Danube Facts and Figures

SERBIA

(March 2017)

General Overview

The Republic of Serbia covers an area of 88,499 km^2 and includes two provinces: Vojvodina (21,614 km^2) and Kosovo and Metohija (10,910 km^2); the latter being currently under an international protectorate. Approximately 92% of the country, 81,560 km^2, lies within the Danube Basin, (10% of the total basin). Since more than 90% of Serbia's renewable water resources originates from outside national territory international cooperation on water issues is crucial for sustainable water management.

The Republic of Serbia is a legal successor of the FR Yugoslavia/Serbia and Montenegro that ratified the Danube River Protection Convention on 30 January 2003, becoming a full member of the ICPDR in August 2003.

The Republic of Serbia, as an EU candidate country, is harmonizing its legislative system with EU water legislation, and is in a process of preparation of first River Basin Management Plan for the territory of Serbia, in accordance with EU Water Framework Directive.

Topography

The relief of Serbia is diverse. The northern region is a part of the Pannonian Plain, crossed by rivers (the Danube, Sava, Tisza, Tamiš, Begej, etc.), numerous canals of the Danube-Tisza-Danube Hydrosistem and some lakes. To the south of the Danube, the terrain is hilly and mountainous and can be sub-divided five-fold: the Rhodope Mountains (northern, central and southern Serbia); the Carpathians (in the north-east); the Balkan range (extending across the east and south); the Dinarics (in Metohija); and the Skardo-Pind mountains (of Kosovo and Metohija).

Precipitation, climate and water flow

Serbia's climate is moderate continental with an average annual temperature of 11-12°C and January and June averages of -1 to +1°C and 22 to 23°C respectively.

The major water balance components vary widely with respect to time and space. Annual rainfall is lowest in the north (<500 mm) and highest in the south-west (over 2,500 mm), with an average of about 730 mm. During the growing season, rainfall in some regions is 28% of the annual average, but land and climate conditions are pretty conducive to agriculture, in general. Average annual precipitation is about 65 km^3 and annual runoff 16 km^3. With an annual inflow of 162.5 km^3, the total annual runoff to the Danube on leaving Serbia is about 178.5 km^3.

Serbia is rich in Quaternary, Neogene and karstic groundwater. There are 6 hydro-geological entities in Serbia: Bačka and Banat; Srem, Mačva and Posavo-Tamnava; and the South-western; Western; Central; and Eastern regions.

Land use and population

Agricultural land covers some 57% of the territory of Serbia. Until the late 1960s, the economy was dominated by agriculture. With the industrialization that followed came migration to larger industrial, administrative, educational and cultural centres.

The depopulation trend is present and the estimated number of people in the Republic of Serbia in mid-2018 was about 6,982,500 (excluding Kosovo and Metohija Province), with the valleys of the Danube, Sava, Morava and Tisza being the most densely populated and developed regions. These valleys also house the major traffic and energy supply corridors and most major cities: Belgrade (1.7 million inhabitants), Novi Sad (325,000) and Niš (260,000).

Natural highlights

In the territory of the Republic of Serbia, the protected area status has been assigned to 460 natural resources: 5 national parks, 17 nature parks, 20 special landscape areas, 68 nature reserves (strict and special), 309 natural monuments (botanical and dendrological, geomorphological, geological and hydrological) and 3 protected habitats. The total surface of the protected areas is 583,183 hectares, accounting for 6.6% of the country's territory.

International protection has been granted to ten areas included in the List of Ramsar Wetlands, with the total surface area of 63,919 hectares, as well as to one area included in the List of Biosphere Reserves under the UNESCO Man and Biosphere Programme, with the total surface area of 53,800 hectares. Under relevant international programmes there are 42 identified Important Bird Areas, 61 Important Plant Areas and 40 Prime Butterfly Areas in Europe.

The EMERALD network, under the Convention on the Conservation of European Wildlife and Natural Habitats, covers 61 areas with the total surface area of 1,019,270 hectares, which translates to approximately 11.5% of Serbia's territory.

Human uses of water resources

The main uses of Danube waters in Serbia are for domestic and industrial water supply, irrigation, navigation and cooling of thermal power plants. Data in this section do not include data from Kosovo and Metohija Province.

Water supply

The percentage of the population connected to public water supply systems is around 85%. The quantity abstracted for municipal water supply in 2018 was about 660 million m^3, out of which 425 million m^3 was distributed to households and other users. This means that losses are still pretty high – 36%. Specific consumption has been reduced from about 460 litres per user per day in the beginning of 1990s to about 300 litres per user per day (with losses).

In certain regions (a part of the Autonomous Province of Vojvodina, a part of the Velika Morava river valley etc.) the quality of water supplied is not satisfactory and some areas also have problems regarding the quantity of water (Šumadija, South Serbia etc.).

About 70% of Serbia's population uses water from groundwater sources.

Irrigation

Use of water for the irrigation is closely linked to economy of agricultural production. Official data recognize app. 46,863 hectares as irrigated land in 2018, and the amount of water used for irrigation is circa 54.5 million m^3. These data cover only fully equipped systems. It is estimated that some 45,000 additional hectares are irrigated by individual, privately-owned systems, which mainly use irrigation hose reels and drip irrigation.

Use of hydroelectric power

According to the 2015 Energy Balance of the Republic of Serbia, the total output power of large hydroelectric power plants in Serbia was 2,940 MW, while the output power of small hydroelectric power plants was 52.5 MW, which accounted for approx. 30% of the total installed power capacity of the Republic of Serbia. Energy production of hydropower plant in 2018 was 11,393 GWh. As regards the structure of output of hydroelectric power plants, run-of-the-river hydroelectric power plants account for 88% of the total output, impoundment facilities account for 6.5%, pumped-storage power plants account for 4%, while small hydroelectric power plants account for 1.5%.

Key plants include Iron Gate I, at Danube rkm 943.00 and 80 kilometres downstream, Iron Gate II acts as a compensation reservoir. Zvornik and Bajina Bašta plants on the River Drina and Potpeć on the River Lim allow daily and weekly water regulation. Storage plants include Vlasina and Limske (Uvac, Kokin Brod and Bistrica). The energy system of Serbia has one specific plant, a pumped storage hydropower unit at Bajina Bašta with an upper storage reservoir at Lazići on the Mount Tara.

A lot of small HPP plants were built in last decade creating significant impact on hydromorphological conditions of small and medium size rivers. There is a need for further harmonization of activities between the energy and water sector, particularly having in mind public interest and environmental protection.

Navigation

The basic elements of the 1700 km inland waterway network comprise the Danube, Sava and Tisza rivers, plus the network of canals and canalised rivers of the Danube-Tisza-Danube (DTD) system. All are directly or indirectly connected with the Danube, and thus with the European inland network.

The Serbian Danube is usually divided into upper and lower sections. The first, covering the stretch from the Hungarian border (km 1433) to Belgrade (km 1166), comprises a near-natural hydrologic-hydraulic regime. The second sector from Belgrade to the Bulgarian border (km 845) is located mainly within the Iron Gate I and II complex, offering excellent navigation. The Serbian stretch of the Tisza is navigable over 164 km, with good conditions throughout (with the exception of short stretches covering <2% of the length). The Sava is navigable over 211 km, from its mouth to Jamena, and forms part of the Sava international waterway. Navigation is one of the key purposes of the DTD system. Consisting of a 930 km

network of mostly canalised rivers and canals, navigation is possible along 600 km.

Flood protection

Flood protection is also a pressing issue in the Republic of Serbia, due to frequent high waters on many of its watercourses. The situation was particularly grave in 2006 and 2013 on the Danube, in 2006 on the Tisa and in 2010 in a number of basins (Timok, Južna Morava, Drina, Kolubara); however, the existing flood protection facilities provided successful protection.

However, the disastrous high waters of May 2014 mainly in the Sava River Basin, which were the result of extreme hydrometeorological conditions, caused damage to the protection structures in many places. The activities on further improvement of flood protection system are underway.

Smaller rivers are also prone to torrents, with frequent flash floods and landslides; control measures are only partially developed.

Pressures and impacts on water

Pollution pressures

Overall pressures on surface and groundwater can be considered as high to very high and are a reflection of a general conditions of infrastructure, economy and overall societal attitude towards environmental protection and capacity of the society to take protective and preventive measures. In general, this part of water sector will need highest investments in the future in order to achieve the objectives of the WFD and other related Directives. In recent years some efforts are made to remedy the situation, but investments remain far below the desired level and reforms of the system are too slow and not sufficiently coordinated in implementation. Lack of capacity at all levels, and especially at local level leaves a lot to be desired and major improvements are needed. It is anticipated and expected that significant steps forward will be made over the next few years as the significance of the problem becomes more visible and awareness of the urgency of action increases. Capacity to put control over pressures on water is slowly being increased, partially thanks to significant support from the EU and publicity that the sector is receiving.

Municipal sources continue to be dominant sources of pollution over time. The level of development of sewerage systems and infrastructure, in particular public wastewater treatment plants, is very low (56% of the total population is connected to sewerage systems and less than 10% of the collected wastewaters is treated to some level, while less than 7% is treated at the level called for by the UWWT Directive). Many of the existing collection and treatment systems are relatively old and in need of major reconstruction and renewal.

In the Republic of Serbia 76.5% of the population leaves in settlements >2000 people (447 settlements). Of the 447 settlements >2000 people only 57 have some form of wastewater treatment and only 39 settlements have secondary or better treatment. It is noted that in settlements with wastewater treatment only 33 settlements have sewer connection rates >50% of population.

With a large proportion of Serbia's population remaining in small settlements (23.5% live in communities of <2000), this has a significant impact for wastewater management.

The most significant municipal pollution sources come from 95 settlements >10000 people of which 25 settlements are > 50000 people and 8 settlements are >100000 people. None of the major cities of Beograd, Novi Sad and Niš, with emission levels >150,000 PE have wastewater treatment plants.

Only few industrial facilities perform pre-treatment of technological wastewater before it is released into sewerage networks or other recipients.

It is important to note that industrial plants are currently operating at significantly reduced capacities. Existing data indicate the largest polluters are the food industry (mostly organic emissions) and chemical, metal processing industries, etc. (specific pollutants).

Agricultural sources of pollution are dominated by livestock farming with limited and relatively small contribution of the loads on surface and groundwaters coming from mineral fertilizer use on productive agricultural lands of which only a minor portion is irrigated. This is a consequence of farm size and structure which is dominated by small holding subsistence farms (average farm size in the country is < 5 ha).

Total livestock in Serbia averages around 3.5 million standard animal units (SAU) with more than 50% of this being distributed on small farm holdings in western, eastern and southern Serbia (South of the Danube and Sava rivers).

Arable land is primarily used for the production of wheat, maize, barley, leguminous plants, sugar beet, sunflowers, onions and potatoes. In the absence of sufficient quantities of manure chemical fertilizers are the preferred method for most farmers and are widely used but in limited quantities. Their use dropped from 195 kg/ha in 1991 to 44 kg/ha in 1999 but recently an increase to approximately 60-70 kg/ha has been observed (compared with Western Europe rates of 300-800 kg/ha). The current trend in pesticide-use is modest and is also much lower than in EU countries. Existing data indicates that copper -based pesticides are the most common. Only 14 of the 25 EU List of Priority Pesticides are legal in Serbia. Aldrin and DDT are prohibited. Major problems with regard to the distribution and use of pesticides persist including inadequate or non-existent distribution control; use of prohibited pesticides; illegal trade; use of outdated products; poor storage methods and inappropriate use.

In summary, pressures on surface and ground water in Serbia are dominated by municipal and industrial sectors and point sources.

Impacts of the pollution pressures on surface and ground waters in Serbia are manifested differently and as a function of the size of receiving water body (water flows of the receiving surface water bodies). Large rivers such as the Danube, the Sava, the Tisza and the Drina are not showing significant effects of pollution load and pressures on them and in fact remain in good chemical status most of the time with the exception of localised effects in the close vicinity of untreated sewage discharge. The situation is rather different on small streams and in the

Morava river basin where even modest pressure can show significant effects on surface water quality of the receiving water bodies. As a result, most of the streams in the Morava river basin receiving point source discharges are not in good status and at some locations show serious and pronounced effects and impacts of existing pollution pressures.

Pressure on surface and ground waters from non-point sources of pollution still remain relatively low with the exception of few distinct locations under the influence of known major sources of pollution but it is noted that septic tanks in unsewered communities do represent an issue of concern at the local scale with respect to ground water resources.

Manure management best practices still leave a lot to be desired and will take time to implement due in particular as a consequence of farm structure and size and marginal status of many of small farms.

HYMO pressures

Hydromorphological pressures on surface water bodies in Serbia have not been assessed systematically and in accordance with the guidelines of the WFD until recently. This work is still in progress and will take some years to complete due to luck of methodology and appropriate skills in the country. In general, it can be said that HYMO pressures in Serbia represent just as significant problem as do pollution pressures and at some locations probably even more significant. The main HYMO pressure comes from different purpose barriers constructed on many streams for different purposes (hydropower, irrigation, erosion control, flood control, etc.) without due consideration for river continuity maintenance. Probably the most significant HYMO pressure is the result of diversion mini hydropower plants being aggressively pursued at many locations and small streams in the mountainous parts of Serbia as these streams are most sensitive to HYMO pressures if appropriate rules and guidelines on flow diversion are not followed.

Flood control structures such as dikes are typically not seen as a major HYMO pressure as they are generally located at some distance from the main river channel. River training works, and especially regulations within urbanized sections of streams and rivers can be considered as significant HYMO pressures at many locations.

Significant HYMO pressure in some parts of the country is sand and gravel extraction directly from the riverbed and its consequences are yet to be evaluated.

Useful web links

https://www.srbija.gov.rs/

http://www.minpolj.gov.rs/

http://www.srbijavode.rs/web/

http://www.vodevojvodine.com/

https://www.ekologija.gov.rs/

http://www.sepa.gov.rs/

http://www.hidmet.gov.rs/

https://www.stat.gov.rs/

http://www.eps.rs/

http://www.zzps.rs/

https://www.jcerni.rs/

http://www.ibiss.bg.ac.rs/

http://www.wwf.rs/

Key reports

Water Management Strategy for the Territory of the Republic of Serbia by 2034, 2017.

Municipalities and Regions in the Republic of Serbia, 2019.

Eco-Bulletin, 2018.

Energy balances, 2018.

River Basin Management Plan for the Territory of the Republic of Serbia 2021-2027 (in progress).