

ASPECTS OF WATER MANAGEMENT

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Abstract

Mankind could not develop without water. Both for domestic and industrial consumption the quality of water is important. Water is a natural resource. Sustainable development is influenced by the proper management of natural resources. With this in mind, the article presents an analysis of the wastewater volume, depending on the activity sectors. People's health and quality of life, in general, are closely related to the environment. The analysis is made of the statistical data on the number of people benefiting from waste water treatment plant, which are connected to the sewerage system. If the due importance is not given, wastewater may adversely affect the environment. Thus, the article presents the expenditures on environmental protection for producers in the environment field corresponding to water. The demand for resources is increasing, but the amount of resources is limited. This increases the pressure on resources. This leads to an increased environmental degradation and fragility. From this point of view, we need a better use of resources.

Keywords:

Water management, environmental protection, pollution, environment

Introduction

Water and its quality is a key issue that must be taken into account when we consider the eradication of poverty and hunger. The quality of water resources directly affects food security. Also, the temperature increase and climate changes may result in a decrease in agricultural production. These issues have negative effects on livestock activities, as well. Thus, in these conditions, the grazing areas are being reduced, which contributes to lower food production.

The lack of oxygen and an increased accumulation of carbon dioxide in the sea water lead to disruption of food webs. Also, if water changes its quality and characteristics, processes occur that affect biodiversity, by reduction or even loss. Longer droughts may occur in situations that where precipitations are reduced. Also, flooding may occur due to scattered rains, but of high intensities.

Due to climate warming water evaporates at a different pace, leading to increase its salinity. Water, used in the production processes of many commodities, produces changes in terms of technology due to its high salinity.

The article presents an analysis of statistical data on the population served by the public water supply system and connected to the sewerage system. It also presents a comparative volume of wastewater by sectors.

In addition to meeting requirements regarding social and economic needs, people must also benefit from favourable environmental conditions to conduct daily activities.

Generally speaking, one can consider that the environment is a source for resources.

The population is influenced by environmental policies. This influence is reflected in the living conditions. Approximately 77% of the Member States of the European Union consider that environmental problems have a direct effect on their daily lives (EC, 2014). In Romania, this percentage is of 82%.

For the population, the aspects regarding air pollution and water pollution are two of the interest areas. Thus, measures that support environmental protection have increasingly greater success.

Restoring ecosystems degraded by pollution was not based on economic potential, even though the environment offered both the potential for human food and the substance for objects and means of economic activities. Thus, the value gain of economic systems is achieved at the expense of low entropy inflows resulting from the destruction of living or non-living systems of the natural environment (Bran, 2009).

Responsible production and consumption are essential elements for environmental protection. Most EU Member States have implemented a specific legislation in this regard. This approach positively influences the existence and living conditions of the population.

These reconsiderations of the environment can lead to the creation of new jobs and economic growth. From this point of view, it is important to follow the situation concerning expenditures for environmental protection of producers in the environmental field of water. An analysis of statistical data on these expenses is made in this article.

Transition to an economy with low greenhouse gas emissions allows the mitigation of the climate changes effects. However, if the necessary measures are not taken, there is a risk that social differences will increase. The failure to give due importance to environmental aspects can increase the risk of exposing disadvantaged groups to inadequate housing conditions, lack of mobility and the achievement of ill health (EESC, 2014).

For a high resource recovery, it is necessary to examine all phases of the product life cycle. Interventions are important right from the raw material extraction to the product development, production, distribution and consumption, repair and reuse systems, as well as waste management and an increased use of secondary raw materials.

Compared to the situation 25 years ago in Europe, the waters are much cleaner. This is due to investments in wastewater collection systems. These investments were aimed at reducing pollution caused by urban waste (EEA, 2015).

1. Environment protection

Expenses incurred by conducting surveillance activities and environmental protection can be considered among environmental protection expenditures. These expenses refer to the prevention or repair of damage done to the environment (INS, 2016).

Expenses incurred for the purpose of environmental protection are also part of the investments made for environmental protection. Thus, we can mention the costs for construction works, installation and assembly, for the purchase of equipment and means of transport. This category can contain the value of the services related to property transfer of existing fixed assets and lands.

For companies, internal current expenditure for environmental protection involve expenditures for operation, repair and maintenance of equipment for environmental protection. These expenses include salaries and related taxes, as well as material costs (raw materials, fuel, energy, water, etc.).

Regarding environmental protection, certain activities are considered specific activities. Within this category are: preventing and combating pollution (air protection, water protection, waste management, protection of soil and groundwater), and protection of natural resources and biodiversity (species protection, protected areas, remediation and ecological restoration, restoration aquatic environment, the prevention of dangerous natural phenomena).

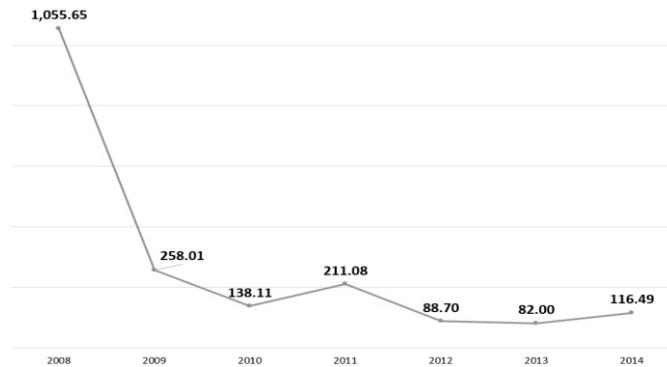
Market services that result in environmental protection activities represent environmental protection services.

Regarding environment protection, there are several categories of manufacturers. Thus, one can distinguish:

- Specialized manufacturers (unit for collection and treatment of waste water, facilities for waste collection, treatment and disposal; recyclable materials recovery activities; remediation services units and establishments dealing with wholesale of waste and scrap);

- Unspecialized manufacturers (forestry units, economic units of mining, manufacturing, production and supply of electricity, gas, steam and air conditioning; units for collection, treatment and supply of water, construction units and units that have transport as their main activity);
- General government sector (central and local government units).

Thus, given the importance of the collection and treatment of wastewater, the following figure shows the variation of environmental protection expenditures of specialized manufacturers for the period 2008-2014 (millions RON).

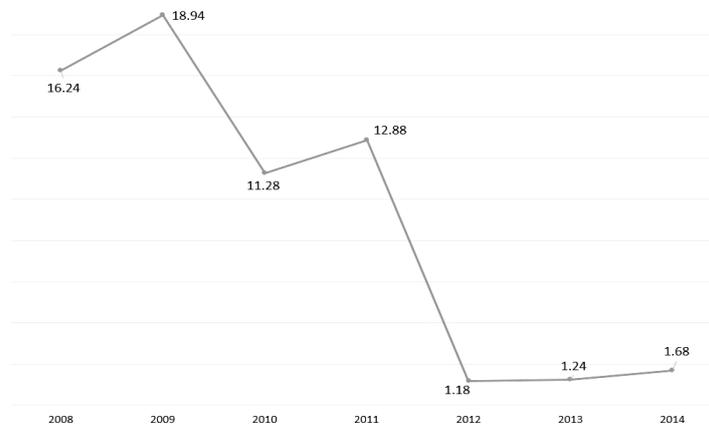


Source: made by the author based on data published on website of INS

Fig. 1 Variation environmental expenditure of specialized producers for the period 2008-2014 (million RON)

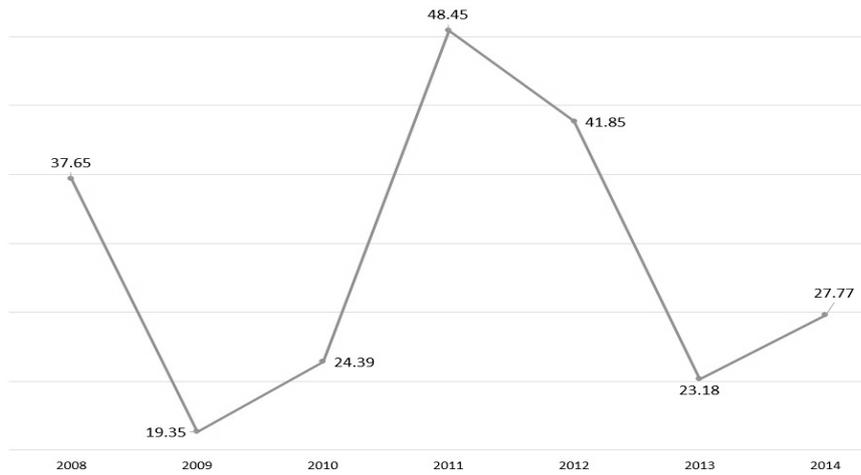
A decrease can be observed, coinciding with the economic crisis in 2008. Following this decline, the value of environmental protection expenditures of specialized manufacturers for collection wastewater treatment activities is relatively constant.

Also for manufacturers specializing in the environmental field of water there was a decrease in expenditures on environmental protection, according to Figure 2. Here, a significant decrease was recorded in 2011-2012.



Source: made by the author based on data published on website of INS

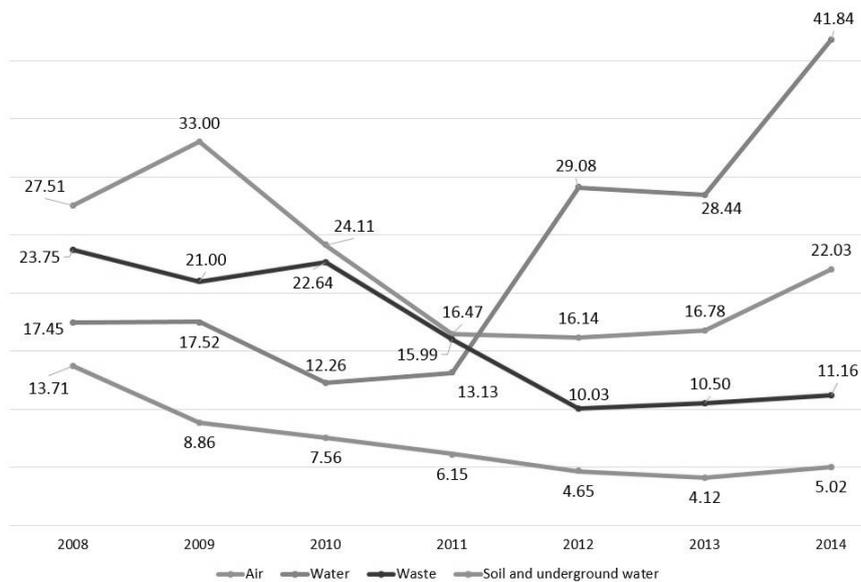
Fig. 2 Variation of expenditures for environmental protection for manufacturers specialized in the field of water suitable environment for the period 2008-2014 (%)



Source: made by the author based on data published on website of INS

Fig. 3 Variation of expenditures for environmental protection for producers in the government sector in the field of water suitable environment for the period 2008-2014 (%)

And the category of producers in the government sector for the period 2008-2009 there was a decrease in expenditure on environmental protection. But for this category, the period 2009-2011 is a time when spending on the environment has increased. After this period, and for this category of manufacturers decrease costs for environmental protection.



Source: made by the author based on data published on website of INS

Fig. 4 Variation of expenditures for environmental protection of key environmental areas for the period 2008-2014 (%)

For the unspecialized manufacturers' category, the expenditures on environmental protection for the main environmental areas are shown in Figure 4. Thus, a decrease in environmental protection expenditures for areas corresponding to air, waste and soil can be observed. At the same time, for the unspecialized manufacturers' category, the environmental protection expenditures concerning water increase.

2. Wastewater treatment

The minimum requirements for collection and treatment of urban wastewater are established by Directive 91/271 / EEC concerning urban waste water treatment. The EU has around 500 million inhabitants. Uncollected and untreated wastewater generated by this population affects both the quality of freshwaters and marine waters. These issues pose a risk to human health and biodiversity (EC, 2016). Thus, in Romania, the population served by the public water supply system is shown in Table 1.

Table 1 Population served by public water supply system (people)

| Regions | 2008 | 2014 |
|---------------------------|------------|------------|
| North-West Region | 1,434,038 | 1,634,948 |
| Centre Region | 1,450,470 | 1,629,593 |
| North-East Region | 1,341,998 | 1,612,880 |
| South-East Region | 1,713,807 | 1,764,447 |
| South-Muntenia Region | 1,594,334 | 1,718,797 |
| Bucharest – Ilfov Region | 1,727,078 | 1,862,414 |
| South-West Oltenia Region | 924,059 | 1,005,990 |
| West Region | 1,150,892 | 1,225,840 |
| Total | 11,336,676 | 12,454,909 |

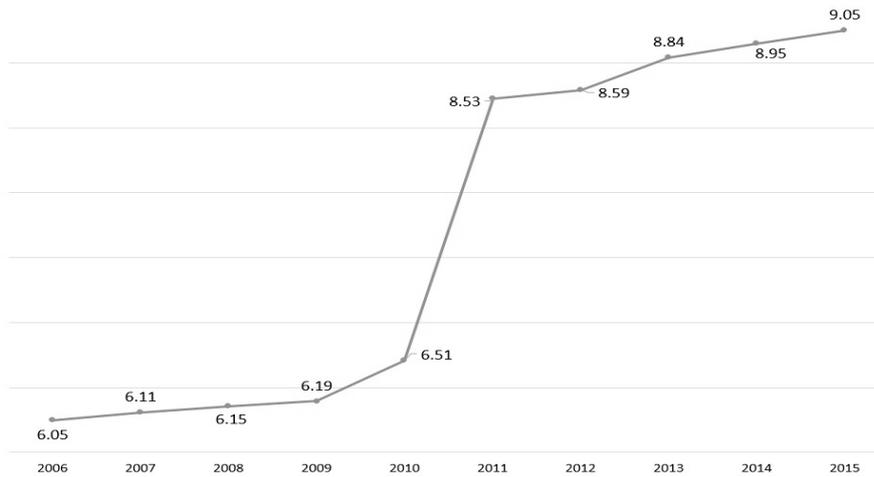
Source: made by the author based on data published on website of INS

Compared to 2008, 2014 registered a significant increase in the number of people benefiting from the public water supply in regions: North-East Region (20.18%), North-West (14.01%), and Centre (12.35%). The lowest increases were recorded in the South-East Region (2.95%).

For them to be disposed together, wastewaters from several sources are collected through a system of canals and pipes called sewage system. Reducing the amount of pollutants in wastewater is achieved through a group of facilities that form the treatment plant.

Romania's population lives mainly in urban areas. Urban waste waters are composed of a mixture of domestic and industrial wastewater. Urban wastewater treatment plants are operated by the settlements' public administration.

Considering these aspects, Figure 5 presents an evolution of the number of people benefiting from waste water treatment plant (millions of people).



Source: made by the author based on data published on website of INS

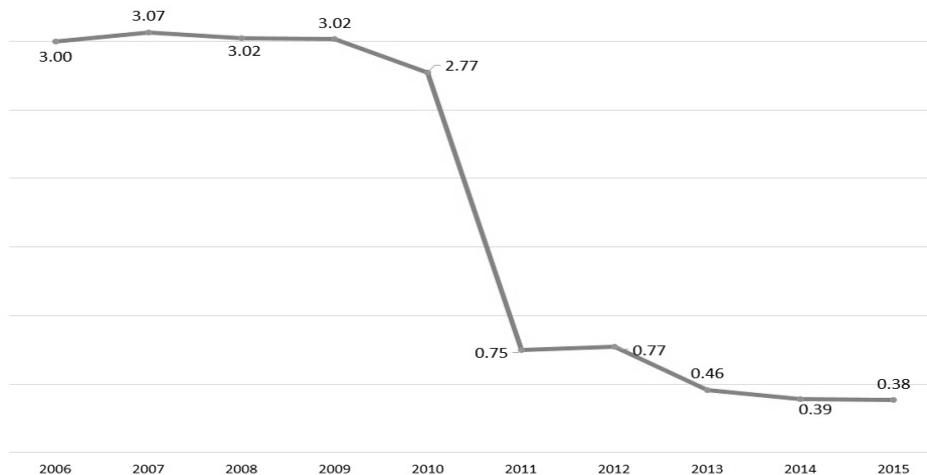
Fig. 5 Evolution of the number of people benefiting from waste water treatment plant (million people)

There is an increasing in the number of people benefitting from waste water treatment plants. Thus, a significant growth is observed for the time period 2010-2011.

Increasing beneficiaries of urban waste water treatment plants may be due to the implementation of projects with European funds. The aim of these projects was to help improve the infrastructure for the collection and treatment of wastewater.

Also, it can be appreciated that the approval and implementation of legislation on water management led to better management of water resources and issues related to protection against depletion and pollution of water resources.

At the same time, it can be observed in Figure 6 that the number of people connected to the sewerage systems without treatment decreased in the time period 2006-2015. For the period of 2010-2011, the increase mentioned in Figure 5 is corresponding to the decrease from Figure 6.



Source: made by the author based on data published on website of INS

Fig. 6 Evolution of the number of people who are connected to sewerage systems without treatment (million people)

By decreasing the population number which is connected to waste water collecting systems without treatment, the waste water no longer seeps into the soil and rivers. Thus, it can be considered to decrease the degree of pollution of rivers and groundwater.

Table 2 shows the volume of wastewater, by sectors of activity, for the years 2006 and 2014 (millions cubic meters / year).

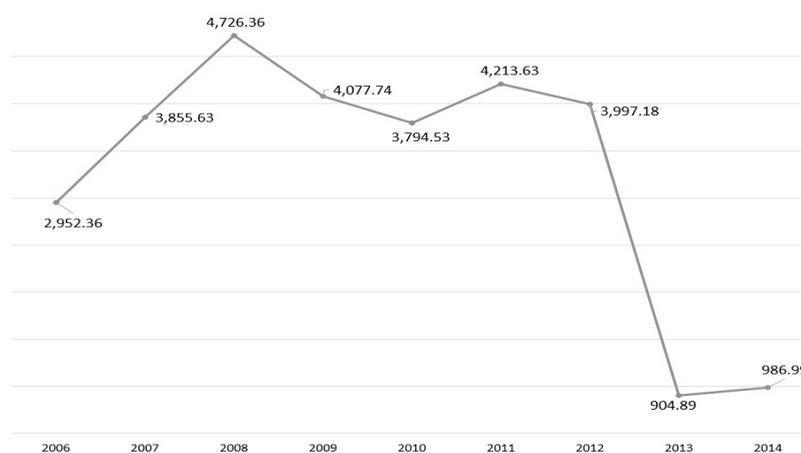
Table 2 Wastewater volume, depending on the sectors for the year 2006 and 2014 (millions cubic meters / year)

| Activity sectors | 2006 | 2014 |
|--|----------------|---------------|
| Total, of which: | 3984.36 | 1974.7 |
| Agriculture, forestry, fishing | 3.69 | 1.82 |
| Mining industry | 80.1 | 54.84 |
| Food processing industry | 44.17 | 25.27 |
| Basic metals | 117.98 | 106.00 |
| Transport | 3.23 | 6.26 |
| Textiles | 12.33 | 6.86 |
| Paper & paper products | 20.38 | 3.19 |
| Chemical products & refined petroleum | 143.61 | 75.51 |
| Production and distribution of electricity | 2223.16 | 580.20 |
| Construction | 3.71 | 6.74 |
| Industrial wastewater – Total | 2952.36 | 1066.99 |
| Domestic wastewater – Total, of which: | 1032 | 907.71 |
| Other activities | 124.41 | 328.42 |
| Households activities | 907.59 | 579.29 |

Source: made by the author based on data published on website of INS

There was a decrease to half of the total volume of wastewater for 2014 compared to 2006. By sectors of activity, the most significant decreases are recorded for: Paper & paper products (-84%) Production and distribution of electricity (- 74%). There are increases in wastewater volume for the following activities, as well: Transport (+ 94%), Construction (+ 82%).

Given the types of sewer systems, Figure 7 shows the volume of industrial wastewater (millions cubic meters / year).



Source: made by the author based on data published on website of INS

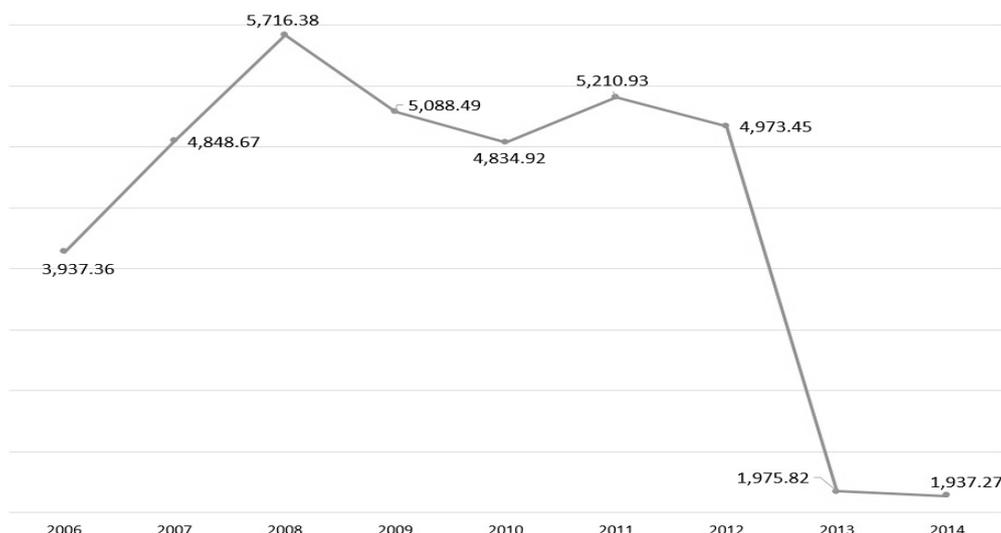
Fig. 7. The volume of industrial wastewater (millions cubic meters / year)

Thus, the total volume of industrial wastewater has decreased for the time period 2011-2014. If before the start of the 2008 crisis, the sewage volume grew, in the period following 2008 there was a decrease of these values.

Reducing industrial activities and introducing the metering systems has led to decreased volume of industrial wastewater.

Waste waters, similar to waters used in industrial production or in households, are discharged through the sewer system into natural receivers (rivers, lakes, Black Sea) or on different terrains, with or without prior treatment.

Figure 8 shows the evolution of the volume of wastewater discharged into natural receivers.



Source: made by the author based on data published on website of INS

**Fig. 8. The evolution of wastewater discharged into natural receivers
(Millions cubic meters / year)**

A decrease in the volume of wastewater discharged into natural receivers can be observed. This decrease can be explained on the basis of the interest granted lately to the management of wastewater.

Conclusions

The investments that can be made in the construction of specific infrastructure lead to the ability to provide quality services related to wastewater. Also, this investment contributes both to the creation of new jobs and to an economic growth in the water sector.

Another important aspect of water management is the possibility of creating partnerships in the field. Through these partnerships, made at the local and regional communities' level, the groundwork for innovative ideas can be laid. Thus, besides wastewater treatment, an intervention can be made for the reuse and recycling of water. Also, given the risks manifested lately on floods, a special attention may be given to floods and drought risk management.

For a better management of the climate changes impact, the urban water supply systems should receive more attention. Otherwise, reducing the importance given to the water supply and treatment systems contributes to increased greenhouse gas emissions.

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