PROMITHEAS – 4

Serbia

Mapping national procedures, sources, available data and information

Author: *Prof. Dejan IVEZIĆ*

University of Belgrade – Faculty of Mining and Geology, Serbia

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Acknowledgements

Co-author:

Dr Marija Živković, University of Belgrade – Faculty of Mining and Geology

This report has been read, commented and approved by all members of the PROMITHEAS-4 Scientific Committee.

Members of the PROMITHEAS – 4 Scientific Committee:

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CONTENTS

1. General information

1.1. Government structure

The Serbian government was formed on July 7, 2008 with the appointment of Mirko Cvetkovic as Prime Minister. In addition four Deputy Prime Ministers are appointed. The government reshuffle was made on 14 March 2011. Current Government structure is as follows:

- Ministry of Finance,
- Ministry of the Interior Affairs,
- Ministry of Foreign Affairs,
- Ministry of Defence,
- Ministry of Justice,
- Ministry of Agriculture, Trade, Forestry and Water Management,
- Ministry of Economy and Regional Development,
- Ministry of Infrastructure and Energy,
- Ministry of Human and Minority Rights, Public Administration and Local Self-Government,
- Ministry of Education and Science,
- Ministry of Youth and Sport,
- Ministry of Health,
- Ministry of Labour and Social Policy,
- Ministry of Environment, Mining and Spatial Planning,
- Ministry of Culture, Media and Information Society,
- Ministry for Kosovo-Metohija,
- Ministry of Religion and the Diaspora,
- Ministry without Portfolio.

1.2. Mapping national procedures

1.2.1. Key categories according to IPCC

The IPCC's Good Practice Guidance defines a key source category as a "[source category] that is prioritized within the National Inventory System because its estimate has a significant influence on a country's total inventory of direct greenhouse gases in terms of the absolute level of emissions, the trend in emissions, or both. . .". According to this definition, key categories for Serbia are Energy (IPCC Source Category 1), Industrial processes (IPCC Source Category 2), Agriculture (IPCC Source Category 4), land–use change and forestry (IPCC Source Category 5) and Waste (IPCC Source Category 6).

1.2.2. Methodology for retrieving key-category data

Most data necessary for calculation and estimation of key-categories' emissions are collected in The Statistical Yearbooks of the Statistical Office of the Republic of Serbia (SORS). Statistical data in the Yearbook are the summary of basic data from more than 200 statistical surveys that have been carried out during the year. Methodological explanations, necessary for proper use of published data, are given in each chapter of the Yearbook, together with sources and methods of data collecting, coverage and comparability of data and definitions.

Energy

Energy statistics produces Energy Balances that contain annual data on production, imports, exports, transformation and distribution of electricity, heat energy, coal, oil, oil derivates, natural gas, geothermal energy and firewood in the Republic of Serbia. The total energy balance of the Republic of Serbia includes all separate energy balances, expressed in a joint unit of measure, TJ.

Data on production, imports, exports, transformation and distribution of fuels are collected by means of annual energy surveys. The figures for each fuel are shown in standard unit of measurement and in TJ.

To produce energy balances one needs the data obtained through:

1. Regular annual statistical surveys of energy statistics;

2. Regular statistical surveys of:

- Foreign trade,
- Industry,
- Construction,

- Transport,

- Agriculture and Forestry;

Publications of IEA/OECD.

The surveys of energy statistics cover enterprises engaged in the production, trade, transport, distribution of fuels, and final consumers of energy in industry, construction, transportation, agriculture and forestry.

The methodology for compiling energy balances, defining and grouping fuels and types of energy, as well as the statistical terminology, are harmonized with the standards of IEA/OECD and Eurostat, Manual, Regulation 1099/2008.

Industrial processes

Data on Industry Statistics originate from bookkeeping records, personnel and other documentation of reporting units. These data are collected by means of monthly and annual reports. By means of monthly industry report, the data regarding production and number of employees are collected.

Industry report covers business companies that are, according to the Classification of Activities, classified in the industry, as well as parts of non-industrial business companies performing industrial activity. By monthly industry reports, reporting units, that have 20 employees and more and that make together 80 % of value added for each division, are followed. Military production data are not included.

Agriculture

Data on number of livestock and livestock turnover, as well as data on production of milk, eggs, honey and wool have been collected from regular annual reports of business enterprises and agricultural cooperatives, as well as annual surveys for family holdings. Data on family holdings also cover livestock in households out of the family holdings. Since 2004 a two-stage stratified simple random sample for the Survey on livestock number, covering about 1% of family holdings, has been applied. Due to harmonization with European standards and recommendations, the Survey on livestock number has been carried out with state as on 1 December (instead of on 15 January) since 2006, while Annual report on livestock has been carried out with state as on 1 December (instead of on 31 December) since 2007, with modifications in livestock classification.

Statistical data on crop production cover funds and business enterprises production and agricultural crop production agricultural cooperatives. These reporting units deliver reports for part of family holdings production, also, which is realized in cooperation with business enterprises and agricultural cooperatives. For family holdings, data cover total areas and

yields, as well as areas and yields out of family holdings (non-agricultural households, town gardens and similar).

Data on business enterprises and agricultural cooperatives are collected by means of regular annual reports, based on data taken from accounting and other records. For family holdings, data on areas present estimates based on data taken from comprehensive cadastral register. A networked group of about 1,250 statistical estimators has been set up to cover 4,000 estimation areas, each consisting of one or more cadastral communes, by the rule. Agricultural experts or advanced agricultural producers, well acquainted with local conditions and trained for these tasks are engaged as statistical estimators. They keep in touch, permanently, with statistical offices and their work is supported by the latest cadastral data, estimates from preceding years, information obtained from agricultural producers and experts, as well as their own observations and other sources.

Land–use change and forestry

Land–use change is not explicitly covered by Statistical yearbooks. However, this topic is considered in "Report on the State of the Environment in Republic of Serbia". This publication has been issued annually since 2006. Monitoring of land-use change in the years 1990, 2000, and 2006 has been used by analysis of Corine Land Cover database for 2000 and 2006 compared to the initial Corine Land Cover database for 1990.

Forests data, timber felling, forest growing and tending, plantations, intensive plantings and hunting were collected with full coverage in Yearbooks. Forest assortments production and sale data cover organizations engaged in state forests with a view to continuous forest assortments' manufacture. Data on damages in state forests are fully covered, while data on damages in private forests are being collected in much reduced volume, relating only to damages caused by fire.

Waste

Data on industrial waste and waste-water are collected in statistical yearbooks. Data on industrial waste are obtained by statistical surveys on Industrial waste that was carried out according to the standards and rules of Regulation (EC) 2150/2002 on reporting of Waste Statistics and harmonized with international standards, the OECD/Eurostat and the UNSD/UNEP. This survey cover all reporting units whose enterprises with 10 or more employees, are engaged in the sectors Mining and quarrying, Manufacturing (Recycling not included) and Electricity, gas, and water supply (Collection, purification and distribution of water not included). Data on municipal waste are collected by local/municipal public companies obliged for waste collecting. Reliable evidence about communal waste structure does not exist, but for "Report on the State of the Environment in Republic of Serbia" S.W.A. – Tool (methodological tool to enhance the precision & comparability of solid waste analysis data) has been used and proposed as an official methodology. Wastewater discharge data are obtained by means of regular annual reports from referent public enterprises

responsible for public water supply and sewage management in related localities. Starting 2004, data have been collected annually. Reports are based partly on records and documentation and partly on estimates.

1.2.3. Responsible authorities and contact persons

Statistical Office of the Republic of Serbia is special professional organization in the system of state administration of the Republic of Serbia that performs the expert tasks related to adopting programs, organization and conducting of the statistical surveys, methodology creation, collecting, processing, statistical analysis and publishing of the statistical data – including data for all key categories according to IPCC (except Land–use change and forestry). Contact person is Dr Dragan Vukmirović, Director.

Land–use change and forestry is covered by "Report on the State of the Environment in Republic of Serbia". This report is issued annually by the Serbian Environmental Protection Agency. Contact person is Momčilo Živković, Director.

1.2.4. Procedures to address climate-change issues

The Ministry of Environment, Mining and Spatial Planning (MEMSP) is the national coordinator (the focal point) for the implementation of The United Nations Framework Convention on Climate Change and Kyoto Protocol. The Climate Change Division of MEMSP (unit responsible for the initiation and coordination of climate change-related activities) coordinated all activities in preparation and publishing of The Initial National Communication of the Republic of Serbia, including an official Inventory of emissions of greenhouse gases.

1.3. Population

1.3.1. Demographic characteristics

The average estimated population of Serbia in 2009 amounts to 7,320,807. The rate of population growth in relation to the previous year was negative and amounted to -4.0 per 1,000 inhabitants. According to vital statistics, the rate of natural increase was -4.6 per 1.000 inhabitants (rate of live births 9.6 and the mortality rate 14.2).

Starting from 1999 the Statistical Office of the Republic of Serbia has not at disposal and may not provide available certain data relative to AP Kosovo and Metohia and therefore these data are not included in the coverage for the Republic of Serbia (total).

In the period from 2002 until 2009 the population decreased by 179 thousand, the average annual growth rate was -3.5 per 1,000 inhabitants. In the same specified period, the proportion of the population younger than 15 years and older than 65 years in the total population ranged: the percentage of young people (0-14) fell from 16.1 % in 2002 to 15.2 % in 2009, while the population aged 65 and over increased from 16.6 % (2002) to 17.1%

(2009). Working contingent of population (15-64) slightly increased, from 67.3 % (2002) to 67.7 % (2009).

The average age of the Serbian population increased from 40.2 years (2002) to 41.2 (2009). The average life expectancy of male and female population in Serbia has extended in the last seven years by 1.4 year (from 69.7 years to 71.1 years for males and from 75.0 to 76.4 years for women).

In the same period (2002-2009), the rate of live births decreased from 10.4 to 9.6 live births (per 1,000 inhabitants). The share of women in the fertile period in the total population decreased from 24.1% to 23.1 % or 7 index points in the period 2002- 2009. Mortality rate rose from 13.7 to 14.2 deaths per 1,000 inhabitants.

Generally it can be concluded that the area of the Republic of Serbia has all the characteristics of spatial-demographic polarized area, bearing in mind that nearly a third of the population is concentrated in one fifth of the territory of Serbia. The highest concentration was recorded area of Belgrade, where as estimated, 22.1 % of the population is concentrated.

1.3.2 Development indicators

The main feature of the projected movement of population in Serbia 2002-2032 is developing process of depopulation. According to each of the five variant projections, the population of Serbia in 2032 would be lower than in 2002, and Serbia would be a typical region of negative natural increase. Population would get older demographically, so that in thirty years, the proportion of persons older than 65 would increase from 17 % to 22 %. At the end of the projection period almost every fourth resident would be older than 65 years, and the rate of demographic dependency of older people during the projection period would increase from 25 % to 33 %. These projections were made by Statistical office of the Republic of Serbia (Statistical yearbook 2010).

1.4. Geographic profile

1.4.1. Geomorphologic characteristics

The Republic of Serbia is continental country, mainly located in southeastern Europe (about 80 % of the territory). The smaller, northern part of the country belongs to Central Europe. Serbia is situated in the central part of the Balkan Peninsula, between 41° 53' and 46° 11' latitude North and 18° 49 'and 23° 00' longitude East. The general length of the state border is 2,397 km. In the east, Serbia borders Bulgaria (371 km), in the northeast Romania (544 km), in the north Hungary (166 km), in the west Croatia (315 km) and Bosnia and Herzegovina (391 km), in the southwest Montenegro (236 km) and in the south Albania (122 km) and Macedonia (252 km). The Republic of Serbia covers an area of 88,361 km^2. Northern Serbia, or more preciously the Pannonian Plain, is mainly flat. Flatlands exist also in Mačva,

the Sava Valley, the Morava Valley and the Stig, and Negotin Marshes in eastern Serbia. South of the Sava and Danube Rivers is the central part of Serbia and the Highlands Šumadija. Going to the south, the hills gradually turn into mountains. The valleys of the Great, Southern and Western Morava, the Ibar and the Nisava Rivers intersect the mountainous parts of the country and are main traffic routes. 55 per cent of Serbia is arable land, mainly located in Vojvodina, the main agricultural region of the country. The mountains of Serbia can be divided into: the Rhodope Mountains, the Carpathian–Balkan Mountains and the Dinaric Alps. Up to 30 mountain peaks are over 2,000 m above sea level, the highest being Djeravica in the Prokletija Range (2,656 m). The State Rivers belong to the Basins of the Black, Adriatic and Aegean Seas. Three rivers are navigable along the whole length through Serbia: the Danube, the Sava and the Tisa. The Great Morava and the Tamis are partly navigable. The longest river in the country is the Danube, which flows for 588 km, of its 2,783 km course, through Serbia, and it comprises over 90 % of the river basins. The Danube is a waterway connecting the western and Central European countries with the countries of eastern Europe. The total length of the artificial channels is 939.2 km. The largest canal system is located in the plain part of the country and is known as the Danube–Tisa–Danube Canal, the names of the Rivers that it connects. The largest artificial reservoir is located on the Danube and is called the Lake; it covers an area of 163 km2 on the Serbian side (the Romanian part: is 253 km^2). Serbia has 5 National Parks: Đerdap, the Kopaonik, Tara and SAR Mountains, and Fruska gora.

1.4.2. Ecosystems

The Republic of Serbia is the Central Balkan and Danube region country, ant it is characterized by a rich and varied natural heritage. Thanks to the specific position, its turbulent geological past, this part of the Balkan Peninsula is one of the most important centres of geological diversity of Europe. The richness of the natural conditions is provided by the complex geological structure and soil cover, relief, in which alternate high mountains, river valleys, basins, etc.

The great richness of the habitat has led that at the territory of Serbia are living together numerous plant and animal species with different biology, origin, time of onset of the expansion and lifestyle. A large number and diversity of plant and animal species, their communities and ecosystems makes the Republic of Serbia one of the centers of biological diversity of Europe.

With 3662 described plant species and subspecies the Republic of Serbia is among the European countries with the highest plant diversity. Republic of Serbia with a registered 110 species of fish, 44 species of amphibians and reptiles, 360 species of birds and 94 species of mammals is among the countries with the richest fauna in Europe.

The most important ecosystems and areas of the Republic of Serbia are protected as natural assets, which makes 5.86 % of the territory.

1.4.3. Land use, land-use change and forestry

In the period 1990 – 2000, 1.15 % of the total land area of the Republic of Serbia was subjected to a land use change. Agricultural land areas were reduced by 8,473 ha, while forest areas were increased by 36,419 ha.

Today, 65 % of the territory (57,506 km^2) is considered to be agricultural land, forestland occupies 29.7 % of the territory (26,276 km^2), while other land types comprise the remaining 5.3 %.

Current condition of the state-owned forestland is characterized by insufficient production capacities, unfavorable stand structure with respect to stand age, unsatisfactory stand density, unfavorable forest composition, including a large number of locations occupied by damaged forest stands and large percentages of weed infested areas, as well as unsatisfactory tree health.

The ongoing process of transition to a market oriented economy has imposed higher demands on forestland use change, caused by additional land needed for construction of industrial, infrastructure and recreational facilities.

Analysis of changes in land uses in the Republic of Serbia in the period 1990-2000 shows that the biggest changes were in the category of non-natural land with the increase of 3947 ha. Agricultural areas in the reporting period were reduced for 8473 ha. Forest areas are increasing, a result of a forestation of agricultural land. Area of water basins have increased for 2343 ha, due to the construction of non-natural lakes.

Analysis of changes in land uses, occupied by urban development, shows that most used areas were under pastures, and mixed agricultural areas (Figure 1.4.1 and Table 1.4.1).

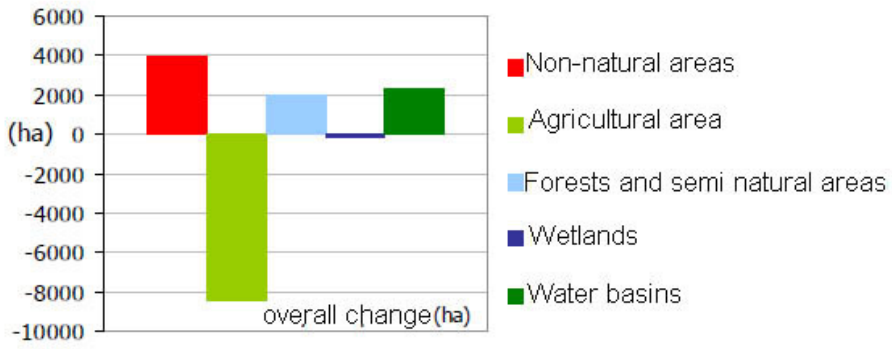

Figure 1.4.1: Changes of Corine Land Classes during the period 1990-2000
Source: Report on the State of the Environment in Republic of Serbia for 2009

Categories	Area, ha		
	1990-2000	2000-2006	Total
Pastures and mixed agricultural areas	2,818	2,280	5,098
Arable land and permanent crops	2,468	939	3,407
Water basins	58	0	58
Bare areas with little or no vegetation	0	0	0
Natural grass areas	12	3	15
Forest and transitional forest area	546	1,066	1,612
Wetlands	21	36	57

Table 1.4.1: The origin of urban land, as a percentage of the various categories of land which has changed the purpose.

Source: Report on the State of the Environment in Republic of Serbia for 2009

1.5. Climatic profile

Most of Serbia has a temperate continental climate. A continental climate prevails in the mountainous, whilst the climate in the Serbian southwest borders on the Mediterranean subtropical and continental. According to the Köppen climate classification, most of Serbia has a moderately warm rainy climate with warm summers, whilst the mountainous areas have a snowy forest climate.

1.5.1. Precipitation

The sum of the annual precipitation increases with altitude. The lowest precipitation, under 600 mm, is characteristic for northern Serbia and parts of Kosovo. The amounts of precipitation in the Sava region as well as in the Great Morava and South Morava valley regions ranges between 600 and 700 mm, in the mountainous areas between 800 and 1000 mm a year, and above 1,000 mm a year on some mountain peaks in Southwest Serbia.

The number of days with an average annual precipitation higher than 0.1 mm and higher than 10 mm is 120–150, while 20 days have more than 10 mm.

The major part of the Pannonian Plain and central Serbia receives most rain in late spring, most often in May and June. The secondary precipitation maximum is in February, whilst October is the driest month in this area. Due to the influence of the Mediterranean climate in the far southwest of Serbia, this region receives maximum rainfall in late autumn and the minimum in the summer months. The trend of annual sum of precipitation in the Republic of Serbia in % N1961-1990 is shown in Figure 1.5.1.

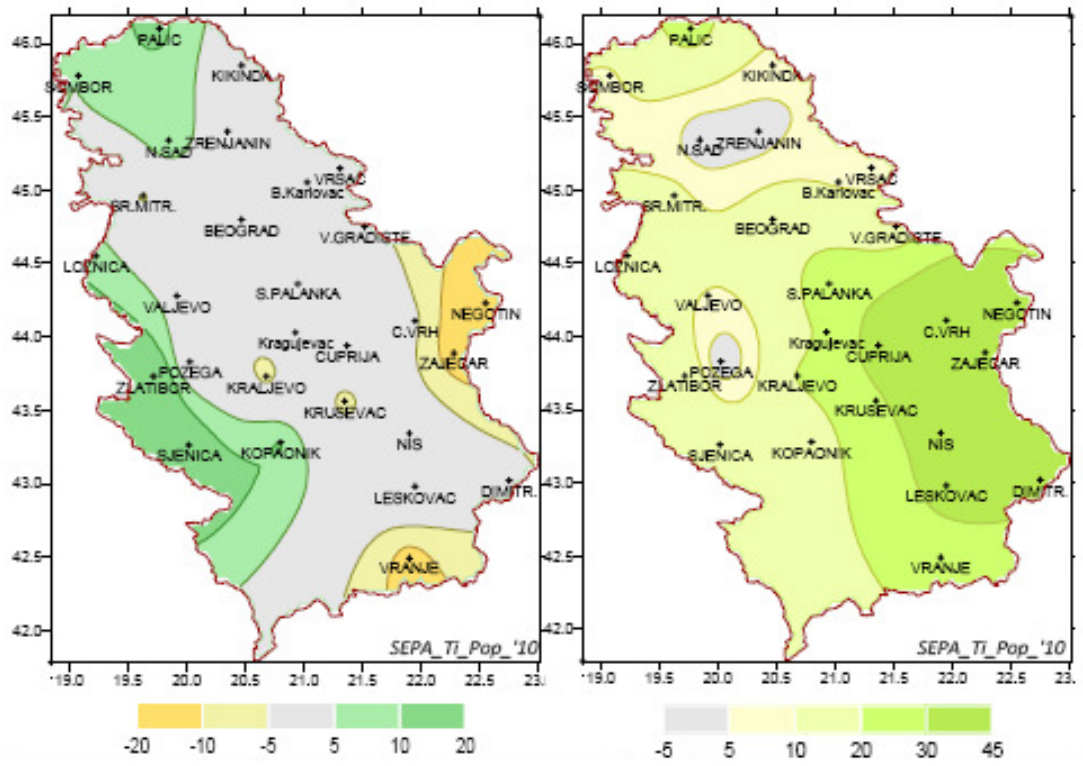

Figure 1.5.1: The trend of annual sum of precipitation in the Republic of Serbia in %N 1961-1990 - Left For the period 1951-2009, right for the period 1991-2009
Source: Republic Hydro-meteorological Service of Serbia

1.5.2. Temperature

According to measurements made during 1961–1990, the mean annual air temperatures are between 10 and 12 °C in the lowlands and Metohija, below 10 °C at altitudes higher than 600 meters, around 6 °C at altitudes above 1,000 meters, and around 3°C at altitudes above 1,500 meters. The coldest month is January, the warmest is July. The trends of territorial distribution of annual temperature in the Republic of Serbia are shown in Figure 1.5.2.

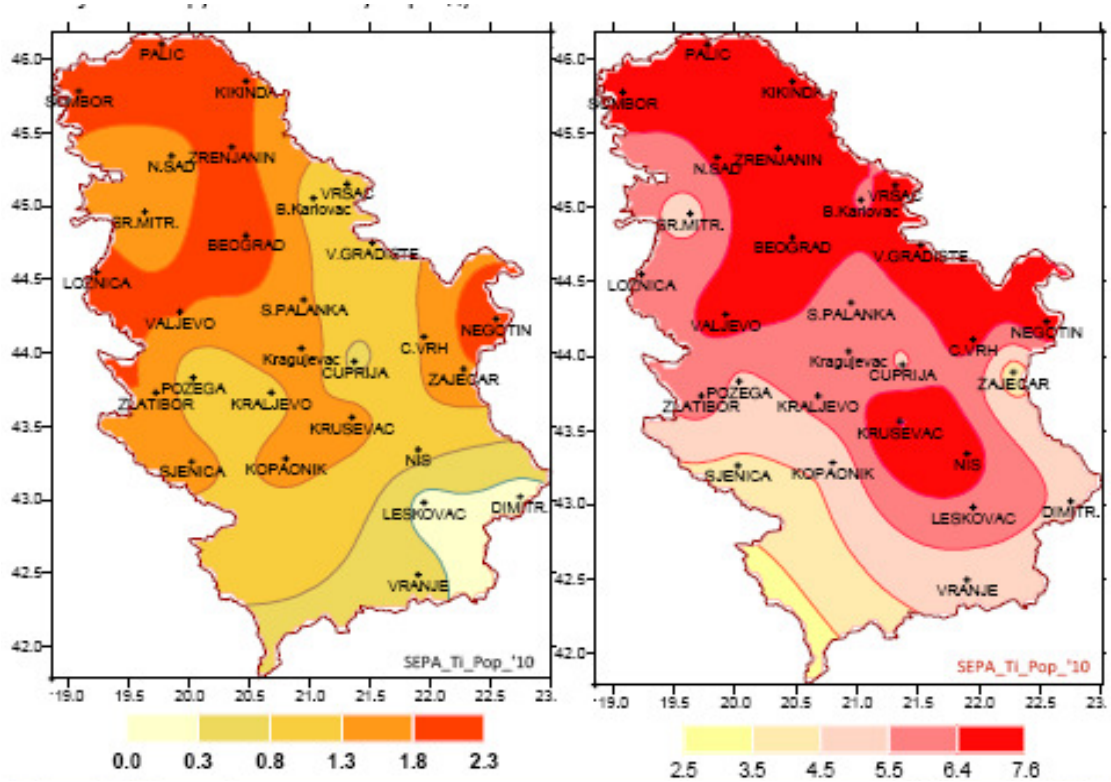

Figure 1.5.2: The trends of territorial distribution of annual temperature in the Republic of Serbia - Left for the period 1951-2009 in °C/100 years, Right For the period 1991-2009 in °C/100 years
Source Republic Hydro-meteorological Service of Serbia

1.5.3. Other climatic characteristics

North-westerly and westerly winds dominate the warmer period of the year, whilst easterly and south-easterly winds (Košava) blow during the cold period of the year. In the mountainous areas in southwest Serbia, south-westerly winds prevail.

The annual sums of sunshine duration range from 1,800 to 2,100 hours, with only one town Pozega having around 1,550 hours a year.

1.6. Economic profile

1.6.1. General

Economic development of the Republic in Serbia in the period from the mid nineties of the last century to the 2000 was characterized by a slowdown in industrial production and reduced investments, high unemployment rate, problems related to internal and external dept, high external trade deficit and low competitiveness on the international market. The specified industrial slow-down of the country and other circumstances that occurred in the considered period resulted in a decreased gross domestic product (GDP) per capita.

After year 2000, the country went through the economic liberalization, and experienced fast economic growth (GDP per capita went from $1,160 in 2000 to $7,054 in 2008). Furthermore, it has been preparing for the membership in the European Union, its most important trading partner. Estimated GDP (PPP) of Serbia for 2008 is $80.717 billion which is $10,911 per capita.

In the period 2001-2008 the significant results in terms of economic growth where obtained, with a gradual reduction of inflation, but with the increase in the deficit of public finances and the trade deficit. The economy has achieved strong economic growth, macroeconomic stability has been established, the liberalisation of prices and foreign trade have been implemented, significant progress in reforming the tax system has been achieved etc. The main objectives of economic policy were maintaining macroeconomic stability, while achieving a high rate of economic growth. There has been significant progress in completing the incentive environment for business.

In 2009 economy was strongly influenced by the global economic crisis whose effects in the second half of year were reduced by the economic policy measures.The economic stability was provided with a slight recovery in economic activity. The economic crisis and recession of the Serbian economy from the end of the year 2008, have resulted in the increase in the number of unemployed and poor citizens.

The consequences of the economic crisis are reflected in the reduction of gross domestic product of 3 %. The largest negative effects of the crisis affected the industry (reduction of 12.1 %), then to the trade (12.3 %), and the construction. In addition to the agricultural, high positive growth rate recorded the transport sector (7 %). Trade deficit has been reduced due to a larger decrease in imports compared to exports: 30.7 % and 22.4 %, respectively. The consumer price rose by 8.6 %, while real wages increased by 0.2 %. Unemployment and poverty continue to have extremely high rates. The effects of the global financial crisis are eased, by the measures of the Serbian Government pointed to encourage savings, economic revitalization, and by the monetary policy of the National Bank of Serbia to increase liquidity and bank lending, etc. Main economic indicators are shown in Table 1.6.1.

	2006	2007	2008	2009
GDP (€ million)	23,610	29,124.5	33,417.9	29,967.0
GDP growth (%)	5.6	7.1	5.5	-3.0
GDP per capita (€)	3,185,6	3,945.6	4,546.5	4,093.4
Industrial output growth (%)	4.7	3.4	1	-12.2
Unemployment rate (%)	27.8	26.8	24.6	26,0
Consumer price (%)	13.4	12	13.5	8.6
Foreign direct investment-FDI (mill. €)	4,085	2,910	1,771.4	1,228.6
FDI per capita (€)	398	278	242.6	167.6

Table 1.6.1: Main economic indicators.

Source: Statistical Office of the Republic of Serbia, 2007 - 2010

At the end of year 2009, positive trend in the process of Serbia's accession to the European Union has been continued. According to the Decision of the Council of the European Union from December 2009, the Interim Trade Agreement with Serbia was unfrozen and enabled its implementation from February 2010 that would enable reduction of costs based on import duties and easier access to EU market. EU membership application was submitted at December 19th 2009.

1.6.2. Primary sector

During the 1990s, in agriculture, which is traditionally considered to be one of the key sectors contributing to the economic development of the Republic of Serbia, agricultural production volumes was reduced and production structure altered. Although revenues from agricultural activities were significantly reduced (due to decreased demand and supply), an increase in the relative contribution of agriculture sector to the GDP was recorded. Reduction in agricultural production recorded in the period 1990-2000 had resulted in reduced the strain on natural resources, primarily due to the decreased use of chemicals in agricultural production. However, a modest increase in agricultural production has been recorded during the last couple of years.

Agriculture and rural areas have tremendous place and role in the overall development of Serbia, especially in the process of harmonization of economic mechanisms for the realization of certain social goals, primarily the implementation of reforms and transition. Agribusiness is the most important industry in the Republic of Serbia, which in the overall domestic product (GDP) accounts for about 20% as shown in Table 1.6.2.

Year	Agricultural production	Food Processing	Other
2002	14.8 %	5.9 %	79.3 %
2003	13.6 %	5.7 %	80.7 %
2004	15.0 %	5.4 %	79.6 %
2005	13.5 %	5.4 %	81.1 %
2006	12.6 %	5.3 %	82.1 %
2007	10.8 %	5.2 %	84.0 %
2008	11.8 %	5.5 %	82.7 %
2009	10.8%	7.2%	82.0%

Table 1.6.2: Share of agriculture in overall domestic product

Source: Statistical Office of the Republic of Serbia

In the total value of agricultural production in 2009 plant production participated with 69.3%, and cattle production with 30.7 %. In comparison to 2008 net index of physical volume of agricultural production is higher, by 1.0 %.

Plant production in relation to the previous year is higher, by 3.6 %. Within the plant production value of agricultural production is higher, by 2.4 %, fruit growing by 8.3 % and viticulture by 15.6 %.

In the total agricultural area in 2009, arable fields and gardens participate with 65.3%, orchards with 4.7 %, vineyards with 1.1 %, meadows with 12.4 % and pastures with 16.5 %. In the structure of sown areas of arable fields and gardens grain participate with 63.3 %, industrial crops with 13.0 %, vegetable crops with 8.9 % and fodder crops with 14.8 %.

The realized production in 2009 compared to 2008 is smaller for wheat, by 1.3 % and sunflower, by 16.8 %, while there is a higher production of maize realized, by 3.9 % as well as of sugar beet, by 21.7 %.

The value of livestock production in relation to the 2008 year is smaller, by 4.5 %. In the structure of livestock production value of cattle breeding is smaller, by 4.0 %, sheep breeding by 4.1 and poultry breeding by 1.0 %.

Compared to the 2008 year the number of livestock units is smaller, by 2.3 % as well as meat production, by 1.8 % and milk production for human consumption and its processing by 3.7%.

1.6.3. Secondary sector

Industrial production in the Republic of Serbia in 2009 was smaller by 12.1 % compared to 2008. Volume of industrial production in 2009 compared to 2008 records: the fall in 25 areas whose participation in the structure of industrial production is 78 %, growth in 4 areas whose participation in the structure of industrial production is 22 %.

Observed by sectors, in 2009, compared to 2008, the following trends were recorded: Manufacturing sector - a decrease of 15.8 %; sector Mining and quarrying - fall of 4.3 % and the sector of Electricity, gas and water supply - growth of 0.6 %.

Data on industrial production by destination groups, in 2009, compared to the previous year, show that there was a decline in production: of durable consumer goods, by 26.8 %, intermediate goods, except energy, 22.2 %, capital goods, by 22.1 %; non- durable consumer goods, by 8.8 % and energy by 0.6 %.

The biggest impact on the decline in industrial production in 2009, compared to 2008 had: Production of basic metals, Manufacture of chemicals and chemical products, Manufacture of food products and beverages, Manufacture of furniture and Manufacture of products of non-metallic minerals. Indices of industrial production by activities, 2005-2009 are shown in Table 1.6.3.

Previous year = 100	2005	2006	2007	2008	2009
Industry – total	100.8	104.7	103.7	101.1	87.9
Mining and quarrying	102.1	104.1	99.4	103.6	95.7
Manufacturing	99.3	105.3	104.3	100.8	84.2
Electricity, gas and water supply	106.6	102.2	102.8	101.8	100.6

Table 1.6.3: Indices of industrial production by activities, 2005-2009
Source: Statistical Office of the Republic of Serbia.

In spite of the fact that a change in negative industrial production trends was observed from 2001 onwards, the production levels achieved are still below 1990 levels. In general, industrial sector is still characterized by low competitiveness and is primarily based on utilization of imported traditional technologies dating from the 70's and the 80's of the last century. Insufficient financial resources and lack of investments, mainly in 1990s, have prevented much needed industrial reconstruction and modernization, including introduction of clean technologies.

Construction

The value of work done in the Republic of Serbia in 2009 amounted to 184,795 millions of RSD (about 1,848 millions of €), which is 15.2 % less compared to 2008 year. Observed by the type of construction, 52.9 % of the value was carried out on buildings and 47.1 % on other constructions.

The total value of works by contractors from Serbia performed abroad in 2009 amounted to 14,161 millions of RSD (about 142 millions of €). The largest construction activity was recorded in the Russian Federation, 24 % of the total value of works done.

In 2009 19,103 dwellings were completed, which is 3.6 % less than the number of completed dwellings in 2008.

Energy industry

In contrast to other industrial sectors in the Republic of Serbia, energy sector has not exhibited a drastic decline in production when compared to production levels achieved during the 90's of the last century. Reduced industrial production, lack of imported fuels and unrealistically low electricity price (imposed as a social peace-keeping factor), have led to a change in the electricity consumption structure. General electricity consumption in households and public and commercial sectors has increased significantly at the expense of industrial sector electricity consumption. Reduced share of industrial sector in total electricity consumption is manifested in the fact that the industry's share of 46% recorded in 1990 was decreased to 36% in 1998. In the same time, household share in total electricity consumption was increased from 42 % in 1990 to approximately 58 % in 1998. In this way electricity production has remained at approximately the same level as during the 90's of the last century.

Total electricity consumption per capita was relatively low during the period considered. However, specific consumption per unit of GDP had been increasing significantly in the period considered. Between 1990 and 2000, energy intensity changed from 0.59 toe to 1.35 toe used to generate 1,000 US$ of GDP. Relatively low efficiency of energy transformation processes still represents one of the key problems facing the energy sector in Serbia.

Energy resources in the Republic of Serbia are relatively modest and geographically scattered. Total available energy reserves predominantly represent coal varieties (99 %), primarily low calorific value lignite. The remaining energy resources (1 %) comprise oil and gas reserves. Since domestic production of crude oil, natural gas and high rank coal was insufficient to meet national demands, additional quantities of specified energy sources were imported, but only in the amounts permitted by economic and political situation of the time. Total electricity production is based on combustion of low-rank domestic coals in thermal power plants and utilization of available hydro potential in run-off-river and pumped storage hydro power plants.

Electricity production was primarily organized through facilities of Public Utility Enterprise „Elektroprivreda Srbije" (EPS). EPS has been equipped with production system comprising eight lignite-burning thermal power plants (TPP) having 25 production units and three liquid fuel and gas burning combined heat and power (CHP) plants having 6 production units. Total installed capacity of the said production units equalled approximately 9,053 MW, with 2,587 MW installed in hydro power plants. Approximately 450 MWe is installed in industrial energy plants of more than 30 companies. However, significant portion of these production capacities is currently out of operation.

1.6.4. Tertiary sector

Trade

Since 1st January 2010 according to the recommendations of the UN Statistics Division, the general trade system was introduced, which is a broader concept, and the exports and imports include all goods entering the economic territory of the country or even leaving it, with the exception of goods in transit and the transactions and commodities that have a temporary character (for trade fairs, test samples, etc.).

The import expressed by the general system for these years amounted to 19,164 millions of US$ in 2007 and 24,331 millions of US$ in 2008. The coverage increase amounts to 3.3% in 2007 and 6.4% in 2008. When it comes to the 2009, imports by the general system of trade are 16,056 millions of US$. The coverage in 2009, according to the general system, is higher by 1.5%. External trade balance is shown in Table 1.6.4.

	Value, mill. EUR		Value, mill. US$		Balance of trade	
	Exports	Imports	Exports	Imports	Exports minus imports, mill. US$	Export as % of imports
2005	3,608	8,439	4,482	10,461	-5,979	42.8
2006	5,102	10,463	6,428	13,172	-6,743	48.7
2007	6,433	13,952	8,825	19,164	-10,338	46.0
2008	7,429	16,478	10,974	24,331	-13,356	45.1
2009	5,961	11,505	8,344	16,056	-7,710	51.9

Table 1.6.4: External trade balance

Source: Statistical Office of the Republic of Serbia.

The total number of enterprises stores which carried out retail activities in the Republic of Serbia in 2009 amounted to 101,627 of facilities and it was lower by 1.9% than the number of stores in 2008, while the number of employees was 302 344 and it is higher by 1.4 % compared to the previous year.

Goods turnover in retail trade in 2009 (current prices) amounted to 1.264,087 millions RSD (about 12,641 millions of €) and was by 4.7 % lower than the turnover in 2008, while turnover observed in constant prices was lower by 11.6 %. The greatest part of goods turnover in retail trade in 2009 was achieved in the field of trade in non-specialized stores (30.4 %), and in the field of sales of motor vehicles, motorcycles, parts and fuel (27.8 %). Turnover in wholesale trade (current prices) in 2009 amounted to 1.676,871 millions RSD (about 16,769 millions of €) and was higher by 2.7 % compared to 2008 year.

The structure of trade turnover in wholesale trade by types of buyers in 2009 shows that 77.2 % of the turnover was realized in commercial companies for further sale, 15 % was realized by large consumers for their consumption, and 7.8 % were sold to other companies for processing. Turnover structure in wholesale trade by trade activities shows that most of the turnover was carried out in wholesale trade's branch by reproduction materials, waste and residues and amounts to 26.8 %, then in the branch other wholesale trade where it amounts to 25.4 %.

Tourism

The total number of tourists in 2009 amounted to 2,019 thousands and was by 10.9 % lower than in 2008, of which the number of domestic tourists amounted to 1,373 thousands and was reduced by 15.2 %, while the number of foreign tourists who visited our country amounted to 646 thousands and was on the same level as in 2008.

Realized number of all tourists' nights who were using the accommodation facilities was 6,762 thousands and was lower by 7.8 % compared to the previous year. Domestic tourists realized 5,293 thousands of nights (fall of 10.8 % compared to 2008), while the number of overnight stays of foreign tourists was higher by 5.0 % than in 2008 and it amounted to 1,469 thousands of nights.

The structure of tourist arrivals in 2009 by type of tourist sites is similar as in 2008, so that the largest number of tourists was visiting the main administrative centers 32.7% (661,000), other tourist sites 26.0 % (525,000), mountain sites 19.2 % (389,000) spa seats 17.7 % (358,000) and the rest 4.2 % (86 thousands).

The largest number of domestic tourists was visiting other tourist spots 27.2 % (373,000), and then mountain areas 25.5 % (350,000), while foreign tourists were visiting mostly major administrative centers 63 % (407,000) and other tourist sites 23.5 % (152,000).

The structure of tourist nights in 2009 shows that the largest number of nights was realized in the spa areas 33.8% (2287,000), then in the mountain areas 24.7 % (1,673,000), in the main administrative centers 19.9 % (1,349,000), in other tourist areas 18.5 % (1,251,000) and in other places, 2.9 % (202,000).

The largest number of foreign tourists who visited Serbia in 2009 were tourists from Bosnia and Herzegovina, Montenegro, Slovenia, Croatia and Germany.

In 2009 there was 865,4 millions of dollars of foreign exchange earnings, witch is 8.3 % lower compared to 2008.

Transport

Poorly developed infrastructure and inadequate transport organization is a major obstacle to economic growth, increase of productivity, competitiveness and employment.

Current economic situation in the country, damaged and destroyed transportation infrastructure (the road network and bridges) and discontinuation of international traffic that occurred during the 1990s, has resulted in a reduced physical volume of transportation (in all branches of the transport sector), causing a slow-down in transport sector development towards the provision of more efficient and competitive transport sector services.

One of the key problems with respect to energy efficiency, environmental protection and transportation safety represent the old age of vehicle fleet, import of low-quality fuels and similar.

Investments in rail and river transport made since 1990 were insignificant, causing this mode of transportation today to be in particularly unenviable situation. This is especially reflected in the poor condition of rail infrastructure and transport vehicles, low service quality, increased debt, high operation costs and business losses, improper system organization and similar.

The higher utilization rate of railway and waterway transport at the expense of road freight transport is deemed one of the country's priorities in the period to come.

During the 1990s, the advantages of air transport were not utilized, which was reflected in reduced GHG emissions and was therefore associated with positive environmental effects.

Observing all branches of transport in 2009, compared to 2008, it can be noticed that there was a decrease in activity in all areas without exception. The largest fall was recorded in the inland waterway transport, of 36.3%, while road transport is the branch that is at the similar level as in previous years. Data on income from transport for period 2005-2009 are shown in Table 1.6.5.

	2005	2006	2007	2008	2009
Road transport	21,801	36,309	56,337	71,728	69,840
Inland waterway transport	12,112	16,223	21,339	25,952	11,722
Air transport	130,096	130,975	190,413	176,904	174,296
Cargo handling	2,603	2,450	3,776	4,120	3,840

Table 1.6.5: Foreign currency receipts of transport, storage and communication enterprises, US$, thousands

Source: Statistical Office of the Republic of Serbia.

Telecommunications is the only sector which recorded growth of 28.9 % in relation to the previous year, and this trend is still continuing.

1.6.5. Future prospects for the country's economy and development

As the result of applying the macroeconomic model that was developed in cooperation between Centre for Strategic Economic Studies "Vojvodina-CESS" and the Institute for Advanced Studies (Institute for Advanced Studies - IHS), Vienna report "Economic forecast for Serbia in 2011 and 2012" has been published. This edition indicates that Serbia is overcoming the crisis and that it is on the road to recovery, but there are many challenges along the way. Given that Serbia is a small, relatively open economy which is significantly affected by the international situation, the report presents the current situation and future trends in international environment. The summary of expectations of movement of GDP, unemployment, inflation and employment for these years presented in report are presented here in Table 1.6.6.

	2010	2011	2012
GDP growth (%)	1.8	2.7	3.6
GDP per capita (€)	3955	4347	4778
Industrial output growth (%)	6.6	2.0	2.2
Unemployment rate (%)	26.9	26.4	25.5
Consumer price (%)	6.2	8.4	7.1
Employment, growth (%)	-5.0	0.7	1.4

Table 1.6.6: Summary of economic forecasts

Source: Economic forecast for Serbia in 2011 and 2012.

1.7. Transportation

1.7.1. Road transport

The Republic of Serbia is situated at the crossroads of major transport corridors VII and X. Through its territory pass the shortest and most rational road and rail links the countries of Central and Western Europe with the countries of the southern part of Europe and with Middle East. Unfortunately, the level of transport infrastructure in Serbia is generally unsatisfactory.

Road transport traditionally represents the most developed mode of transportation in the Republic of Serbia. Road network, relatively well developed (total length of roads reaches about 38.000 km), is in quite poor condition. Lack of financial resources starting from 1990 onwards, as well as utilization of all available funds for maintenance and repair of infrastructure damaged during the 1999 bombardment, represent the main reasons for the situation encountered today. Poor condition of road network directly affects the safety of road transport, low level of transportation services provided through the existent and perspective road network, as well as high exploitation costs.

A key problem with respect to energy efficiency, environmental protection as well as transportation safety represents the old age of vehicle fleet. In the period 1990 – 1999, an average annual increase in the number of vehicles was about 7%. However, much of the increase was due to importation of used vehicles from the western countries, which had largely influenced the average age of vehicle fleet. Present number of road vehicles by category is shown in Table 1.7.1.

	2008	2009
Motorcycles	31,803	31,794
Passengers cars	1,486,609	1,486,174
Special Passengers cars	13,574	13,573
Buses	8,557	8,553
Lorries (trucks)	139,331	139,243
Special lorries	24,169	24,166
Tractors	1,590	1,587
Trailers and semi trailers	7,387	7,344
Sum	1,713,020	1,712,434

Table 1.7.1: Number of road vehicles and trailers

Source: Statistical Office of the Republic of Serbia.

The period 1990 – 2000 was also characterized by „grey economy" associated with the import of low rank fuels (in addition to domestic production of low rank fuels). Use of diesel fuel had rapidly increased.

All of enumerated problems had negatively affected pollutant emission at national level, in spite of the fact that reduced transport sector contribution to the national economy was recorded.

1.7.2. Shipping

River transport in Serbia is only modestly utilized, mainly due to poor condition of related infrastructure resulting from improper maintenance of waterways and auxiliary infrastructure in previous decades.

Total length of waterways in the Republic of Serbia, measured at the mean river water levels, equals approximately 1,680 km. The waterways predominantly comprise navigable

river streams of the Danube, Sava and Tisa river (960 km in total), as well as a network of navigable canals of the hydro-engineering system Danube-Tisa-Danube (600 km in total).

With respect to the annual volume of river transport and available capacity, the most important river ports are the port of Belgrade, Novi Sad, Pančevo, Smederevo and Prahovo. Most of the river ports are either directly connected or are close to the main railways and roads, which represent a strategic and logistic advantage not sufficiently exploited over the last twenty years. The said is clearly demonstrated in the fact that total traffic that came in Serbian river ports in 2000 equaled about 40 % of the traffic achieved in 1989.

Such significant decrease was primarily a result of reduced national river transport caused by negative trends in the country's economy. Given that Serbia has a considerable potential of waterways (rivers and canals), long-term state strategy is to divert, as much as is possible, the flow of goods from road to river traffic. Transport by inland waterways has significant advantages compared to other forms of transportation: it is very effective and energy efficient (energy consumption per ton-km of transported goods is 1/6 of the consumption on the road and 1/2 of that of rail), noise and emissions are significantly less and the total external costs of inland navigation are seven times lower than those of road traffic. Transport on inland waterways provides a high level of security, especially when it comes to transportation of hazardous materials and helps to reduce congestion on the overburdened road network in densely populated regions

Equipment and operations of enterprises of inland waterway transport in period 2005-2009 are presented in Table 1.7.2, while goods' traffic at river ports for the same period is presented in Table 1.7.3.

	Passenger vessels		Cargo vessels		Transport of goods, thous. T						
	Total	Passenger seats	Total	Carrying capacity thousands t	All	National transport	Exports	Imports	Transit	Traffic between Foreign ports	Tonkilometers, mill.
2005	7	200	334	404	6,360	5,158	323	687	154	38	1,622
2006	7	200	309	348	5,840	4,541	357	626	294	22	1,640
2007	5	200	301	336	5,379	4,277	214	628	259	1,0	1,584
2008	4	200	302	338	5,355	4,366	227	702	59	1,0	1,369
2009	2	100	275	322	1,994	1,207	392	344	59	12	8,72

Table 1.7.2: Equipment and operations of enterprises of inland waterway transport in period 2005-2009

Source: Statistical Office of the Republic of Serbia.

	Traffic									Transit		
	Total traffic			National traffic			International traffic					
	Total	Loading	Unloading	Total	Loading	Unloading	Total	Exports	Imports	Total	Upstream	Downstream
2005	15,074	6,337	8,737	10,316	5,158	5,158	4,758	1,179	3,579	4,399	2,105	2,295
2006	14,024	6,045	7,979	9,146	4,573	4,573	4,878	1,472	3,406	4,512	2,322	2,190
2007	14,515	5,975	8,450	8,554	4,277	4,277	5,961	1,698	4,263	5,491	2,520	2,971
2008	14,044	5,691	8,353	8,734	4,367	4,367	5,310	1,324	3,986	6,350	4,195	2,155
2009	7,122	3,155	4,007	2,414	1,207	1,207	4,708	1,908	2,800	5,480	2,285	3,195

Table 1.7.3: Goods' traffic at river ports, 2005-2009, thousands t.

Source: Statistical Office of the Republic of Serbia.

1.7.3. Railways

Investments in rail transport made since 1990 were insignificant, causing this mode of transportation today to be in particularly unenviable situation. The said is specially reflected in poor condition of rail infrastructure and rail transport vehicles, low service quality, increased debt, high operation costs and business losses and improper system organization. All of this has led to a decreased share of rail transport starting from 1990 onwards.

In recent years, the state policy changes imply a contribution to the development of this sub-sector. Therefore, intermodal transport, which takes into account ecological principles, has a special place, which led to the intensification of its development. In the most of European countries (using intermodal transport, reductions of CO_2 emissions reduction is obtained in range from 18 to 55 % compared to road transport, depending on the type of technology which is used for intermodal transport). Until 2005, intermodal transport in the Republic of Serbia was represented in overall transport with approximately 0.5 % (EU countries 6–9 %). Development of intermodal transport in the Republic of Serbia, as transport of the wider public interest, environmentally acceptable, economically justified and safe, requires support from the government. The role of the government in the development of intermodal transport is very important in order to facilitate its development expansion by developing stimulating measures in order to promote more cost-effective transportation and create alternatives to road transportation. This applies particularly to the creation of a financial support model to stimulate projects for the developing development of infrastructure for intermodal transport (terminals), organization and equipment at the terminals and the transportation itself. Current situation in railway sector is well described in Tables 1.7.4 and 1.7.5.

	Effective length of tracks, km		Locomotives		Passenger wagon stock and motor trains		Freight wagon stock	
	Total	Of total electrification	Number	Power, thousands kW	Number	Seats thousands	Number	Total carrying capacity, thousands t
2005	3,809	1,254	368	898	804	49	10,561	496
2006	3,809	1,254	345	840	784	49	9,014	439
2007	3,809	1,254	334	815	804	49	8,354	413
2008	3,809	1,254	334	815	804	49	8,145	406
2009	3,809	1,254	333	810	804	49	8,980	456

Table 1.7.4: Railway assets, 2005-2009.

Source: Statistical Office of the Republic of Serbia.

	Locomotive km, thous.				Gross-ton km, mill.			Passengers transported, thous.		Goods carried, thous.t	
	Total	Of which: train km, thous.			Total	Passenger transport	Freight transport	Passengers	Passenger kilometers	Goods	Tonkilometers
		All	Passenger transport	Freight transport							
2005	27,343	24,878	17,843	7,035	10,036	3,103	6,933	6,492	713	12,568	3,482
2006	28,271	25,554	17,504	8,050	11,215	3,031	8,184	6,445	684	14,139	4,232
2007	28,486	25,763	17,104	8,659	11,356	2,787	8,569	5,974	687	14,902	4,551
2008	26,587	23,867	15,642	8,225	10,617	2,429	8,188	5,618	583	14,130	4,339
2009	24,117	20,869	14,619	6,250	7,900	2,128	5,722	5,358	522	10,419	2,967

Table 1.7.5: Use of transport equipment of railway transport, 2005-2009.

Source: Statistical Office of the Republic of Serbia.

1.7.4. Air transport

The Republic of Serbia has two airports opened to international flights (Belgrade Airport and Niš Airport) which belong to the primary network of airports, five airports from secondary network (those for bigger aircrafts) and 16 tertiary airports (small airports for sport flying). Some data about air transport enterprises are presented in Table 1.7.6.

	Aircrafts		Length of scheduled services km	Route flights	Aircraft flown, km thousands	Hours flown	Passengers transported, thous.	Passenger kilometers, mill.	Cargo carried, tons	Ton-kilometers thousands
	Total	Passenger seats								
2005	17	2,060	90,735	18,664	17,178	33,443	1,122	1,219	4,945	5,937
2006	15	1,694	63,965	21,020	18,190	37,243	1,216	1,252	4,678	5,464
2007	16	1,734	51,920	21,765	19,169	39,068	1,312	1,395	4,091	4,627
2008	16	1,734	58,225	21,604	19,190	38,938	1,350	1,445	3,379	4,067
2009	15	1,668	38,405	18,585	16,488	32,836	1,054	1,123	2,487	2,657

Table 1.7.6: Equipment and operations of air transport enterprises, 2005-2009.

Source: Statistical Office of the Republic of Serbia.

1.8. Energy generation

1.8.1. Energy supply

Since 2007 energy consumption and imports are reduced, but production is still in the slight increase. Also, since 2002, total energy intensity decreases, due to greater economic growth than the increase in total energy consumption. The share of renewable energy sources is increasing in the total primary energy consumption, but still at a very low level of 8.6 %.

From 2002 to 2009, primary energy production is in constant slight increase. According to estimates of the Ministry of Mining and Energy production in 2009 was 9.7 million toes, which is 3 % more than in 2008. In the period 2002 to 2008 import dependency rose from 36.7 to 40 %, while in 2009 was recorded a mild decline in the import dependence, so it was 33.3 %. Reduction of import dependence in 2009 is the result of an energy crisis that occurred, causing a significant reduction in natural gas delivery. Production, imports and exports of energy in Serbia are presented in Table 1.8.1.

	Total	Natural gas	Oil and Oil products	Electricity	Heat	Coal and Coal Production	Geothermal Energy	Fire wood
Primary production	395,351	9,658	27,631	36,392	-	308,601	272	12,797
Transformation output	288,029	-	132,737	98,158	34,663	22,471	-	-
Imports	313,107	74,634	166,938	31,950	-	39,564	-	21
Exports	44,499		10,231	31,687	-	2,417	-	164

Table 1.8.1: Production, input, output energy in 2008, TJ.

Source: Statistical Office of the Republic of Serbia.

Company NIS-NAFTAGAS, part of NIS – Gazprom Neft, is obliged for exploration and production of crude oil, natural gas, ground water and geothermal energy. Results of 50-year exploration activities in Serbia are discovery of 95 oil and gas fields and discovery of 267 reservoirs. Oil production started in 1956 and gas production in 1952. The maximum output of crude oil and natural gas was reached around the year 1980 (1.3 million tons of crude oil in 1982 and 1.14 Gm^3 of gas in 1979). Domestic production of crude oil in 2008 was 0.635 million tons, but with tendency of growth (0.681 millions tones in 2009 and estimated 0.875 millions tones in 2010). Supply of crude oil is mostly provided from imports (81 %), while the smaller part (19 %) is provided from domestic production.

The Republic of Serbia has very limited natural gas production, 0.252 Gm^3 in 2007, coming from fields located in the northern part of country. After a decade of constant fall, domestic production of natural gas started to grow in 2009 (0.263 Gm^3) and 2010 (0.379 Gm^3 estimated). The required quantities of natural gas are provided by imports from Russia.

The mining sector of Serbia is based on low heating value coal (lignite). The main characteristics, of the hitherto production of primary energy, are: a highly intensified development of lignite production in open-pit mines and an initially slow growth of coal production in underground mines, followed by an absolute decrease. The fundamental characteristics of the previous production of secondary energy from coal in Serbia are as follows: a highly intensified production of electric power in the thermal power plants (accounting for more than 95 % of coal consumption), development of the production of dried lignite and start-up of the production of synthetic gas, followed by its abandonment.

Serbia's coal reserves are mostly located in 3 coal basins: Kolubara, Kostolac and Kosmet. The latter is temporarily not functioning as part of the energy system of Serbia, due to the transitional status of the southern Serbian province. These coal reserves can be mined by surface mining methods. The majority of Serbia' primary energy is based on lignite, predominantly coming from opencast mining at the Kolubara and Kostolac coalfields. Annual coal production necessary for regular supply of the power plants is about 35 million tons. Consumption of the power plants from the Kolubara basin is more than 29 million tons and from the Kostolac basin is approximately 7 million tons. Annual excavation of overburden should exceed 100 million m^3. Some 110,000 tons of lignite are produced from underwater exploitation (Kovin).

1.8.2. Energy consumption

Period from 2002-2007 was characterized by the increase in primary energy consumption, and domination of fossil fuels (coal, oil and gas) consumption. Primary energy consumption in 2009 was 14.86 Mtoe, which is 5 % less than in 2008. The decrease in consumption in 2009 was caused by less consumption of energy, except renewable energy sources. Although renewable energy in the structure of consumption accounted only 7 %, it is encouraging

constant growth of their participation. Primary energy consumption in the Republic of Serbia in 2008 is shown in Figure 1.8.1.

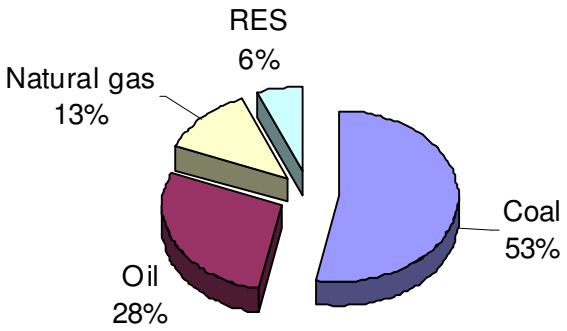

Figure 1.8.1: Primary energy consumption in the Republic of Serbia in 2008 (Source: Ministry of Mining and Energy).

From 2002 to 2009, total primary energy consumption increased by about 26 % while the gross domestic product grew by about 39 %. Final energy consumption in 2009 amounted to 7.74 Mtoe, or decreased compared to 2008 by 8%. The largest reduction in energy consumption was in the transport sector 19 %, 6 % in industry while in the household sector and agriculture about 1 %.

Structure of final energy consumption has changed significantly since 1990. Industry participation has been reduced by 32 %, the household sector and agriculture 4 %, while the share of traffic increased by 5 %. Structure of final energy consumption in the Republic of Serbia in 2008 is shown in Table 1.8.2 and in Figures 1.8.2 and 1.8.3. The final consumption of oil products is characterized by a high share, in the total consumption, of those used up for heating purposes (heavy and light heating oil) and a relatively low share for the transport sector.

	Total	Natural gas	Oil and oil products	Electricity	Heat	Coal and Coal Products	Geothermal energy	Fire wood
Total final consumption	354,853	57,287	154,535	98,129	30,422	40,227	270	12,715
Final Non-Energy consumption	38,732	5,559	32,407	-	-	766	-	-
Final Energy consumption	354,853	51,728	122,128	98,129	30,422	39,461	270	12,715
Industry	116,457	40,512	14,531	24,696	12,379	23,409	-	930
Construction	3,434	1,703	953	742	-	33	-	3
Transport	99,950	189	98,797	950	-	14	-	-
Household	90,616	2,737	1,434	50,753	15,160	13,538	-	6,994
Agriculture	3,294	179	2,146	774	-	34	149	12
Other users	41,101	6,408	4,266	20,214	2,883	2,433	121	4,776

Table 1.8.2: Final energy consumption in 2008, TJ, Source: Ministry of Mining and Energy

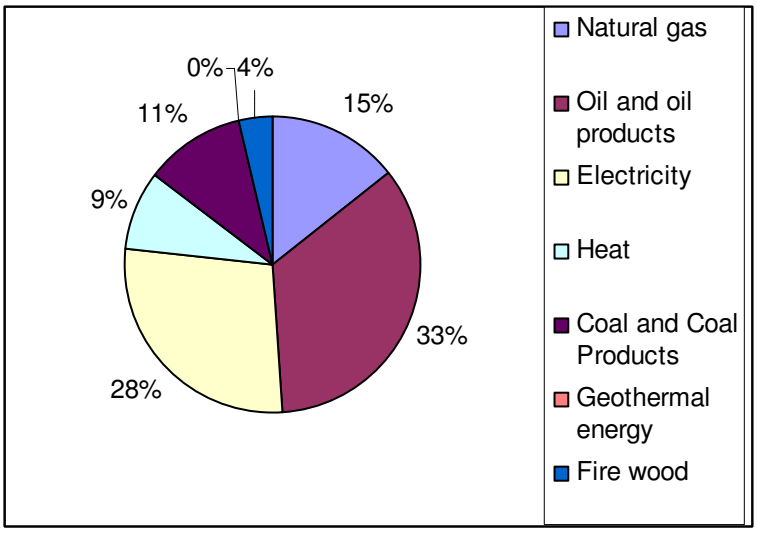

Figure 1.8.2: Final energy consumption by fuels, Source: Ministry of Mining and Energy

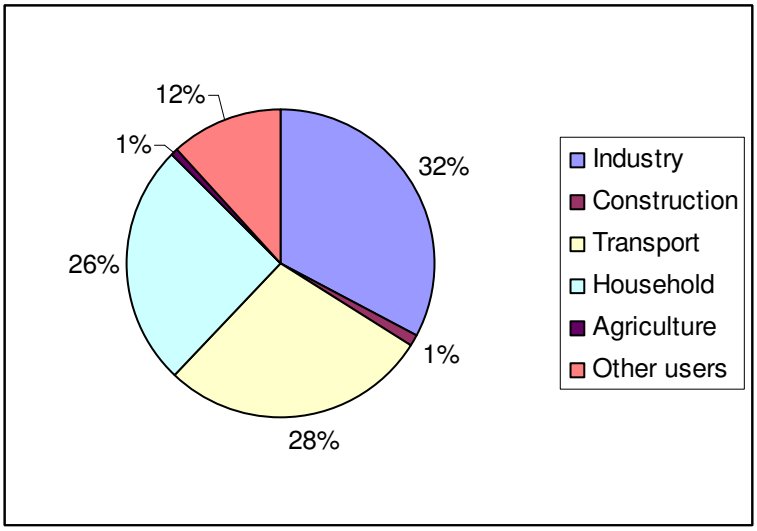

Figure 1.8.3: Final energy consumption by sector, Source: Ministry of Mining and Energy

In all sectors of final energy consumption can be seen lagging behind in terms of energy efficiency, as compared to developed European countries and some countries from the region.

Total energy intensity is a measure of total energy consumption in relation to economic activity. According to estimates energy intensity in the Republic of Serbia is 2-3 times higher than in the countries of the European Union.

It should be noted that in the Republic of Serbia in 2008 was used 2.1 toe per capita, which is lower than the EU average which is 3.6 toe per capita.

1.9. Waste disposal

1.9.1. Solid waste disposal

In the Republic of Serbia there is no organized system for waste collection, sorting and recycling. There is no location for the disposal of hazardous waste, as well as operators of hazardous waste treatment.

Municipal waste

Serbia has inherited from previous decades poor waste management method. Current situation is as follows: 164 registered landfills, but there are about 4400 illegal landfills.

Applying the model to estimate the value of indicators related to waste the following data were obtained (Table 1.9.1).

Indicator	Year			
	2006	2007	2008	2009
The total quantity of waste generated, mill. T	1.73	2.07	2.55	2.63
Average daily amount of municipal waste per capita, kg	0.62	0.77	0.95	0.98
The average annual amount of municipal waste per capita, t	0.23	0.28	0.35	0.36

Table 1.9.1: Indicators related to waste

Source: Report on the State of the Environment in Republic of Serbia

As can be seen from the table, there is a slight increase in the value of average daily quantities of solid waste per capita in 2009, compared to 2008. This is the result of better data collection. Yet, most of the local government does not keep records of the composition of municipal waste is collected.

Industrial waste

In 2009, from the reports of 334 companies it was registered 1,864,303.66 tons of industrial waste. Of the total amount of 64.8 % is non-hazardous waste and the hazardous is 35.02 % (Table 1.9.2).

Index from European Waste Catalogue	Origin	t	
		non-hazardous	hazardous
01	Mining	/	/
02	Agriculture and food processing	186,005.69	58.34
03	Wood, paper, cardboard	3,861.1	/
04	Leather, fur and textile industries	/	/
05	Processing of oil, natural gas and coal	/	1,186.7
06	Inorganic Chemical Industry	1,505	60,003.46
07	Organic Chemical Industry	143.45	33.04
08	Coatings, adhesives and printing inks	25.29	24.48
09	Photographic Industry	/	/
10	Wastes from thermal processes	821,814.06	482,575,623
11	Shield of metals and other materials	323	584.36
12	Surface treatment of metals and plastics	4,245.47	447.99
13	Waste oil	/	3,989.22
14	Waste organic solvents, refrigerants	/	/
15	Packaging waste	36,626.53	22.01
16	Wastes not otherwise specified in the catalog	8,543.46	10,361.3
17	Construction waste and demolition waste	2,505.51	143.28
18	Health of humans and animals	/	/
19	Wastes from waste treatment facilities	102,747.9	5,993.6
20	Municipal waste	2,045.59	8.9
	Total	1,168,888.56	565,341.30

Table 1.9.2: Structure of industrial waste.

Source: Report on the State of the Environment in Republic of Serbia

1.9.2. Wastewater treatment

The biggest polluters of water in the Republic of Serbia are concentrated municipal and industrial sources that over the sewer system is discharged untreated.

The total amount of sewage spilled from the sewer system of settlements in the Republic of Serbia is an average of 360 million m^3 per year. For the same period the amount of treated wastewater from the settlements, in relation to the total amount spilled was not higher than 17% and amounted to an average of about 62 million m^3 per year. Quantity spilled waste water are increasing and amounts of purified water in 2007 and 2008 are decreasing (Figures 1.9.1, 1.9.2).

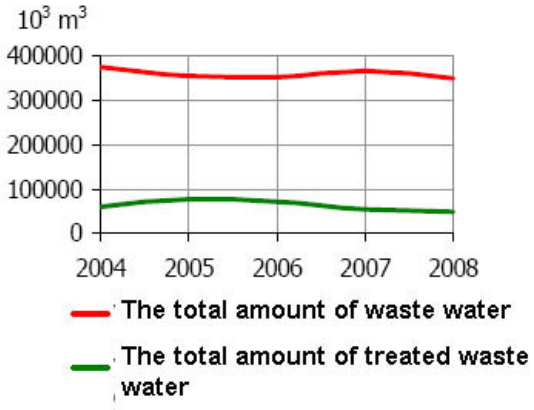

Figure 1.9.1: Total amount of waste water and treated waste water.

Source: Report on the State of the Environment in Republic of Serbia

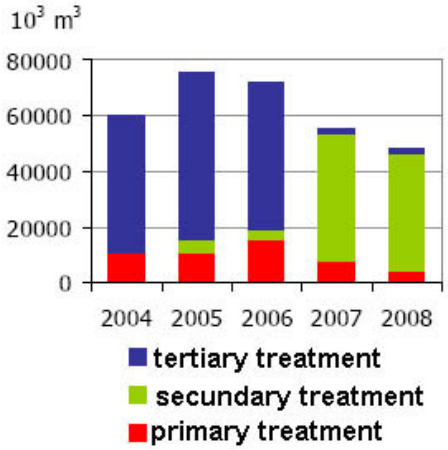

Figure 1.9.2: Structure of water treatment.

Source: Report on the State of the Environment in Republic of Serbia

According to data presented in the report for the period 2004 to 2008 a great reduction of treated wastewater tertiary treatment was identified.

In the Republic of Serbia in just 21 municipalities, there are facilities for waste water treatment. Analysis of the relationship of population connected to the sewerage system with treatment plant in relation to the total population shows that only 11.5 % of the population connected to sewerage systems with waste water treatment. The data indicate a large gap in our country in this field. Existing laws in the area of water protection in the Republic of Serbia is in a time lag comparing with the countries of the European Union.

2. The National GHG inventory

2.1. Development of a national system for the GHG inventory

2.1.1. Government Ministries/agencies responsible for collecting and inventorying data

The Republic of Serbia has been a member of The United Nations Framework Convention on Climate Change since 10 Jun, 2010, and Kyoto Protocol since 17 January 2008, as a developing country (non–Annex I country). Taking into account the status under the Convention, the Republic of Serbia does not have quantitative GHG emission reduction commitments, in the first commitment period. Simultaneously, the Republic of Serbia has all the commitments with regards to establishing and implementing measures and activities that contribute the achieving the objectives of the Convention

The Ministry of Environment, Mining and Spatial Planning (MEMSP) is the national coordinator (the focal point) for the implementation of the Convention and Protocol. The Climate Change Division (CCD) was established within the Ministry in 2008. This unit is responsible for the initiation and coordination of climate change-related activities.

MEMSP and CCD coordinated all activities in preparation and publishing of The Initial National Communication of the Republic of Serbia. This document, issued in November 2010, is the very first national report regarding climate change issues. This document includes, also the first official Inventory of emissions of greenhouse gases.

The data bases produced during the process of preparation of the GHG inventory are located in the Environmental Protection Agency of the Republic of Serbia.

This Agency was founded in 2004 within the MEMSP to carry out expert work: development, harmonization and maintenance of national information system for environmental protection, reports on the environment condition, implementation of the environment protection policy, development of methods for processing data on environment and their assessment, management of data about the best available technology and their implementation in environmental protection, as well as cooperation with EEA and EIONET.

Besides MEMSP in the development of the National Communication and Inventory of GHG others relevant ministries (Ministry of Energy and Mining, Ministry of Agriculture, Forestry and Water Management, etc.) and governmental institutions (Republic Hydro Meteorological Service of Serbia) that deal with observation and monitoring of climate change have been included.

Republic Hydro Meteorological Service of Serbia (RHMSS) is the primary institution in Serbia, which is responsible for measuring, observation, collecting and providing information, products and services related to the weather, climate and water, as well as their application

in the human activities that are under the influence of atmospheric and related phenomena. RHMSS provides continuous collection and archiving of reliable long-term meteorological, hydrological and related data series.

2.1.2. Supporting institutions

In the development of the National Communication, as well as GHG inventory not only were involved the relevant ministries, institutions that deal with observation and monitoring of climate change and scientific institutions involved, but also relevant businesses and economic entities, non–governmental sector and other stakeholders.

A team of national experts (representatives from various R & D institutions) worked on the GHG inventory, under the coordination of the Institute for Nuclear Sciences VINČA and in collaboration with representatives of government institutions. For each sector, and additionally for the energy sub–sectors, a team of 3 experts was formed who were in charge of acquisition, systematization, documentation and archiving of the data. Institutions included in GHG inventory creating, besides previously mention, were as follows:

Faculty of Agriculture, Novi Sad,

Faculty of Forestry, Belgrade,

Institute of Meteorology,

Faculty of Physics, Belgrade,

Institute of Field and Vegetable Crops, Novi Sad,

Faculty of Agriculture, Belgrade,

Faculty of Biology, Belgrade,

Faculty for Environmental Protection, EDUCONS University, Sremska Kamenica,

Faculty of Mechanical Engineering, Belgrade,

Institute for Biological Research „Siniša Stanković", Belgrade,

Institute for Water Management „Jaroslav Černi", Belgrade,

Laboratory for Medical and Veterinary Entomology, Faculty of Agriculture, Novi Sad,

State Enterprise for Forest Management "Srbijašume", Belgrade,

Public Enterprise "Electric Power Industry of Serbia", Belgrade.

2.1.3. Measurement methodology and data sources

In the development of the National Communication, as well as GHG inventory not only were involved the relevant ministries, institutions that deal with observation and monitoring of climate change and scientific institutions involved, but also relevant businesses and economic entities, non–governmental sector and other stakeholders.

A team of national experts (representatives from various R & D institutions) worked on the GHG inventory, under the coordination of the Institute for Nuclear Sciences VINČA and in collaboration with representatives of government institutions. For each sector, and additionally for the energy sub–sectors, a team of 3 experts was formed who were in charge of acquisition, systematization, documentation and archiving of the data. Institutions included in GHG inventory creating, besides previously mention, were as follows:

- Faculty of Agriculture, Novi Sad,
- Faculty of Forestry, Belgrade,
- Institute of Meteorology,
- Faculty of Physics, Belgrade,
- Institute of Field and Vegetable Crops, Novi Sad,
- Faculty of Agriculture, Belgrade,
- Faculty of Biology, Belgrade,
- Faculty for Environmental Protection, EDUCONS University, Sremska Kamenica,
- Faculty of Mechanical Engineering, Belgrade,
- Institute for Biological Research „Siniša Stanković", Belgrade,
- Institute for Water Management „Jaroslav Černi", Belgrade,
- Laboratory for Medical and Veterinary Entomology, Faculty of Agriculture, Novi Sad,
- State Enterprise for Forest Management "Srbijašume", Belgrade,
- Public Enterprise "Electric Power Industry of Serbia", Belgrade.

2.1.4. Activity data

The "Statistical Yearbook of Serbia" offers data from almost all statistical surveys, for the Republic of Serbia, Central Serbia and autonomous provinces. The Yearbooks are complex yearly publications and contain basic data elements from all aspects of social and economic life.

After 1997 complete data for the Autonomous Province Kosovo and Metohia from the regular statistical surveys were not available, so while calculating the total, estimates and other synthetic statistical indicators that related to the Republic of Serbia prevalently relevant data for Central Serbia and the Autonomous Province Kosovo and Metohia were used in the whole. But data that are not liable to changes during the course of time (as some geographical data, data on natural and cultural patrimony and similar) are being shown for the Autonomous Province Kosovo and Metohia, too. The data for municipalities are published in a separate publication "Municipalities of Serbia", and together with the "Statistical Yearbook of Serbia", represent integral parts for a reference year.

Besides the data collected by the Statistical Office of the Republic of Serbia, the Yearbooks contain also the results of statistical surveys of other authorized bodies and organizations such as: National Bank of Serbia, Ministry of Finances, Republic Hydro-meteorological Service of Serbia, Republic Seismological Service of Serbia, Republic Geodetic Authority, Ministry of Justice, Ministry of Internal Affairs, National Employment Service, Health and Insurance Funds, Geographical Institute of Belgrade, Military Geographical Institute, Bureau for Environmental Protection of Serbia etc.

Statistical Yearbooks are issued by Statistical Office of the Republic of Serbia. That is special professional organization in the system of state administration of the Republic of Serbia that performs the expert tasks related to: adopting programs, organization and conducting of the statistical surveys, methodology creation, collecting, processing, statistical analysis and publishing of the statistical data; preparation and adopting of unique statistical standards; development, maintenance and usage of administrative and statistical registers of the Republic; establishing and maintenance of the system of national accounts; cooperation and expert coordination with bodies and organizations that are in charge of carrying out the statistical surveys; cooperation with international organizations so as to provide standardization and data comparability; data processing, with the aim of providing election results and referendum on the level of the Republic, as well as other tasks stipulated by the law.

2.1.5. Conformity with data-exchange standards

As a member of the World Meteorological Organisation, Serbia supported the establishment of the Global Climate Observing System (GCOS) and actively participates in the implementation of the GCOS Action Plan for Central and Eastern Europe (adopted in 2005). RHMSS, as a national hydro-meteorological institution, is tasked with meeting Serbia's obligations towards the GCOS. In this way, Serbia directly meets the obligations arising from the UNFCCC referring to systematic climate observation and international data exchange.

Statistical Office of the Republic of Serbia has been working in accordance to The European Statistics Code of Practice and UN's Fundamental Principles of Official Statistics.

2.2. *Systematic observations*

2.2.1. Measurements of meteorological parameters and instrumentation deployed

The first meteorological measurements in Serbia commenced in 1848. Systematic measurements through an organised network of 20 meteorological stations began in 1856. The network was expanded to 27 stations in 1857. In 1887, the Meteorological Observatory was founded in Belgrade.

Today, the synoptic, climatological and agro-meteorological situations are continuously observed (24 hours a day, 365 days a year) at 28 of the 32 surface synoptic stations (Figure 2.1.1 – left panel). The four remaining stations worked intermittently. The national network of meteorological stations is comprised of an upper air observation station Beograd–Košutnjak, 75 climatological stations and 481 rainfall stations. The observation system was automated in last years.

Meteorological observation system of Serbia (MOSS) is a part of Global observation system (GOS) and consists of all the micro-locations with observations. On meteorological stations the following parameters are measured and observed:

present weather; past weather; direction, speed and wind intensity; quantity, type and height of cloud base; visibility; air temperature; air humidity; atmospheric pressure; pressure tendency and its characteristics; extreme temperatures (minimum and maximum); precipitation intensity, duration and quantity; soil condition; cloud movement direction; special occurrences; solar radiation; minimum temperature on 5 cm; soil temperature at depths of 2, 5, 10, 20, 30, 50 and 100 cm; soil evaporation; evaporation from open water surface; phenological observation; soil moisture; solar radiation components; daily samples of air and precipitation; air and precipitation gamma radiation intensity; icing on conductors; electric discharge.

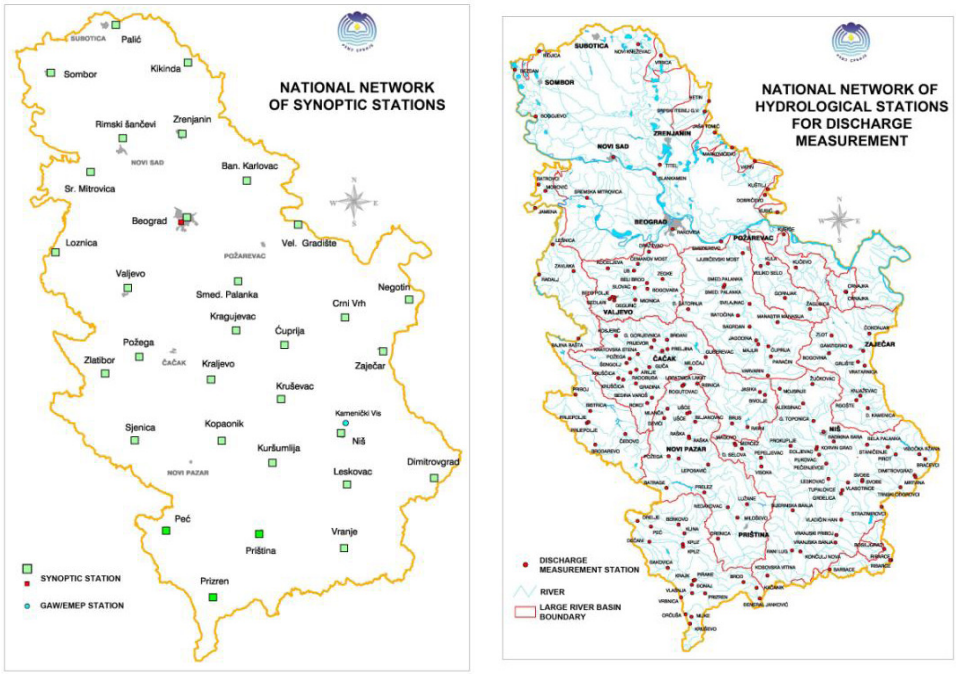

Figure 2.1.1: National network of synoptic stations (left panel) and hydrological stations measuring water flow (right)
Source: Republic Hydro-meteorological Service of Serbia

Climate data verified to date are kept in digital form in the CLIDATA data base.

In various forms over the years, since 1952, Serbia has had a national laboratory for testing and calibration of instruments (Laboratory for instruments and observation methods within RHMSS).

In the period 1956–1983, measurements using a radiosonde were realised twice daily (at 00.00 am and 12.00 pm), during 1983–2000 once daily and since 2000, this type of measurement has again been performed twice daily.

2.2.2. Oceanic observations

The first hydrological observations in Serbia commenced in 1812. The hydrological observation system now consists of a network of 179 surface water hydrological stations and a network of 415 groundwater hydrological stations (Figure 2.1.1 – right panel). All 179 stations observe water levels, 130 also measure water flow, whilst 41 measure water temperature as well. The hydrological data from 61 reporting hydrological stations are collected in real time.

The groundwater hydrological station network is comprised of main stations (18), 1st rank stations (176) and 2nd rank stations (245). The main stations measure the water level and temperature of the groundwater on a daily basis, whilst quality control is performed twice a year. The 1st rank stations measure the groundwater level and temperature six times a

month, and quality control is performed once a year at 62 stations. The 2nd rank stations measure the groundwater level three times a month.

Quality monitoring of waters, accumulations and lakes is realised at 22 water supply accumulations, 11 multipurpose accumulations and 5 lakes in Vojvodina. There are three automated stations for water quality control. Comparative monitoring of the results gathered in both traditional and automated measurements is performed at these locations.

Operational jobs in general working program of surface water hydrological stations network are the following:

- daily reporting from 60 stations;
- observations of ice events and conditions on 183 stations;
- sampling and chemical analysis on 66 stations;
- hydrometric measurements and water quality examining according to the program of examination of water quality on first rank spring on 33 stations;
- daily sampling for the purpose of analysing water sediment on 27 stations;
- recording of water mirror downfall on 66 stations;
- controlling of water gage zero level and surveying of cross section;
- controlling of observer duties;
- controlling and cleaning of limnigraph;
- changing of limnigraph sheets;
- maintenance and intervention on the stations network;
- evidencing and updating of archive data;
- preparing fee payment for observers in the surface and ground water stations network.
- Twenty–eight main meteorological hourly reporting stations and 28 hydrological stations are included in international data exchange.

2.2.3. Terrestrial observations

Under the ICP forests programme, the monitoring of forests has been established in Serbia, funded by the Ministry of Agriculture, Forestry and Water Management. Two scientific research projects under this programme concern the effects climate change on and the vulnerability of forest ecosystems. Data on microclimate parameters, soil temperature and

humidity, diversity of insects, fungi and soil microorganisms, biomass and carbon in soil are collected through these projects and the obtained data are presented in annual reports. Since 2003, monitoring Level I has been performed with a 16 x 16 km grid, which consists of 103 bioindicative parcels (points). During 2004, 27 parcels with a 4 x 4 km grid were added to the network. The Institute of Forestry, Faculty of Forestry in Belgrade and the Institute of Lowland Forestry and Environment in Novi Sad are involved in conducting this monitoring program.

Realization of the Intensive Monitoring Programme – Level II in Serbia is in its initial stage. The draft Forest Action Plan imposes the establishment of 10 stations adequate for this monitoring level. One such station has been established on the Fruška Gora Mountain (Iriški venac) and the equipping of another (on Kopaonik) is in progress.

2.2.4. Air-quality monitoring

The Ministry of Environment and Spatial Planning coordinates the monitoring of air quality. The institutions responsible for air quality monitoring are the Environmental Agency, the RHMS of Serbia and local self–government via public health institutes and organisations authorised for environmental monitoring.

The Serbian national network of 25 stations for air quality monitoring consists of 24 surface synoptic stations, whilst one (Kamenički Vis) has been implementing the GAW/EMEP monitoring programme for the past 27 years. A network of 30 stationary automated stations for automated air quality measurements is being established.

Radar observations are realised with 15 radars spread over 14 locations.

The RHMSS utilises products of the second generation of Meteosat satellites with multispectral images of the Earth's surface and cloud systems.

3. Reporting

3.1. The GHG inventory, emissions per sector

Taking into account UNFCCC/CP/2002/7/Add.2, Decision 17/CP.8 Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention, and the best available data, the Republic of Serbia prepared a national GHG inventory. This inventory is integral part of The Initial National Communication of the Republic of Serbia. GHG inventory for the year 1990, as the base year, covers GHG emissions from the energy sector, industrial processes, waste, agriculture, land–use change and forestry. In the course of the preparations for the inventory, all available data in the period 1990–1998 were analysed, but due to irregular working conditions in most sectors and years, and due to missing data, only data for the year 1998 are given, in accordance with the guidelines for national inventories for non–Annex I countries.

The total GHG emissions in the referent year 1990, not taking into account the amounts removed by forests, was 80,803 $GgCO_2eq$. Taking into account that the assessed amount of the removed CO_2 by the forests in 1990 was in the order of 6,665 $GgCO_2eq$, the net GHG emissions in 1990 were 74,138 $GgCO_2eq$. The GHG emissions are expressed in CO_2 equivalent taking into account the 1995 IPCC global warming potential (GWP) values. All the estimated values are given in UNFCCC standardized form (Table 3.1.1) including standard indicators as appropriate, for emissions by sources and removals by sinks of GHG: NO (not occurring) for activities that do not occur for a particular source/sink category in Serbia and NE (not estimated) for existing emissions and removals which were not estimated.

IPCC Source and Sink Categories	**CO_2 emissions (Gg)**	**CO_2 removals (Gg)**	**CH_4 (Gg)**	**N_2O (Gg)**	**CO_2eq emissions (Gg)**
Total national emissions and removals	**62,970**	**–6,665**	**432.46**	**28.23**	**80,803**
1. Energy	**59,259**	**0**	**157.58**	**0.67**	**62,776**
A. Fuel combustion (sectoral approach)	**59,259**		**13.66**	**0.67**	**59,753.5**
1. Energy Industries	37,559		0.44	0.47	37,713.9
2. Manufacturing industries and construction	6,309		0.43	0.05	6,333.5
3. Transport	5,678		1.06	0.05	5,715.8
4. Other sectors	9,713		11.73	0.10	9,990.3
5. Other (please specify)	0		0	0	0
B. Fugitive emissions from fuels	**0**		**143.92**		**3,022.3**
1. Solid fuels			61.19		1,285
2. Oil and natural gas			82.73		1,737.3
2. Industrial processes	**3,711**	**0**	**0.53**	**1.77**	**4,270.8**
A. Mineral products	**1,831**				**1,831**
B. Chemical industry	**268**		**0.53**	**1.77**	**827.8**

IPCC Source and Sink Categories	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO_2eq emissions (Gg)
C. Metal production	**1,612**		**0**	**0**	**1,612**
D. Other production	**0**		**0**	**0**	**0**
E. Production of halocarbons and sulphur hexafluoride					
F. Consumption of halocarbons and sulphur hexafluoride					
G. Other (please specify)	**NE**		**NE**	**NE**	**NE**
3. Solvent and other product use	**NE**			**NE**	
4. Agriculture			**194.13**	**25**	**11,827**
A. Enteric fermentation			**158.68**		**3,332.3**
B. Manure management			**28.23**	**2.96**	**1,510.4**
C. Rice cultivation			**NO**		
D. Agricultural soils				**21.84**	**6,770.4**
E. Prescribed burning of savannahs			**NO**	**NO**	**NO**
F. Field burning of agricultural residues			**7.22**	**0.20**	**213.6**
G. Other (please specify)			**0**	**0**	**0**
5. Land–use change and forestry	**0**	**–6,665**	**0**	**0**	**–6,665**
A. Changes in forest and other woody biomass stocks	**0**	**–6,764**			
B. Forest and grassland conversion	**99**	**0**	**0**	**0**	
C. Abandonment of managed lands		**NE**			
D. CO_2 emissions and removals from soil	**NE**	**NE**			
E. Other (please specify)	**NE**	**NE**	**NE**	**NE**	**NE**
6. Waste			**80.22**	**0.79**	**1,929.5**
A. Solid waste disposal on land			**80.22**		**1,684.6**
B. Waste–water handling			**NO**	**0.79**	**244.9**
C. Waste incineration					**NO**
D. Other (please specify)			**NE**	**NE**	**NE**
7. Other (please specify)	**NE**	**NE**	**NE**	**NE**	**NE**
Memo items					
International bunkers	**459**		**0**	**0**	**459**
Aviation	459		0	0	459
Marine	NE		NE	NE	NE
CO_2 emissions from biomass	2,404				

Table 3.1.1: The GHG emissions and removed amounts, Republic of Serbia, 1990.
Source: Initial communication of the Republic of Serbia

The largest share, 77.69 % of the total emissions, i.e. 62,776 Gg CO_2eq, came from the energy sector. The agriculture sector, due to the relatively intense agricultural production (biochemical processes in stockbreeding and farming), emitted 11,827 Gg CO_2 eq. or 14.64 % of the total GHG emissions. The emission of GHG due to chemical reactions from industrial processes was estimated in the order of 4,270.8 Gg CO_2eq, i.e. 5.28 % of the total GHG emissions. The emissions from municipal dumps and from sludge waste were 1,929.5 Gg CO_2eq or 2.39 % of the total GHG emissions. The GHG emissions per sectors and sub-sectors are shown on Figures 3.1.1 and 3.1.2.

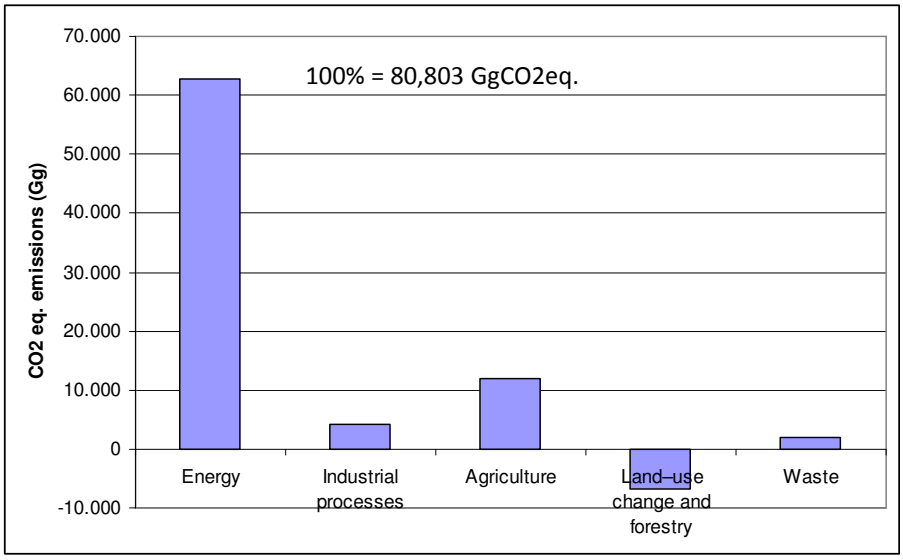

Figure 3.1.1: GHG Emissions by sectors, Republic of Serbia in 1990.
Source: Initial communication of the Republic of Serbia

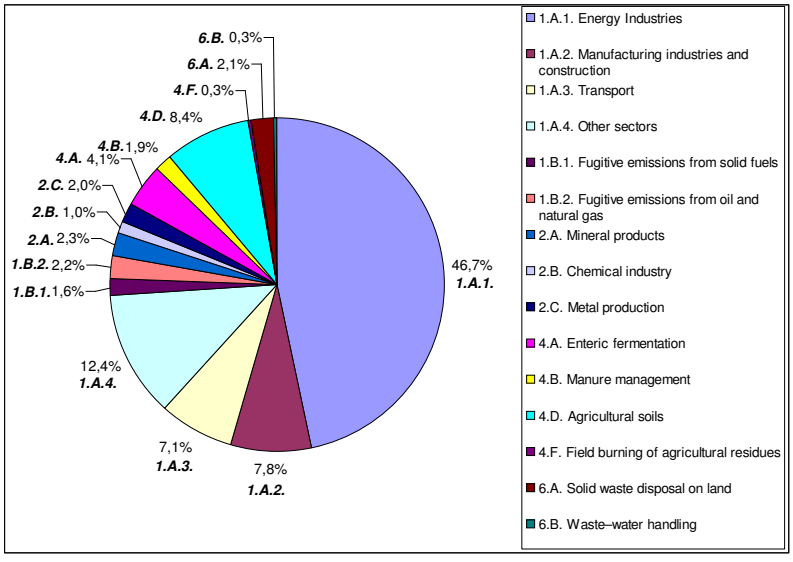

Figure 3.1.2: GHG Emissions by sub-sectors, Republic of Serbia in 1990 (100% = 80.803Gg CO_2eq.)
Source: Initial communication of the Republic of Serbia

The total emissions of GHG in 1998, disregarding the net removed amounts of CO_2 in forests, amounted to 66,346 Gg CO_2eq. Since the estimated amount of the removed CO_2 in 1998 in the forest complex of the Republic of Serbia was 8,661 Gg CO_2eq, the net emissions of GHG for the year 1998 amounted to 57,685 Gg CO_2eq. Estimated values in UNFCCC standardized form are given in Table 3.1.2.

IPCC Source and Sink Categories	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO_2eq emissions (Gg)
Total national emissions and removals	**50,605**	**-8,661**	**424.53**	**22.02**	**66,346**
1. Energy	**47,430**	**0**	**140.57**	**0.54**	**50,549**
A. Fuel combustion (sectoral approach)	**47,430**		**8.12**	**0.54**	**47,768**
1. Energy Industries	34,675		0.39	0.43	34,816
2. Manufacturing industries and construction	3,434		0.23	0.02	3,445
3. Transport	3,852		0.71	0.03	3,876
4. Other sectors	5,469		6.78	0.05	5,627
5. Other (please specify)	0		0	0	0
B. Fugitive emissions from fuels	**0**		**132.45**		**2,781**
1. Solid fuels			56.13		1,179
2. Oil and natural gas			76.32		1,603
2. Industrial processes	**3,176**	**0**	**0.63**	**1.39**	**3,620**
A. Mineral products	**1,514**				**1,514**
B. Chemical industry	**257**		**0.63**	**1.39**	**701**
C. Metal production	**1,404**		**0**	**0**	**1,404**
D. Other production	**0**		**0**	**0**	**0**
E. Production of halocarbons and sulphur hexafluoride					
F. Consumption of halocarbons and sulphur hexafluoride					
G. Other (please specify)	**NE**		**NE**	**NE**	**NE**
3. Solvent and other product use	**NE**			**NE**	
4. Agriculture			**167.61**	**19.29**	**9,500**
A. Enteric fermentation			**135.37**		**2,843**
B. Manure management			**25.77**	**2.58**	**1,341**
C. Rice cultivation			**NO**		
D. Agricultural soils				**16.52**	**5,121**
E. Prescribed burning of savannas			**NO**	**NO**	**NO**
F. Field burning of agricultural residues			**6.47**	**0.19**	**195**
G. Other (please specify)			**0**	**0**	**0**
5. Land–use change and forestry	**0**	**–8,661**	**0**	**0**	**0**

IPCC Source and Sink Categories	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO_2eq emissions (Gg)
A. Changes in forest and other woody biomass stocks	**0**	**–8,661**			
B. Forest and grassland conversion	**NE**	**NE**	**NE**	**NE**	**NE**
C. Abandonment of managed lands		**NE**			
D. CO_2 emissions and removals from soil	**NE**	**NE**			
E. Other (please specify)	**NE**	**NE**	**NE**	**NE**	**NE**
6. Waste			**115.71**	**0.8**	**2,678**
A. Solid waste disposal on land			**115.71**		**2,430**
B. Waste–water handling			**0**	**0.8**	**248**
C. Waste incineration					**NO**
D. Other (please specify)			**NE**	**NE**	**NE**
7. Other (please specify)	**NE**	**NE**	**NE**	**NE**	**NE**
Memo items					
International bunkers	**186**		**0**	**0**	**186**
Aviation	186		0	0	186
Marine	NE		NE	NE	NE
CO_2 emissions from biomass	1,815				

Table 3.1.2: The GHG emissions and removed amounts, Republic of Serbia, 1998
Source: Initial communication of the Republic of Serbia

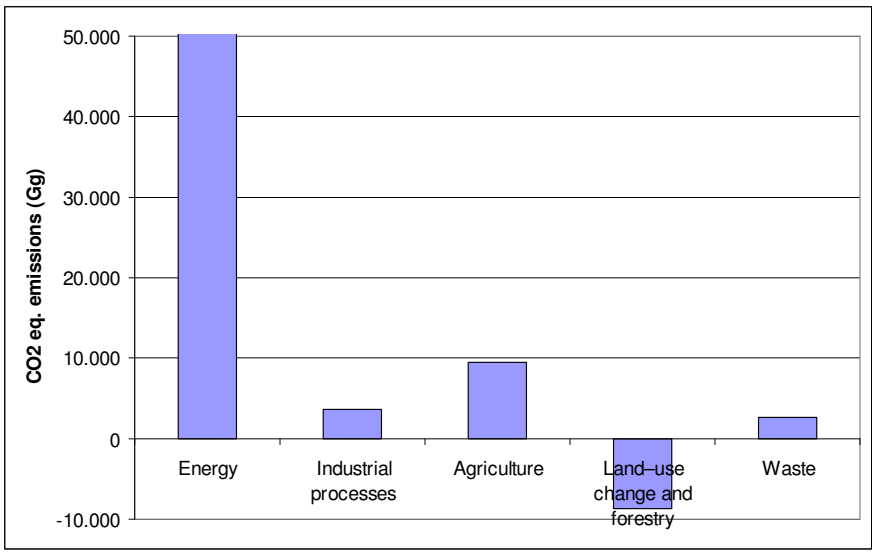

Figure 3.1.3: GHG emissions by sectors, Republic of Serbia in 1998
Source: Initial communication of the Republic of Serbia

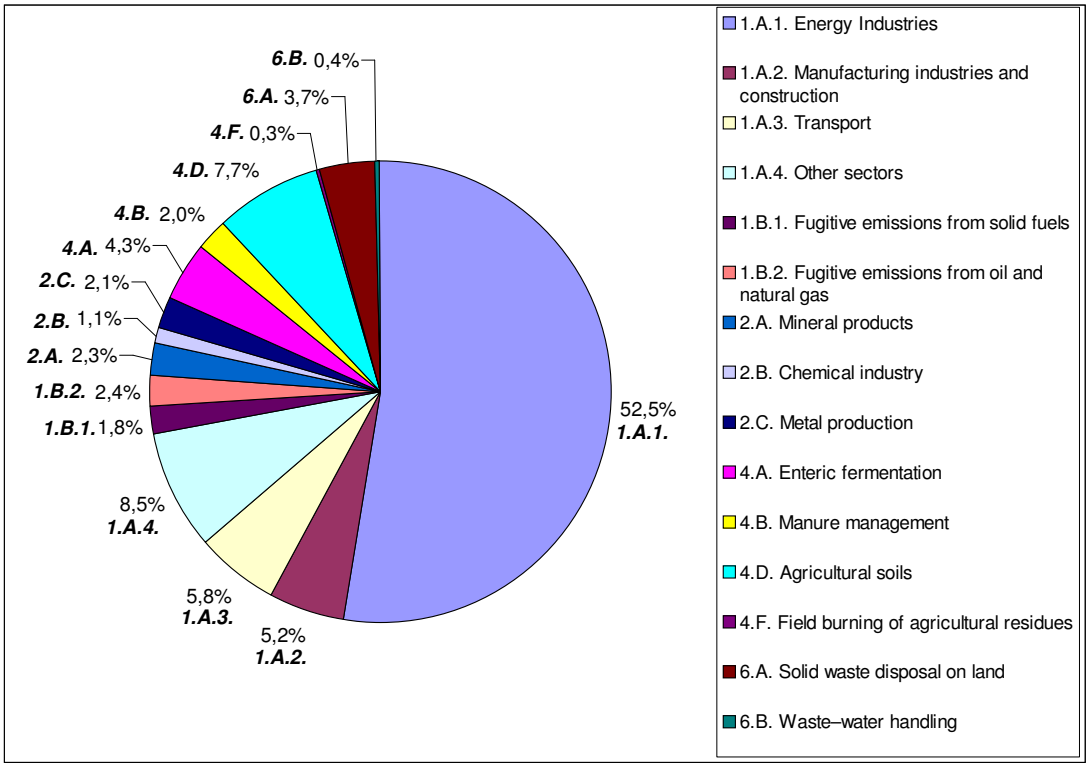

Figure 3.1.4: GHG emissions by sub-sectors, Republic of Serbia in 1998 (100% = 66,346 Gg CO_2eq.) Source: Initial communication of the Republic of Serbia

The greatest share in the total emissions, amounting to 76.19 % (50,549 Gg CO_2eq), was contributed by the energy sector. The agriculture sector contributed to total emissions with 14.32 %, i.e., 9,500 Gg CO_2eq, industrial processes with 5.46 % (3.620 Gg CO_2eq), and communal landfills and sludge waste with 4.04 % (2.678 Gg CO_2eq). Emissions per sectors and sub-sectors are shown on Figures 3.1.3 and 3.1.4.

Comparison of emissions by sectors in 1990 and 1998 shows reduction of total emission -21.79 %, and the net emission -28.52 %. This tendency is a result of the decrease of all industrial and other activities in the Republic of Serbia in this period. Thus, in the energy sector, the GHG emission trend was on the level of –24.19 %, in the sector of industrial processes, –18 % and in the agriculture sector, of –24.5 %. An exception from the negative trends was the increase of the GHG emissions from communal waste and waste water management, for which the GHG emission Trend was +27.9 %. This resulted from the increased amount of deposited communal waste due to a population increase. On the other hand, in 1998 the amount of the removed quantities of CO_2 in the forest complex in the Republic of Serbia increased by +23% in relation to the referent year 1990.

In the same time, there is no significant change in shares of specific sectors. Except increasing of waste sector share (2.39 % to 4.04 %), all others differences are less than one percentage. In sub-sectors share of Energy Industries has been increased (46.7 % to 52.5 %)

to the account of others energy sub-sectors, while the share of the others sub-sectors remains on the similar levels.

3.2. GHG inventory, emissions per type

Carbon dioxide (CO_2) emissions

The total carbon dioxide emission in the Republic of Serbia in 1990 was 62,970 Gg (not including the 99 Gg of CO_2 emitted as a result of conversion processes by forest fires). In 1998 this emission was decreased to 50,605 Gg. The largest share was emanated from the energy sector, i.e., 94.11 % or 56,259 Gg (in 1990) and 93.73 % or 47,430 Gg (in 1998). The remaining part, 5.89 % or 3,711 Gg (in 1990), and 6.27 % or 3,176 Gg (in 1998) of the emissions resulted from industrial processes.

In Figure 3.2.1 CO_2 distribution per sub-sectors is presented. From Table 3.1.2 and Figure 3.2.1, it may be seen that the greatest emissions of CO_2 in both years originated from the 1.A.1 Energy industries sub-sector (59.6 % and 68.5 %), followed by 1.A.4 Other energy sectors - public/commercial, residential and agricultural sub–sectors (15.4 % and 10.8 %), related to energy transformation and fossil fuel combustion. Serbian industry collapse in 90's resulted in almost double less emission in 1.A.2 Manufacturing industries and construction sub-sector in 1998, compared with 1990.

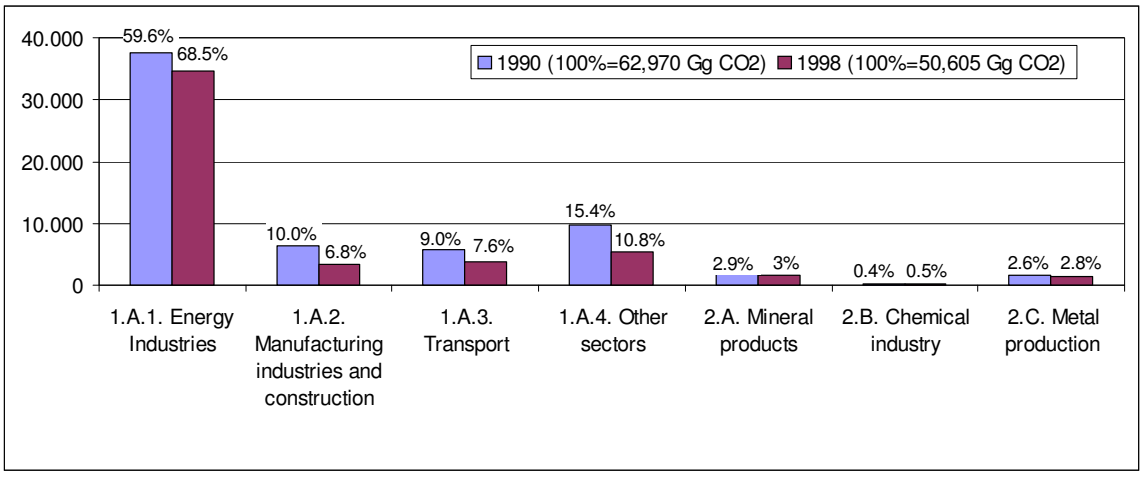

Figure 3.2.1: CO_2 (in Gg) emissions by sub-sectors, Republic of Serbia in 1990 and 1998.
Source: Initial communication of the Republic of Serbia

Methane (CH_4) emissions

Of the total emission of methane (432.46 Gg) in 1990, the greatest part, 44.9% or 194.13 Gg, was emitted from the agriculture sector, primarily from biochemical processes in stockbreeding, 36.4% or 157.58 Gg, from the energy sector, predominantly by fugitive emissions, 18.5 % or 80.22 Gg by emission of waste dump fumes formed during the

decomposition of the organic part of communal waste and quite a small part of 0.1 % or 0.53 Gg, from industrial chemical processes.

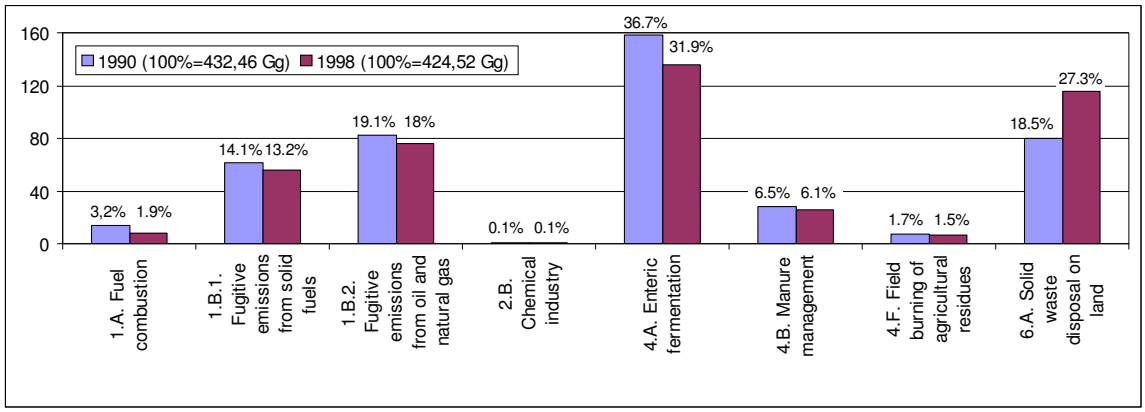

Figure 3.2.2: CH_4 (in Gg) emissions by sub-sectors, Republic of Serbia in 1990 and 1998
Source: Initial communication of the Republic of Serbia

The total methane emissions in 1998 were estimated at the level of 424.52 Gg. The greatest part, 167.61 Gg, i.e., 39.4 % of the total CH_4 emissions, occurred from biochemical processes in the agriculture sector. The energy sector followed, with 140.57 Gg i.e., 33.1 % of the total CH_4 emissions. Fugitive emissions during the production and processing/upgrading of fossil fuels amounted to 132.45 Gg, i.e., 32.2 %, while 8.11 Gg (1.91%) was released due to fossil fuel combustion for energy purposes. The contribution of the waste sector (biochemical processes, related to waste management) contributed to the total emissions of CH_4 with 27.3 % (115.71 Gg). The lowest contribution, 0.1 % (0.63 Gg) of the total CH4 emissions in 1998, arose from chemical reactions in Industrial processes. In Figure 3.2.2 CH_4 distribution per sub-sectors is presented.

Nitrous oxide (N_2O) emissions

The total emission of nitrous oxide in 1990 was estimated to be 28.23 Gg, while in 1998 this amount was 22.02 Gg. Four sectors: Agriculture, Industrial Processes, Waste and Energy contributed to the total emission of nitrous oxide in 1990 and 1998 (Figure 3.2.1). In 1990 the largest part of the total N_2O emissions occurred from biochemical processes in agriculture, 25 Gg, i.e., an 88.55 % share in the total N_2O emissions, mostly resulting from the use of fertilizers (21.84 Gg). In 1998 N_2O emission in Agriculture was somewhat less 19.29 Gg but with similar share 87.6 %.

Considerably smaller parts of the total emissions originated from industrial processes (IPCC Source Category 2), in the order of 1.77 Gg in 1990 and 1.39 in 1998, by biochemical processes during the decay of waste, in the order of 0.79 Gg in 1990 and 0.80 in 1998, and during combustion of fossil fuels in the energy sector, in the order of 0.67 Gg in 1990 and 0.54 in 1998.

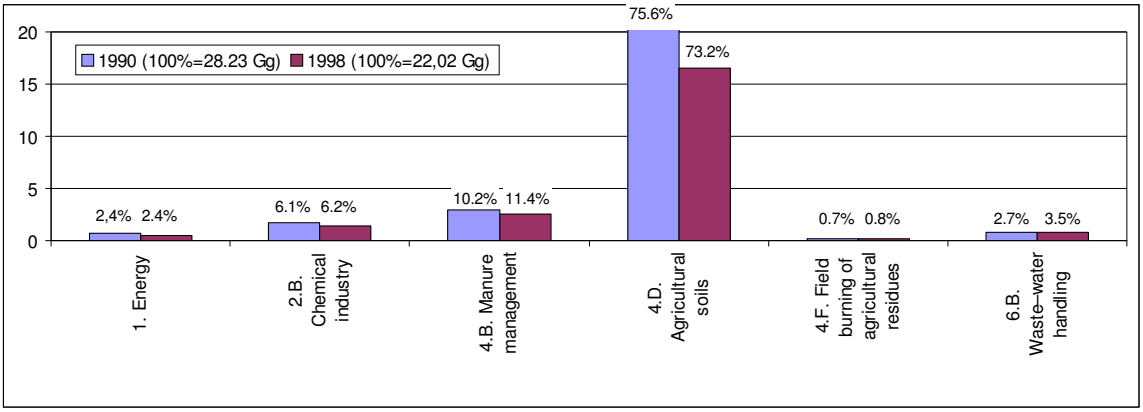

Figure 3.2.3: N_2O (in Gg) emissions by sectors and sub-sectors, Republic of Serbia in 1990 and 1998
Source: Initial communication of the Republic of Serbia

Emission of synthetic GHG

According to the available data, there was no production of synthetic gases (halogenic hydrocarbons: HFC and PFC, or sulphur hexafluoride SF6) in the Republic of Serbia in 1990 and 1998. In the available official documents, there is no record of import and consumption, i.e., the available amounts of synthetic gases, and thus the related emissions could not be estimated according to the international method. Certain data necessary for determining the emissions of these gases exist starting with the year 2004.

Emissions of indirect GHG (NO_X, CO, NMVOC, AND SO_X)

The results of the inventory of the indirect GHG (NOx, CO, NMVOC, and SOx) in the Republic of Serbia in 1990 and 1998 are shown in Tables 3.2.1 and 3.2.2. The total emissions in 1990, per gas, was: nitrogen oxides (disregarding nitrous oxide) 208 Gg, carbon monoxide 644 Gg, NMVOC 271 Gg and sulphur oxides 389 Gg. In 1998 these emissions were: nitrogen oxides (disregarding nitrous oxide) 165 Gg, carbon monoxide 465 Gg, NMVOC 115 Gg and sulphur oxides 389 Gg.

IPCC Source and Sink Categories	NOx (Gg)	CO (Gg)	NMVOCs (Gg)	SOx (Gg)
Total national emissions	**208**	**644**	**271**	**490**
1. Energy	197	489	114	466
A. Fuel combustion (sectoral approach)	**197**	**488**	**85**	**461**
1. Energy Industries	95	7	2	325
2. Manufacturing industries and construction	18	4	1	54
3. Transport	57	376	71	7
4. Other sectors	27	100	12	76
5. Other (please specify)	0	0	0	0
B. Fugitive emissions from fuels	**0**	**0**	**29**	**5**
1. Solid fuels	0	0	0	0

IPCC Source and Sink Categories	NOx (Gg)	CO (Gg)	NMVOCs (Gg)	SOx (Gg)
2. Oil and natural gas	0	0	29	5
2. Industrial processes	**3**	**2**	**157**	**24**
A. Mineral products	**0**	**0**	**137**	**1**
B. Chemical industry	**3**	**1**	**1**	**22**
C. Metal production	**0**	**0**	**0**	**0**
D. Other production	**0**	**1**	**19**	**1**
E. Production of halocarbons and sulphur hexafluoride				
F. Consumption of halocarbons and sulphur hexafluoride				
G. Other (please specify)	**0**	**0**	**0**	**0**
3. Solvent and other product use			**NE**	
4. Agriculture	**7**	**152**	**0**	**0**
A. Enteric fermentation				
B. Manure management			**0**	
C. Rice cultivation			**NO**	
D. Agricultural soils			**0**	
E. Prescribed burning of savannahs	**NO**	**NO**	**NO**	
F. Field burning of agricultural residues	**7**	**152**	**0**	
G. Other (please specify)	**0**	**0**	**0**	
5. Land–use change and forestry	**0**	**1**	**0**	**0**
A. Changes in forest and other woody biomass stocks				
B. Forest and grassland conversion	**0**	**1**		
C. Abandonment of managed lands				
D. CO_2 emissions and removals from soil				
E. Other (please specify)	**NE**	**NE**		
6. Waste	**0**	**0**	**0**	**0**
A. Solid waste disposal on land	**0**		**0**	
B. Waste–water handling	**0**	**0**	**0**	
C. Waste incineration	**NO**	**NO**	**NO**	**NO**
D. Other (please specify)	**NE**	**NE**	**NE**	**NE**
7. Other (please specify)	**0**	**0**	**0**	**0**
Memo items				
International bunkers	**2**	**1**	**0**	**0**
Aviation	2	1	0	0
Marine	NE	NE	NE	NE
CO_2 emissions from biomass				

Table 3.2.1: Indirect GHGs, Republic of Serbia, 1990
Source: Initial communication of the Republic of Serbia

IPCC Source and Sink Categories	NOx (Gg)	CO (Gg)	NMVOCs (Gg)	SOx (Gg)
Total national emissions	**165**	**465**	**115**	**389**
1. Energy	155	327	74	382
A. Fuel combustion (sectoral approach)	**155**	**327**	**57**	**379**
1. Energy Industries	96	7	2	319
2. Manufacturing industries and construction	9	2	0	27
3. Transport	39	250	47	5
4. Other sectors	11	69	7	28
5. Other (please specify)	0	0	0	0
B. Fugitive emissions from fuels	**0**	**0**	**17**	**3**
1. Solid fuels	0	0	0	0
2. Oil and natural gas	0	0	17	3
2. Industrial processes	**2**	**2**	**41**	**6**
A. Mineral products	**0**	**0**	**32**	**1**
B. Chemical industry	**2**	**1**	**1**	**5**
C. Metal production	**0**	**0**	**0**	**0**
D. Other production	**0**	**0**	**8**	**0**
E. Production of halocarbons and sulphur hexafluoride				
F. Consumption of halocarbons and sulphur hexafluoride				
G. Other (please specify)	**NE**	**NE**	**NE**	**NE**
3. Solvent and other product use			**NE**	
4. Agriculture	**7**	**136**	**0**	**0**
A. Enteric fermentation				
B. Manure management			**0**	
C. Rice cultivation			**NO**	
D. Agricultural soils			**0**	
E. Prescribed burning of savannahs	**NO**	**NO**	**NO**	
F. Field burning of agricultural residues	**7**	**136**	**0**	
G. Other (please specify)	**NE**	**NE**	**NE**	
5. Land–use change and forestry	**0**	**0**	**0**	**0**
A. Changes in forest and other woody biomass stocks				
B. Forest and grassland conversion	**0**	**0**		
C. Abandonment of managed lands				
D. CO_2 emissions and removals from soil				
E. Other (please specify)	**NE**	**NE**		
6. Waste	**0**	**0**	**0**	**0**
A. Solid waste disposal on land	**0**		**0**	
B. Waste–water handling	**0**	**0**	**0**	
C. Waste incineration	**NO**	**NO**	**NO**	**NO**
D. Other (please specify)	**NE**	**NE**	**NE**	**NE**
7. Other (please specify)	**0**	**0**	**0**	**0**

IPCC Source and Sink Categories	NOx (Gg)	CO (Gg)	NMVOCs (Gg)	SOx (Gg)
Memo items				
International bunkers	**1**	**0**	**0**	**0**
Aviation	1	0	0	0
Marine	NE	NE	NE	NE
CO_2 emissions from biomass				

Table 3.2.2: Indirect GHGs, Republic of Serbia, 1998
Source: Initial communication of the Republic of Serbia

3.3. Information publicly available

The Initial National Communication of the Republic of Serbia, issued in November 2010, is the very first national report regarding climate change issues. This document includes, also the official Inventory of emissions of greenhouse gases for the years 1990 and 1998. This document is printed in 300 copies and it is publicly available at the web site of the Ministry of Environment, Mining and Spatial Planning[1].

Statistical Yearbook of Serbia, as the main data source for inventory of GHG, is being published since 1950 and since 2004 it is being published as bilingual publication in Serbian and English language. This document is publicly available at the web site of the Statistical Office of the Republic of Serbia[2].

Data about climate, state of water, air and water quality are publicly available at the web site of the Republic Hydro Meteorological Service of Serbia[3].

[1] www.ekoplan.gov.rs
[2] www.stat.gov.rs
[3] www.hidmet.gov.rs

4. Verification

4.1. Statistical methods for QA/QC analyses

The GHG inventory for the Republic of Serbia was prepared according to the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. In addition to the IPCC Guidelines, the Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, IPCC, 2000, and Good Practice Guidance for Land Use, Land–Use Change and Forestry–GPG for LUCF, IPCC, 2003 were also used for the GHG inventory.

A team of national experts (representatives from various R & D institutions) worked on the GHG inventory, in collaboration with representatives of government institutions. For each sector, and additionally for the energy sub–sectors, a team of 3 experts was formed who were in charge of acquisition, systematization, documentation and archiving of the data.

The validation of the input data as well as the output documents was performed by specifically appointed experts. The final control and the control of the partial (for each of the sub–sectors) input and calculated data was performed during the integration of the results into the overall inventory of the GHG emissions, for each analyzed year, using IPCC software[4].

4.2. Calculation of data-verification indices

The uncertainty of the calculations of the GHG for 1990 was determined according to the internationally recommended method (IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, Tier 1 Method).

In Annex 2 of the Initial national communication of the Republic of Serbia under the UNFCCC, an overview is given of the key sources of emissions according to the gas species, classified according to their contribution to the total emissions, as well as the corresponding combined uncertainty (calculated on the basis of the uncertainty of the activity/amount of fuel and the uncertainty of the emission factor) for that source. Based on these calculations, the estimated uncertainty of the total GHG emissions in the Republic of Serbia for the year 1990 is 10.5 %.

The comparison of the results of the calculations of the available/combusted fossil fuels in the energy sector and the emission of the carbon dioxide according to the Reference Approach and Sectoral Approach for 1990 and 1998, given in tabular form in Annex 3 of the Initial national communication of the Republic of Serbia under the UNFCCC, indicates relatively small discrepancies in the emissions of CO_2 by these two methods (1.92 % for 1990 and 1.32 % for 1998).

[4] http://www.ipcc–nggip.iges.or.jp/public/gl.software.htm

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Abbreviations

GHG = greenhouse gas

IPCC = Inter-governmental Panel on Climate Change

LULUCF = Land use, land-use change, forestry

QA = quality assurance

QC = quality control