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Analysis of the sources of financing for water management in the Polish economy

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ABSTRACT

Environmental protection expenditures stimulate the investment process in each area of environmental protection including water management. Thus, the pace and scope of these investments is dependent on the level of expenditures incurred by both commercial and public sectors, including local government units. In this paper, a comparative analysis of expenditures of the EU countries in Poland in relation to GDP has been presented. A completed study showed some significant differences between various countries; however, some similarities have been seen within the so-called old and new EU members. With regard to new members, some significant progression of the environmental expenditure in relation to GDP has been noticed while in the case of the so-called old countries the relationship remained relatively constant. At the same time, it has been proved in structure analysis that the analyzed amount of expenditures is not determined by the level of development of individual countries. Moreover, higher dynamics of incurred expenses in the New Union compared to countries belonging to the so-called Old Union has been diagnosed. Against this background, the structure of sources regarding financing Poland's water economy has been assessed indicating that the debt including in particular funds mainly from the EU, environmental funds and the state budget are an important source of financing. It should be emphasized that funds obtained from the EU in the period 2005–2010 increased significantly. That increase resulted in reconverting the structure of financing the capital expenditure on fixed assets in water management, whereas in the years 2010–2011, the highest proportion of funds accounted for the funds mainly provided by the EU. Despite a decline in new investments undertaken in the years 2011–2012, it still remains the main source of funding. The regression of investment in water management in the years 2011–2012 occurring especially in business enterprises and municipalities should be a matter of concern.

Keywords: Water management; Investments; Fund

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1. Introduction

Environment protection is a certain set of ideas, which are aimed at maintaining the environment suitable for optimal human existence and ensuring the continuity of some essential processes in the biosphere, which are the basis of human production and consumption activity [1]. As a result, the need to perform the tasks regarding environmental protection is crucial for the steady functioning and existence of the human race at the same time, ensuring a decrease in the level of undesirable environmental changes [2]. Investment processes have been creating favorable conditions for modernization of the economic structure of the country in light of requirements of environment protection and water treatment. Therefore, in this interdisciplinary paper, the main field of research has been concentrated on the comparative analysis of expenditures on environmental protection including water management in Poland as well as selected countries of EU.

1.1. The level of expenditures and investments spent on environmental protection in the European Union in the period 2004–2012

In the context of Polish legislation, the term environmental protection refers to actions or alternatively their omissions, which make it possible to preserve or restore the natural balance. These activities may include in particular: the rational management of the environment and management of environmental resources in accordance with the principle of sustainable development, the fight against pollution and restoration of natural elements to the appropriate state [3].

The Polish classification distinguishes 9 elements co-creating the field of environmental protection, which include in particular [4]: protection of ambient air and the climate; wastewater management and water preservation; waste management; protection and restoration of soil, the use and protection of groundwater and surface water; limiting noise and vibration; protection of biodiversity and landscape; protection against ionizing radiation; research and development activities and other activities related to environmental protection.

Execution of tasks in the field of environmental protection requires incurring certain expenditures by both the public sector and the commercial one. Changes in the level of these expenditures in selected countries of the European Union in the period 2004–2012 are presented in Table 1. An analysis of the table shows that the size and the scope of these expenses vary greatly in different countries belonging to European Union. Environmental protection expenditures (according to Eurostat) are treated as the money spent on activities aimed at prevention, reduction, and elimination of pollution or any other degradation of the environment. Table 1 shows the level of general government environmental protection expenditures as a percentage of GDP. Its analysis indicates that the level of expenditure referred to the local GDP is slightly higher in countries belonging to the so-called old Union. In the UK, its level between 2006 and 2012 fluctuated by almost 1%, in Belgium it ranged from 0.5 to 0.7, in Finland ranging from 0.55 to 0.59 while in Italy it remained relatively stable throughout the period of the test (0.88%). In contrast, a specific feature of the so-called New Union countries is a strong progression of these expenses in the study period. On the one hand, it is due to the inflow of capital investments from the European Union, and on the other, it is forced by the implementation of directives in the field of environmental protection related to the accession to the European Union. An important exception is the level of government expenditure incurred for environmental protection in Slovenia. The value of this indicator is the highest in relation to GDP among all analyzed countries of the EU. In addition, it should be emphasized that Slovenia's accession to the European Union did not increase the growth rate of these expenditures. In relation to GDP this indicator was already very high during the first year of integration with the European Union. It was 0.95% in 2004. Among countries belonging to the so-called New Union, considering the level of these expenses, Lithuanian government sector stands out significantly. In 2004, Lithuania noted government spending on environmental protection in relation to GDP at 0.32%, while in 2012 it reached 0.9. At the same time, it should be emphasized that in Lithuania, Latvia, Croatia, Romania, and Bulgaria, the growth rates of these expenditures were very high. Particularly, noteworthy is a record increase in these expenses by as much as 1,150% in Latvia in 2005 (compared to 2004). This seems to be a result of the use of external sources of funding coming from the European Union. Among the countries of the so-called New Union only in Hungary, the trend since 2004 (i.e. from the accession to the European Union) was variable and it characterized by a decrease in the total expenditure for the period 2007–2012 in comparison to 2004. Against this background, the level of the expenditure in Poland systematically and proportionally increased from the level of 0.3 in 2004 to 0.48% in 2012. Similar phenomena were observed in Slovakia.

The specificity of real investments in environment protection can be distinguished when various countries from the Old and New Union are compared. However, in this aspect, the variation in the new EU

Table 1
Total investment of environmental protection by industry, government (as % of GDP) and general government environmental protection expenditure as % of GDP

Geo/time	Total investment of environmental protection by industry as % of GDP							Total investment of environmental protection by total government in Europe as % of GDP									General government environmental protection expenditure as % of GDP								
	2004	2005	2006	2009	2010	2011	2012	2004	2005	2006	2007	2008	2009	2010	2011	2012	2004	2005	2006	2007	2008	2009	2010	2011	2012
European Union (28 countries)	**0.08**	**0.1**	**0.1**	**0.12**	**0.11**	**0.1**	**0.1**	**0.13**	**0.14**	**0.14**	**0.14**	**0.14**	**0.15**	**0.13**	**0.14**	**0.12**	**0.61**	**0.65**	**0.69**	**0.67**	**0.67**	**0.75**	**0.7**	**0.68**	**0.67**
European Union (15 countries)	**0.07**	**0.08**	**0.09**	**0.1**	**0.09**	**0.09**	**0.08**	**0.13**	**0.13**	**0.13**	**0.13**	**0.13**	**0.14**	**0.12**	**0.12**	**0.11**	**0.63**	**0.65**	**0.68**	**0.69**	**0.68**	**0.77**	**0.71**	**0.69**	**0.68**
Belgium	na	na	0.06	0.06	0.09	0.07	0.07	0.15	0.09	0.13	0.09	0.08	0.08	0.03	0.04	0.06	0.59	0.53	0.57	0.55	0.56	0.61	0.61	0.7	0.63
Bulgaria	0.48	0.37	0.83	0.4	0.46	0.32	0.25	0.16	0.19	0.19	0.24	0.31	0.3	0.2	0.19	0.18	0.34	0.37	0.39	0.52	0.59	0.64	0.51	0.6	0.73
Czech Republic	0.27	0.25	0.31	0.29	0.23	0.27	0.27	0.34	0.26	0.28	0.15	0.14	0.19	0.28	0.27	0.32	na	na	0.51	0.36	0.35	0.43	0.52	0.51	0.56
Spain	0.11	0.11	0.12	0.1	0.07	0.07	na	0,1	0.11	0.13	0.13	0.12	0.15	0.11	0.09	na	0.31	0.33	0.28	0.3	0.29	0.33	0.25	0.26	na
France	0.06	0.07	0.06	0.08	na	0.06	na	0.12	0.14	0.06	0.06	0.07	0.07	0.07	0.08	na	0.54	0.56	0.54	0.54	0.56	0.6	0.59	0.58	na
Croatia	0.37	0.36	0.43	0.54	0.49	0.48	0.23	0.01	0.07	0.05	0.35	0	0.01	0.05	0.26	0.02		0.07	0.08	0.36	0.02	0.02	0.07	0.32	0.26
Italy	0.06	0.13	0.13	0.14	0.12	0.12	na	0.21	0.22	0.22	0.19	0.22	0.22	0.18	0.18	na	0.86	0.86	0.8	0.8	0.84	0.89	0.88	0.88	na
Latvia	0.11	0.09	0.18	0.47	0.23	0.14	0.19	0.02	0.15	0.22	0.19	0.09	0.09	0.06	0.13	na	0.06	0.75	0.73	0.95	0.88	0.88	0.58	0.71	na
Lithuania	0.12	0.14	0.33	0.25	0.16	0.31	0.22	0.13	0.29	0.41	0.55	0.51	0.8	0.96	0.56	0.5	0.32	0.48	0.75	0.89	0.85	1.2	1.36	0.94	0.9
Hungary	0.21	0.17	0.15	0.11	0.1	0.16	0.12	0.36	0.46	0.48	0.2	0.13	0.11	0.27	0.14	0.25	0.7	0.78	0.69	0.32	0.26	0.31	0.46	0.39	0.42
Austria	0.11	0.1	0.09	0.09	0.09	na	na	0.04	0.02	0.03	0.04	0.06	0.09	0.06	na	na	0.76	0.71	0.8	0.75	0.58	0.59	0.5	na	na
Poland	**0.22**	**0.24**	**0.25**	**0.31**	**0.28**	**0.29**	**0.32**	**0.31**	**0.32**	**0.32**	**0.29**	**0.27**	**0.32**	**0.33**	**0.38**	**0.28**	**0.3**	**0.35**	**0.47**	**0.43**	**0.4**	**0.48**	**0.49**	**0.53**	**0.48**
Portugal	0.17	0.16	0.22	0.1	0.1	0.09	0.05	0.13	0.13	0.07	0.09	0.09	0.09	0.07	0.06	0.05	0.47	0.48	0.47	0.49	0.54	0.59	0.51	0.48	0.41
Romania	0.39	0.25	0.31	0.33	0.33	0.2	0.39	0.12	0.1	0.13	0.31	0.32	0.3	0.35	0.45	0.22	0.22	0.23	0.54	0.57	0.58	0.59	0.81	0.95	0.6
Slovenia	0.29	0.32	0.36	0.34	0.29	0.45	na	0.57	0.49	0.43	0.53	0.63	0.87	0.67	0.62	na	0.95	0.82	0.71	0.71	0.81	1.01	0.92	0.94	na
Slovakia	0.44	0.49	0.47	0.31	0.3	0.25	0.22	0.04	0.04	0.05	0.04	0.04	0.03	0.05	0.07	0.09	0.28	0.26	0.26	0.24	0.24	0.27	0.28	0.31	0.32
Finland	0.1	0.09	0.09	0.13	0.1	0.14	na	0.07	0.01	0.08	0.07	0.09	0.06	0.1	0.06	na	0.58	0.52	0.58	0.55	0.56	0.59	0.64	0.59	na
United Kingdom	0.05	0.07	0.09	0.11	0.06	0.02	na	0.08	na	0.11	0.12	0.13	0.13	0.13	0.13	0.15	0.49	na	0.9	0.96	0.91	1.05	1.02	0.94	0.92

Source: Own study based on data Eurostat (na—not available).

countries is also significant. General government total investment in the old Union represents a relatively small percentage in relation to GDP. In Belgium, the implementation of the investment by the government sector accounted for only 0.06% of GDP in 2012. Similar values are characteristic for Spain, France, Austria, Portugal, and Finland. Slightly higher is the share of government investment in Gross domestic Product in the UK since it fluctuated in the range of 0.11–0.15% during the entire study period. In the countries of the so-called New Union two groups of countries, for which the value of investments by the government sector is similar to the old EU countries can be distinguished. This group of countries includes Bulgaria, Slovakia, Croatia, and Latvia. However, it should be emphasized that the lowest level of this relationship is in Croatia (0.02% in 2012) and Slovakia (only 0.09% in 2012). Another group of countries consists of Slovenia, Lithuania, the Czech Republic, Poland, Hungary, and Romania. Similarly as in the previous relationship, the level of government investment undertaken in environmental protection in relation to the value of GDP is the highest (among all surveyed countries) in Slovenia. Importantly, this value during the entire research period was at a high level, reaching the highest magnitude in 2008 (as much as 0.87%) and in 2011, nearly 0.62% of GDP. High levels of realized government investment in environmental protection in relation to GDP can also be observed in Lithuania (0.5% of GDP in 2012). Additionally, a significant increase throughout the whole study period was noted there in 2004 since it was only 0.13% and in 2012 0.5%. Among the countries of the New Union only in the Czech Republic the level of investment in relation to GDP remained at a relatively constant level. In Bulgaria and Hungary, this indicator was changing significantly during the test, which made identifying a permanent trend impossible. In Poland, this ratio varied slightly from 0.31 in 2004 to 0.28 in 2012. This level indicates that the investment realized by general government to protect the environment after the accession to the European Union did not increase growth in relation to GDP.

In addition to the government sector, also the level of industrial operators' investments in the field of environmental protection should be emphasized. The level of investment undertaken by industrial entities in different countries of the European Union in relation to GDP is illustrated in Table 1. Its analysis shows that the value of investment in relation to GDP in the countries of the European Union is also diversified. However, certain differences can be observed in the group of the so-called Old Union countries and the so-called New Union. In developed countries including Belgium, Spain, France, Italy, Austria, Portugal, and Finland, the level of investment in relation to GDP is relatively low and, which is important, it is not subject to any major changes. The lowest level of these investments is in the UK (0.02% in 2011), followed by Portugal (0.05% in 2012), Spain (0.07% in 2012), France (0.06%), Belgium (0.07%), and Austria (0.09%). In addition, the second group of old EU countries characterized by only slightly higher value of discussed relations includes Italy 0.12% in 2011 and Finland 0.14%. It should be emphasized that among this group of countries only in Finland the level of its

Table 2
Foreign aid concerning environmental protection by origins

	2010 Support value		2011 Support value		Dynamics	2012 Support value		Dynamics
	In million EUR	Total in %	In million EUR	Total in %	2011/2010	In million EUR	Total in %	2012/2011
Total	1166.3	100.0	989.8	100.0	84.9	321.8	100.0	32.5
Cohesion fund	1060.3	90.9	936.1	94.6	88.3	266.5	82.8	28.5
European regional development fund	62.5	5.3	25.9	2.6	41.4	35.1	10.9	135.4
NMF and MF EOG (Norway, Liechtenstein and Iceland)	29.9	2.6	18.1	1.8	60.5	–	–	–
LIFE + Financial instrument	13.6	1.2	9.5	1.0	69.6	20.0	6.2	211.2
SIDA (Sweden)	–	–	0.2	0.0	0.0	–	–	0.0
PHARE	–	–	–	–	–	0,2	<0.1	0.0

Source: Own study based on [16].

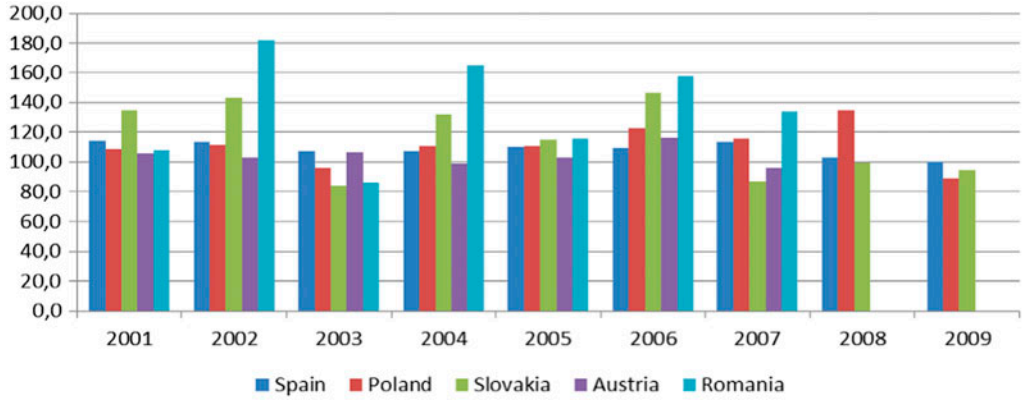

Fig. 1. The dynamics of the total expenditure on environmental protection in selected EU countries (in % yoy). Source: Own study based on data Eurostat.

investments in the area of environmental protection by commercial sector was much higher against the government investment. This relationship was present throughout the study period. An inverse relationship is present regarding the level of investment in environmental protection in the United Kingdom. For the UK, the level of investment of the government sector far exceeds the size of investment undertaken by the commercial sector in relation to GDP. In other countries of the old EU, the value of launched investments by the industrial sector in relation to GDP did not differ significantly from the investment undertaken by the central budget.

In the group of new EU countries, the value of investments in the industrial sector in relation to GDP significantly exceeded the value of indicators noted by countries of the old EU. Among the group of new EU countries with a high level of investment undertaken by the commercial sector Slovenia, Romania, Poland, the Czech Republic, and Slovakia should be indicated. Like the other two relationships, the highest level of investment undertaken by the industrial sector in GDP ratio is characterized by Slovenia. In 2011, this ratio was at 0.45%, the highest rate among all EU countries. High levels of this indicator was characterized by Romanian investments in the industrial sector (in 2012, almost 0.4%). In Poland, the share of investment in the sector in relation to GDP also remained at a high level throughout the study period. In 2004, it was approximately 0.22%, while in 2012 as much as 0.32%.

The presented research shows that general government expenditure on environmental protection in relation to GDP in developed countries is relatively lower than in the countries of the New Union between the years 2004 and 2012. It should also be noted that the value of investments by the commercial sector is also higher in the New Union.

Analyzing the level of expenditure in environmental protection, a dynamic pace of change was also assessed. Fig. 1 illustrates the dynamics of the total environmental expenditure in selected countries. The presented data show that in 2008 and 2009, the growth rate of these expenditures in Spain and Slovakia decreased significantly. This reduced growth indicates the impact of sub-prime crisis and suspended, in particular, real investments. However, the lack of data presented by Eurostat makes it difficult to complete a full analysis in this regard [5].[1] Reducing the environmental expenditure took place in Poland and Slovakia only in 2009, which is due to a drop in GDP growth due to the impact of the financial crisis.

Analyzing the value of the expenditure on environmental protection, the group of engaged parties should be distinguished. The subject structure of environmental expenditure with regard to the public sector, industry (mining and quarrying, manufacturing and electricity, gas and water supply) and specialized producers of environmental services (public and private enterprises specialized in production) has been illustrated in Fig. 2. An analysis of the figure shows that in countries belonging to the so-called New EU expenditure on environmental protection were implemented mainly by the government and business sector. In Poland, the total value of the expenditure throughout the study period by the private and public

[1]Incomplete database published by EUROSTAT for the analyzed parameter for most of countries for the years 2008–2009 and the complete lack of data for subsequent years should be emphasized.

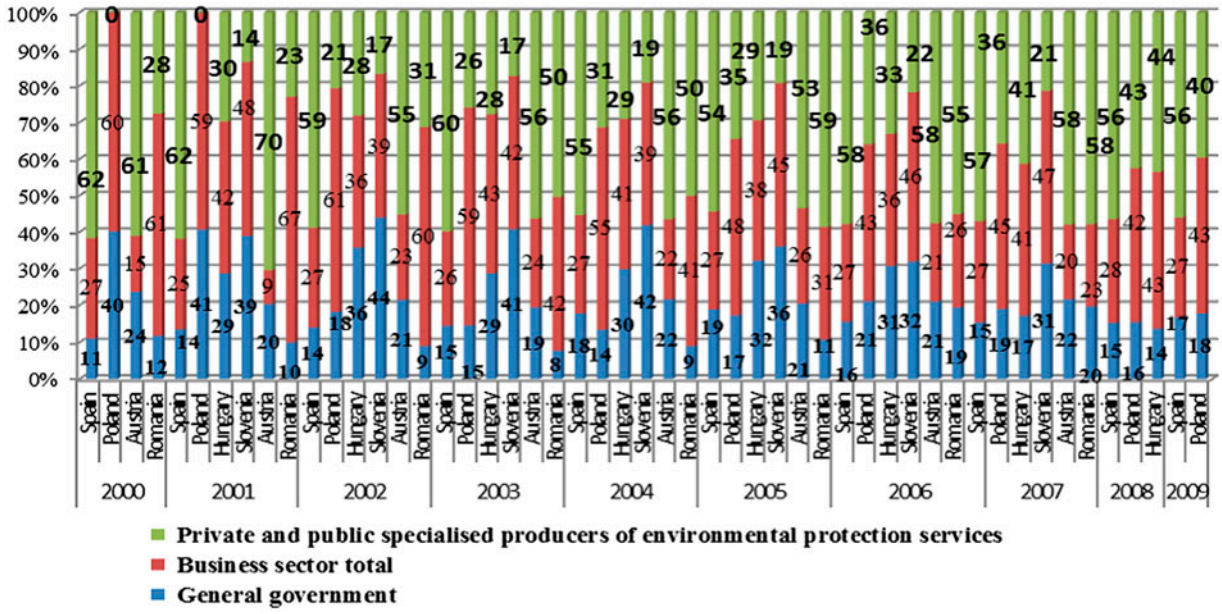

Fig. 2. Subject structure of expenditures on environment protection in particular EU countries between 2000 and 2009. Source: Own study based on data Eurostat.

specialized producers of environmental services was steadily increasing (from 21% in 2002 to 43% in 2009). Similar trends are characteristic for such countries as Slovenia, Romania, and Hungary. However, the strongest growth occurred in Romania where already in 2003, the share of environmental protection expenditures incurred by these entities, was close to 50% and in subsequent years it systematically expanded to reach in 2009 the level of 58%. However, in Slovenia until 2005, the share of the government sector expenditure significantly decreased whereas stronger growth in business expenditure was observed. As a result, there was the slowest growth in expenditures on environmental protection implemented by private and public producers of specialized environmental services. Similar trends were characteristic for the expenditure carried out by operators in Hungary. A systematic increase in private and public spending of specialized producers was accompanied by a proportional decrease in both the government sector and business spending.

In developed countries such as Austria and Spain, expenditures on environmental protection of private and public specialized producers are dominant and in all studied periods significantly exceeded 50%. In addition, in all tested periods, a higher share of business sector expenditures was observed compared with government spending in total investments.

1.2. Analysis of capital expenditure on Polish water management in the years 2000–2012

Wastewater management and water protection is one of the components of the field of environmental protection[2] [4]. Wastewater management and water protection by the nomenclature includes in particular sewerage network management, pollution prevention through the modification processes, wastewater treatment, cooling water treatment, measurement, control, laboratory activities, and other activities in the field of wastewater management and water conservation.

Execution of tasks in the field of environmental protection including in particular water management requires making some investment processes. Because these processes through the implementation of their core functions, enable the creation and modernization of fixed assets in all areas of human activity. These activities make it possible to increase production capacity and service (tangible and intangible), but are also suitable for improving the working and living conditions of the population. At the same time, the literature on the subject emphasizes even more

[2]The introduction of this regulation resulted from the necessity of consideration of environmental issues in the economic aspect and in particular with international comparisons. As a result, an appropriate category of activity and equipment specific to the activities in the field of environmental protection was implemented.

important function of the investment, which is equalizing the level of economic development in various areas, as well as creating conditions for modernization of the economic structure of the country in light of requirements concerning environmental protection [5,6].

Analyzing the level of the capital expenditure incurred on water management in Poland, the level of total investment of water waste management realized by general government and private and public specialized providers of services of environmental protection in two dichotomic groups was assessed. Besides the specificity of the old EU countries covering 15 countries and aggregate data for the EU (28 countries) was taken into account. The data are presented in Fig. 3.

The analysis of the figure shows that the type of entity performing it determines the level of ongoing investment in this area. In the group of the so-called old member states (15 countries), the level of investment undertaken by private and public specialized producers of environmental protection services almost 3 times exceeded the investments of the government sector. Nevertheless, for a group of 28 countries, this disparity is significantly reduced, but still private and public investments specialized producers are almost twice as high as those undertaken by the government sector. Investment of 15 countries of the EU realized by general government fluctuated greatly throughout the study period. In 2001–2003, the level was much lower than the value in 2000. Then again, in 2004 and 2005, their level significantly decreased. However, the period between 2006 and 2008 was characterized by strong economic growth. Regression of these investments occurred in 2009, when the level of almost 9% was exceeded and was the result of the effects of subprime crisis of 2008. Private and public investments of specialized producers launched in the old EU countries (EU-15) between 2000 and 2007 systematically increased (only in 2005 decreased by 3%). However, in 2008–2009, the decline was significant because in the first year of the crisis in 2008 a decrease by more than 7% was observed compared to 2007 and in 2009 by more than 3.3% compared to 2008. As a result, the level of undertaken investment was still lower in 2009 than in record 2007. Government investments implemented in 15 EU countries varied significantly. However, between 2006 and 2008, the level increased and only in 2009 and decreased by up to the level of 9%.

Investments within the water management in accordance with the Polish law are compared with the construction and modernization of the intakes used for collecting surface water, ground and mine water. These expenses are related with spending funds on the water main and the distribution network which cover the intakes, wells, filters, pump stations, water mains supply (without connections to buildings and households), and water treatment plants [7]. In addition, these investments include the construction of water quality control laboratories, including automatic water quality sampling stations, storage reservoirs

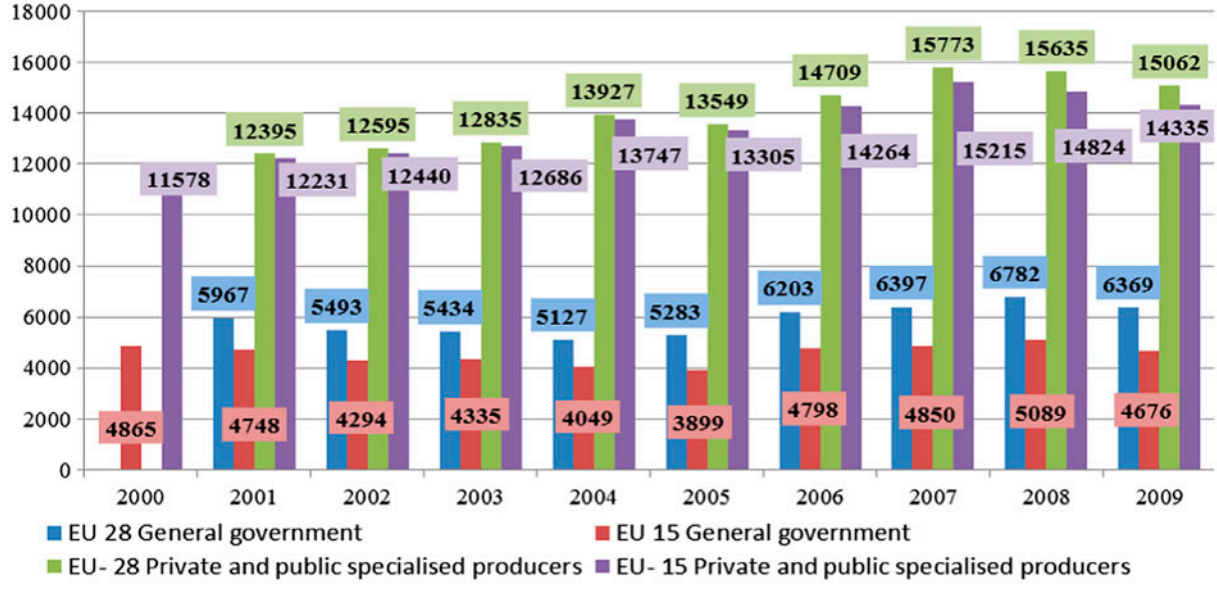

Fig. 3. General government, private and public specialized producers of environmental protection services in relation to total investment of water waste management in EU 25 countries and EU 15 countries (in million euro).
Source: Own study based on data Eurostat.

(tanks fire outside and daily adjustments), barrages, marine and energy and locks and weirs. Other advantages include investments, which include regulations and redevelopment of rivers and streams, flood embankments and the construction and upgrading of pumping stations for collapses and depression areas.

The size and dynamics of investment realized in Polish economy are illustrated in Fig. 4. This analysis shows that accession to the European Union had a significant impact on the level of capital expenditures incurred in the area of water management [8]. The level of investment expenditure increased more than once (growth exceeded 107%) after the accession to the European Union. However, since 2010, the total financial outlays for this part of the economy have decreases significantly and the dynamics of that decline is worrying. It should also be noted that the decrease in capital expenditures incurred in Poland resulted in particular from the decline in economic growth. Inhibition of GDP growth in Poland in 2009–2012 resulted in the total expenditures decrease in 2011 compared to 2010 by 12% (Fig. 4).

In the following year 2012, some further decrease in expenditures by almost 12% could be observed. The dynamics of investment, based on their structure in the analyzed period, is illustrated in Fig. 5. An analysis of the figure shows that despite the decline in total capital expenditures regarding water, outlays for flood embankments and pumping stations increased both in 2011 (by 25%) and 2012 (28%). In contrast, the largest decline in spending was noticed with regard to water treatment plants, water intakes, and supply systems. The most significant declines contributed to the overall reduction in investments in water management in the

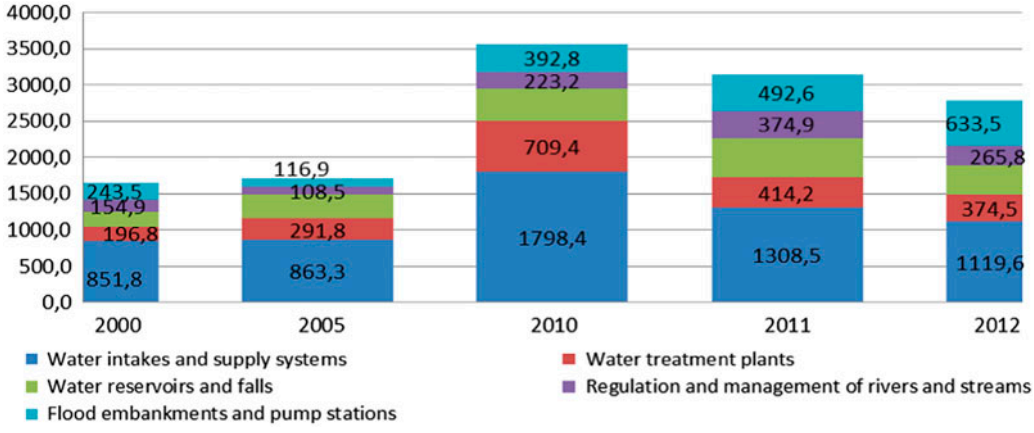

Fig. 4. Structure of investment on water management in Poland between 2000 and 2012 (in million PLN).
Source: Own study based on [16].

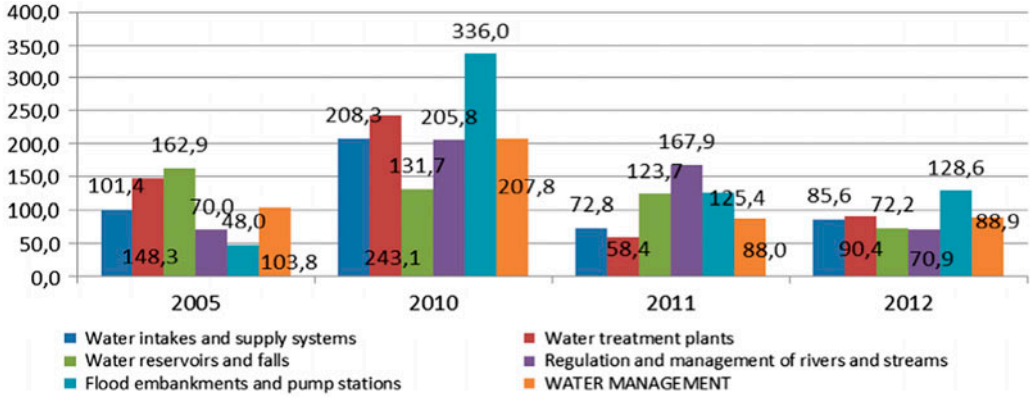

Fig. 5. Dynamics of investment on water management—different types.
Source: Own study based on [16].

analyzed period. This is mainly due to the fact that expenditures on water intakes and supply systems accounted for slightly more than 50% of total expenditures in the first 3 periods of the analysis. Their share in the total sum decreased in 2011 and 2012 to around 40%. It should be emphasized that this decline was accompanied by an increase in the share of flood embankments and pump stations and on the regulation and management of rivers and streams.

1.3. Analysis of financing sources of investment in water management in Poland

Capital-intensive nature of water management investments requires high costs. Regardless of the structure and the type of entity performing them, these investments cannot be realized without any external sources of financing [9]. A standard approach to financing those sources allows one to identify equity provided by the owner and debt capital provided by creditors [10].

The structure of financing for fixed investment in water in Poland in the years 2000–2012 is illustrated in Fig. 6. An analysis of the figure shows that the share of equity in the total sum of fixed investment in water management was the major source of funding in 2000–2005. However, its share in the analyzed period significantly declined. In 2000, this share was slightly above 45%, while in 2012 only 33.95%. This means a parallel proportional increase in the share of the foreign capital in the financing of expenditures on water. Throughout the reported period, the share of foreign financing sources exceeded 50% and in the years 2011–2012, their share rose to 66%. However, it should be emphasized that the dynamic decrease in the share of equity occurred in the years 2011–2012. In addition, it should be pointed out that local government units are important bodies that take investment in water management. Their own contribution to the financing of projects ranged from 17% in 2005 to almost 11% in 2012. The share of own resources engaged in the investments made by other entities ranged from 28% in 2005 to 22% in 2012. This means that own funds were not the dominant source of financing for investment in water management. However, these measures were the main source of funding for these investments by commercial entities in 2000 and 2005, when their value amounted to 750 and 486 million PLN (Fig. 7). In 2010, their value (486 million PLN) was lower only than fixed capital expenditures carried out by municipalities (305 million PLN). In the following two years, that relationship was reversed. Both in 2011 and 2012,

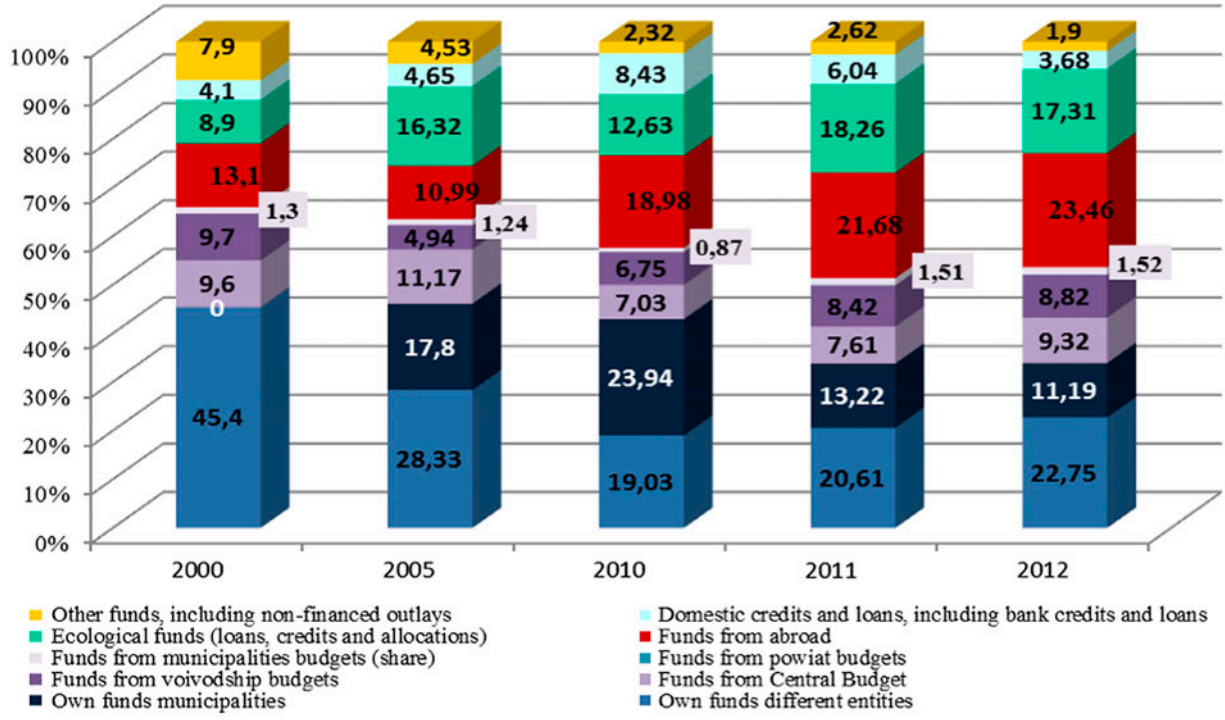

Fig. 6. Source Fund structure of outlays on fixed assets for water management in 2000–2012 in Poland.
Source: Own study based on [16].

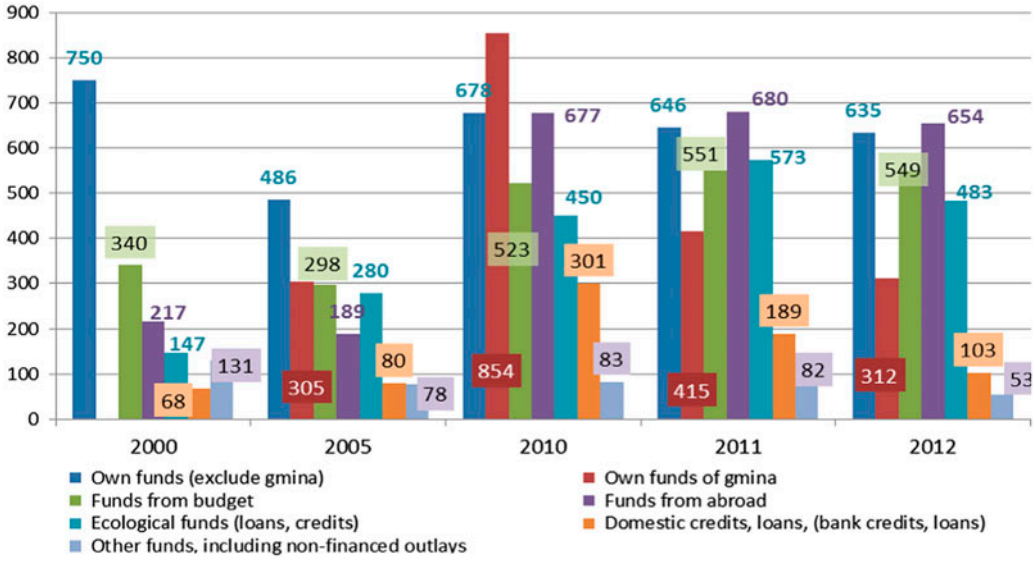

Fig. 7. Outlays on fixed assets for water management by sources of financing in 2000–2012 in Poland (in million PLN). Source: Own study based on [16].

own outlays of commercial entities significantly exceeded the value of equity investments realized by municipalities. It should also be emphasized that regression of own expenditures for fixed assets was significantly higher among municipalities than commercial entities.

Debt is the major source of funding investment activities focused on water management. Taking into account the specificity of investments in fixed assets, several key sources can be identified including structural funds, ecological funds, and funds from the banking sector. In this approach, sources of funding streams, which are financial power investment budget including both measures of the central government, voivodeships, poviats, and municipalities, were evaluated. Their total share in the financing of fixed investments was highest in 2000, when it exceeded 20%. By contrast, in 2010, their share was the smallest and as it was just over 14% of the total sum of the capital. It is important that the share of funds from the central budget and voivodeships is dominant in this group. Funds from the budgets of different counties represent the lowest percentage in the whole study period and do not exceed 0.5%. In addition, funds from the municipal budget, which are co-financing investment projects in water management, represent a small share of the total financial sources. In the analyzed period, the share of funds from the budget of voivodeships significantly changed. In 2000, it was 9.7% (which was the same as the expenditures of the state budget), while in 2005 that share was below 5%.

Expenditures on water management in Poland are also financed by the foreign capital with funds from abroad. In 2010, their combined share in expenditures on environmental protection almost doubled in comparison to 2005 (Fig. 6). However, such a significant increase in share meant a very high increase in expenditures (Fig. 7). The value of investment increased from 189 million PLN in 2005 to 677 million PLN, which is an increase by over 258%. Since 2005, the share of cash from abroad in their total sum steadily increased from 18.98 in 2010 to 23.46% in 2012. Despite the increase in the share of these expenditures in 2012 (compared to 2011), their real value decreased slightly from 680 million PLN in 2011 to 654 million PLN in 2012. This effect was due to a proportionally smaller decrease in expenditures to the total amount of expenditures and other financing sources (including, in particular, expenditures of municipalities and environmental funds).

The main sources of funding for environmental projects in the group of funds coming from abroad include, in particular: The Infrastructure and the Environment Operational Programme, the Cohesion Fund, the European Regional Development Fund or Sida-Sweden.[3] Additionally, funds obtained outside the EU are NMF and MF EEA Norway, Liechtenstein and

[3]Sida-Sweden is a swedish government agency working. Its mission is to reduce poverty in the world. Through cooperation the agency contribute to implementing Sweden's Policy for Global Development.

Iceland, and the LIFE + Financial Instrument [11]. Table 2 illustrates the structure and dynamics of the funds allocated in 2010–2012.

Due to the high level of acquired cash and cash equivalents of the indicated funds also the level and the structure of foreign aid focused on the financing of environmental investments (Table 2) and water management and the protection of waters in 2010–2012 (Fig. 8) were evaluated. In Table 2, the structure and dynamics of foreign aid initiated only in a given year of the analysis were estimated. From this perspective, this statement does not disclose the total value of foreign aid but only this value, which is a newly launched investment. This approach enables the assessment of the investment activity of business entities and municipalities and budget in 2010–2012.

The analysis of the structure of foreign aid (Table 2) indicates that the dominant channel of refinancing the investment in environmental protection is the Cohesion Fund [12]. Measures granted by the fund accounted for 90% of the total appropriations in 2010 and 82% in 2012. It should be emphasized that the growing importance of the support was offered by the European Regional Development Fund. The share of this assistance increased from 5.3% in 2010 to 10.9% in 2012. The value of funds allocated by the Fund in 2011 dropped by over 58% compared to 2010, and in 2012, that increase exceeded 35%.

It should be emphasized that the impact of cohesion policy on socio-economic development in Poland was positive. European funds affected particularly investment activity and hence the economic growth. The Cohesion Fund is important especially for public sector investments. According to the Report of the Ministry of Regional Development, with an increase in total investment outlays by average of about 19%, estimated by Hermin model in 2011–2013 compared to the reference scenario without EU funding in the public sector, implementation of these funds should increase the gross investment on fixed assets by an average of about 44%. This is due particularly to the significant investment in infrastructure, while the private sector even during the peak of transfers, their stimulating effect on the value of investment expenditure only slightly exceeded 12% [13].

Directions of support implemented by foreign funds are shown in Fig. 8. An analysis of the figure shows that support released in the form of supply of foreign funds largely contribute to investments in real water management and water conservation.

In 2010, out of the total pool of funds spent on environmental protection as much as 77% were investments in water protection and management. In 2011, the newly acquired funds accounted for only 33% of the total funds raised from foreign funds. In 2012, this ratio increased to 42%. A worrying phenomenon is a very strong decline in granted new funds in the subsequent years, both in the total expenditure on water management and the total value.

In 2011, the decline in foreign aid aimed at protecting the environment was 15%, while in 2012, it rose to a level of 67% (Fig. 8). Stronger decreases in the value of foreign aid were observed in the area of water management and water conservation in the same period. In 2011, the value of transferred funds decreased compared to 2010 by as much as 65%. The following year that trend stopped and the value of initiated new investments decreased by as much as 56%. This phenomenon is due in particular to a decline in newly started investment by operators and seems to be the result of a decrease in the growth rate of GDP in Poland.

It is worth noting that the regression of foreign aid granted in the year 2011–2012 on water management

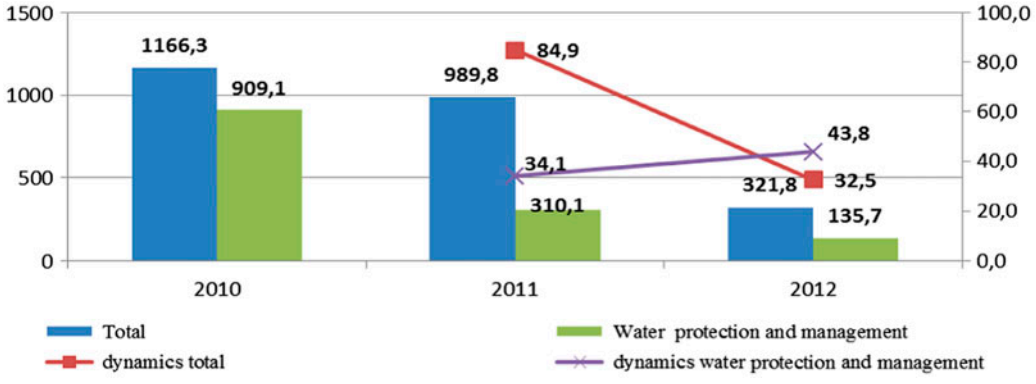

Fig. 8. Direction of foreign aid in total environmental protection, water protection, and management in years 2010–2012. Source: Own study based on [16].

and protection of water was accompanied by a parallel decrease in the capital expenditure on fixed assets in the area of environmental protection (Fig. 4).

In conclusion, it should be noted that Poland's accession to the EU was important for the realization of investments in water management. A significant increase in the share of these funds was observed between 2010 and 2012. However, these measures constituted an important source of funding still in pre-accession period (about 13%). Throughout the analyzed period both before accession to full membership, participation funds from this source increased steadily from 13% in 2000 to 23% in 2012. At the same time between 2010 and 2012, investment activity focused on raising funds from foreign funds to finance fixed investment in water management decreased.

When analyzing the sources of financing of fixed investment in water management, the essence and tasks of Ecological Funds operating in Poland should also be emphasized [3]. The primary institution supporting efforts to protect the environment is the National Environmental Protection and Water Management Fund (NEPaWMF), Voivodeship Environmental Protection and Water Management Fund (VEPaWMF) and both county and municipal funds. These funds support the implementation of environmental investments nationwide and trans-regionally through grants, payment and preferential loans. They also provide credit from the fund by banks and grant subsidies for interest payments for loans on favorable terms.[4] It should be emphasized that the share of this source of funding in total expenditure is significant (Fig. 4). In the year 2000, it amounted to almost 9% and in 2012 over 17%. At the same time, a significant increase in the share of expenditure on fixed assets in their total number in 2000–2005 was observed. This share increased from 8.9% in 2000 to 16.3% in 2005. An inverse relationship was observed in 2010 compared to 2005 when the share fell from 16.32% to 12,639 (in 2010). It should be emphasized that, despite the regression of this relationship (years 2005–2010), the value of realized expenditures increased significantly from 280 million PLN in 2005 to 450 million PLN in 2010. The total value of outlays on fixed assets in water management by the Ecological Funds decreased until 2012 to the amount of 483 million PLN.

The banking sector has an important but the smallest share in the financing of the fixed investment. Participation in the financing of expenditures on fixed assets through the use of bank loans in 2000 accounted for 4% of all expenditures and 3.68% in 2012. Its highest proportion occurred in 2012 and was in fact slightly above 8%. In the years 2000–2010, there was a significant increase in funding outlays on fixed assets granted by the banking system. The value of credits and loans to finance this type of activity was the highest in 2010 and was equal to 301 million PLN, which accounted for only 6% of the total expenditure on water management. In subsequent years, both the share of this source of funding in total expenditure and the value of allocated funds by the banking sector decreased. It should be emphasized that the rate of decline in the lending is very high and was maintained throughout the entire period of 2010–2012. This is worrying because it points to the inhibition of investments in water management.

The activity of the banking sector in the financing of investment in environmental protection is strongly associated with the Ecological Funds. This is because Ecological funds grant loans in cooperation with commercial banks. In Poland, the primary financial institution specializing in credit activities focused on supporting investments in environmental protection is BOŚ SA [14].

Fig. 9 illustrates the level of pro-ecological loans granted by the BOŚ SA for environmental protection, water management, and water protection with cooperation with NEPaWMF and VEPaWMF. The overall level of credits for the protection of ecological environment in cooperation with the National Fund was the highest in 2005 and amounted to 331 million PLN. In the years 2010–2012, there was a sharp decrease in the amount to 31 million PLN in 2011. In 2012, the value of loans increased to 50 million PLN.

The situation was somewhat different in the case of loans granted by VEPaWMF. The fund, together with BOŚ SA subsidized investments in environmental protection in the highest amount of 136 million PLN. In subsequent years, i.e. in 2011 and 2012, that value reached, respectively, the level of 77 million PLN and 89 million PLN. Such changes in the volume of granted loans confirm the preconception related to the inhibition of investment activity of entities pursuing investments in environmental protection. Another worrying phenomenon is a quite noticeable drop in the value of loans granted for environmental protection of water by the National Fund with BOŚ SA. The value of loans

[4]The purpose of the creation of environmental funds was to ensure the independence of the sources of funding for environmental projects from the current state budget and local government units. Their specific form of financing involving mainly the collection of fees and penalties for polluting the environment, allowing them to meet the challenges of environmental protection investment. The interest rate for loans from this fund is dependent on the NBP rediscount rate and determined by the type of entity performing investments.

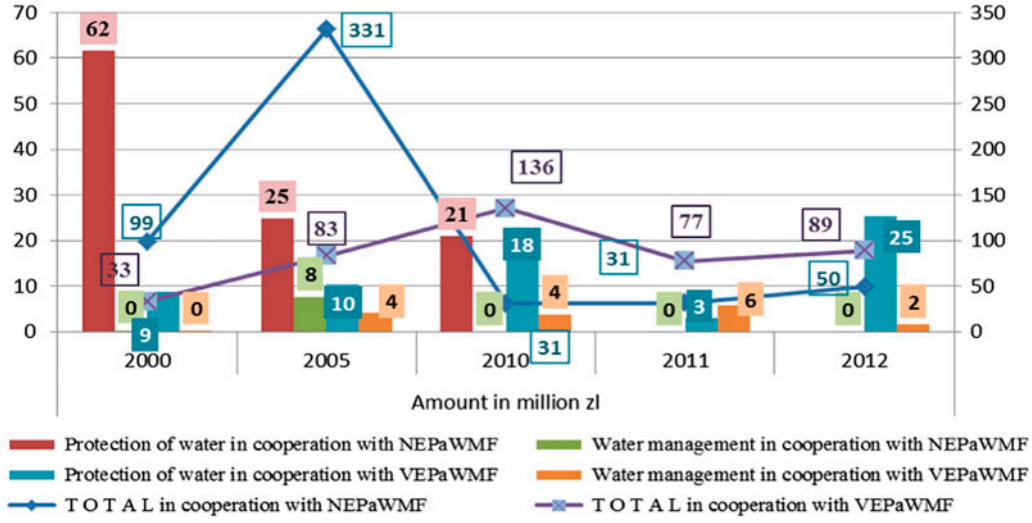

Fig. 9. Pro-ecological loans granted by the BOŚ SA for environmental protection, water management and water protection with cooperation with NEPaWMF and VEPaWMF.
Source: Own study based on [16].

granted by the National Fund for water protection in 2005–2010 decreased steadily with the amount of 62 million PLN to 21 million PLN. This form of financing did not occur at all in the years 2011–12. However, a parallel moderate growth of loans granted by the voivodeship funds for protection of waters in 2000–2010 and a significant decline in 2011 to the amount of 3 million PLN could be observed. In 2012, the value of these loans increased to 25 million PLN. However, taking into account that there was no investments supported by the National Fund in the area at that time, that increase should not be considered satisfactory. Lending activity of BOŚ Bank SA destined on water management by both the National and voivodeship environmental funds was very low. National Fund granted such support in the amount of 8 million PLN only in 2005. In contrast, the value of loans granted in 2005–2012 by the voivodeship fund in cooperation with BOŚ SA was not significant.

The value of investment in fixed assets, including the type of entity is shown in Fig. 10 The data illustrates that the growth rate of total fixed assets outlays in water management in Poland was the highest in 2010 and amounted to 206%. In subsequent years, that positive trend was not maintained, which resulted in total regression of total expenditures in 2011 by 18% and in 2012 by additional 10%. Such a large decline in total expenditures was particularly caused by the strong reduction of property investment carried out by business entities. In the period 2000–2010, the highest growth rate was typical exactly for representatives of the commercial sector. The highest investment activity was observed among businesses in 2010. Such a high level of investment in the sector in 2010 resulted in an increase in the share of all investments up to 45%. However, in the years 2011–2012, their share significantly decreased to a level of 28 and 30%. It may be noted that the effects of economic crisis had the strongest influence on business operators during that period. The phenomenon was most strongly felt in 2011, when capital expenditures decreased by as much as 46% (in 2011–2010) and in 2012 by 2%. As a result, fixed assets investments made by these entities significantly decreased from 1,580 million PLN in 2010 to 860 in 2012. Similar relationships were observed in investment activities of municipalities [15]. The dynamics of investment implemented by these entities also indicates that in 2010 the level of these investments was the highest and increased by as much as 76% compared to 2005. Nevertheless, in contrast to the commercial sector investments of municipalities declined by "only" 10% and in 2012 by additional 16%. Against that background, slightly different relations could be indicated for budgetary entities. These entities in 2005–2011 inhibited only the growth rate of investment in fixed assets. As a result, the level of property investment in August increased steadily by 74% in 2011 and 38% in 2012. The real decline in value of fixed assets occurred only in 2012 and when compared to other entities it was not high (7%). It seems, therefore, that there was a significant conversion of the structure of entities implementing investments in water management. In 2010, the participation of business operators in financing total expenditures was

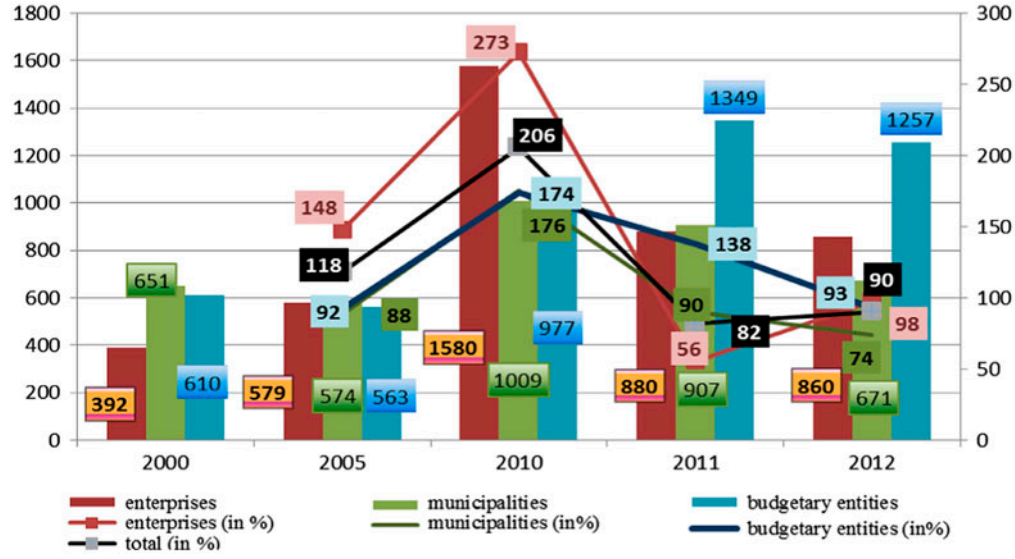

Fig. 10. Value and dynamics of investment in fixed assets in the area of water management, including the type of entity. Source: Own study based on [16].

almost 45%, while in 2012 the highest share (45%) was characteristic for budgetary entities. However, it should be emphasized that municipalities and budgetary entities are the dominant factors in the financing of expenditures on fixed assets.

2. Conclusion

Implementation of environmental tasks forces business operators and local government units to undertake some investment actions. The research results indicate that the level of investment expenditure in relation to GDP in the countries belonging to the so-called old EU is slightly higher than in the case of new member countries. The specificity of the dynamics of investment in the countries of the so-called New Union indicates their strong progression during the study period, which seems to be a result of the accession to the European Union and the necessity of the implementation of EU directives. The phenomenon of a systematic increase in the level of environmental expenditure in 2000–2010 was also observed in Poland. When assessing the level of the government investment, it should be pointed out that in Poland there was a sharp increase in relation to GDP and throughout the study period that ratio remained at a relatively stable level of about 3%. A similar phenomenon was observed taking into account the relation of the industrial sector to the GDP in the field of environmental protection. It should be also emphasized that between 2000 and 2009 there was a conversion of the structure of expenditure on environmental protection with regard to entities pursuing them. In 2009–2010, entities having the highest expenditure on environmental protection were the business sector and the private and public producers of specialized environmental services. An increase in investment in water management in Poland was the highest in 2010. Unfortunately, in subsequent years, the value of investment was systematically reduced, which is also reflected in the analysis of sources of funding. In this aspect, it should be emphasized that investment in water management are funded both through equity, which accounted for approximately 40% of all expenditures in the period 2010–2012. The group of debt sources was dominated by funds from abroad and from environmental funds. The study for the evaluation of the level of funds acquired from the structural funds confirmed a very strong regression of obtained new funds in 2011–2012, which also contributed to the decline in investments made in water management.

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