

## Financing the Counteraction of Natural Disasters' Effects in Lower Silesian Voivodeship

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**Abstract.** Authors present the financial aspects of the counteraction of the natural disasters' effects. On the background of the conducted analysis in of Lower Silesian voivodeship (NUTS 2) in Poland, following conclusions can be drawn. Expenses for counteracting the natural disasters' effects were co-financed from the ecological funds. One of them is the Fund for Environmental Protection and Water Management. Expenses for the permanent assets serving the water management in Lower Silesian voivodeship in the years 1998-2013 amounted approx. 1.5 billion US dollars indexed to the year 2013. Investing expenses for the low water retention in the area of the examined region in the years 2003-2013 exceeded 19 million US dollars. The range of objects in Lower Silesian voivodeship in the years 2003-2013 amounted 525. Total increasing capacity in the examined period exceeded 5.5 million m<sup>3</sup>. The share of expenses for removing effects of the natural disasters in the expenditures for public safety, fire and health protection is minimal.

### Introduction

In the years 1997 and 2010, Lower Silesian voivodeship in Poland was affected by two great floods. Destructive hurricanes occurred in the examined area in 2005 and 2007 (orcan *Kyrill*). Between these years, Lower Silesian voivodeship was affected by drought [7, 8, 14].

Floods, hurricanes and droughts are natural disasters. The natural disaster is an unforeseen and often sudden event that causes great damage, destruction and human suffering. It can be defined as the situation or the event, which overwhelms local capacity, necessitating a request to national or international level for external assistance [4]. The natural disasters are started by the natural hazards – the probability of occurrence of a dangerous event [1]. There are biological, geological and hydrometeorological factors of these events [15]. The natural catastrophes have large impact on very poor and very rich societies. The former present the highest casualty totals and the latter the highest property damages [2].

In relation to the negative consequences caused by the natural disasters, the crucial significance for the economy of the each region has preventing the effects of these kinds of events. The aim of this article is to present counteracting the natural disasters' effects in Lower Silesian voivodeship in Poland. Authors used the methodology of Zbigniew Piepiora[9] and extended his research from floods[10] to all types of natural disasters and the examined period from 1998-2011 to 1998-2013[11, 12] concerning on the financial issues[5].

### Counteracting the natural disasters' effects in the examined area

Lower Silesian voivodeship (also called 'province') is located in the south-west part of Poland which is the member of the European Union. It borders with the provinces; Lubusz, Geater Poland, Opole. Moreover, it borders with Germany (70 km) and Czech Republic (the length 340 km). 60 % of Lower Silesian voivodeship is situated in the area near the border. The present border of Lower Silesian and

Greater Poland provinces is a historic border between the Silesia and Greater Poland, created in the Middle Ages. From the year 1939 it was also the border between Germany and Poland. The south border in the Sudety Mountains (Sudetes) was formed finally in the 19th century. The actual shape of the province reminds the Wrocław Province before year 1975 with the lined Głogów and the environs [8, 11, 13].

The examined province occupies 19 948 km<sup>2</sup> of area and it has the seventh position in Poland (which is 6,4 % of Poland's territory), the number of inhabitants is approx. 2.9 million (which is approx. 7 % of Poland's population). The area is characterized by the high level of population density, approx. 145 people per 1 km<sup>2</sup> but the population density differs in different parts of the examined region [12].

The biggest city of the province is Wrocław with approx. 640 thousand inhabitants. Other big cities are: Wałbrzych (approx. 120 thousand), Legnica (approx. 102 thousand), Jelenia Góra (83 thousand inhabitants). The cities with over 60 thousand inhabitants are: Lubin, Głogów and Świdnica [16].

Expenses for the permanent assets serving the water management in Lower Silesian voivodeship in the years 1998-2013 amounted approx. 1.5 billion US dollars indexed to the year 2013. Expenditures for levees in the years after the floods in 1997 (expenses in the years 1998 and 1999) and 2010 (expenses in the years 2011-2013) were significant higher and amounted approx. average 20 million US dollars every year. Expenses in the years 2000-2010 leveled down and amounted approx. average 5 million US dollars every year [3, 6].

The main source of the expenditures for permanent assets serving the water management in the examined area in the years 2002-2013 which totally exceeded 1 billion US dollars were own measures. From these sources, there were financed approx. 34% of total expenditures in the examined period [3, 6].

The effects of investing in the water management in the years 2003-2013 in Lower Silesian voivodeship are corresponding with the expenditures. In the years 2001-2010, the number of kilometers of levees which were built amounted approx. 6 km every year. In the period 2011-2013 there were built approx. 8 km levees every year [3].

The expenses for counteracting the natural disasters' effects were co-financed from ecological funds. One of these funds is the Fund for Environmental Protection and Water Management. The charges and incomes to this fund in Lower Silesian voivodeship in the years 2002-2013 amounted approx. 611 million US dollars. The incomes from charges for the waste management were the main part of total incomes and exceeded 255 million US dollars [3, 6].

Table 1 The investing expenses for the low water retention in Lower Silesian voivodeship – the investing directions in the years 2002-2013 [in '000 US dollars indexed to the year 2013]

Years	Total	Man-made water reservoirs	Independent staging structures and water intakes on primary water-races	Independent staging structures and water intakes on secondary water-races	Staging lakes	Fish ponds	Other
2003	4609	2365	6	19	0	2204	15
2004	3524	3168	0	3	0	352	1
2005	2806	2156	0	4	0	645	1
2006	2635	1228	10	9	0	1372	16
2007	1216	559	26	23	0	595	13
2008	1538	304	18	6	0	1183	27
2009	1047	206	0	0	0	842	0
2010	1053	66	0	3	0	975	0
2011	438	150	11	0	0	276	1
2012	138	32	0	0	0	107	0
2013	60	13	0	0	0	47	0
Total-all years	19064	10247	71	67	0	8597	74

Source: Own study on the basis of: [3, 6].

The investing expenses for the low water retention in the area of the examined region in the years 2003-2013 according to the investing directions are presented in the table 1. As we can see, the investing

expenditures for man-made water reservoirs exceeded over 10 million US dollars. The total investing expenses for the low water retention exceeded 19 million US dollars [3, 6].

The investing expenses for the low water retention in Lower Silesian voivodeship in the years 2003-2013 according to the financing sources are presented in the table 2. As we can see, the expenses were financed mainly from the Fund for Environmental Protection and Water Management (approximately 22%).

Table 2 The investing expenses for the low water retention in Lower Silesian voivodeship in the years 2003-2013 – the financing sources [in '000 US dollars indexed to the year 2013]

Years	Total	From budget of voivod	From fund for environmental protection and water management	From fund for protection rural areas	From eu's structural funds	From budgets of self-governments	Other
2003	4609	1074	305	398	0	359	2473
2004	3524	1604	1495	102	0	46	277
2005	2806	751	1384	118	0	16	537
2006	2635	282	660	238	0	224	1232
2007	1216	98	163	165	0	235	554
2008	1538	34	0	248	0	175	1082
2009	1047	0	0	142	0	47	68
2010	1053	0	0	165	0	38	849
2011	438	0	107	48	0	163	168
2012	138	0	27	84	5	0	27
2013	60	0	0	11	0	0	49
Total-all years	19064	3841	4141	1721	5	1304	7315

Source: Own study on the basis of: [3, 6].

The effects of investing in the low water retention are presented in the table 3. The range of objects in Lower Silesian voivodeship in the years 2003-2013 amounted 525. The total increasing capacity in the examined period exceeded 5.5 million m<sup>3</sup>.

Table 3 The effects of investing in the low water retention – the range of objects in Lower Silesian voivodeship in the years 2003-2013

Years	Objects	Invreasing capacity	Staging of lakes		Artificial water reservoirs		Fish ponds	
Units of measure	1.	2.	1.	2.	2.	km	unit	km
2003	91	1212	0	0	3	316	76	896
2004	22	303	0	0	1	133	19	170
2005	58	337	0	0	1	3	40	334
2006	55	1484	0	0	2	881	47	603
2007	55	618	0	0	13	351	33	268
2008	62	447	0	0	12	52	35	395
2009	41	231	0	0	19	32	22	199
2010	335	371	0	0	304	24	29	347
2011	36	259	0	0	7	39	27	220
2012	29	265	0	0	10	88	19	178
2013	13	41	0	0	5	8	8	32
Total-all years	525	5574	0	0	377	1927	355	3641

1. Objects [units], 2. Capacity ['000 m<sup>3</sup>]

Source: Own study on the basis of: [3].

The total expenses for removing the natural disasters' effects according to the budget classification in Lower Silesian voivodeship in the years 2008-2013 are amounted approx. 366 million US dollars. The largest share in the expenses for removing effects of these kind of phenomena had measures from the budgets of municipalities (55.9%) and the smallest – from the budgets of counties (21.5 %). The largest

part of measures from budgets of counties and municipalities were spent for the transport and communication – almost 200 million US dollars. From the budget of Lower Silesian voivodeship, there were mainly financed the expenses in agriculture and hunting (76.3 million US dollars)[3, 6].

Table 4 The expenditures for public safety, fire and health protection in Lower Silesian voivodeship according to the divisions of the budget classification in the years 2008-2013 [in '000 US dollars indexed to the year 2013]

	Public safety (ps) and fire protection (fp)	Share of measures of individual budgets in total expenditures for ps and fp	Health protection (hp)	Share of measures of individual budgets in total expenditures for hp
Measures from budget of Lower Silesian voivodeship	5715	1%	254501	36%
Measures from budgets of counties	215940	39%	251930	36%
Measures from budgets of municipalities	326077	60%	199606	28%
Total	547731	100%	706037	100%
Total ps, fp and hp	1253769			

Source: Own study on the basis of: [3, 6].

The expenditures for public safety, fire and health protection in Lower Silesian voivodeship according to the divisions of the Budget Classification in the years 2008-2013 are presented in the table 4. As we can see, the total expenses in the examined period amounted approx. 1.3 billion US \$. The largest share in the expenditures for the public safety and fire protection had the budgets of municipalities. The largest share in the expenses for the health protection had the budgets of counties and the budget of Lower Silesian voivodeship.

Table 5 The share of the expenses for removing effects of natural disasters in the expenditures for public safety, fire and health protection in Lower Silesian voivodeship according to the divisions of the budget classification in the years 2008-2013 [in '000 US dollars indexed to the year 2013]

	Expenses for public safety and fire protection	Including: removing natural disasters effects	Share of measures for removing natural disasters effects in expenditures for public safety and fire protection	Expenses for health protection	Including: natural disasters effects	Share of measures for natural disasters effects in expenditures for health protection
Measures from budget of the Lower Silesian voivodeship	5715	0	0,0%	254501	0	0,0%
Measures from budgets of counties	215940	3644	1,7%	251930	0	0,0%
Measures from budgets of municipalities	326077	8033	2,5%	199606	426	0,2%
Total	547731	11676	2,1%	706037	426	0,1%

Source: Own study on the basis of: [3, 6].

Considering the data from tables 4 and 5, it is worth noting the minimal share of the expenses for removing the effects of natural disasters in the expenditures for the public safety, fire and health protection. As we can see, only 12 million US dollars expenses were spent for counteracting the negative consequences of natural disasters from 548 million US \$ expenditures for the public safe and fire protection. Only approx. 0.5 million US dollars expenses were spent for counteracting the negative consequences of this kind phenomena from 706 million US \$ expenditures for the health protection.

## Conclusion

After conducted analysis in Lower Silesian voivodeship in Poland, the following conclusions can be drawn.

1. The expenses for counteracting the natural disasters' effects were co-financed from the ecological funds. One of them is the Fund for Environmental Protection and Water Management.

2. The expenses for permanent assets serving the water management in Lower Silesian voivodeship in the years 1998-2013 amounted approx. 1.5 billion US dollars indexed to the year 2013. The expenditures for levees in the years after the floods in 1997 and 2010 were significant higher. In the years 2001-2010, the number of kilometers of levees which were built amounted approx. 6 km every year. In the period 2011-2013, there were built approx. 8 km levees every year.

3. The investing expenses for the low water retention in the area of examined region in the years 2003-2013 exceeded 19 million US dollars. The range of objects in Lower Silesian voivodeship in the years 2003-2013 amounted 525. The total increasing capacity in the examined period exceeded 5.5 million m<sup>3</sup>.

4. The share of the expenses for removing effects of natural disasters in expenditures for the public safety, fire and health protection is minimal.

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