Active natural disasters policy in Poland

Zbigniew Piepiora

Wrocław University of Environmental and Life Sciences
Wrocław, Poland
zbigniew.piepiora@up.wroc.pl

Marian Kachniarz

Wrocław University of Economics
Wrocław, Poland
marian.kachniarz@ue.wroc.pl

Arkadiusz Babczuk

Wrocław University of Economics
Wrocław, Poland
arkadiusz.babczuk@ue.wroc.pl

Abstract—In the article, there is verified the active natural disasters' policy in the area of Poland. In the examined area, preventing the negative consequences of the extreme phenomena is financed from the central budget and from the budgets of local governments (self-governments). Expenses are assisted by the measures from e.g. foreign states, ecological funds, credits and loans. The hypothesis from the beginning of the article is verified positively: the active natural disaster policy in Poland changed after the great flood in the year 2010. Thus, the answer for the research question of the article is: the natural disasters policy after 2010 is different than the before 2010. The highest level of total expenses for permanent assets serving the water management and for the low water retention was noted in the years after the great flood 2010.

Keywords—natural disaster, policy, Poland, counteraction, funding, financing, effects

I. INTRODUCTION

In 1997 and 2010 the area of Poland was affected by two great floods. The most devastating inundation the Oder River basin recently happened in the year 1997 and in the Vistula River basin – 2010. The landslides occurred after the flood in 2010 in the Carpathian Mountains. In 2015, the area of Poland was affected by drought.

Floods, droughts, landslides, and tornadoes are examples of natural disasters. These phenomena can be defined, according to the Natural Disaster Act, as an events connected with impacting of nature's forces. Besides mentioned examples, catastrophes are also: atmospheric discharges, storms, seismic activity, intensive rainfalls, extreme temperatures, fires, ice's phenomena on rivers, lakes, water reservoirs and the sea, infestations of insects and diseases of plants, animals and people[15].

The natural disaster can be launched by natural factors: hydrometeorological (e.g. the storm), biological (e.g. the disease), geological (e.g. the seismic activity). It is often a sudden event with tragic effects which causes damages, suffering of people and also changes connected with the affected area[1, 2].

Active natural disasters' policy can be defined as the conscious activity of the government and council authorities, as well as the national and international institutions specialized to minimize the damages caused by natural disasters[7].

The aim of this article is to verify the hypothesis: the active natural disaster policy in Poland changed after the great flood in the year 2010. The research question of the article is: whether the natural disasters policy after 2010 is different than the before 2010?

It is worth to notice that the article is part of the research project 'Financing catastrophic damages' chaired by PhD Zbigniew Piepiora[9].

II. THE METHODOLOGY

The data were collected from two databases: the EM-DAT [3] and the BDL – GUS [4]. Then the analysis in spreadsheet was conducted. The currency was changed from Polish Zloty to US dollar. After the analysis the conclusions were drawn.

III. THE CHARACTERISTICS OF STUDIED AREA

Figure 1. The manifestation of the natural disasters in the area of Poland in the years 1919-2015

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

Poland (The Republic of Poland) is located at the Baltic Sea in the Middle-East Europe. The south part of the examined country has two mountain ranges called the Carpathian Mountains (Karpaty) and the Sudetes (Sudety). The main rivers of the state are Vistula (Wisła) and Oder (Odra). The climate of Poland is characterized as a transient of the mesothermal zone.

The manifestation of the natural disasters in the area of Poland in the years 1919-2015 period is presented on the figure 1. As we can see at the figure, floods and storms occurred most often in the examined area. Storms and the floods are hydrometeorological disasters [8, 10, 11].

IV. INSTITUTIONAL AND FINANCIAL ASPECTS OF THE ACTIVE NATURAL DISASTERS POLICY IN THE EXAMINED AREA

On the national, regional and local level the primary meaning in executing the natural disasters policy by the Prime Minister with the Government and the Parliament has the Constitution of the Republic of Poland. The Constitution is completed adequately on the lower levels of the administration by the acts: about the Voivodship Self-Government [14]; about the County Self-Government [13]; about the District Self-Government [12]; and about the Voivod and the Government Administration in the Voivodship [16]. According to the article number 228 of the Constitution, in the situations of the extreme danger, such as the natural disaster, if the normal constitutional measures are insufficient, it can be introduced the adequate extraordinary state: the war state, the exceptional state or the natural disaster state [5]. In the case of the last state, the principles of proceeding are precised in the different law – the Act on State of the Natural Disaster [15].

TABLE I. EXPENDITURES FOR PERMANENT ASSETS SERVING THE WATER MANAGEMENT IN THE AREA OF POLAND IN THE YEARS 1998-2014 – DIRECTIONS OF INVESTING (IN '000 US DOLLARS INDEXED TO THE YEAR 2014)

1.	2.	3.	4.	5.	6.	7.	8.
1998	839585	449581	102822	94581	94881	90829	6891
1999	758926	357734	99894	99705	103438	89713	8441
2000	661674	341009	78781	82407	62001	91952	5524
2001	478205	245702	61105	66724	42151	58776	3747
2002	496348	234709	74993	69868	60969	49859	5949
2003	574527	260808	75527	81256	81542	66217	9176
2004	661217	337843	84035	83739	71532	75779	8289
2005	556263	279890	94588	108694	35178	36391	1521
2006	635590	333196	113496	89584	49495	41903	7916
2007	705957	356388	115223	105740	61640	51457	15509
2008	694669	418321	122634	64671	44764	42248	2032
2009	831052	492325	191420	76094	39084	28668	3462
2010	1014032	511499	201767	125553	63492	106170	5550
2011	869380	362710	114809	151373	103924	117686	18878
2012	740961	297559	99543	104853	70640	149983	18383
2013	784065	261576	114280	184759	89510	108878	25062
2014	965527	286372	149766	210988	145796	150890	21715
total – all years	1226797	582722	189468	180059	122003	135739	16804
	9	2	6	0	8	8	5

1. years, 2. total, 3. intakes and deliveries of water, 4. building and modernization of water conditioning stations, 4. water reservoirs and stages, 5. regulation and development rivers and streams, 6. levees, 7. pump stations on breaking downs and depression areas
Source: Own study on the basis of: [4, 6].

Expenses for permanent assets serving the water management in Poland in the years 1998-2014 according to directions of investing are presented in the table I. Total

expenses for permanent assets serving the water management in Poland in the years 1998-2014 amounted approximately 12.3 billion US dollars indexed to the year 2014. Total expenses were decreasing after the great flood in 1997. The highest level of total expenses and expenditures for levees, and water reservoirs and stages was noted a year after the great flood in 2010.

Effects of investing in the water management in the years 2003-2014 in Poland are presented in the table II. As we can see, data from this table are corresponding with data from the table I. In the period 1998-2013, there were built 216 water reservoirs and 2467 km levees. Almost 37% length of levees were built after the great flood 2010.

TABLE II. EFFECTS OF INVESTING IN THE WATER MANAGEMENT IN THE YEARS 1998-2014 IN THE EXAMINED AREA

1.	2.	3.	4.	5.	6.	7.	8.	9.
units of measure	'000 m3	'000 m3	km	unit	'000 m3	km	unit	km
1998	404109	182460	11018	84	8669690	309	20	777
1999	325131	381785	8832	46	682633	266	11	447
2000	300619	172532	7837	52	8075070	204	19	205
2001	138945	111453	6381	41	24257111	163	15	527
2002	172609	101296	6582	45	31725159	103	25	609
2003	142916	91834	7348	18	30853335	190	24	859
2004	152414	164025	7471	23	5619229	243	11	597
2005	98404	146768	5576	13	51867123	78	6	280
2006	100977	125048	5869	7	4166906	102	0	222
2007	101297	87864	5169	11	5258508	95	8	326
2008	141291	104033	4979	13	54994410	248	11	416
2009	160668	125738	4693	6	125831	60	8	246
2010	106266	127796	6271	5	214093	110	3	299
2011	67075	68490	5185	10	4184474	305	16	654
2012	70503	76711	4028	3	510327	305	12	385
2013	78366	118300	4315	8	4872504	156	6	297
2014	57444	71563	4043	13	635664	308	6	374
total – all years	1589175	1520919	77909	216	219284674	2467	151	6089

1. years, 2. intakes – efficiency per 24 hours, 3. water conditioning per 24 hours, 4. water supply system, 5. water reservoirs – total number, 6. water reservoirs – total capacity, 7. levees, 8. pump stations on breaking downs and depression areas, 9. regulation and development rivers and streams
Source: Own study on the basis of: [4, 6].

TABLE III. EXPENDITURES FOR PERMANENT ASSETS SERVING THE WATER MANAGEMENT IN POLAND – DIRECTIONS OF FINANCING SOURCES IN THE YEARS 2002-2013 (IN '000 US DOLLARS INDEXED TO THE YEAR 2014)

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
2002	496348	239242	41512	36409	569	3853	39448	81614	20638	33064
2003	574527	233812	37670	43141	674	5983	129787	78371	20490	24598
2004	661217	258632	33077	51125	54	4250	132750	101178	37617	42534
2005	556263	256604	62083	27470	191	6893	61131	90806	25891	25194
2006	635590	296337	43779	40489	286	8162	94407	72781	48822	30526
2007	705957	342061	32953	68075	38	7089	95593	71135	56687	32325
2008	694669	357585	43033	51455	1190	11031	82125	82293	40625	25331
2009	831052	351232	34419	42136	1507	6931	173892	118004	57481	45449
2010	1014032	435617	71291	68442	215	8869	192490	128045	85518	23544
2011	869380	294186	66157	73212	241	13102	188484	158756	52487	22753
2012	740961	251540	69038	65351	355	11239	173844	128253	27284	14057
2013	784065	246855	121670	43288	388	7995	198262	132342	24051	9215
2014	965527	263117	109653	85071	615	9104	300323	124443	53309	19891
total – all years	9529589	3826819	766335	695664	6324	104503	1862537	1368024	550901	348482

1. years, 2. total, 3. own measures, 4. measures from the central budget, 5. measures from the budget of voivodeship, 6. measures from budgets of counties, 7. measures from budgets of municipalities, 8. measures from foreign countries, 9. ecological funds, 10. country credits and loans, 11. other measures
Source: Own study on the basis of: [4, 6].

Expenditures for permanent assets serving the water management in the examined area in the years 2002-2013 according to directions of financing sources are presented in the table III. As we can see, the main source of expenses were own measures of investors. From these source, there were financed 40% of total expenditures in the examined period which totally exceeded 9.5billion US dollars.

Expenses for water management were co-financed from ecological funds. One of these funds is the Fund for Environmental Protection and Water Management. Charges and incomes to this fund in Poland in the years 2002-2014 amounted over 5.4 billion US dollars. As we can see in the table IV, incomes from charges for air protection and climate were the main part of total incomes and amounted approx.2.4billion US \$.

TABLE IV. CHARGES AND INCOMES TO THE FUND FOR ENVIRONMENTAL PROTECTION AND WATER MANAGEMENT IN POLAND IN THE YEARS 2002-2014 (IN '000 US DOLLARS INDEXED TO THE YEAR 2014)

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
2002	0	0	0	0	0	0	0	0	0
2003	22718	519066	173243	236851	78476	0	30495	47678	4132
2004	28755	542918	148661	280166	83755	0	30336	39353	12847
2005	20502	426886	121630	211590	61342	5	32319	23290	5942
2006	36126	493505	139331	254956	82850	7	16362	7169	1482
2007	20091	530873	143953	259016	107263	25	20616	8993	1113
2008	24856	569718	137807	250675	160116	1	21119	8417	1051
2009	20419	551652	132155	193014	207816	0	18666	19493	1288
2010	13247	552943	129859	205171	203234	2	14676	24122	1720
2011	19276	532117	128475	211758	186113	50	5770	22821	1822
2012	14113	485165	125114	192422	158393	0	9235	16669	3530
2013	8628	227432	58415	87853	73612	0	7551	12270	2465
2014	7230	413307	116797	162615	114414	0	19480	9263	1834
total – all years	228732	5432274	1438645	2383473	1402972	89	207146	230274	37392

1. years, 2. level of measures at beginning of the year, 3. total incomes, 4. incomes from charges for wastewater management and water protection, 5. incomes from charges for air protection and climate, 6. incomes from charges for waste management, 7. incomes from charges for other fields, 8. other incomes, 9. administered penalties, 10. incomes from penalties
Source: Own study on the basis of: [4, 6].

Investing expenses for the low water retention in Poland in the years 2003-2014 according to investing directions are presented in the table V. As we can see, investing expenditures for man-made water reservoirs exceeded 167 million US dollars. Total investing expenses for the low water retention amounted approximately 245 million US \$. The highest levels of total expenses were noted after the great flood in 2010.

Investing expenses for the low water retention in Poland in the years 2003-2014 according to financing sources are presented in the table VI. As we can see, expenses were financed mainly from structural funds of the European Union and from the other sources.

TABLE V. INVESTING EXPENSES FOR THE LOW WATER RETENTION IN POLAND – DIRECTIONS OF INVESTING IN THE YEARS 2003-2014 (IN '000 US DOLLARS INDEXED TO THE YEAR 2014)

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	fishponds	other
2003	21142	13912	2064	76	62	2651	2377
2004	22327	16697	2098	22	290	982	2237
2005	7271	4957	544	69	88	1241	373
2006	19235	15255	1552	44	292	1709	383
2007	23211	15186	4863	140	969	1149	904
2008	12561	6697	2476	6	81	1524	1778
2009	13853	10342	1895	0	15	1349	151
2010	17619	9426	4142	3	2366	1515	1
2011	29323	21251	4834	160	751	1392	934
2012	17683	10322	3844	7	977	1069	1464
2013	28267	21786	3735	784	0	597	1365
2014	32655	21283	7933	61	83	2152	1141
total – all years	245147	167115	39980	1372	5973	17330	13109

Source: Own study on the basis of: [4, 6].

TABLE VI. INVESTING EXPENSES FOR THE LOW WATER RETENTION IN POLAND IN THE YEARS 2003-2014 – SOURCES OF FINANCING (IN '000 US DOLLARS INDEXED TO THE YEAR 2014)

years	total	from budget of Voivod	from Fund for Environmental Protection and Water Management	from Fund for protection in rural areas	from structural funds	from budgets of self-governments	other
2003	21142	5936	1562	1612	0	1374	10657
2004	22327	8187	6439	934	0	965	5801
2005	7271	1999	2351	376	0	755	1791
2006	19236	5121	5856	1925	0	3143	3191
2007	23211	2609	4024	310	0	5390	1701
2008	12561	3054	2296	511	2850	1760	2090
2009	13853	855	2807	569	3527	2965	3131
2010	17619	2217	91	905	9245	1843	2488
2011	29323	3968	3971	686	14711	3278	3395
2012	17683	3182	1737	984	152	2947	8834
2013	28267	4808	1674	1513	16622	1902	18371
2014	32655	6024	59	0	16782	3662	22911
total – all years	245147	47959	32865	10326	63889	29982	84360

Source: Own study on the basis of: [4, 6].

Effects of investing in the low water retention are presented in the table VII. The range of objects in Poland in the years 2003-2014 amounted 6750. Total increasing capacity in the examined period exceeded 87061 m³.

TABLE VII. EFFECTS OF INVESTING IN THE LOW WATER RETENTION – THE RANGE OF OBJECTS IN POLAND IN THE YEARS 2003-2014

years	obje cts	increasingca pacity	staging of lakes		artificialwaterres ervoirs		fishpo nds	stagingstruct ures		oth er	surfac e of irrigat ion
	1.	2.	1	2.	1.	2	1.	2.	1.	1.	(ha.)
2003	253	10824	1	293 7	62	6185	130	1702	60	0	1517
2004	162	13162	2	597 4	52	6348	69	841	39	0	1049
2005	171	4943	1	199 7	34	1928	84	1018	52	0	718
2006	665	9568	2	171 7	42	6068	567	1783	54	0	1356
2007	292	5940	3	793	92	4516	55	631	142	0	808
2008	249	4751	2	155	104	1686	82	2910	48	13	285
2009	171	6204	1	0	62	1526	80	4678	16	12	830
2010	3604	7456	6	457 9	3503	1126	60	1751	34	1	8935
2011	377	6821	3	155 6	90	4188	81	1077	200	3	785
2012	245	11475	9	493 8	113	5206	87	1331	29	7	924
2013	370	3285	0	0	141	2783	40	502	178	11	661
2014	191	2633	0	0	96	2045	58	589	26	11	2472
total - allye ars	6750	87061	3 0	246 45	4391	43604	1393	1881 1	878	58	20340

1. objects (units), 2. capacity ('000 m³)

Source: Own study on the basis of: [4, 6].

IV. CONCLUSIONS

After the analysis of active natural disasters policy in Poland, the following conclusions can be drawn.

The hypothesis from the beginning of the article was verified positively: the active natural disasters policy in Poland changed after the great flood in the year 2010. Thus, the answer for the research question of the article is: the natural disasters policy after 2010 is different than the before 2010.

In the examined area, the active natural disasters policy is financed from the central budget and budgets of local (self-governments). Expenditures are supported by means, among others, from foreign, environmental funds, loans and advances.

Expenses for permanent assets serving the water management in Poland in the years 1998-2014 according to directions of investing amounted 12.3 billion US dollars indexed to the year 2014.

Total expenses were decreasing after the great flood in 1997. The highest level of total expenses and expenditures for levees, and water reservoirs and stages was noted a year after the great flood in 2010, in the year 2010 and next years.

In the period 1998-2013, there were built 216 water reservoirs and 2467 km levees. Almost 37% length of levees were built after the great flood in 2010.

The main source of expenses were own measures of investors. From these source, there were financed 40% of total expenditures in the examined period which totally exceeded 9.5 billion US dollars.

Incomes from charges for air protection and climate were the main part of total incomes of the Fund for Environmental Protection and Water Management and amounted approx. 2.4 billion US \$.

Investing expenditures for man-made water reservoirs exceeded 167 million US dollars. Total investing expenses for the low water retention amounted approximately 245 million US \$. Expenses were financed mainly from structural funds of the European Union and from the other sources. The highest levels of total expenses were noted after the great flood in 2010.

The range of objects of the low water retention in Poland in the years 2003-2014 amounted 6750. Total increasing capacity in the examined period exceeded 87061 m³.

REFERENCES

- [1] Abbott P. L., *Natural disasters*, San Diego State University, San Diego 2009.
- [2] Alexander D., *Natural disasters*, Wydawnictwo Springer Science & Business, Berlin 1993.
- [3] EM-DAT: OFDA/CRED (2012), <http://www.emdat.be> (31.10.2015).
- [4] GUS, Bank Danych Lokalnych, http://www.stat.gov.pl/bdl/app/strona.html?p_name=indeks, 30.10.2015.
- [5] Konstytucja Rzeczypospolitej Polskiej (1997), Dz.U. 1997, nr 78 poz. 483.
- [6] MyBank.pl, <http://kursy-walut-kupno-sprzedaz.mybank.pl/>, 31.10.2015.
- [7] Z. Piepiora, Ekonomiczne aspekty lokalnej polityki przeciwdziałania skutkom katastrof naturalnych, wyd. Zbigniew Piepiora, Kowary 2012.
- [8] Z. Piepiora, The law and economic aspects of counteracting the natural disasters' effects in the area of Poland, w: Корецкий Н. X. (red.) Современный Научный Вестник, No 4 (116) 2012, Wydawnictwo Руснаучника, Коллектив авторов, Белгород 2012, ISSN 1561-6886, s. 104-119.
- [9] Z. Piepiora, A. Babczuk, M. Kachniarz, Financing the Counteraction of Natural Disasters' Effects in Lower Silesian Voivodeship, DOI 2991-10-01, <http://www.atlantis-press.com/php/pub.php?publication=icmemi-15&frame=http%3A//www.atlantis-press.com/php/paper-details.php%3Ffrom%3Dsession+results%26id%3D16211%26querystr%3Ddid%253D304>, Atlantis Press 2015, p. 215-221.
- [10] J. Rodzik, Wpływ deszczów ulewnych i roztopów na rozwój wąwozu lessowego, w: Landform Analysis, Vol. 8, wyd. Stowarzyszenie Geomorfologów Polskich, Poznań 2008.
- [11] U. Somorowska, Wzrost zagrożenia suszą hydrologiczną w różnych regionach geograficznych Polski w XX wieku, w: Prace i Studia Geograficzne, tom 43, Uniwersytet Warszawski, Warszawa, 2009, s. 97-114.
- [12] Ustawa z dnia 8 marca 1990 roku o samorządzie gminnym, Dz. U. z 1990 r. 142, poz. 1591 z późniejszymi zmianami.
- [13] Ustawa z dnia 5 czerwca 1998 r. o samorządzie powiatowym, Dz. U. 1998 nr 91 poz. 578 z późniejszymi zmianami.
- [14] Ustawa z dnia 5 czerwca 1998 r. o samorządzie województwa, Dz. U. 1998 nr 91 poz. 576 z późniejszymi zmianami.
- [15] Ustawa z dnia 18 kwietnia 2002 r. o stanie klęski żywiołowej Dz. U. 2002 nr 62 poz. 558 z późniejszymi zmianami.
- [16] Ustawa z dnia 23 stycznia 2009 r. o wojewodzie i administracji rządowej w województwie, Dz. U. z 2009 r. nr 31, poz. 206.