

Blaž Repe

Abstract

This chapter briefly explains the general and geographical features of Slovenia, a country located in Central Europe bordering Italy, Austria, Hungary, and Croatia. Geographically, it is situated where four large European regions meet—the Alps, the Pannonian Basin, the Dinaric Mountains, and the Mediterranean. This endows Slovenia with extreme natural diversity, probably one of the highest levels in Europe. As a result of this situation, there are five main natural regions in Slovenia: (1) the mountainous Alpine Region—glacially reshaped and transformed, it features the highest altitudes, the steepest slopes, and high rates of precipitation; (2) the hilly, largely forested Pre-Alpine Region, with swift alternations between carbonate and noncarbonate parent materials; (3) the forested and agricultural Karstic–Dinaric Region, with an absence of surface waters and the absolute dominance of soluble and permeable limestone and dolomite; (4) the lowland Sub-Pannonian Region, with its hot continental climate in summer, significantly lower mean annual precipitation, undulating hills, and flat river plains; and, finally, (5) the warmest of them all, the Sub-Mediterranean Region—the coast of the Adriatic Sea.

2.1 Slovenia—Country Information

Slovenia is a Central European country bordering Italy to the west, Austria to the north, Hungary to the north-east, and Croatia to the south-east (Fig. 2.1). It is situated at the crossroads of four large and diverse European regions: the Alps to the north and north-west; the Pannonian Basin to the east; the Balkan Peninsula with the Dinaric Mountains to the south-east, and part of the Mediterranean—the Adriatic Sea—in the south-west. The geomorphological and climatic transitions over a very short distance (apx. 200 km) make the country extremely diverse. This diversity is reflected in the architecture, cuisine, cultural heritage, dialects, and, of course, soils. In spite of being one of the smallest countries in Europe, Slovenia is considered one of the most diverse.

B. Repe (✉)
Geography Department, University of Ljubljana, Faculty of Arts,
Ljubljana, Slovenia
e-mail: blaz.repe@ff.uni-lj.si

2.1.1 Basic Country Data

- Official name: Republic of Slovenia
- Area: 20,273 km²
- Maximum distance: north–south 163 km, west–east 248 km
- Geometric Centre: 46° 07' 11.8"N, 14° 48' 55.2", 64 m.a.s.l. (Spodnja Slivna, near Litija)
- Total length of the borders: 1370 km (with Austria 318 km, Hungary 102 km, Croatia 670 km, Italy 280 km)
- Coastline: 46.6 km on the Adriatic Sea
- Highest peak: Mt. Triglav (2864 m)
- Deepest sea point: 37 m (300 m NW from Cape Madona, close to the town of Piran)
- Average elevation: 556.8 m
- Average inclination: 13.17° (23.4%)
- Mean annual precipitation: 1567 mm
- Mean annual temperature (2001–2010): 9.2 °C
- River network density: 1.32 km/km²
- Number of known species: 22,000

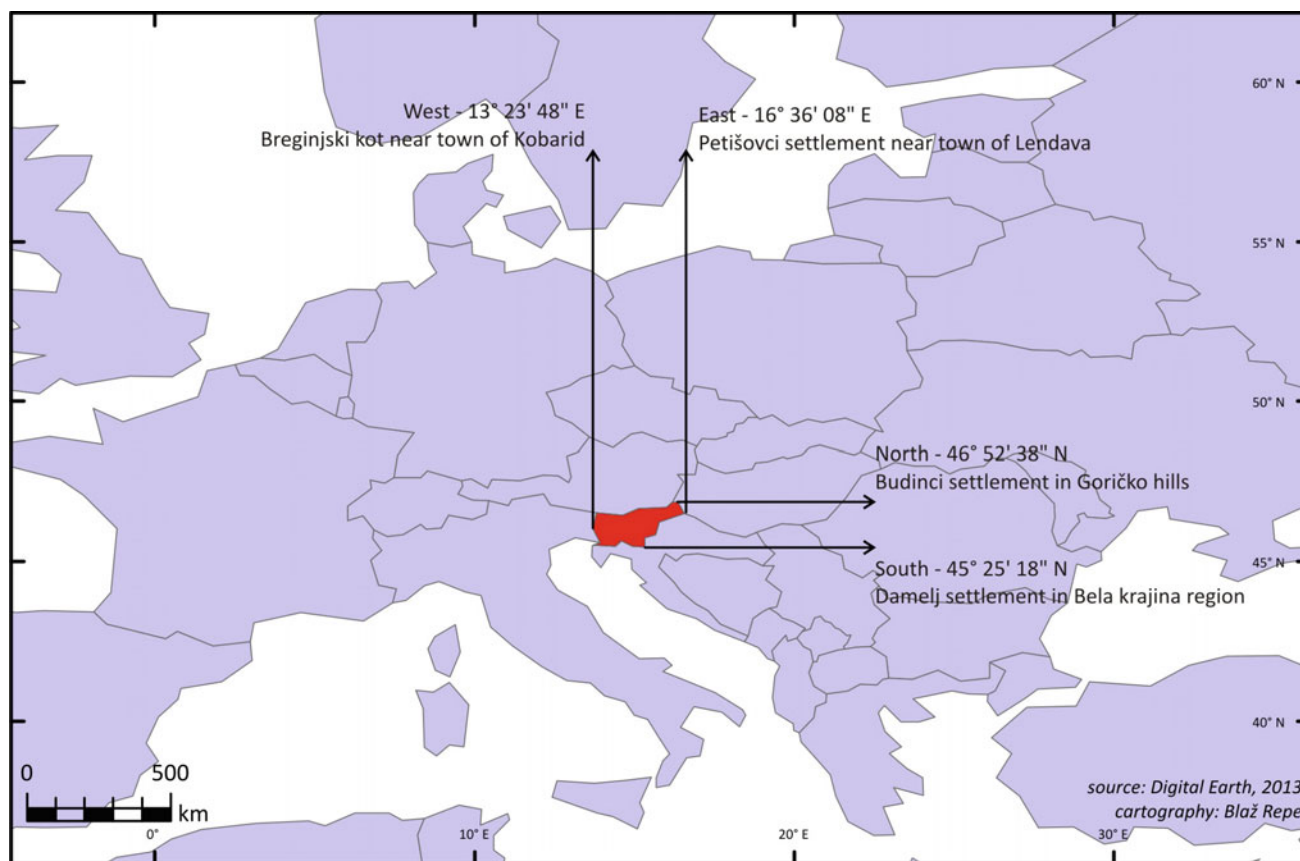


Fig. 2.1 The location of Slovenia in Europe

- Population (2013): 2,025,866
- Population density: 99 persons per km²
- GDP (2012): €35.466 billion; €17,343 per capita

2.1.2 The Geographical Position

Slovenia lies in Central Europe at the crossroads of the 46° northern latitude and 15° eastern longitude, which is in the direct vicinity of its geometrical centre. Slovenia is 20,273 km² and ranks 154th of the world's 249 countries ("List of countries and dependencies by area", 2014). Despite its small size, Slovenia represents a very special natural environment on a European as well as global scale. The natural diversity of Slovenia is extremely high, even exceeding many other much larger countries. It is especially rich in terms of biodiversity. Although Slovenia occupies only 0.00136% of the entire land surface of our planet, it represents a habitat for more than 1% of all the living species on earth and more than 2% of all living land species, including fresh water ecosystems (Mršič et al. 1997a). The large number of different habitats shows extreme diversity

(CKFF 2010a, b, c, d). The reasons for this enormous variety can be attributed to the variety of its natural features, which also includes the soils. Slovene soil scientists have identified more than 400 soil type varieties and forms (Ministry of Agriculture and the Environment, 1999). The variety of natural features is determined by the country's geographical position. To the north it borders Austria, to the east Hungary, to the south Croatia, and to the west Italy. Slovenia shares a maritime border with the latter two.

Considering the physical geography of Europe, four large units intersect in the territory of Slovenia: the Alps, the Pannonian Basin, the Dinaric Mountains, and the Mediterranean (Fig. 2.2). This junction position results in enormous variety, with the transitioning and changing of natural (and social) features over extremely short distances. Tectonically and geologically speaking, Slovenia, with all its diversity of mostly sedimentary rock, lies in a tectonically active area where the African tectonic plate subducts under the Eurasian plate. There are nearly all possible varieties of geomorphological features, from highlands to lowlands (mountains, hills, high and low plateaus, broad and narrow valleys, basins, and river and coastal plains). Nevertheless, the topography is mainly hilly, horizontally and vertically very

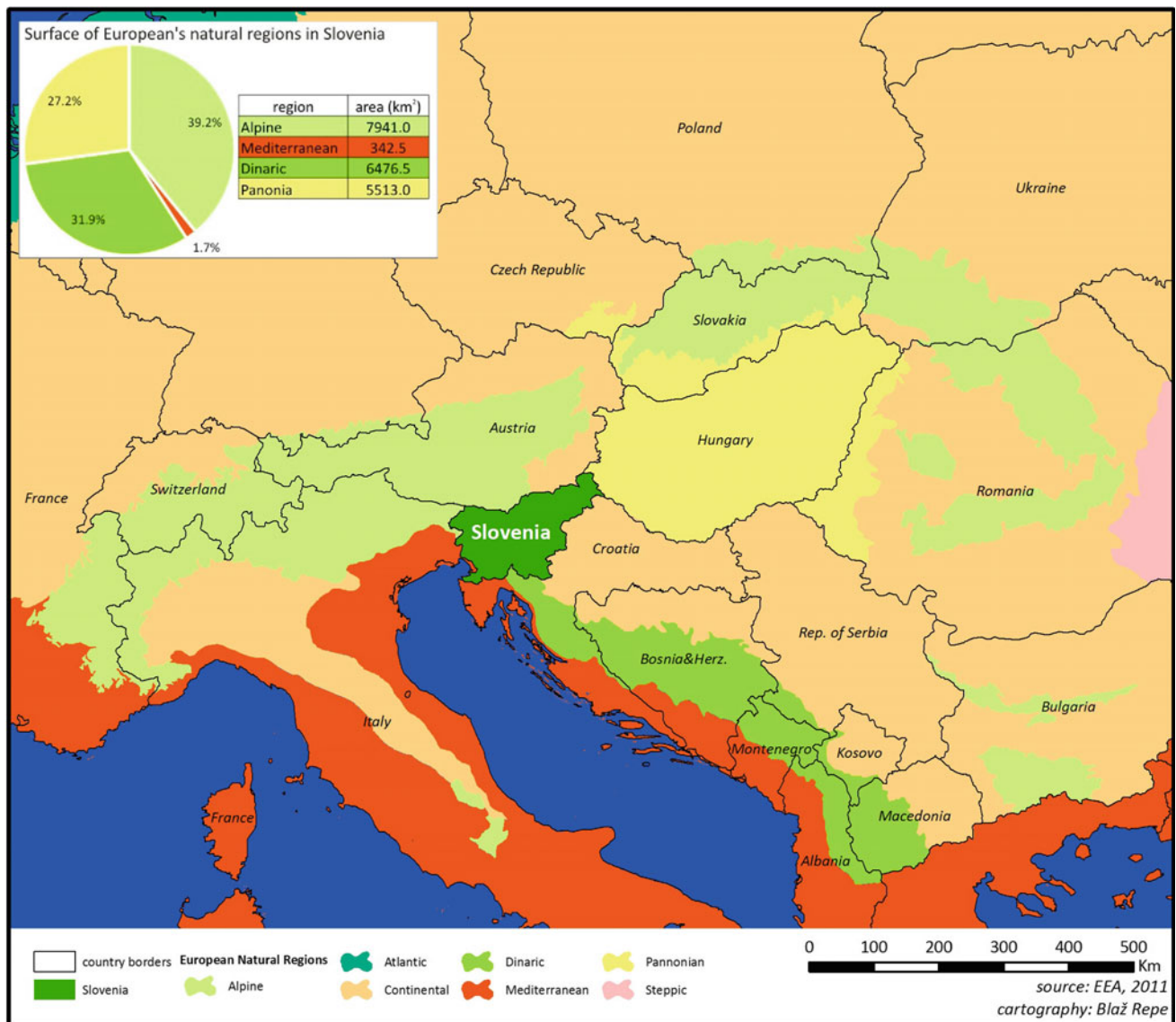


Fig. 2.2 The position of Slovenia within the natural macroregions of Europe

variable over short distances. A substantial part of Slovenia is karstic, with one of the highest karstic areas in Europe, due to the abundance of limestone and dolomite. Entering English via German, the term “karst” originates in Slovenia as a descriptor for the geomorphology of the Karst region, which comprises the south-western part of the Republic of Slovenia.

Climatically Slovenia is influenced by western air circulation, which brings moist oceanic air masses and consequently precipitation. There are also other strong influences: cold Alpine influences from the north, warm Mediterranean influences from the south-west, and dry continental influences from the east. Sufficient quantities of precipitation make Slovenia humid, rich in water and therefore the soils

largely have udic properties. On the other hand, 1/3 of the country is karstic and without any surface waters. Forests are also one of the dominant land covers of Slovenia, covering nearly 60% of the country, thus ranking third in Europe behind Finland and Sweden (Gale 2011). Slovenia hosts around 24,000 recognised living species, which live from the highest altitudes down to the deepest, dark corners of the karstic underground. The total number of species is estimated at between 50,000 and 120,000. A large portion of this estimation is accounted for by the soil organisms (Mršić et al. 1997a). According to the total land area, Slovenia has a disproportionally high biodiversity, comparable to tropical regions (Ogrin and Plut 2009, p. 127).



Fig. 2.3 Natural (ecological) regions of Slovenia (Natek 2002)

2.2 The Regions and Landscapes

In order to present the general characteristics and regions of Slovenia, the ecological-landscape method has been chosen from the many efforts to define the natural regions (Natek 2002). Considering topography, lithology, and climate, three large units can be distinguished: the Alpine, Pre-Alpine, and Karstic-Dinaric. Adding in the climatic factors, two more can be extracted: the Sub-Mediterranean and the Sub-Pannonian. The prefix “Sub-” in the latter two units places a stress on the transitory, marginality, and less prominent features that are otherwise typical of European natural macroregions. There is also another region, the Slovenian Sea or the Gulf of Trieste area. Typically, it is not included in general research or is treated as an integral part of the Sub-Mediterranean region (Fig. 2.3).

2.2.1 The Alpine Region

The Alpine region extends over the north-western and the northern parts of the country. The Slovene Alps belong to

the extreme south-eastern end of the European Alps, which are already substantially lower when they reach Slovenia. Nevertheless, the topography has a clearly recognizable mountainous appearance and it reaches the highest elevations of Slovenia (Fig. 2.4). There is a prevalence of permeable and soluble limestone and dolomite with an extensive area of high mountain karst. The bottoms of intermediate valleys are covered with glaciofluvial deposits, mostly carbonate gravel and sand. The mountains, glacially reshaped and transformed during the Pleistocene Era, have very steep, east-west oriented slopes. Flat or plain land is scarce. The harsh mountainous weather has a short vegetal growing period. Precipitation, although extreme in quantities (Slovenian Environment Agency, 2010) falls mostly as snow. In contrast, soil conditions, although generally udic, can appear xeric-like due to the extreme slopes. Forest is one of the dominant features of this region and its coverage (70%) is significantly above the Slovenian average. The upper forest line appears between 1700 and 1900 m.a.s.l. (Lovrenčak 2007).

Soils are mainly shallow and belong to different types of Leptosols (Rendzic, Nudilithic, Eutric, Hyperskeletal, etc.).



Fig. 2.4 The Julian Alps (Photo B. Repe)

Agriculturally, the region is sparsely inhabited and limited to the narrow bottoms of the valleys and mostly oriented to dairy cattle farming. The same areas are also occupied by transport infrastructure and industry. Therefore, some areas are facing a serious lack of space, which significantly affects soils (urban sprawl).

2.2.2 The Pre-Alpine Region

The Pre-Alpine Region is a 10–30 km wide belt of lower mountains, high hills, and intermediate basins and valleys, with an average height of 560 m.a.s.l. It is a very diverse and heterogeneous region, characterized by swift alternation between carbonate and noncarbonate parent materials. In most cases, higher areas and summits are made of limestone and dolomite, while less steep lower areas and foothills are made of siliceous sedimentary rocks, mostly sandstones and shale. In the eastern part, some magmatic and metamorphic

rocks can be found (the Pohorje Mountains). Basins and valleys are filled with thick deposits, mostly gravel and sand, rarely with silt and clay. In spite of the lower altitudes, the surface is very diverse and dynamic, with slopes still very steep and valleys often gorge-like. The climate can be described as a moderately continental or moderately warm and humid climate with warm summers (Ogrin 1996). The slopes are well-drained, with an udic regime, but the valleys and basins are often aquic. On a noncarbonate parent material, the river network is very well developed and dense. The streams and rivers are very torrential and cause annual flooding. The natural vegetation is forest, mostly of European beech (*Fagus sylvatica*) associations. These forests frequently have a protective function, due to the steep slopes and heavy erosion processes. For the past 60 years, people have constantly been migrating to the cities, leaving a once cultural landscape to degradation and reforestation (Fig. 2.5).

Soils are extremely diverse, as all known Slovene types can be found here. In higher areas, there are still Leptosols



Fig. 2.5 Pre- Alpine hills of western Slovenia (Photo B. Repe)

(Rendzic, Eutric), with hydromorphic types in lower areas (Fluvisols, Gleysols, Stagnosols), however Cambisols prevail (Dystric, Chromic, Eutric). To an even greater extent than in the Alpine region, the soils in the valleys and basins are seriously degraded by urban sprawl.

2.2.3 The Karstic-Dinaric Region

This region lies over a substantial part of southern Slovenia. It is a part of the larger Dinaric mountain system that extends further in the south-easterly direction to the Balkan Peninsula (Gams 2003). The main feature of this region is the absolute dominance of soluble and permeable limestone and dolomite and consequently the karstic characteristics of the topography, hydrology, soils, and vegetation. There are some fluvial deposits on larger karst poljes. The topography is extremely rough (dolines and collapsed dolines) and diverse, with alternating hilly mountains, plateaus, karstic poljes, and plains. Mountain ridges follow a typical

NW-SE (Dinaric) direction. Water corrodes the limestone in distinct karst-related features (caves, dolines, poljes, etc.). The climate is typically udic, moderately continental, with higher rates of precipitation (over 2000 mm/year). Hydrology is distinctly karstic with no surface running or still water. Nearly all the water runs underground through permeable and cracked limestone (Fig. 2.6). The only surface streams run over fine loamy deposits on Karst poljes (Fig. 2.7). The area is particularly suitable for forest growth. The European beech (*Fagus sylvatica*) and silver fir (*Abies alba*) forests, extending as far south as Macedonia, are the largest contiguous forested area in Europe. With forest cover over 80%, this region ranks highest in this respect in Slovenia.

Soils are directly parent material dependant. Different types of Leptosols (Eutric, Rendzic, etc.), Cambisols (Chromic), Luvisol (Haplic) tightly intertwine mosaically. The physical and chemical soil properties are favourable, but the varying depth, the presence of surface rocks, and mostly the lack of water makes this region very unsuitable for arable



Fig. 2.6 Chromic Cambisol—the corrosion of limestone at the lithic contact (*Photo B. Repe*)

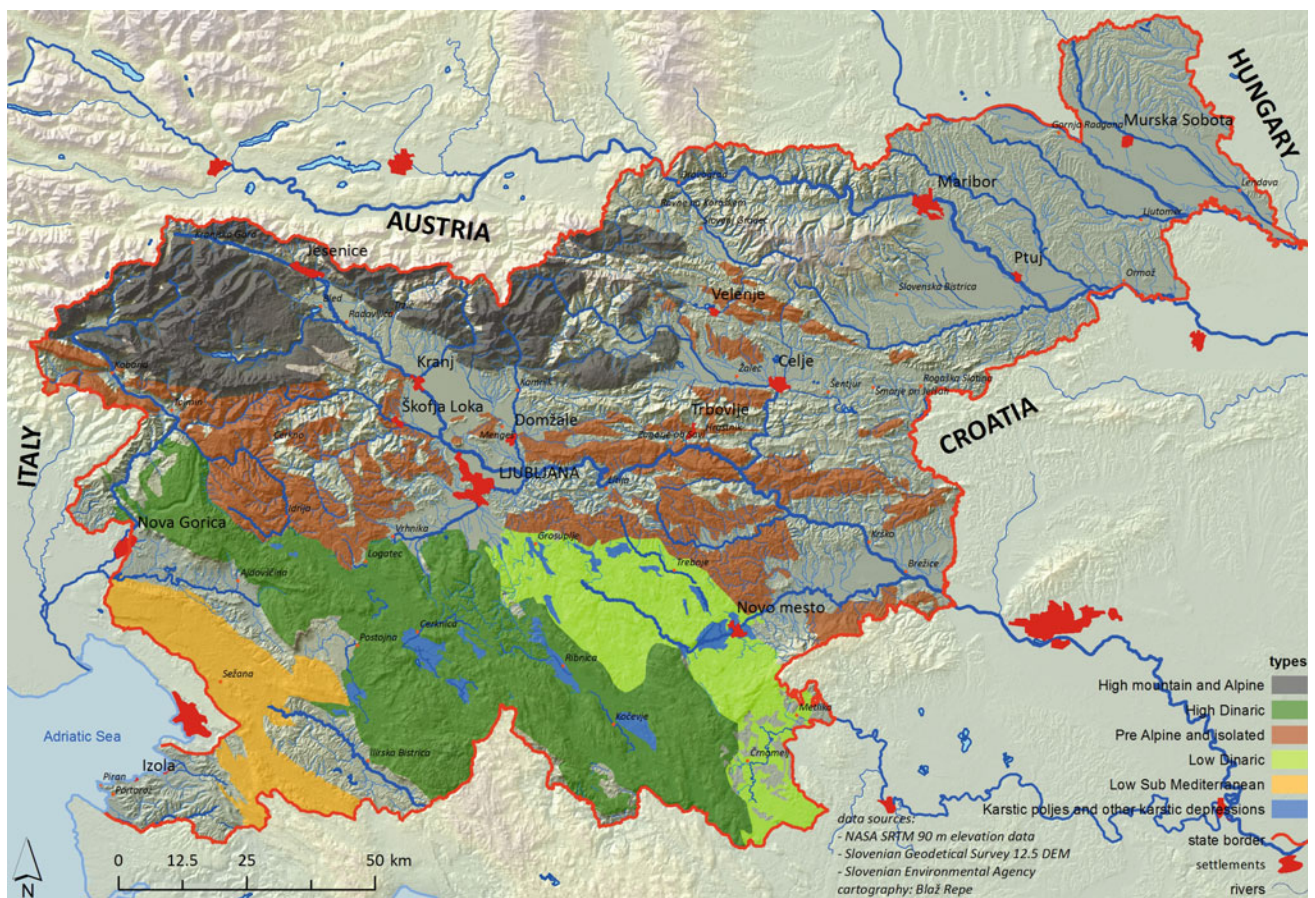


Fig. 2.7 The Karst and hydrographic network



Fig. 2.8 Vineyard terraces of Haloze in the Sub-Pannonian region, eastern Slovenia (Photo B. Repe)

land farming. All karstic areas are characterized by very sparse population densities.

2.2.4 The Sub-Pannonian Region

The Sub-Pannonian Region occupies the entire north-eastern and eastern parts of Slovenia, on the most western edges of the Pannonian Basin. It is a topographical and climatic transition into a typical, levelled, and continental European inland. The geological structure is mainly of soft tertiary sediments, which are only partially solidified (marl, mudstone, sandstone, etc.). The topography is a mixture of alternations between low hills, basins, and river plains. The plains are thickly covered with mostly noncarbonate clayey, silty, or sandy material; the floodplains are wide. The altitudes are low, on average apx. 250 m.a.s.l. Openness to the Pannonian Basin characterizes the region with a moderately continental climate, with the most typical continental distribution of precipitation and average quantities below 1000 mm. The soil water regime is generally udic, but there is a certain duality. Due to the topography, the largest areas of hydromorphic soils can be found here, but on the other

hand, droughts are also the most frequent in this part of the country. Due to the levelled, even concave surface and impermeable parent material, groundwater is shallow beneath the surface and the river network is very dense. Rivers are typically lowland, making meandering loops, and regularly flooding. The natural vegetation in the lowlands is hygrophyle forest of English oak (*Quercus robur*), black alder (*Alnus glutiosa*), and willows (*Salix alba*), while the low hills are covered with an acidophilic association of European beech and sweet chestnut (*Castanea sativa*). Forest cover is well below the Slovene average (30%). The natural features and conditions favour an agricultural orientation of the region (60%) (Fig. 2.8).

The soils are young, mostly under the direct influence of water (Fluvisols, Gleysols, Stagnosols). Where water drains normally, the soils are influenced by lithology and the most frequent types are Cambisols (Dystric) and Umbrisols.

2.2.5 The Sub-Mediterranean Region

This region encompasses the quite lower, south-western part of Slovenia, which opens onto the Adriatic Sea.



Fig. 2.9 A narrow strip of alluvial flat surface with salt pans on the Slovenian coast (Photo B. Repe)

Geologically, the region can be divided into two entirely different parts. The first one is built of flysch and is mainly low, flat, or undulating with small-scale low hills; the second part is of limestone and is represented by higher hills and a karstic plateau. The average temperatures are above 0° throughout the entire year. The distribution of precipitation shows a transitional pattern between the Mediterranean and continental regimes, and generally does not meet the criteria for xeric. The cold, strong, and gusting Bora wind (Slovenian: *burja*) is very common during the winter months, which can cause some soil wind erosion. Along the Soča River, valley maritime influences reach far north, deep into the Alps (Ogrin 1996). Impermeable flysch allows surface running water with a dense river network, while the hydrology on the limestone is typically karstic. The vegetation, although still thermophile and drought tolerant, is not evergreen, but deciduous of downy oak (*Quercus pubescens*), manna ash (*Fraxinus ornus*), and hop hornbeam (*Ostrya carpinifolia*).

The dominant soil types on limestone are Leptosols (Eutric, Rendzic, etc.) and Cambisols (Chromic, Eutric, etc.). The Karst is known for *Terra Rossa*. Eutric Cambisols on flysch are of great importance and are known as Slovenia's best agricultural soil. Marshes with Gleysols commonly appear on the bottoms of the flysch valleys. Fluvisols form along rivers and on wider and mostly gravelly floodplains. Directly on the coast, a limited area of salt-affected soils (Solonchaks) can be found.

The abundance of preclusive activities (tourism, transport, industry, and settlements) leads to land use conflicts at the expense of the natural environment and soil degradation.

This region includes the sea, i.e. the most north-eastern part of the Adriatic Sea or approximately one-third of the Gulf of Trieste (180 km²) (Radinja 1990), and the 46.6 km of the coast between Italy and Croatia. By far the largest areas of sub-aqueous soils can be found in this region (Repe and Pristovšek 2011) (Fig. 2.9).

The Soils of Slovenia

Vrščaj, B.; Repe, B.; Simončič, P.

2017, XXVI, 216 p. 212 illus., 209 illus. in color.,

Hardcover

ISBN: 978-94-017-8584-6