

STATISTICAL ANALYSIS OF THE DYNAMICS OF THE MAIN COMPONENTS OF BULGARIAN ENVIRONMENT

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Abstract. *The article is devoted to some contemporary statistical problems of the environmental study. The objects of the analysis are the state and dynamics of the main components such as air, water, waste, protected natural scenery, noise, expenditure and tangible fixed assets with ecological use. Analyses are made on the ground of data from the National Statistical Institute (NSI) and Executive Environmental Agency at the Ministry of Environment and Water (MOEW).*

Key Words: *environmental statistics, components of the Bulgarian environment, state and dynamics of the main components of the Bulgarian environment*

JEL: C10, C22, C82, Q53.

INTRODUCTION

Environmental studies are described by specific features of different components. Environmental statistics must take into consideration all of them. Most of them will be presented and discussed consecutively in this article. They are good not only for Bulgarian statistics but for Eurostat's activities as well.

1. AIR

The data about the emissions of pollutants in the air is from the National Statistical Institute (NSI) and Executive Environmental Agency at the Ministry of Environment and Water (MOEW). The data about emissions by industrial regions, in which the basic sources of pollution are concentrated, refers to industrial combustible (including heating of public and factory buildings) and industrial processes only. For collection of primary information and estimation of pollutant emissions methods of NSI and MOEW are used,

which are harmonized with the methods developed by European Union CORINAIR. With reference to 2007 third updated variant of the methods is used. The emissions are estimated using a calculation method based on the following indicators: consumed fuels, Sulphur contents, calorific value, quantity of produced output and invested raw materials, as well as emission factors applicable to the respective pollutants.

The emissions into the air are a direct result from the economic activity within the country. The amount of the emitted harmful substances depends both on the quantity of used fuels and produced output and the level of technology used. The most general characteristics of the relation "economy - environment" are contained in the indicator '*emission per unit of GDP*'. Referred to the produced GDP the emissions characterize its resource capacity (energy capacity) and structure [5], [7]. The high consumption of energy for production of unit of GDP is accompanied by large emission per unit of GDP and vice versa.

In a long-term perspective the reduction of emissions per unit of GDP could be due to changes in the technological processes – the usage of resource-saving technologies, purification of the waste gases and production of high-technology output. In a short-term perspective the changes in the emissions per unit of GDP are caused mainly by changes in the GDP structure - for instance, by the increase of the relative share of services at the account of industry.

After 1999 [12], there is a tendency of reduction in the emissions in the air. This tendency could be illustrated by the emission of Sulphur oxides in 2007, which was reduced by 2% compared to 2006. The emissions of the rest of the main pollutants are also reduced in the interval 65 - 93% compared to the previous 2006. The only exception is the emission of ammonia which increased by 5%. The following graph illustrates the tendency towards reduction of Sulphur oxides on the background of increasing

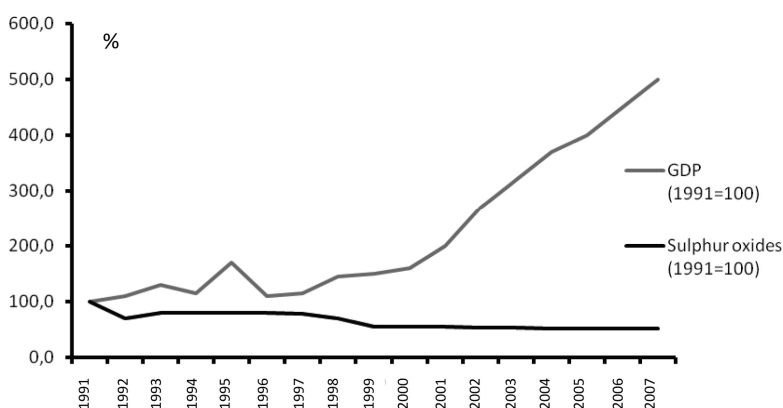


Fig. 1 Emissions of Sulphur oxides and GDP (1991 = 100)

The emissions of Sulphur oxides in 2007 are twice lower compared to the level in 1991, while GDP has increased almost 5 times (at corresponding year prices) =

In the structure of Sulphur oxides' emissions the biggest is the share of processes related to combustion of fuels for energy production - 92%, followed by 'Other sources' and industrial processes, relatively 5 and 3%.

The production of electricity and heating generates 70% of the Carbon dioxide emission as well.

The industrial processes have a relatively small share in the total Sulphur oxides' emissions but form 75% of the Nonmethane volatile organic compounds' emissions, while the group of 'Other sources', which includes the household heating, transport, agriculture and nature forms 88% of the emission of Carbon oxide, 95% of the emission of Methane and 50% of Nitrogen oxides' emission. Big sources of Methane are the nature, gas-pipe network and transport.

The comparison between the emissions and GDP reveals a sustainable tendency to reduction of pollution per unit of produced GDP. In comparison to 2003, in 2007 the Sulphur oxides' emissions per 1000 USD of GDP1 decreased twice – from 0.049 to 0.022 tons. The energy efficiency indicator is improving respectively. The GDP produced per 1 kWh of produced electricity rises from 0.47 USD in 2003 to 0.91 USD in 2007. Despite the improvement Bulgaria is still behind other countries, such as Austria (6.05 USD), Germany (7.02 USD), the Czech Republic (1.98 USD) and Turkey (3.44 USD) per 1 kWh (data for 2007).

In a territorial aspect the industry within the country is concentrated in and around regions with a high population density. In this way, industrial regions have been formed, which are characterized both by a relatively higher level of emissions compared to the rest of the country, and at the same time by air pollution of few kinds of harmful substances.

In 2007 the most significant, with regard to air pollution, continues to be the contribution from the region of 'Maritsa-Iztok'. About 68% of the total emitted Sulphur oxides were emitted from this region. Also high were the volumes of the harmful substances emitted in the region of Devnya - Nitrogen oxides and Ammonia, in the region of Dimitrovgrad - Ammonia, and Burgas - Non-methane volatile organic compounds.

On average for the country's territory the emission of Sulphur oxides per 1 square kilometre in 2007 amounted to 7.7 tons (compared to 7.9 tons in 2006), and on average per capita of population – to 112 kg (114 kg in 2006). In comparison to 2001, the Sulphur oxides' emissions were reduced by 9, while the population - by 3% [11], [12].

2. WATER

The source of data is the annual statistical surveys on water, which include the following surveys:

Survey on services related to water supply, sewage and waste water purification – exhaustive. The data is collected by public water supply companies, water suppliers through hydromeliorative systems and operators of urban waste water treatment plants.

Survey on water use - Object of survey are the economic units using water more than 36 thousand m³ annually. Water abstraction by physical persons is not surveyed [1].

Water quantities are recorded through direct methods of measurement, and in absence of such the estimate is accomplished by the way of calculation - based on the specific technological processes, capacity of the water abstraction/treatment equipment, etc.

The published data are a result of application of balance methods for estimation and real data from statistical surveys.

Fresh water is natural water having low salt content. Fresh water abstraction from surface water sources includes the abstraction of water from inland rivers, the Danube,

dams, fresh lakes shaft, kettle, mining, and drainage systems. Fresh water abstraction from ground water is abstraction from springs and drilling wells.

Non-fresh water is the sea water and transitional water, such as brackish swamps, lagoons and others. Up to 2005, the lake Varnensko was in the category of transitional waters. After Bulgaria joined the EU as a full member the regulations of European law are being applied and particularly The Water Framework Directive. Accordingly the Classification for characterization of surface water bodies' types being in conformity with the Water Framework Directive transitional waters have not been identified in Bulgaria (National Report for implementation of Water Framework Directive, 2007). For that reason since 2006 only the sea waters have been referred to non-fresh water.

Gross water abstraction is the total sum of fresh and non-fresh water abstracted by the hydromeliorative systems, public water supply (PWS partnerships) and that abstracted by self-supply in the surveyed enterprises (including NPP). Water used for hydroelectricity generation and in-site use is excluded, but the data are published in separate tables.

Returned water is the water abstracted from any fresh water source and discharged back into it without use. (It occurs primarily in mining and construction activities.)

Water net abstraction is water gross abstraction minus returned water.

Water supply is being performed by means of [1], [4]:

- **Self-supply** - water abstraction for own needs of the surveyed economic units. Self-supply of physical persons is excluded.
- **Public water supply** - water delivery by the economic units engaged in water collection, purification and distribution (public water supply partnerships).
- **Other water supply** - supply through the hydromeliorative systems and transferring water between enterprises.

There is a peculiarity that in its capacity of 'water abstraction' operator the hydromeliorative systems are included in the economic activity 'Agriculture', while in the capacity of 'water supply' operator they are referred to 'Other water supply'.

Water used is calculated as a sum of water from self-supply and water supplied to the end users (water supply partnerships, irrigation systems and other enterprises). The distribution of supplied water by economic sectors is based on balance calculations. The distribution error to a great degree is determined by that is in what extend the supplier is informed about the economic activity of its clients.

Cooling water is the water, which is used to absorb and remove heat.

Water losses are the volumes of water lost during transport between the point of abstraction and the point of use. Water losses are reported by the water supply partnerships, branches of the One-man joint-stock company 'Irrigation systems' and irrigation associations. It is considered that self-supply does not form water losses.

Waste water - in accordance with the international practice the discharged water from cooling processes is not included in waste water. For that reason the water quantities discharged after usage are distinguished in two categories - 'waste water' and 'cooling water'.

Waste water generated from point sources is the total quantity of the water discharged after usage by the economic units covered by statistical surveys. Waste water, which is reused within the same enterprise, is not included. Waste water generated by the households was calculated as 90% of the water supplied to the households by water supply partnerships.

Waste water collected into the public sewerage - it is formed by point and non-point sources (such as rainwater, drainage and other non-distributed waters) [1], [6]. A

part of the water collected into the sewerage incomes in the UWWTPs, and another part are discharged into water bodies without treatment.

Urban waste water treatment is each treatment of waste water in urban waste water treatment plants (UWWTPs). The treatment plants of hotels and enterprises that treat municipal waters from the adjoining settlements are not considered UWWTPs. They are referred to the category "Others WWTPs" according to Eurostat definition. UWWTPs are usually exploited by state, municipal or private firms working upon public order. Only really working UWWTPs are covered.

Primary treatment is the purification of urban waste water by physical and/or chemical processes involving settlement of suspended solids, or other processes in which the BOD5 of the incoming waste water is reduced by at least 20% before discharge and the total suspended solids of the incoming waste water are reduced by at least 50%.

Secondary treatment - treatment of urban waste water by a process involving biological treatment with following secondary settlement or other process at which the requirements are kept as follows: unsuspended solids < 35 mg/l and BOD5 <25 mg/l, and COD <125 mg/l.

Tertiary treatment (additional treatment) – processes of additional treatment after secondary treatment for decreasing nitrogen and/or phosphorous and/or other pollutants, reacting on quality or specific usage of the water: for example microbiological pollution, color and others.

The volume of waters undergoing several kinds of processing is recorded once - only at the final stage of purification.

Waste water discharged into water bodies is the total water quantities discharged by the waste water treatment plants/ installations as well as those directly discharged into water bodies without treatment. They are generated by the public sewerage, UWWTPs and surveyed population of enterprises and households.

Population (average annual), connected to public water supply/public sewerage - sources of data are the survey on water supply and current demographic statistics. The foreigners staying at the country's territory are not included. It is possible that the share of served population to some degree can be overestimated in cases, when only a part of the settlement is connected to water supply/sewage network. A more precise source of data is the population census.

Population (average annual) with independent waste water treatment - includes the population using own equipment for treatment (septic tanks, cesspools).

The use of water resources and preventing them from pollutants is not only an ecological question, but essential factor for sustainable economic growth especially under conditions of water scarcity and more and more frequent droughts.

2.1. Water abstracted

The average annual volume of abstracted fresh water for the period 2000 - 2007 [12] amounts to about 6.3 billion cubic metres. The highest level has been reached in 2003 (6.9 billion cubic metres), and the lowest - in 2001 (5.8 billion cubic metres). In 2007 the abstracted fresh water is estimated to 6.2 billion cubic metres, 92% of which come from surface water bodies. A special characteristic of country's water use is that the predominant part of abstracted water (average annually about 65%) serves for cooling purposes at energy production, and after

usage is returned back into the water source. The structural changes in the energy sector form not only the level of water use but also set the importance of the separate water sources. In 2006, the water from Danube had the highest share in the water use - 52%, while in 2007 it was compensated by dam water and decreased up to 39%.

The ground water constitutes on average 8% of the fresh water abstracted within the country, which serve mainly for drinking-municipal purposes. In 2007, 473 million cubic metres were abstracted from ground sources which constitute 82% of the 2000 volume.

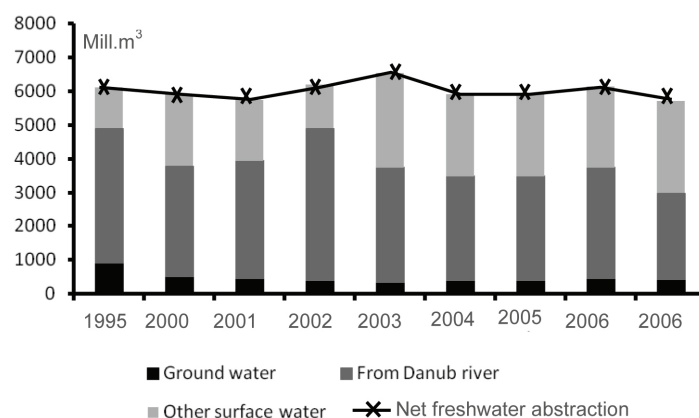


Chart 2 Water abstraction by type of source

About 67% of fresh water in 2007 was abstracted by economic units' self-supply and the other part is apportioned almost equally between the suppliers - public water supply (water supply companies - 17%) and hydromeliorative systems (16%). This structure is relatively stable during the years.

The juxtaposition of produced GDP with the abstracted fresh water shows the effectiveness of water use. The data indicate a stable tendency of increase in the GDP produced by unit of water - from 2.2 Euro per cubic metres in 2000 to 4.7 Euro in 2007 [11].

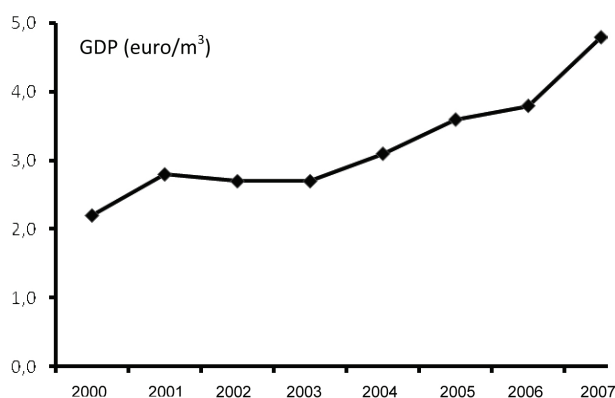


Chart 3 GDP (at current prices) by fresh water abstracted

The abstracted for the period 2000 - 2007 surface and ground waters calculated per capita vary between 737 and 884 cubic metres annually. The comparison with other European countries for 2005 shows that Bulgaria is characterized by a high level of abstracted fresh water per capita and lowest GDP per capita. The equipping with water-metering devices is a prerequisite for reliable information about water abstraction. In 2007 the water volumes were measured by water-metering devices at 86% of self-supplied enterprises, 74% of water supply companies and 35% of operators on hydromeliorative systems. The rest of the operators have reported data based on calculations or estimates.

2.2. Water used

Both the old and amortized water supply system and the hydromeliorative systems built in Bulgaria predetermine the significant loss at water transferring. By suppliers' calculations average annually about 1.2 billion cubic metres of water are lost due to leakage and evaporation. At public water supply companies the loss is estimated on average to 62% of the water entering the water supply network.

About 57% of this network has been brought into exploitation before 1970, and its main part (72%) has been built by asbestoscement pipes. The water loss at hydromeliorative systems is determined by specifics of services - type of irrigated crops, made requests and customers' location. Due to the availability of open-air irrigation channels the loss also depends on climate factors. In 2007 the water loss is estimated at 63% of the waters entered the system but in more dry years (2003 and 2006) they reach 72%.

For instance the total volume of the water used in the country (from self-supply and water supply) for the period 2000 - 2007 varies between 4.8 and 5.8 billion cubic metres. As it was already indicated the highest was the relative share of cooling water used in the energy activity - on average 77% of the total water used came back into the water body after use. If subtract the cooling water the used volume is comparable to the loss at water transferring - about 1.2 billion cubic metres on average [12].

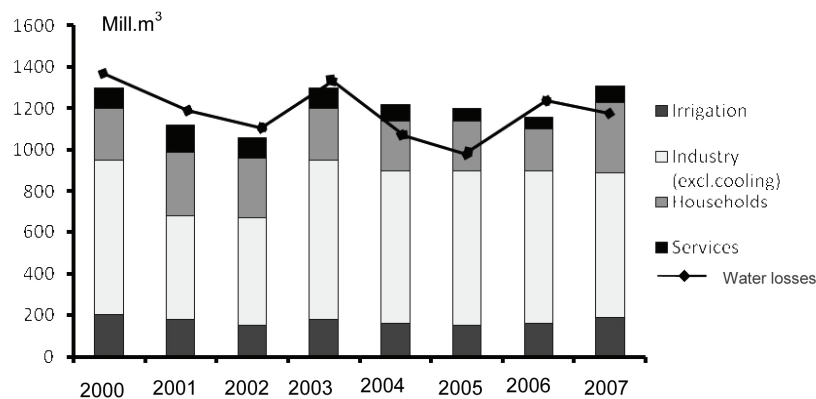


Chart 4 Water used (excl. cooling)

Decrease was registered in the manufacturing, which has the biggest relative share in the water use – water used in 2007 constitutes chemical products and metallurgy. The

mining and quarrying industry has a relatively small share in water use but after 2003 some increase of used water is registered. Increase in water use is also registered in energy production. Waters used for irrigation also augmented - in 2007 their volume reached 242 million cubic metres, which is by 61% more compared to the lowest level registered in 2002.

2.3. Water supply to population

In 2007 water supply services were performed by 58 water companies, 29 of which were state, 24 - municipal and the rest - private (owned by local subjects or under foreign control). The state companies conduct water supply to 77%, municipal - to 7%, and private - 16% of the population. The water-supply system covers about 98.9% of the country's population. All towns and 96% of the villages are supplied by water. With regard to the water supply rate Bulgaria is in a more favourable situation compared to some other European countries (Belgium - 97.6%, Iceland - 95.0%, Poland - 86.1%, Ireland - 76.0%, 2005 data).

The total quantity of water supplied by the water-supply companies in 2007 is about 402 million cubic metres, of which 98% are of drinking quality. Approximately 55% of drinking water was processed by disinfection, and 44% - treated in drinking water purification plants. About 6% of the population was with irregular water supply which was mainly due to reasons of seasonal character. During the drier years the population under water supply regime reached about 21% (2000 and 2001).

The urban population uses more water compared to rural population. The drinking water used in the towns amounts to 106 l/day/capita, and in villages - to 89. Both in towns and villages the used quantity has increased by about 4 - 5 l/day/capita in comparison to 2006.

The equipping with water meters and the rising price of water-supply service stimulates water saving. At the same time, the lower the level of consumption, the lower the cost price of service.

The rising prices of water related services lead also to an increase in the absolute amount of household expenditure on water supply. In spite of that their relative share after 2001 reduced due to restructuring of household monetary expenditure.

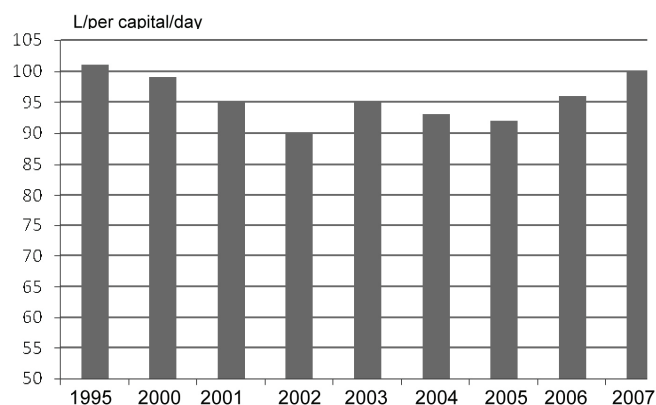


Chart 5 Drinking water used by households (L/ per capita /day)

2.4. Sewage services, Urban Waste Water Treatment Plants (UWWTPs) and Waste water

The total length of sewage network in exploitation by water-supply partnerships in 2007 amounts to 10.5 thousand km, and 90% of it has been built before 1990. By the companies' data, in 2007, 46 km were built and 3 km - reconstructed.

In 2007, according to the current statistics, 30.4% of the population uses independent waste water treatment facilities (septic tanks, cesspools). In principle, the cesspools waste water from which is transported by tank trucks to UWWTPs, are not considered to belong to the independent treatment but at this stage detailed information is not available. The data are obtained by calculation – as a difference between the total population and population connected to public sewage system. More accurate source of information could become the population census. 69.6% of the country's population is connected to public sewage system. In the cities this percentage is 95%, while in rural settlements, it hardly reaches 9%. The tendency of increasing population connected to UWWTPs is positive.

Waste water generated by the covered economic units and households in 2007 is estimated at 503 million cubic metres. Additionally 3337 million cubic metres of cooling waters were generated from economic activity and returned into water bodies. According to the international practice these waters are not included in the waste water and will not be commented further.

Generated waste water from **industrial activity** in 2007 is about 219 million cubic metres. 16% of it was discharged into public sewage system, and the rest - into water bodies. About 60% of waste water discharged into water bodies was purified in independent treatment facilities. These proportions have been relatively stable during the last three years. Large waste water quantities are typical for 2003 and 2004 when waste water from past periods, which until that moment had been kept into sludge reservoirs, was discharged into water bodies upon permission issued by control bodies.

About 277 million cubic metres of waste water in 2007 were generated by the **domestic sector** (households and services), 75% of which entered the public sewage system. The prevailing part of the rest water that is not discharged into the sewerage was treated into independent treatment facilities (septic tanks and cesspools).

The public sewage network in our country is mixed and collects in common municipal, industrial and rain water. The quantity of water commonly collected into the sewerage in 2007 was estimated to 542 million cubic metres, 72% of which were received into UWWTPs.

The **total quantity** of waste water discharged into UWWTPs, sewage system, surveyed economic units and population is estimated to 799 million cubic metres. The availability of measuring devices for outflow waters is not a large-scale practice. About 82% of the respondents in the surveyed enterprises and 39% of sewage systems' operators indicate that data on waste water have been reported indirectly (by calculations and expert estimates). The inexact distinction of the respondents between waste and cooling waters, particularly as regards to mixed water flows also exert influence on data quality.

A condition for achieving sustainable water use is the provision of necessary investments for water-saving technologies, reduction of loss at water transfer and measures for preventing contamination. The data indicate that expenditure on protection of water resources in 2007 exceeded by 2.7 times those made in 2000. The highest is the increase of investments - about 6 times.

The chart below illustrates the outstripping growth of investments in comparison to current expenditure after 2003.

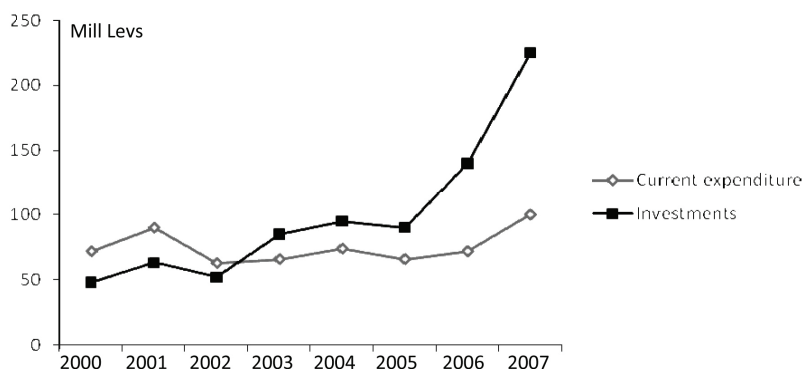


Chart 6 Expenditure on protection of water resources

3. WASTE

The information on waste is provided in accordance with the requirements of the EC Regulation No. 2150 of 25. 11. 2002 on Waste Statistics. The Regulation requires representative data at national level. Since 2004 the information about non-hazardous waste from industrial activity has been collected by means of sample, which is representative for economically active economic subjects in the country. After weighting, the sample data are transferred at a national level and added to the data obtained from the National Automated Environmental Monitoring System (NAEMS) maintained by the Executive Environmental Agency. The data on hazardous waste is obtained entirely from NAEMS.

A new nomenclature 'European Catalogue of Wastes' is used, which corresponds to the 'List of Waste'. The information on municipal waste is obtained through a full coverage survey of municipal administrations. The methodology change, which was done in 2004 impacts the data comparability with the data from previous years and does not allow publishing of data in the existing breakdowns including at administrative-territorial level.

Indicators and definitions corresponding to the Waste Management Act were adopted [State Gazette', No. 86/30.09.2003].

Disposal and recovery are the operations applied to waste according to the law.

Waste means any substance or object or part thereof, which the holder disposes of, intends to dispose of or is required to dispose of, and is included into one of the categories listed in Waste Management Act. Waste from own activity recovered on the site where it was generated is not included in the quantity of generated waste.

Hazardous wastes are the wastes, which composition, quantity or properties create a risk to human health or the environment, possess one or more properties making them dangerous and/or contain components transforming them in dangerous and/or are described as such under the **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal**.

Municipal waste is the waste resulting from the activities of people in homes, in administrative, social and public buildings. Included here is also the waste from commercial outlets, crafts, resort and entertainment facilities, which are nonhazardous, and at the same time, their quantity or composition will not obstruct to be treated together with the household waste.

The sources of data are the municipal administrations. The survey comprises landfill sites, where household waste is deposited by means of a municipal waste collection system. The quantity of collected waste in landfill sites without weighing equipment is usually estimated on the basis of data in transport documents.

The generated municipal waste is a sum of both household waste deposited at landfill sites by means of a municipal waste collection system and generated household waste from households non-served by landfills. Generated household waste from households non-served by landfills is obtained by statistical estimate [9], [13].

Deviations regarding the total are possible due to the different rounding at software product's usage.

Due to methodological changes in 2004 the data refer only to the last three years. The predominant part of the generated waste is the non-hazardous - more than 99% for the last three consecutive years.

3.1. Non-hazardous waste from economic activity

For the three year period being under survey the generated non-hazardous waste constitutes on average 94% of the total waste volume. In 2007 the mineral waste is followed by the waste from combustion processes (3%) and excavated landmasses - 2%. The generated non-hazardous waste excluding the mineral waste amounts to 14.4 million tons.

At the examination by economic activities the greatest part of generated waste comes from the following sectors: Mining and quarrying - 93%, and Electricity and heat energy, gas fuels and water supply - 3%. Only 4% of the waste in 2007 was passed to other enterprises (respectively exported). The remaining part was a subject of disposal operations at the territory of the enterprises, whose activity generated them.

3.2. Hazardous waste

Regarding hazardous waste for the last two years the greatest is the quantity of acids, bases and salts - 52% in 2007. The greatest is the share of generated waste in the branch of metallurgy and output of metal products and equipment - 81% in 2007.

3.3. Municipal waste

During 2007, continuing the tendency of building regional landfills for municipal waste and at the same time closing down landfills built in the past, which do not meet ecological requirements, new contemporary facilities for municipal waste disposal were constructed. As a result of this, there was a reduction in the total number of landfills within the country - from 619 in 2000 to 435 in 2007 [12]. The organized waste collection systems were implemented in new settlements which led to an increase in the population served by municipal waste collection systems - from 78.6% in 2000 to 92.5% in 2007.

In 2007, according to municipal administrations' data, 3,324 thousand tons of municipal waste were collected by organized waste collection to landfills, of which 2,980 thousand tons - were landfilled. The quantities of temporary stored municipal waste in 2007 are estimated to 344 thousand tons, generated mainly on the territory of Capital municipality. The landfill, which served the city of Sofia was closed down in October 2005. The municipal waste collected from the capital city to the opening of the landfill in December 2007 was transported in an organized manner to sites for temporary storage.

On the whole, there was a tendency towards reduction of the collected municipal waste in the period from 2000 to 2007. While in 2000 the collected municipal waste per capita amounted to 518 kg, in 2007 it decreased to 469 a year.

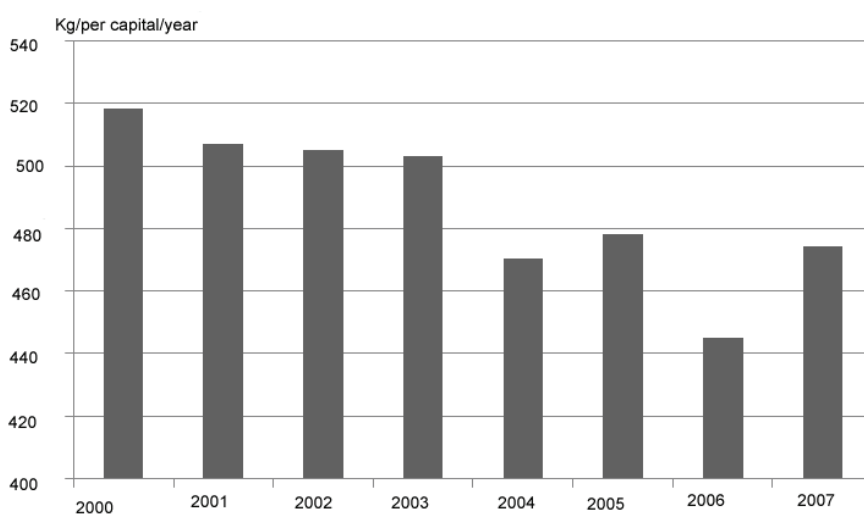


Chart 7 Collected municipal waste per capita of served population

4. PROTECTED NATURAL SCENERY

Protection of the environment and ecosystems biodiversity has been one of the most important priorities of our country during the last few years. In 2007 the area of protected natural scenery in Bulgaria amounted to 566,701 ha or 5.1% of the country's territory and compared to 2006 an increase of 19,916 ha is registered. At the end of 2007 there were 941 protected natural areas in Bulgaria or 60 more than in 2006. The biggest is the relative share of natural parks - 43.2% (10 in number), followed by that of national parks - 26.5% (3), and reserves - 13.6% (55). The smallest is the share of maintained reserves - 0.8%.

In 2007, 62 new protected areas were announced. At the same time 2 new natural landmarks were closed down. The number of the protected plant species of Bulgarian flora in 2007 was 572 (183 more than in 2006), and the number of the protected animal species was 487. The number of protected venerable trees in 2007 amounted to 1,779, which is 19 more in comparison to the previous year.

Due to difficulties related to formation of the administrative-territorial borders within the country the data are presented at national level only. The source of data about protected natural scenery is the Ministry of Environment and Water (MOEW).

5. NOISE

710 points of noise level measurement were surveyed in 2007 [3], [12]. They are located in 35 settlements of this country. This is 183 points more than in 2006, and there is no data about noise level measurement for the town of Silistra.

As in previous years, in 2007, the tendency of exceeding the admissible sanitary norms of the registered noise level of 55 - 60 decibels continues; in 464 of the surveyed points (65.3%) the values of noise level exceeding the admissible norm (63 - 77 decibels) were registered. The most unfavourable acoustic environment in 2007 is a characteristic of the bigger cities of the country having a measured noise level from 68 to 72 decibels: Sofia (the capital), Plovdiv, Russe, Kyustendil, Varna, Stara Zagora and others. The noise level from 63 to 67 decibels was registered in the following cities: Svishtov, Montana, Shumen and others. In 2007 noise levels exceeding 78 decibels were registered in Sofia and Blagoevgrad.

The source of data about noise levels is the National Centre of Public Health Protection.

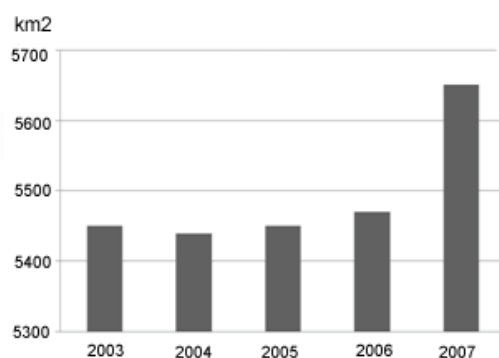


Chart 8 Area of protected natural scenery

6. EXPENDITURE

The survey covers economic subjects (companies, organizations, ministries, municipal administrations and others) that made expenditure on protection and restoration of the environment during the reference year. The methods applied for collecting information about expenditure on acquisition and maintenance of tangible fixed assets with ecological use are in conformity with the Accountancy Law and the National Accounting Scheme in Bulgaria.

The expenditure on protection and restoration of the environment is measured at current prices of the corresponding year. It includes:

- Expenditure on acquisition of tangible and intangible fixed assets with ecological use.
- Expenditure on maintenance and exploitation of tangible fixed assets with ecological use.
- Expenditure on implementation of measures on protection and restoration of the environment.
- Expenditure on administrative activity including sums paid out for wages and salaries, social insurance, and bonuses of the personnel occupied with administrative activities related to environmental protection. Also data received from the Ministry of the Environment and Water, Executive Environmental Agency, regional environmental inspections and others are included.

The expenditure on acquisition of tangible and intangible fixed assets includes:

- Outlays invested in construction of objects; reconstruction and enlargement of existing tangible fixed assets with ecological use, as well as those invested in licenses, know-how, patents and others.
- Expenditure on acquisition of monitoring and control equipment.

Expenditure on activities related to labour protection (acquisition of installations intended for preserving air purity, and noise and vibration reduction in the working premises) is excluded. The expenditure on acquisition of tangible fixed assets with ecological use constitutes a part of the total expenditure on acquisition of tangible fixed assets in the country.

The expenditure on maintenance of tangible fixed assets with ecological use and that intended on implementation of measures for protection and restoration of the environment include:

- Expenditure on exploitation and maintenance of tangible fixed assets with ecological use.
- Expenditure on activities not associated with the use of tangible fixed assets with ecological use on recultivation, chemical amelioration, biological and integrated plant protection, afforestation and planting, preserving the landscape (including protected natural scenery).
- Expenditure on exploitation and maintenance of monitoring and control equipment.

Additionally, the expenditure is classified by economic elements (according to the international requirements since 2005 it does not include expenditure on depreciation, which is not considered as environmental). The expenditure on protection and restoration of the environment does not include sums paid out for environmental fines and sanctions for infringement of laws and normative acts related to environmental protection and restoration.

6.1. Expenditure on protection and restoration of the environment

The effective use of financial funds in the field of environment is the major indicator of the undertakings of the society and the state directed to the reduction of the negative impact of socio-economic processes on the environment. 1,164,817 Levs were spent on protection and restoration of the environment in 2007. In a view of inflation processes, the share of environmental expenditure as a percent of GDP is considered more appropriate for the purposes of comparison. In 2007 it reached 2.1% and compared to 2006 there was no change.

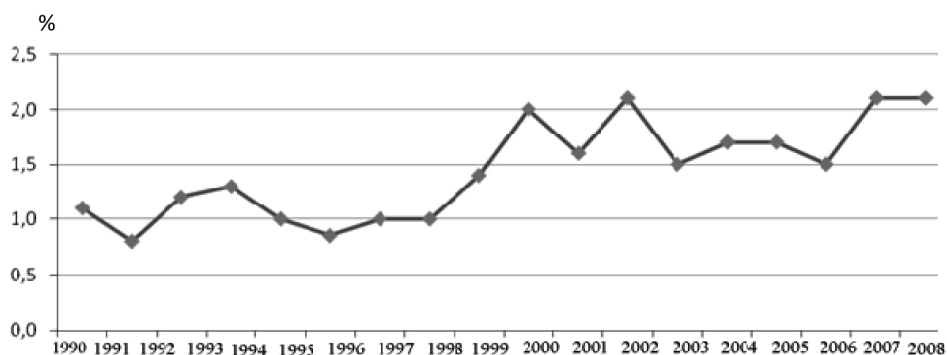


Chart 9 Share of environment expenditure of GDP

Environmental expenditure includes two components: expenditure on maintenance, and expenditure on acquisition of tangible assets. In 2007, similarly to previous years, investments had the greater share in the expenditure structure compared to current expenditure - respectively 54 against 46%.

The total expenditure on protection and restoration of the environment for 2007 was allocated in the following way: the biggest is the share of expenditure on waste disposal and recovery - 32% (22% in 2006), followed by expenditures on water resources - 29% (22% in 2006), preserving air purity - 22% (compared to 41% in 2006), and protection of soil and underground water - 4%. Significantly less is the share of expenditure intended for noise protection, preserving natural biodiversity, protected natural scenery, etc. In 2007 the expenditure on R&D activity amounted to 8,020 Levs, which meant an increase by two times compared to 2006 [12].

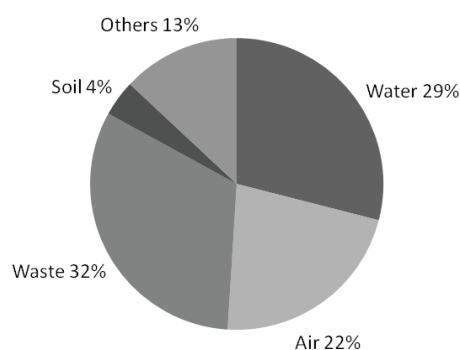


Chart 10 Structure of expenditure on protection and restoration of the environment by ecological use in 2007

In conformity with the Council Regulation (EC, Euratom) No 58/97 concerning structural business statistics (SBS), the expenditure on environmental equipment was split up in two kinds - end-of-pipe and integrated technologies.

As a result of different normative documents related to environment the economic subjects were obliged to allocate certain expenditures on prevention or reduction of contamination, and first of all, on acquisition of tangible fixed assets.

As a rule the own funds of enterprises and municipalities were the major financial source. In 2007 the share of these funds invested on environmental purposes reached 57%. The financial resources received during the year from specialized national funds such as 'Management of the environment protection activities', 'Entrusted eco-fund' and other sources were in the amount of 166,970 Levs or they constituted 14% of the total investment. The funds purposefully intended for the environment and received from the state in a kind of subsidies amounted to 55,126 Levs. 176,996 Levs have been received during the year from the Republic Budget and municipalities.

In 2007 branch relation of the expenditure with ecological use shows that predominant is the share of the expenditure in the industrial domain - total about 51%. The major contaminants are mining and quarrying, and manufacturing industries, which similarly to energetics have the greatest shares in the total expenditure of Industry - 7, round 49 and

42%, respectively. Most of the funds were oriented mainly to preserving air purity. They were followed by the funds allocated to water resources and waste. 7,870 Levs were spent within the sector 'Agriculture, hunting, forestry and fishing' and the funds were allocated mainly to preserving soil and forest resources, and accomplishment of hunting and fishery undertakings.

Total expenditure in the 'Other activities' sector is estimated at 565,556 Levs, 282,342 of which (50%) were spent on 'Government and defence'.

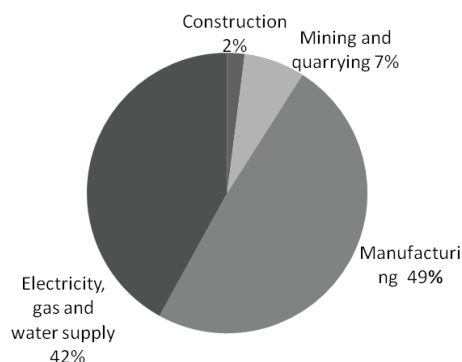


Chart 11 Structure of expenditure on protection and restoration of environment in industry in 2007

The environment protection expenditure per capita in 2007 amounted to 152 Levs. On the other hand for the same period 308 Levs per capita were spent on health care, 283 Levs - on education, and 392 Levs - on defence. The total household expenditure per capita for the same period was estimated at 2,857 Levs, 1,071 of which were spent on food.

6.2. Expenditure on acquisition of tangible and intangible fixed assets with ecological use

The expenditure on acquisition of tangible fixed assets with ecological use in 2007 amounted to 632,975 Levs. The biggest is the share of investment in water resources preserving – about 37% (compared to 23% in 2006) and a part of these funds was allocated to building and modernizing industrial and urban waste water treatment plants. Smaller is the share of expenditure on air preserving - 34% (60% in 2006). The funds were intended for acquisition of and building purifying installations and equipment for trapping and disposal of harmful substances.

The share of funds granted for building installations and landfills for waste disposal, treatment and storage was estimated to 18% (10% in 2006). The investment in circulating water supply, soil, forests, preserving biodiversity, protected natural scenery and noise protection had a significantly smaller share. 7,817 Levs were spent on R&D activity. That is about three times more compared to 2006 [12]. 17,251 Levs were allocated to acquisition of monitoring and control equipment which meant an increase compared to the previous year. As a rule, a part of the funds on acquisition was granted by the Ministry of the Environment and Water.

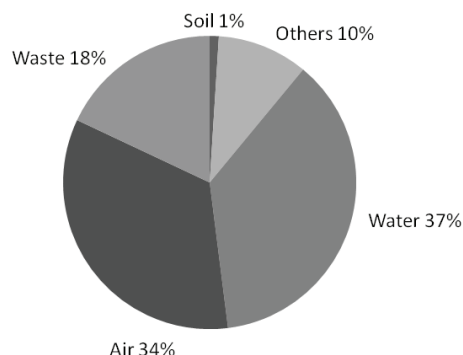


Chart 12 Structure of expenditure on acquisition of tangible and intangible fixed assets with ecological use in 2007

6.3. Expenditure on maintenance of tangible fixed assets with ecological use and activities related to protection of the environment

Expenditure on maintenance and exploitation of tangible fixed assets with ecological use and activities related to protection of the environment in 2007 amounted to 531,842 Levs. The first place is taken by funds spent on waste treatment and storage - 49% of the total amount. The main part of them was allocated for waste collecting and transportation and landfills' maintenance. 20% of the total expenditure for maintenance was invested in maintenance of equipment for water resources preserving. The main part of it was allocated to maintenance of industrial and urban waste water treatment plants.

The expenditure on maintenance of air preserving equipment amounted to 7% of the total expenditure. During that year about 8% of the total expenditure on maintenance was spent on soil protection and it was mainly allocated to recovery of damaged areas, purification of contaminated soils, anti-erosion undertakings, biological and integrated plant protection and others.

Similarly to 2006, 1% of the expenditure on maintenance of tangible fixed assets in the country was directed to protecting forests from pests, afforestation, etc. During the year expenditure in the amount of 203 thousand Levs on estimates related to environmental impact, expertises and scientific services were also made. The expenditure on maintenance of monitoring and control equipment by specialized bodies are estimated to 9,885 Levs [12].

Fines and sanctions for infringement of laws and normative acts related to environmental protection in the amount of 3,830 Levs were paid out in 2007. Among them the first place is taken by the sums paid out in relation to air - 60%. They are followed by sums related to water - 29%, and others. The paid out fines and sanctions related to the environment are not classified as environment protection expenditure but as financial resources they are included into the heading of environmental expenditure.

7. TANGIBLE FIXED ASSETS WITH ECOLOGICAL USE

The tangible fixed assets with ecological use include:

- facilities, installations and equipment necessary for environment protection and recovery by use (water resources, air, soil, waste disposal, protection from noise);
- monitoring and control equipment.

The tangible fixed assets with ecological use do not include the equipment preserving for air purity, and noise and vibration reduction in the working premises, i.e. labor protection activities. The tangible fixed assets acquired during the year, those out of use and available at the end of year are shown at reported value [8], [10].

For studying tangible fixed assets with ecological use a methodology is applied, which is in conformity with the requirements related to their bookkeeping recording according to Accountancy Law and National Accountancy Plan. The tangible fixed assets with ecological use are a part of total tangible fixed assets within the country.

At the end of 2007 the availability of tangible fixed assets with ecological use amounted to 2,554,049 Levs. Compared to 2006, the increase is nearly 1.2 times. Since 2006 in conformity with the Council Regulation (EC, Euratom) No 58/97 concerning structural business statistics (SBS) the environmental equipment has been split up in two kinds - end-of-pipe and integrated technologies.

At the end of the year the share of tangible fixed assets with ecological use reaches: for preserving air - 38%, for water resources preserving - 27%, and for waste - 17%. In 2006 the share of assets related to the indicated uses amounted to 40, 29 and 14% respectively. The value of the available monitoring and control equipment in 2007 amounted to 227,279 Levs compared to 156,898 Levs in 2006.

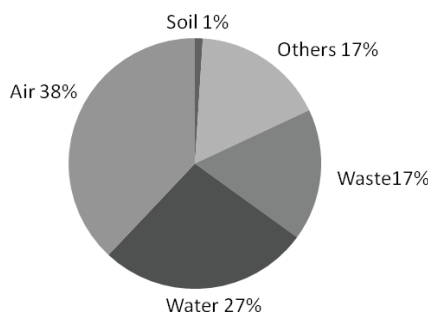


Chart 13 Tangible fixed assets with ecological use as of 31 December 2007

The tangible fixed assets with ecological use brought into operation in 2007 amounted to 395,857 Levs. The predominant part was related to: air preserving - 36%, water resources' preserving - 23%, and waste - 29%. The monitoring and control equipment acquired during the year was estimated to 23,735 Levs. Industry as a whole concentrates 79% of the available tangible fixed assets with ecological use in the country and there is no significant change compared to the previous year. Agents of the largest contamination within this group are: the extraction of raw materials and stuffs, energy production, and a part of the manufacturing enterprises. The share of available equipment and installations on environmental protection at the end of 2007 in these economic activities is the biggest one – 4.50 and 46% respectively.

The total brought into exploitation tangible fixed assets with ecological use in the industry amount to 227,449 levs. Being one of the major contaminators of air, this sector allocates significant financial resources to building purification equipment in this field - 61% of the total brought into exploitation tangible fixed assets with ecological use. The share of the water resources' preserving equipment brought into exploitation during the year is 15%, and of that related to waste - 12%. The available tangible fixed assets with ecological use in the category 'Other activities' are estimated to 522,752 Levs, while the tangible fixed assets brought into exploitation during the year amount to 166,469 Levs.

All problems presented in the article are contemporary and very important for quantitative statistical analysis in the environmental field. They have to be expected and find expression in the methodology of environment statistical studies.

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STATISTIČKA ANALIZA DINAMIKE GLAVNIH KOMPONENTI ŽIVOTNE SREDINE BUGARSKE

Veselka Pavlova

Rad je posvećen nekim savremenim statističkim problemima proučavanja životne sredine. Cilj analize su stanje i dinamika glavnih komponenti kao što su vazduh, voda, otpad, zaštićena prirodna bogatstva, buka, potrošnja i materijalna osnovna sredstva za ekološku upotrebu. Analize su urađene na osnovu podataka Nacionalnog Statističkog Instituta i Izvršne agencije za životnu sredinu Ministarstva Životne sredine i voda.

Ključne reči: statistika životne sredine, komponente životne sredine Bugarske, stanje i dinamika glavnih komponenti životne sredine Bugarske.