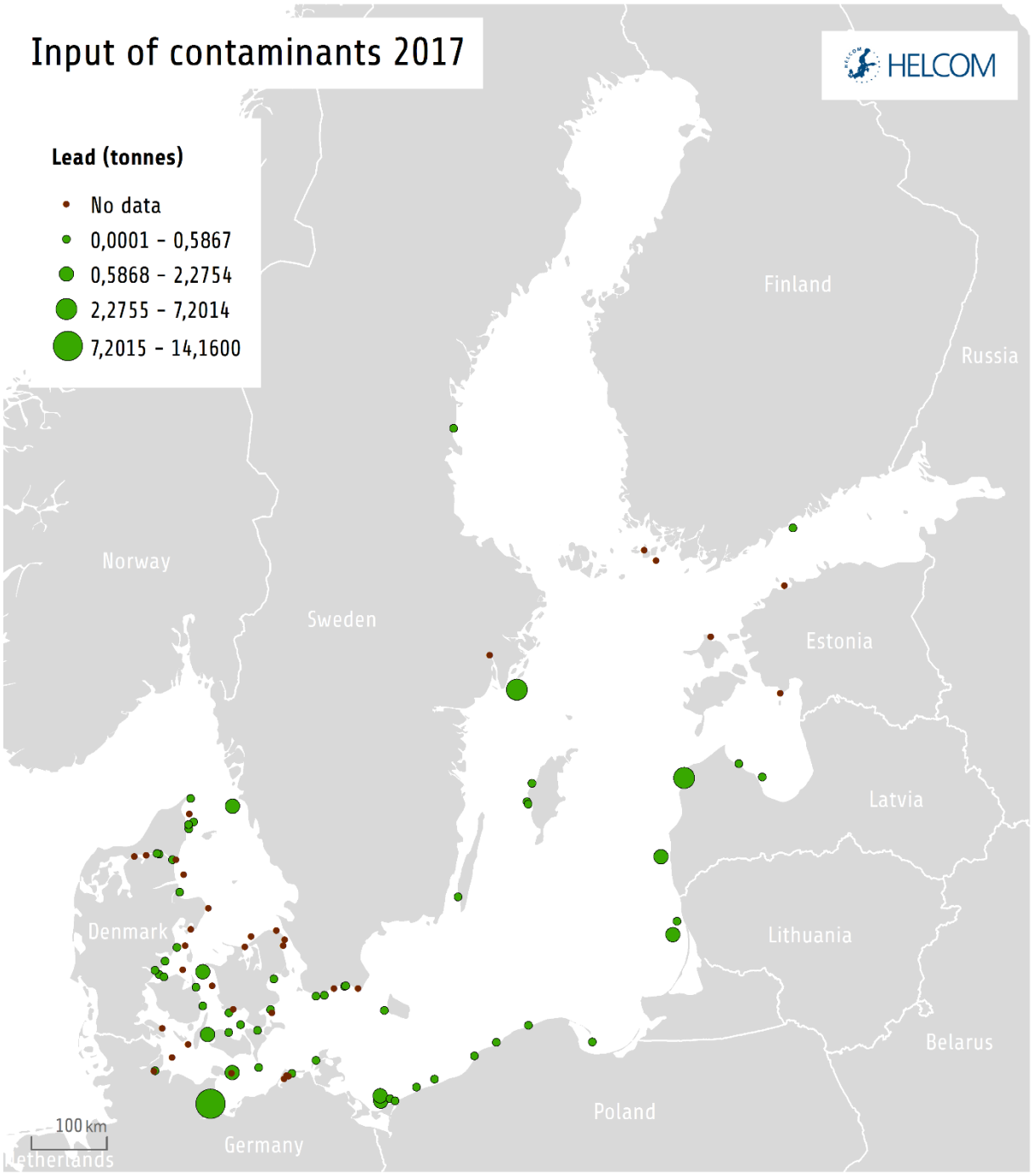
Input of contaminants 2017
HELCOM
Lead (tonnes)
No data
0,0001 - 0,5867
0,5868 - 2,2754
2,2755 - 7,2014
7,2015 - 14,1600
Finland
Russia
Norway
Sweden
Estonia
Latvia
Lithuania
Belarus
Denmark
Poland
Germany
Netherlands
100 km

Figure 43.

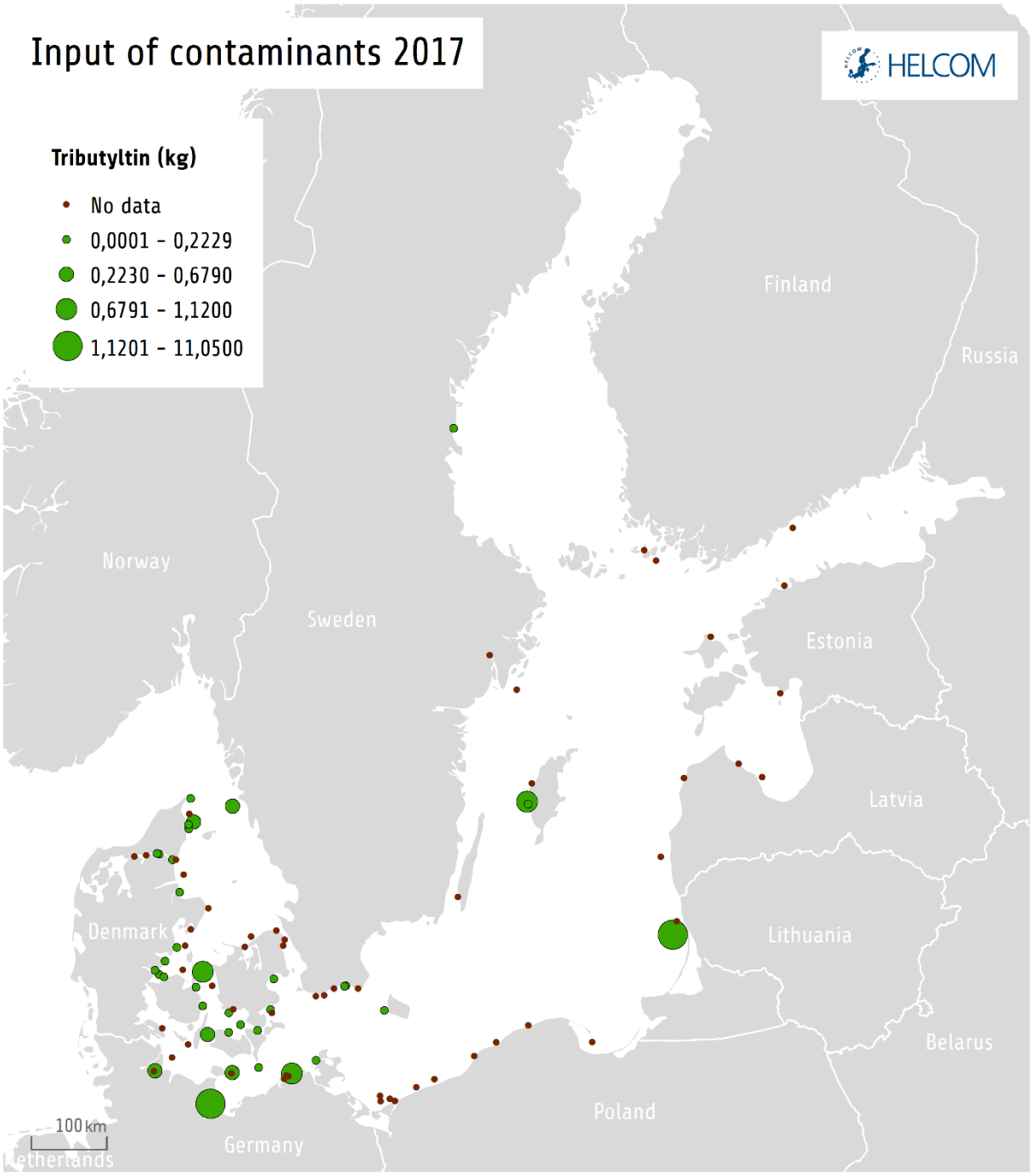
Input of contaminants 2017
HELCOM
Tributyltin (kg)
No data
0,0001 - 0,2229
0,2230 - 0,6790
0,6791 - 1,1200
1,1201 - 11,0500
Finland
Russia
Norway
Sweden
Estonia
Latvia
Lithuania
Belarus
Denmark
Poland
Germany
Netherlands
100 km

Figure 44.

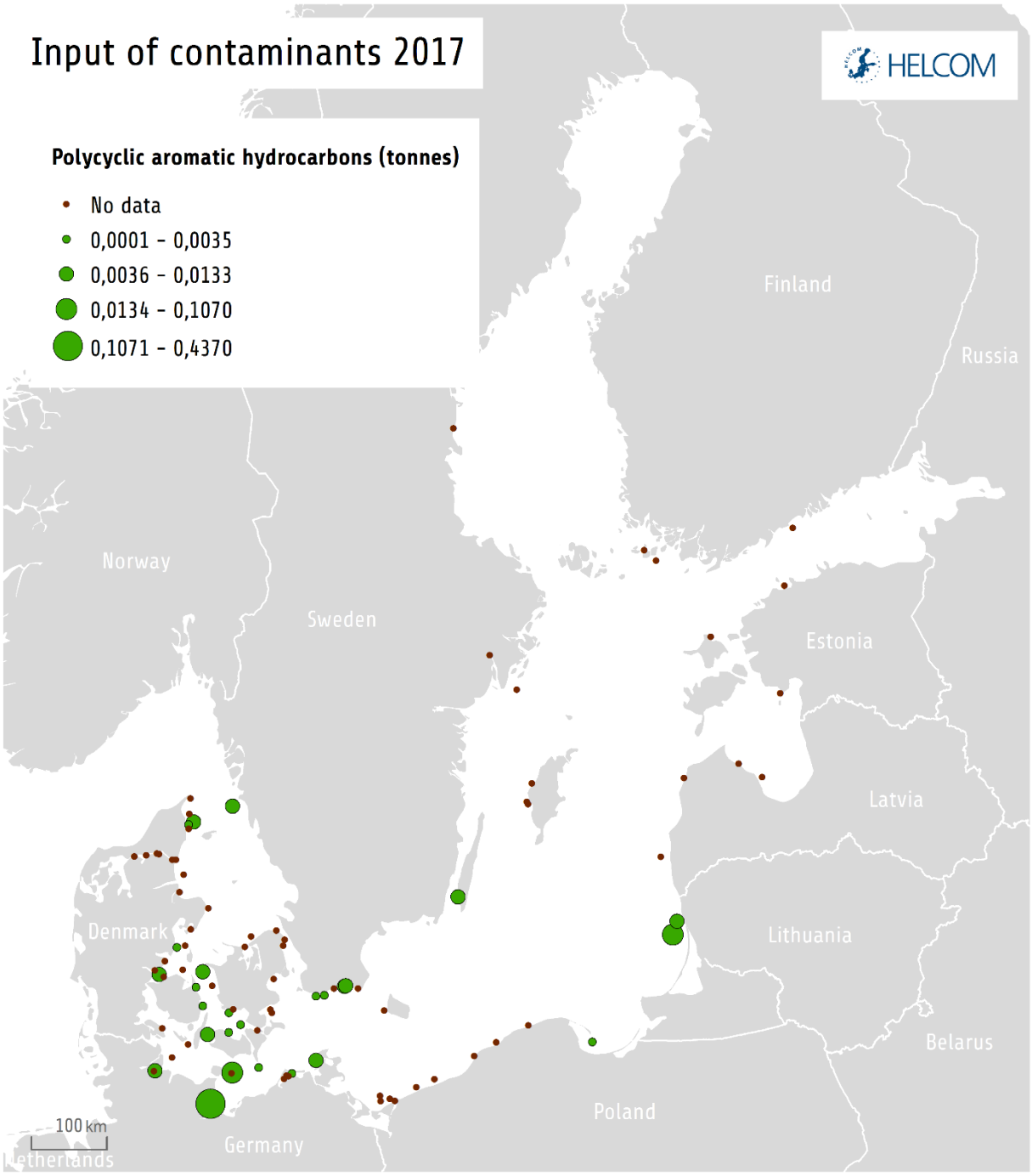
Input of contaminants 2017
HELCOM
Polycyclic aromatic hydrocarbons (tonnes)
No data
0,0001 - 0,0035
0,0036 - 0,0133
0,0134 - 0,1070
0,1071 - 0,4370
Finland
Russia
Norway
Sweden
Estonia
Latvia
Lithuania
Belarus
Denmark
Poland
Germany
Netherlands
100 km

Figure 45.

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.