



# Report of quantity, types and characteristics of the sediments from existing dumping sites in SE Baltic

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"Application of ecosystem principles for the location and management of offshore dumping sites in SE Baltic Region (ECODUMP)"

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## INTRODUCTION

This report constitutes a part of the project "Application of ecosystem principles for the location and management of offshore dumping sites in SE Baltic Region (ECODUMP)".

Dredged material of marine origin comes mainly from the operations aimed at deepening port basins, fairways and approach channels as well as from the investment works carried out in marine areas. Dredged sediments (depending on the type and degree of contamination) can be used economically for the following purposes (HELCOM Guideline 1992; SMOCS 2012; Dembska et al. 2004):

- Engineered uses - land creation and improvement, beach nourishment, offshore berms, capping material and fill;
- Agricultural and product uses - aquaculture, construction material, liners;
- Environmental enhancement - restoration and establishment of wetlands, terrestrial habitats, nesting islands, and fisheries.

However, the most widely applied solution for dredged material use is still its deposition in specially selected seabed areas (offshore dumping sites) (Fig. 1). Currently, dredged material deposition in open waters is a common practice worldwide and in the literature it is referred to as *Open Water Disposal*. As indicated by the IMO reports, more than 1,000 permits to deposit dredged material in the sea are issued annually (IMO 2011, IMO 2012). Most of the material is discharged into water bodies with a depth greater than 20 m, within a few kilometers of the dredging site (EPA). Disposal of dredged material into open waters is often the primary option for economic reasons. Moreover, deposition of the material in its natural environment is also necessary for ecological and geomorphological purposes (Powillet et al., 2006; Zegarowski, 2012).

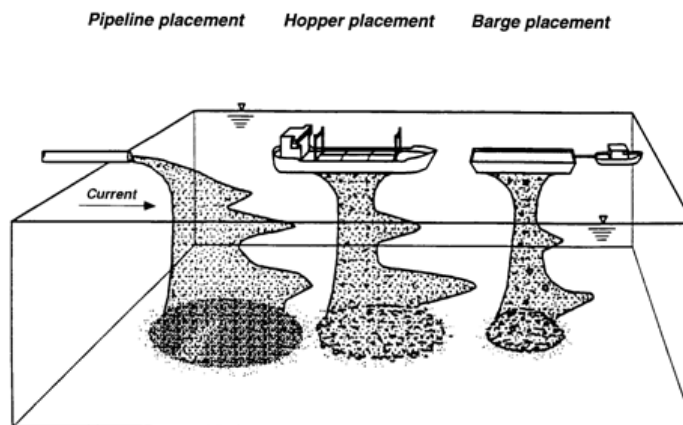


Fig. 1. Deposition of dredged material into open water (Lee at all, 1991; Zegarowski, 2012)

Regulations and conditions of dredged material deposition in the sea were described in detail in the ECODUMP report on “Existing legislative requirements for the location of dumping sites, dumping practices and monitoring approaches within BSR” (Suzdalev et al. 2014), while aspects addressing the location of new dumping sites are covered in details in “Guideline for the location of new dumping sites”.

## 1. LITHUANIA

### 1.1 Existing dumping sites

There are two historical dumping sites operating in Lithuanian territorial waters, which are being used for the dumping of dredged material from the Klaipėda port area (Fig. 2). The main offshore dumping site (III – deep-water dumping), which is used for dumping of all lithological types of sediments, is located 20 km to the SW from the entrance to the Klaipėda port (water depth: about 43-48 m). The operation of this site started in 1986, and its area dedicated for dredged material dumping is about 13.87 km<sup>2</sup>. Since the beginning of its operation, around 20 mln. m<sup>3</sup> of dredged sediments have been dumped there.

Another dumping site (IV dumping) located in the nearshore zone, much closer to the entrance to the Klaipėda port (10 km to NW). It was approved by the decree of Lithuanian minister of Environment in 1996 and so far it has been used for the disposal of sandy sediments (fine sand and silty sand) at the depths of 28-34 m. Since the beginning of 1996, the amount of 1.5 mln. m<sup>3</sup> of sand has been dumped there. Currently, the use of this dumping site is limited due to the insufficient amount of sand, which is dredged from the port area. Moreover, from the beginning of 2001, fine grained sand, dredged from the Klaipėda port entrance channel is used for the nearshore nourishment (depths of 4-6 m), in order to supplement the sediment balance and restore sand resources for further beach accumulation.

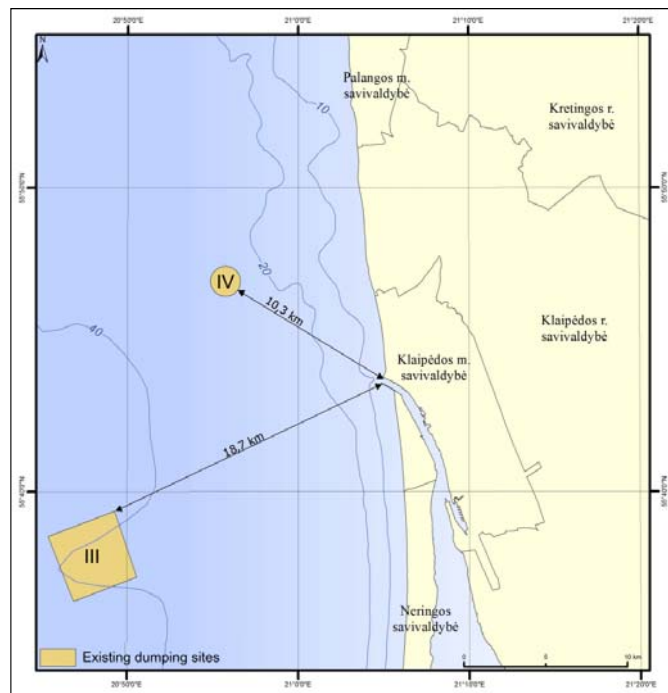


Fig. 2. Existing dumping sites in Lithuanian territorial waters

The intensity of sediment dumping in the existing offshore dumping sites varied through years. During the last decade it depended mostly on the amount of dredging works (Table 1).

**Table 1. The amount of sediments (m<sup>3</sup>), dredged from the Klaipeda port area and brought to the offshore dumping sites in 2000-2010.**

Year	Deep water dumping site (III dumping)		IV dumping site	Nearshore nourishment	Total
	Till	Mud, muddy sand	Fine-grained sand	Fine-grained sand	
2000	25 000	60 000	297 510	-	382 510
2001	1 049 196	749 755	-	480 548	2 279 499
2002	943 811	105 797	656 280	-	1 705 888
2003	390 912	334 927	72 936	-	798 775
2004	1 078 169	153 341	-	-	1 231 510
2005	865 394	190 656	-	128 752	1 184 802
2006	748 989	63 361	-	-	812 350
2007	299 484	212 534	38 611	-	550 629
2008	854 525	326 180	-	-	1 180 705
2009	-	38 712	-	87 968	126 680
2010	-	537 976	64 799	90 238	
<b>Total</b>	<b>6 255 480</b>	<b>2 773 239</b>	<b>1 130 136</b>	<b>787 506</b>	<b>10 946 361</b>

Since 2000 the biggest part of dumped material consisted of till deposits (> 6.25 mln. m<sup>3</sup>), the amount of muds and muddy sands reached 2.77 mln. m<sup>3</sup>, and fine sands – 1.13 mln. m<sup>3</sup>. The total amount of sediments deposited at Lithuanian dumping sites in 2000-2010 was 10.16 mln. m<sup>3</sup> (this amount does not include sand, which was used for the nearshore nourishment purposes).

**Table 2. General information on Lithuanian offshore dumping sites**

Name of a dumping site	Operative since	Area <sup>2</sup> [km ]	Distance from the port [km]	Depth [m]	The amount of deposited sediments <sup>3</sup> [m ]	Type of sediments
Dumping Site III	1986	13.08	20	43-48	20 000 000	all lithological types of sediments
Dumping Site IV	1996	2.70	10	28-34	1 500 000	sandy sediments (fine sand and silty sand)
Nearshore nourishment	2001		2.0	4-6	800 000	Fine-grained sand from Klaipeda port entrance

Name of a dumping site	Operative since	Area [km <sup>2</sup> ]	Distance from the port [km]	Depth [m]	The amount of deposited sediments <sup>3</sup> [m <sup>3</sup> ]	Type of sediments
(Melnrage-Giruliai)						channel

## 2. POLAND

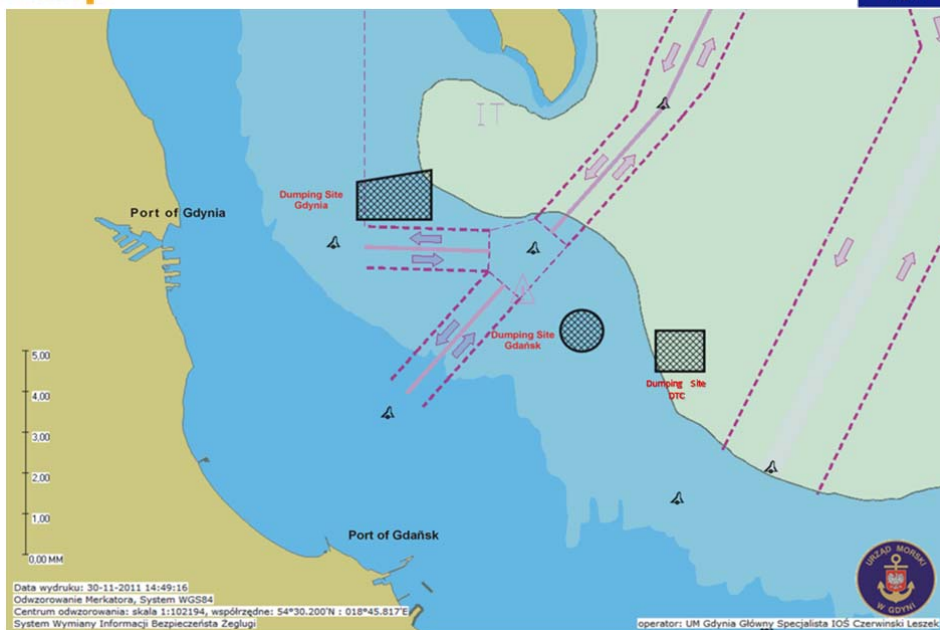
### 2.1 Existing dumping sites

Currently there are 9 offshore dumping sites in territorial waters of Poland, which are designated and managed by Polish Maritime Offices in their administration areas (Fig. 3). The one of the biggest dumping sites (Gdynia, Gdańsk and DTC) belong to the area, administrated by Maritime Office in Gdynia. Four smaller dumping sites (Łeba, Ustka, Darłowo, Kołobrzeg) are located in the administrative area of Maritime Office in Słupsk and two more (Szczecin-Świnoujście) in administrative area of Maritime Office in Szczecin.



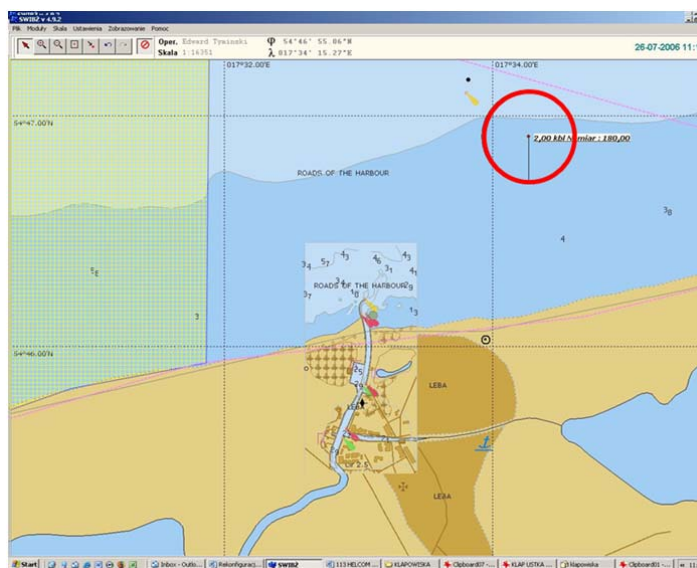
**Fig. 3. Location of the offshore dumping sites, administered by Maritime Office in Słupsk , Maritime Office in Gdynia and Maritime Office in Szczecin**

Gdynia and Gdańsk offshore dumping sites are the largest in Poland, located in the Gulf of Gdańsk (Fig. 4). Gdynia dumping site was established in 1995 and occupies the area of 6.4 km<sup>2</sup>. Since the beginning of its operation more than 4.5 mln. m<sup>3</sup> of sediments, comprising of fine-grained sand and silt, dredged from port channels and fairways, were disposed there. Gdańsk dumping site is used since 1994 for the disposal of fine sands and silts. The area dedicated for dumping is 2.7 km<sup>2</sup>. The amount of disposed sediments is estimated at 1.1 mln. m<sup>3</sup>. Apart from Gdynia and Gdańsk dumping sites, in the Gulf of Gdańsk there is also located DTC dumping site. Since the beginning of its operation more than 2.9 mln. m<sup>3</sup> of sediments, comprising of fine-grained sand and silt, dredged from port channels, were disposed there.



**Fig. 4. Location of Gdynia, Gdańsk and DTC Dumping Sites in the Gulf of Gdańsk**

Łeba dumping site is located approximately 1.0 nautical miles to the NE from the Łeba harbour entrance channel. The area of the site is approximately 0.43 km<sup>2</sup>. This dumping site is operative since 2000 and until 2010 more than 750 000 m<sup>3</sup> of sediments had been dumped there. Prevailing lithological types of sediments are: sand (0.25-0.5 mm) and sandy silt (0.063-0.125 mm).



**Fig. 5. Location of Łeba Dumping Site**

Ustka dumping site is located approximately 2.0 nautical miles in the 030 direction from the Ustka port entrance. This dumping site covers the area of about 431,000 m<sup>2</sup> and from 2002 it has been used for the disposal of sandy sediments (0.2-0.5 mm and 0.125-0.25 mm). The amount of disposed sediments is estimated at 520,318 m<sup>3</sup>.

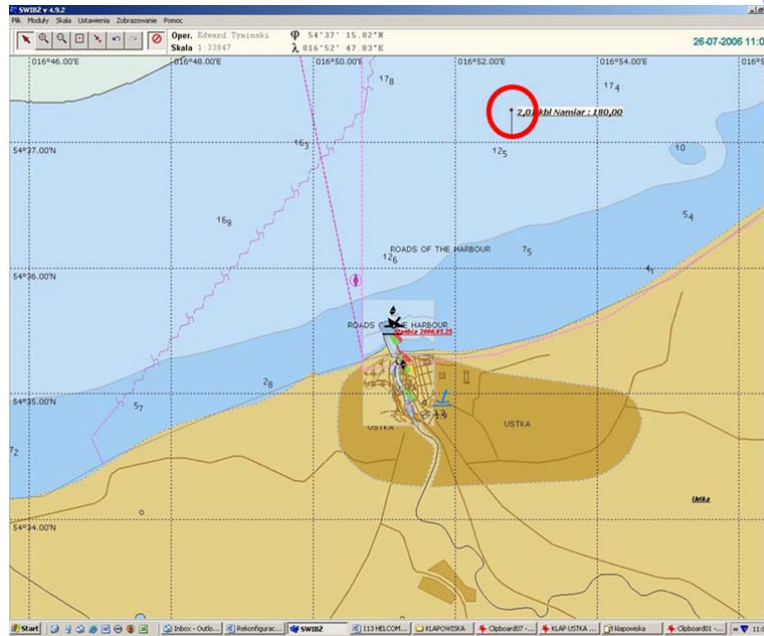


Fig. 6. Location of Ustka Dumping Site

Darłowo dumping site is located approximately 2.5 nautical miles in the 020 direction from the entrance to the Darłowo harbour. It has been operative since 2000 and covers the area of 430,796 m<sup>2</sup>. This dumping site is used for the disposal of fine-grained sands (0.125-0.25 mm). The amount of disposed sediments is estimated at almost 484,000 m<sup>3</sup>.

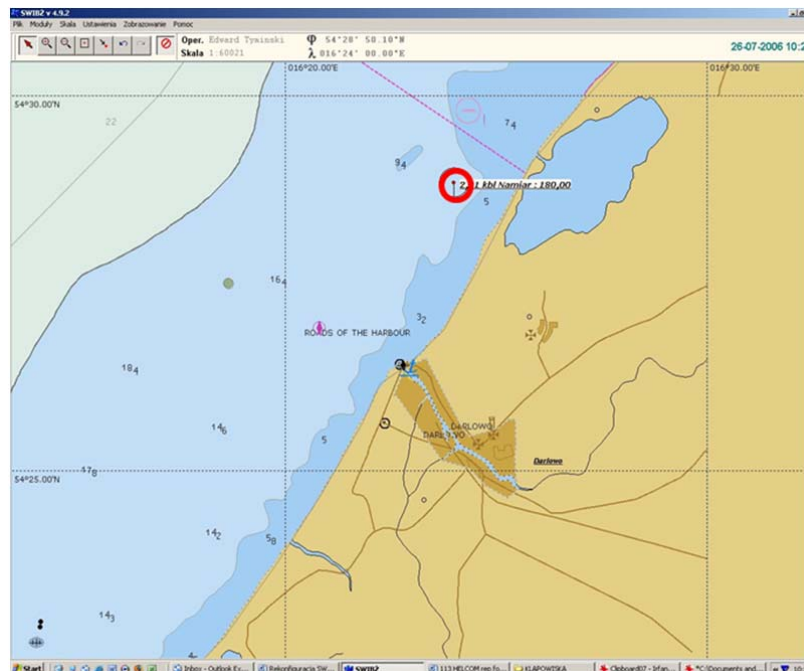


Fig. 7. Location of Darłowo Dumping Site: a) direction b) area

Kołobrzeg offshore dumping site is located approximately 3.5 nautical miles to the north from the Kołobrzeg port entrance. This Dumping site is operative since 2000, and covers the area of about



431,000 m<sup>2</sup>. More than 300,000 m<sup>3</sup> of fine-grained sand (0.125-0.25 mm) had been dumped there until 2010.

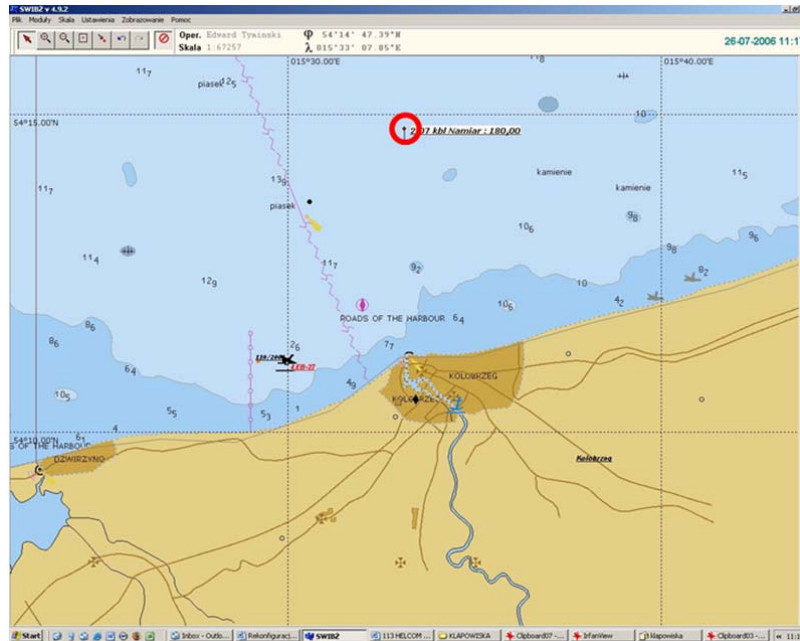


Fig. 8. Location of Kolobrzeg Dumping Site

Dumping site in **Szczecin** was established in 2010. Located in the Pomeranian Bay, it is used for the offshore dumping of fine-grained sediments (0.125-0.25 mm). In only 4 months (July 2010 –October 2010), about 720,000 m<sup>3</sup> of sand were dumped there. More than 2.4 mln. m<sup>3</sup> of sand were dumped at this site until November 2012.

The volume of sediments deposited on dumping sites in: Kolobrzeg, Łeba, Ustka and Darłowo, in individual years, has been presented in Fig. 9.

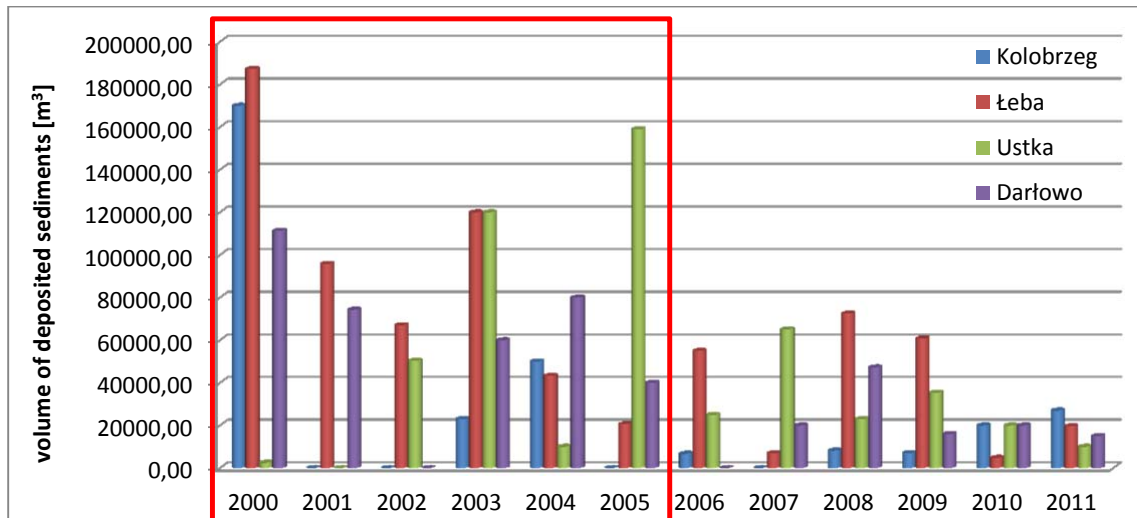


Fig. 9. The amount of sediment deposited on Dumping Sites in individual years

As indicated above, since 2006 we can observe a clear decrease in the amount of sediments deposited on each dumping site, which may be associated with the reduction of investments in ports. In the investigated period, dredged material obtained from port basins and fairways was not entirely deposited in the sea. Particularly, dredged sediments taken from fairways, in large part, were used for beach nourishment (infilling). This is clearly evident in the case of the port in Ustka where about 50% of dredged material obtained from fairways was used for beach reclamation. In case of the other ports, approx. 70-80% of dredged material was deposited on dumping sites (Fig 10).

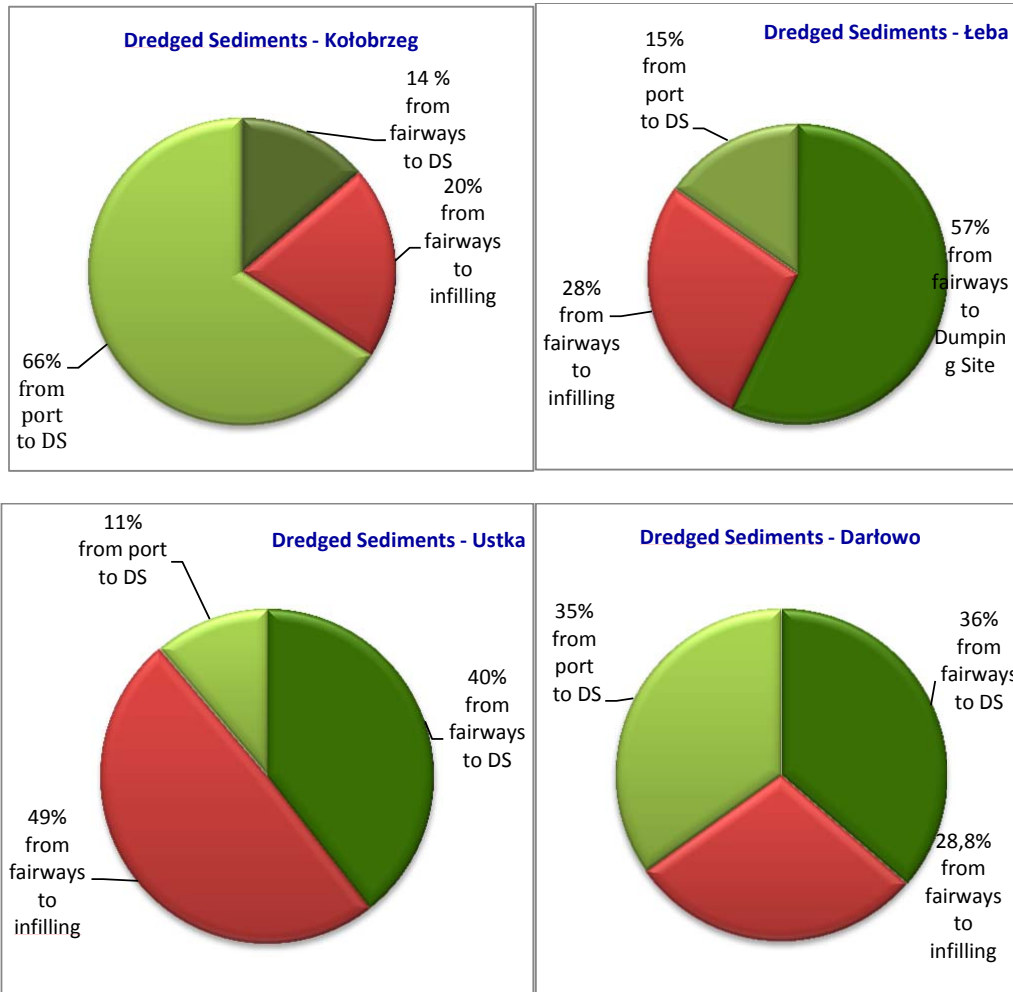


Fig. 10. Different uses of dredged material obtained from the ports in Kołobrzeg, Łeba, Ustka, Darłowo.

A summary of the information on offshore dumping sites located within Polish coastal areas has been presented in Tab. 3.

Table 3. The amount of sediments (m<sup>3</sup>), dredged from port areas and brought to offshore dumping sites in the period 1994-2010/2011.

Name of a dumping site	Operative since	Area <sup>2</sup> [km ]	Distance from the port [km]	Depth [m]	The amount of deposited sediments <sup>3</sup> [m ]	Type of sediments
Gdynia	1995	6.4	15	20-30	4 606 577	Fine-grained

Name of a dumping site	Operative since	Area <sup>2</sup> [km ]	Distance from the port [km]	Depth [m]	The amount of deposited sediments <sup>3</sup> [m ]	Type of sediments
						sand and silt
<b>Gdańsk</b>	1994	2.7	16	20-30	1 060 831	Fine-grained sand and silt
<b>DTC</b>		3.0	16	40	2 950 000	Silts, fine sands
<b>Łeba</b>	2000	0.43	1.6	4.0	753 408	Sands and sandy silts
<b>Ustka</b>	2002	0.43	3.2	12.5	520 318	Sands and sandy silts
<b>Darłowo</b>	2000	0.43	4.0	7.0	483 916	Fine-grained sand
<b>Kołobrzeg</b>	2000	0.43	5.0	10.5	311 914	Fine-grained sand
<b>Szczecin-Świn.</b> <b>- Sea Port Authority S.A.</b>	2010	3.0	10	10-11	3 000 000	Fine-grained sand
<b>Szczecin-Świn.</b> <b>- Maritime Office in Szczecin</b>	2010	12.0	12	11-12	8 000 000	Fine-grained sand

### 3. RUSSIA

#### 3.1 Existing dumping sites

Two offshore dumping sites are established in the Russian part of the Baltic Sea (Kaliningrad region) for the disposal of dredged sediments. The main dumping site, which has been used for dumping of all lithological types of sediments is located 4 km to the north-east from Baltiysk Sea port gates (water depth about 10-15 m). Another dumping site is located near the Cape of Gvardeyskiy (Fig. 7), which being used for dumping of the soil dredged from the Port of Pionerskiy (currently this dumping site is not operative).

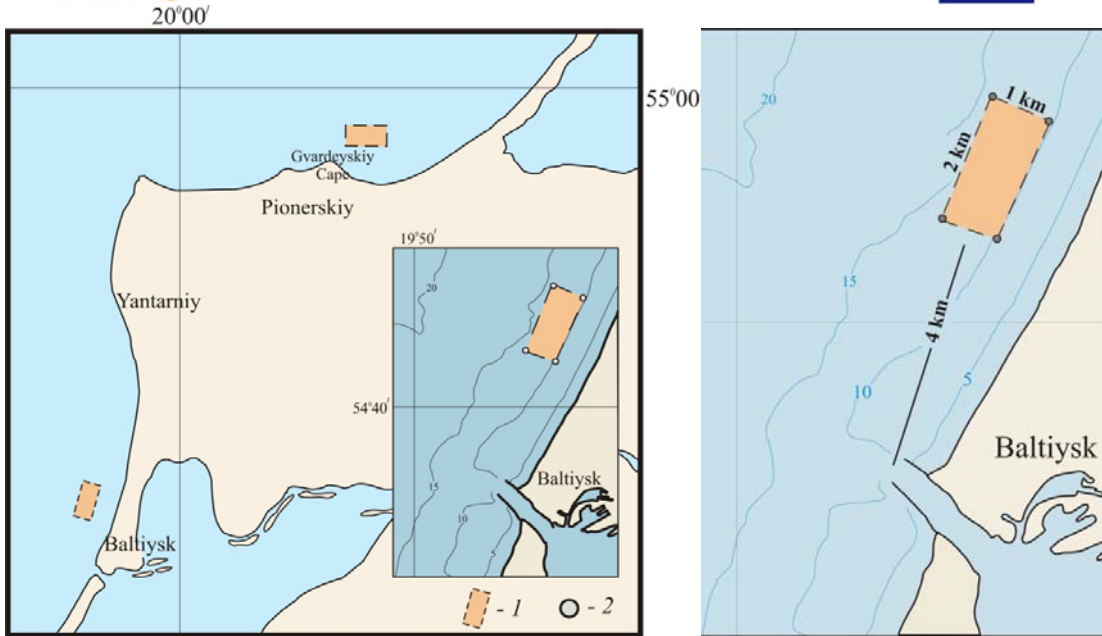
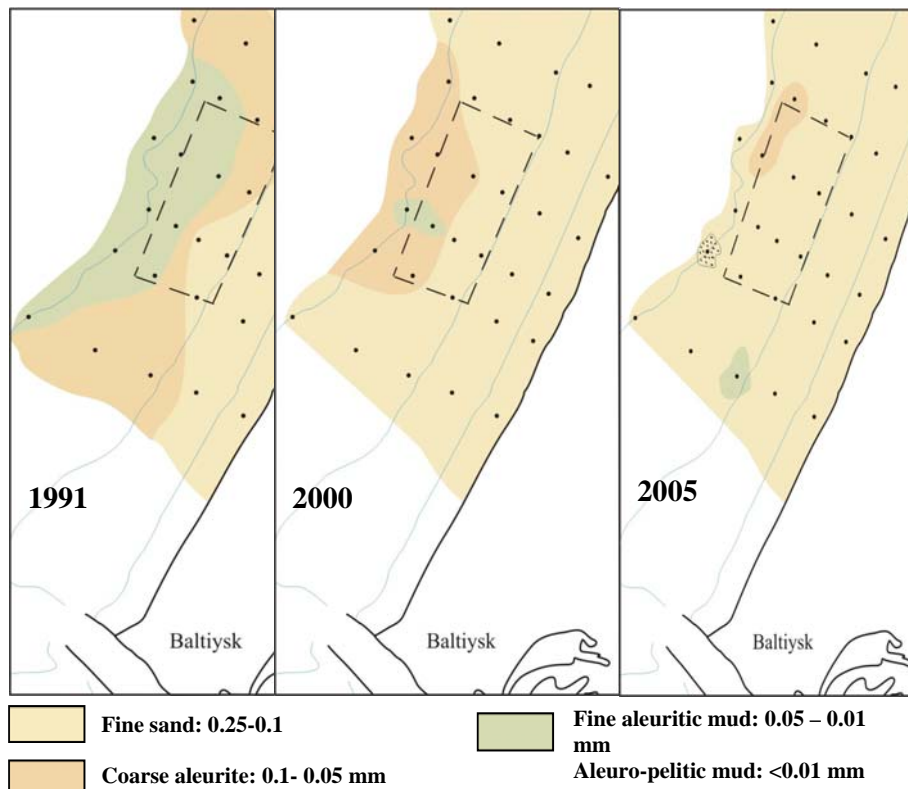


Fig. 11. Offshore dumping sites in Russian part of the Baltic sea (1 – dumping area; 2 – monitoring stations)

The offshore dumping site near Baltiysk Sea Port (2 km long, 1 km wide) is located in the nearshore zone between 10 and 15 m isobaths. Since 1958 this dumping site was used for the disposal of sediments, dredged from Kaliningrad Seaway Channel and Baltiysk Sea Port. Dumped sediments comprising mainly from fine-grained (0.1-0.25 mm) sands, with little amount of medium sands (0.25-0.5 mm) and coarse silts - (0.05-0.1 mm). This was proved by the investigations of grain size of sediments completed in 1991, 2000 and 2005 (Fig. 12).



**Fig. 12. Lithological types of sediments at the Baltiysk offshore dumping site in 1991-2005**

The intensity of dumping activities varied during the entire period. Maximum amount was discharged in the period from 1958 to 1970 (800 000 m<sup>3</sup> of sediments). During the next 20 years (1971 – 1992) the amount of dumped material decreased up to 300 000 m<sup>3</sup>. Recently, the amount of dumped sediments varies between 12 000 to 20 000 m<sup>3</sup> per year, because biggest part of dredged soil is used for the sluicing and restoration of protecting dams. The total amount of dumped sediments since 1958 is estimated at 18 mln. m<sup>3</sup>.

**Tab. 4. The amount of sediments (m<sup>3</sup>) dredged from ports areas and brought to offshore dumping sites.**

Name of a dumping site	Operative since	Area <sup>2</sup> [km ]	Distance from the port [km]	Depth [m]	The amount of deposited sediments <sup>3</sup> [m ]	Type of sediments
Baltiysk	1958	2.0	4.0	10-15	18 000 000	all lithological types of sediments dredged from the <b>Kaliningrad Seaway Channel</b> and <b>port of Baltiysk</b>  <u>Fine and medium sands</u>

#### 4. LITERATURE

Boniecka H, Staniszewska M., Sapota G., Dembska G., Suzdalev S.,2014, Guideline for the location of new dumping sites. Report of ECODUMP project., WWIMG, ISBN 978–83–62438–21–1.

Dembska G., Gryniewicz M., Wiśniewski S., Aftanas B.,2004, Physical and chemical diagnosis of Gdansk Dumping site, as a place to deposit the dredged material with marine waters, Ochrona Powietrza i Problemy Odpadów (in Polish), vol. 37, nr 1, styczeń – luty 2004, s. 10-19.

HELCOM, recommendation 13/1, 1992 r. (HELCOM Guidelines for the Disposal of Dredged Material at Sea)

Lee C.R., Peddicord R.K., Palermo M. R., Francinques N.R., 1991, General decision-making framework for management of dredged material- example application to Commencement Bay, WA. Miscellaneous Paper D-91-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Powillet M., Klaine J., Leuchs H., 2006, Impact of experimental dredged material disposal on a shallow, sublittoral macrofauna community in Macklenburg Bay (western Baltic Sea), Marine Pollution Bulletin, 52, pp.386-396

SMOCS, 2012, Technologies and Solutions for Handling of Contaminated Sediments State - of - the - art review. No. 39



Suzdalev S., Dembska G., Topchaya V., 2014, Report of existing legislative requirements for the location of dumping sites, dumping practices and monitoring approaches within BSR. Report of ECODUMP project.

Zegarowski Ł., 2012, Dumping as a way of dealing with dredged material - study work., WW IMG nr 6735, Gdańsk

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