



# Danube Facts and Figures

## SLOVENIA

(April 2020)

### General Overview

Slovenia covers a territory of 20,273 km<sup>2</sup> and is home to just over 2 million people. It is a diverse country in terms of its landscape and climate, being located at the meeting point of four major European geographical regions: the Alps, the Dinaric Mountains, the Pannonian Basin and the Mediterranean (Adriatic Sea). 81% (16,423 km<sup>2</sup>) of the country is located within the Danube River Basin, which represents 2% of the entire Danube catchment area. Two major Danube tributaries flow through the country, namely the Sava river (along with its tributaries, the Kolpa river and the Savinja river) and the Drava river (and its tributary, the Mura river). Slovenia shares a border with Austria, Croatia, Italy and Hungary and contains 52 km of coastline along the Adriatic Sea.

The Convention on Co-operation for the Protection and Sustainable Use of the Danube River was signed by the Republic of Slovenia in December 1994 and came into force in October 1998.

### Topography

The majority of Slovenian terrain is upland, with around 90% of the surface situated at 200m or more a.s.l.. Mount Triglav is the highest peak at 2864m a.s.l.. In terms of landscape diversity, Slovenia is exceptional in that four major geographical regions meet and interweave within a relatively small area. It can therefore be divided into four basic landscape types: Alpine, Dinaric, Pannonian and Mediterranean.

93% of the rock structure is sedimentary, with carbonate sedimentary rock prevailing in western, southern and central areas (mainly limestone and dolomite and including spectacular karst developments). Carbonate rocks in parts of south-western and central Slovenia often include flysch and similar clastic sedimentary rocks. Oligocene, Miocene and Pliocene postorogenetic sediments occur in the north-east and east, as well as small areas of the south-east. Igneous (accounting for 3%) and metamorphic rock (4%: gneiss, mica schist, amphiboles, eclogites, marbles and slates) are found in a small part of north-eastern and northern Slovenia, the majority located at Pohorje, Strojna, Kozjak and Kobansko. Quaternary sediments form an extensive group in the central Ljubljana basin, stretching toward Gorenjska and covering part of the north-east. These sediments have formed a number of smaller basins and plains, predominantly gravel, sand and clay, and are the least resistant to weathering.

Due to geological and climatic diversity and also the roughness of terrain, Slovenia has a varied soil composition. Various types of rendzina and cambisol, as well as ranker and dystric cambisol, prevail. Extensive plains of Ljubljansko polje, Dravsko-Ptujsko polje, Dolinsko polje and Ravensko polje are covered by dystric cambisol on silicate rock, and eutric cambisol on carbonate gravel and sands.

### **Precipitation, climate and water flow**

Slovenia can be divided threefold in terms of climate: a temperate continental climate in the central and eastern region (typical monthly averages for Ljubljana of  $-0.3^{\circ}\text{C}$  (January;) to  $21.3^{\circ}\text{C}$  (July) with a mean annual precipitation of 1362 mm); an alpine climate to the north-west (averages for Rateče:  $-3.9^{\circ}\text{C}$  (Jan) to  $17^{\circ}\text{C}$  (July); mean annual precipitation of 1459 mm); and a sub-Mediterranean climate along the coast and its hinterland (averages for Portorož:  $4.3^{\circ}\text{C}$  (Jan) to  $22.9^{\circ}\text{C}$  (July); mean annual precipitation of 968 mm). All averages are for the 1981–2010 reference period. A strong interaction occurs between the three climatic zones across much of the country.

Major variations in the spatial distribution of annual precipitation are characteristic of Slovenia, with the wettest areas receiving as much as four times the amount of precipitation recorded in the driest areas. The highest levels of precipitation occur where warm humid south-westerly air from the Mediterranean reaches the Alpine-Dinaric mountain barrier. Mean annual precipitation exceeds 1600 mm across the entire Dinaric-Alpine zone, increasing to more than 2600 mm where the barrier is greatest – in the upper Posočje and Mount Snežnik areas. Precipitation rates decrease with distance from the mountains: north-east areas have on average less than 900 mm per annum. Rainfall peaks occur at different times of the year in the different climatic areas. In the west, two characteristic precipitation peaks occur – at the end of spring and autumn. To the north-east, where the continental climate predominates, most occurs in the summer. Winter-summer variations occur in the type and duration of rainfall: long lasting precipitation accompanying the passing of a weather front is characteristic of the cold half of the year; short, more intensive showers and storms (often accompanied by hail, strong winds and torrential floods) are characteristic of the summers.

In terms of recent variations (from the analysis for the period from 1961 to 2011), the data indicates that Slovenia's precipitation regime is changing: at the annual level, amount of precipitation in the western part of the county is decreasing at the level 2–4% a decade. In the spring and summer is the decrease almost statistically significant at the national level. It is significant on small areas only in the spring and in summer in the places in the south of the country. In the autumn and winter however, changes are not obvious.

Mean annual temperatures in the majority of the country is  $8\text{--}11^{\circ}\text{C}$ ; increasing to  $10\text{--}12^{\circ}\text{C}$  in areas influenced by the continental climate and exceeding  $12^{\circ}\text{C}$  to the

west in the Slovenian Istria, a part of Kras, the Vipava Valley and Brda. For the majority of the Alpine and Dinaric mountain region, 6–8°C is typical, and in the highest parts of the Julian Alps, the annual mean does not exceed 0°C. Between 1961 and 2019, mean annual temperatures throughout the country increased, with 2010-2019 being the warmest 10-year period. The rise fairly uniform over the whole country (0,36°C a decade), with somewhat greater increase in the eastern parts. The greatest increases was observed in summer and spring, somewhat lower was decrease in winter and no increase being observed in the autumn months.

Slovenia is divided into two catchment areas by the Adriatic Sea – Black Sea watershed, with the vast majority (81%; 16,423 km<sup>2</sup>) belonging to the Danube river catchment area. The total length of the river network is 35,128 km, with the significant rivers being the Mura, Drava, Sava, Kolpa and Savinja, all located within the Danube river basin. Slovenia contains 2% of the Danube catchment area, and the Slovenian Sava and Kolpa river basins represent 12% of the Sava catchment area. Slovenian watercourses are short due to the rough terrain and rock composition, with only 46 longer than 25 km (22% of the network). Rivers exceeding 100km include the Sava (221km), Drava, Kolpa and Savinja rivers.

In general, Slovenian rivers form a very dense network but it is not uniform. On areas of impermeable and poorly permeable rocks, the network is dense. The Reka stream, the Sava's tributary near Litija, has a 96 km<sup>2</sup> river basin and a density of 2.8 km/km<sup>2</sup>. Above the mouth of the Črni potok, the Reka stream has a density of 3.5 km/km<sup>2</sup>. Sparse river networks occur in the Dinaric region. The high plateaus, for example, have no river network at all. Similar conditions are found in the karstic Alpine area, but areas without river networks are not so extensive. The central part of the gravel flatlands (with deep groundwaters), such as at Kranjsko polje, Sorško polje, Ljubljansko polje and Dravsko polje, also show sparse networks.

## **Land use and settlements**

According to 2018 data, 55.9% of Slovenia is forested (the third most forested country in Europe after Finland and Sweden); 29.0% is arable/permanent crops/mixed agriculture; 5.3% pastures; 3.5% built-up areas; 2.4% transitional woodland shrub; 1.9% natural grassland/moor; 1.4% other uses and 0.6% comprises water and wetlands. Put simply, forest and herbaceous vegetation covers just under two thirds of the land cover and agriculture just over one third. The largest areas of dense forest cover the Dinaric-Karst plateaus of southern and south-western Slovenia, and in the Alpine region to the north and north-west. In the north-east, agricultural land prevails. Considering land cover changes since the 1970s, afforestation has been identified as the main change in Slovenia and this process is expected to continue and even accelerate in the future due to the selective abandonment and scrubbing up of agricultural land and the transition to predominantly market-oriented agriculture.

In 2019, there were 6035 settlements in the country (57 without inhabitants). Small settlements prevail with half containing less than 100 inhabitants (but home to only 6,5% of the population). Only 16 settlements had more than 10,000 inhabitants in 2019, and Ljubljana, the capital, is the only city with more than 100,000 inhabitants. Small settlements are characteristic of the Dinaric plateaus, Dinaric valleys and Alpine hills; large settlements are characteristic of the Alpine and Pannonian plains. Population distribution is uneven and is governed by the hilly terrain; overall population density is classed as medium, at 103 inhabitants per km<sup>2</sup> (2019 census).

Population density is highest on the Alpine and Pannonian plains and surrounding the major cities and is increasing in these areas (more than tripling on the Alpine plains in the 20th century). Almost two thirds of the population lives in the basins and valley bottoms, covering approximately one quarter of the country. The largest urban area is located in the Ljubljana Basin, continuing almost without interruption to Kranjsko-Sorško polje. Other areas, such as the Dinaric and Mediterranean plateaus, are experiencing depopulation.

## **Natural highlights**

Slovenia is rich with an exceptionally varied landscape, plant and animal diversity. According to 2019 data, ecologically important areas (EIAa) occupy 52% of the country. 3.8% of Slovenia is covered by Natura 2000 sites (within EIAs). National designations account for 14% and although encompassing a much smaller surface area than Natura 2000 sites, they are organized to a higher level with elaborated management plans and appointed managers. Many partially overlap with Natura 2000 sites.

The *Triglav National Park* is the country's only national park, designated in 1981, although its first protection dates back to 1924. Now comprising 880 km<sup>2</sup>, it contains the country's highest peak, Mount Triglav at 2864m. Other 48 larger protected areas include 3 regional and 45 landscape parks

## **Human uses of water resources**

Slovenia has experienced a major concentration of population and economic activities over the last 60 years. In particular, the Pannonian and Alpine plains have seen considerable increases in population density. The basins and valley bottoms are favourable for agriculture, construction of transport infrastructure, expansion of industry and settlements. But the increasing population density has meant increasing environmental pressures in these areas.

### ▪ Flood and high discharge management

Excluding earthquakes, floods represent the most significant category of natural disasters in Slovenia, causing extensive material damage. Constituting a threat to more than 300,000 ha (15% of the country), high waters are common and occur

annually. They take place at any time but are most frequent in autumn and spring, mainly due to reduced plant cover. Floods due to sudden inflows of large amounts of water occur in summer when short blasts of intensive rainfall are commonplace and have the potential to trigger landslides (frequent in the south-east).

Due to the increasing concentration of the country's population being located in the bottom of basins and broad valleys (where almost two thirds of Slovenes reside), a significant share of the population now lives in areas exposed to floods. This is the case for both rural and urban settlements. There are 86 areas of potential significant flood risk. There are approximately 100,000 inhabitants and approximately 90,000 buildings exposed to floods on these areas.

Torrential flooding occurs mainly in the upland areas, as well as along large rivers, for example on the Savinja, Mislinja, Kamniška Bistrica and Sora rivers. Lowland flooding is characteristic of the lower sections of major rivers and is most extensive along the Dravinja, lower Krka, and Sava rivers in Brežiško polje, and the lower section of the Sotla River. In karst poljes, floods occur slowly and water remains for days or weeks before slowly flowing off through the karst underground. This is common in Cerknjsko polje and Planinsko polje, and also Globodol, a Dolenjska karst polje, and Ljubljansko barje.

Slovenia's 2002 Water Act prohibits all activities and encroachments on physical space which, in the event of a flood, could have adverse effects on waters or waterside land, or which increase the flood risk in the area.

▪ Drinking water supply

Slovenia currently has sufficient water resources to provide continuous drinking water supply to its population, although individual areas are indicating periodic deficits. Due to increasing water consumption and anticipated development plans drinking water supply may become a limiting factor in some areas. The increasing demand is the consequence of economic developments and, and increases in household consumption.

Water is a public natural asset and its protection is regulated on the national level. Water protection areas are being established using a uniform methodology for defining these protection areas. It also protects areas used for mineral, thermal, thermo-mineral and other groundwater abstraction. In 2004, the first new water protection areas were defined. In 2016 the total area of all water protection areas in Danube river catchment area in Slovenia was around 16% of the total area covering for example the Ljubljansko polje aquifer, Urbanski plato, aquifers on Dravsko-Ptujsko polje, Apaško polje aquifer and other aquifers. In order to carry out monitoring and management of drinking water resources, a database of existing water resources is established.

### Use of groundwater bodies for drinking water supply

Groundwater supplies greatly exceed surface water supplies and represent the most important source of drinking water in Slovenia, supplying approx. 97% of the population. Slovenia's main groundwater bodies (GWBs) are found in aquifers with intergranular porosity in flatland gravely-sand deposits along the larger rivers. Slovenia has specified 165 aquifer systems combined into 21 GWBs according to their characteristics; 18 of which occur in the Danube river catchment area.

According to national river basin management plan for the period of 2016–2021 83 % of these GWBs are in good chemical status. The remaining GWB i.e. 3 out of 18 GWBs in the Danube river catchment area, are in poor chemical status due to pollution from non-point sources.

GWBs under most pressure are found in the north-eastern lowland areas of Slovenia, where aquifers with intergranular porosity prevail. According to national river basin management plan for the period of 2016–2021 GWB with poor chemical status are in the Drava, Mura and Savinja basins.

Groundwater in this basins is mostly susceptible to pollution from non-point sources. Pollutants that contribute to this pollution are desetilatraine, nitrates and atrazine. Concentrations for all parameters are generally declining. Regarding atrazine and desetilatraine this indicates that the ban on the use of products containing these substances has been effective.

### Use of surface waterbodies for drinking water supply

Using EU Water Framework Directive methodology, Slovenia has defined 155 surface waterbodies (SWB) from which 121 belong to Danube river catchment area. Out of 121 SWBs 101 are classed as watercourses 3 as lake water bodies, 13 have characteristics of heavily modified water bodies and two of artificial water bodies.

According to national river basin management plan for the period of 2016–2021 around 50% of SWBs in Danube river catchment area are achieving good ecological status/potential and, without taking into account ubiquitous, persistent, bioaccumulative and toxic (uPBT) substances, all SWBs in Danube river catchment area achieving good chemical status.

Significant failure to achieve good chemical status in Slovenia represents the exceeding of environmental quality standards (EQS) for mercury, which is an uPBT substance, in biota. Mercury can be transported long distances and poses a long-term risk to human health and ecosystems. Owing to widespread environmental contamination, achieving concentrations at or below the EQS for this substance is particularly challenging for all Danube and EU countries.

Good ecological status is not met for around 50% of SWBs in Danube river catchment area due to organic load, nutrient load, specific non-synthetic and synthetic pollutants and due to hydromorphological alteration/general degradation. In general, the most common pressures that cause the failure to achieve good ecological status of SWBs are hydrological and morphological pressures. Organic matter load, which can originate from different point and diffuse sources of pollution, is decreasing. On the other hand, the mitigation measures which tackle nutrient load reduction, for example measures concerning urban waste water treatment, are still being implemented in Slovenia. Specific non-synthetic and synthetic pollutants, which are also one of the reasons for not achieving good ecological status of SWBs, in most often, originate from the use of plant protection products in agriculture.

Use of SWBs for drinking water supply in Slovenia is not common. Surface resources are only used by about 3% of the population. Assessment of the quality of surface sources of drinking water is a part of national river basin management plan. The results for the period of 2016–2021 show that all considered surface sources of drinking water from SWBs achieve compliance with the requirements of the regulation for drinking water. SWBs which represent sources of drinking water have good chemical and good ecological status with respect to specific non-synthetic and synthetic pollutants.

### **Useful web links**

Environmental indicators in Slovenia website:

<http://kazalci.arso.gov.si/en teme/water>

“Environment in the Palm of Your Hand” website:

<http://eionet.arso.gov.si/publikacije/Datoteke/OND07en/EnvironmentInThePalm-min.pdf>

Ministry of the Environment and Spatial Planning (Department for Waters):

<https://www.gov.si/drzavni-organi/ministrstva/ministrstvo-za-okolje-in-prostor/o-ministrstvu-za-okolje-in-prostor/direktorat-za-vode-in-investicije/>

Environmental Agency of Slovenia: Water Balance of Slovenia 1971 - 2000:

[http://www.arso.gov.si/vode/poro%c4%8dila%20in%20publikacije/vodna%20bilanca/vodna\\_bilanca.html](http://www.arso.gov.si/vode/poro%c4%8dila%20in%20publikacije/vodna%20bilanca/vodna_bilanca.html)

Direkcija Republike Slovenije za vode:

<https://www.gov.si/drzavni-organi/organi-v-sestavi/direkcija-za-vode/>