Map Legend

International boundary	—·—·—·—
Major road	══════
Major river	Po
National capital	■ ROMA (ROME)
Locality (by population)	
1 000 000 - 5 000 000	■ MILANO (MILAN)
250 000 - 1 000 000	● Verona
100 000 - 250 000	● Novara
25 000 - 100 000	● Verbania
10 000 - 25 000	● Ispra

How does the legend work?

A legend is intended to ease the understanding of a soil map and consists typically of a symbol or a series of symbols within a specific colour repeated on the map sheets and consistent over all the maps presented. It is followed by the name of the dominant soil in the mapping unit, the characteristics of which can be deduced from the tables included in the soil classification section.

The symbols used in the legend are those that appeared on the original Soil Map of Europe at 1:1 million scale in 1985. However, since then the soil classification scheme has changed and the names of the units represented have been reclassified in the World Reference Base. This may have led to small errors in boundaries between some units, while the correlation itself between the two systems may not be perfect in places. The colours corresponding with each Reference Soil Group are those used by the Food and Agriculture Organization (FAO), with slight modifications.

Example: Gmc Calcari-mollic Gleysol

The colour of all Gleysols is dark blue and they are all having the symbol G indicating the dominant soil in the unit. (Note that not all Reference Soil Groups in the legend have the same letter symbol as some have been correlated with different soil types due to differences between the soil classification used).

All mapping units with the symbol Gmc would have as dominant soil Calcari-mollic Gleysols characterized by a high water table for a long time during the year, being calcareous between 20 and 50 cm depth and having a nutrient- and organic carbon-rich, dark coloured topsoil.

WRB Major Reference Group Legend

- Acrisol
- Albeluvisol
- Andosol
- Anthrosol
- Arenosol
- Calcisol
- Cambisol
- Chernozem
- Cryosol
- Fluvisol
- Kastanozem
- Gleysol
- Gypsisol
- Histosol
- Leptosol
- Luvisol
- Phaeozem
- Planosol
- Podzol
- Regosol
- Solonchak
- Solonetz
- Umbrisol
- Vertisol

Codes for soil types on regional maps

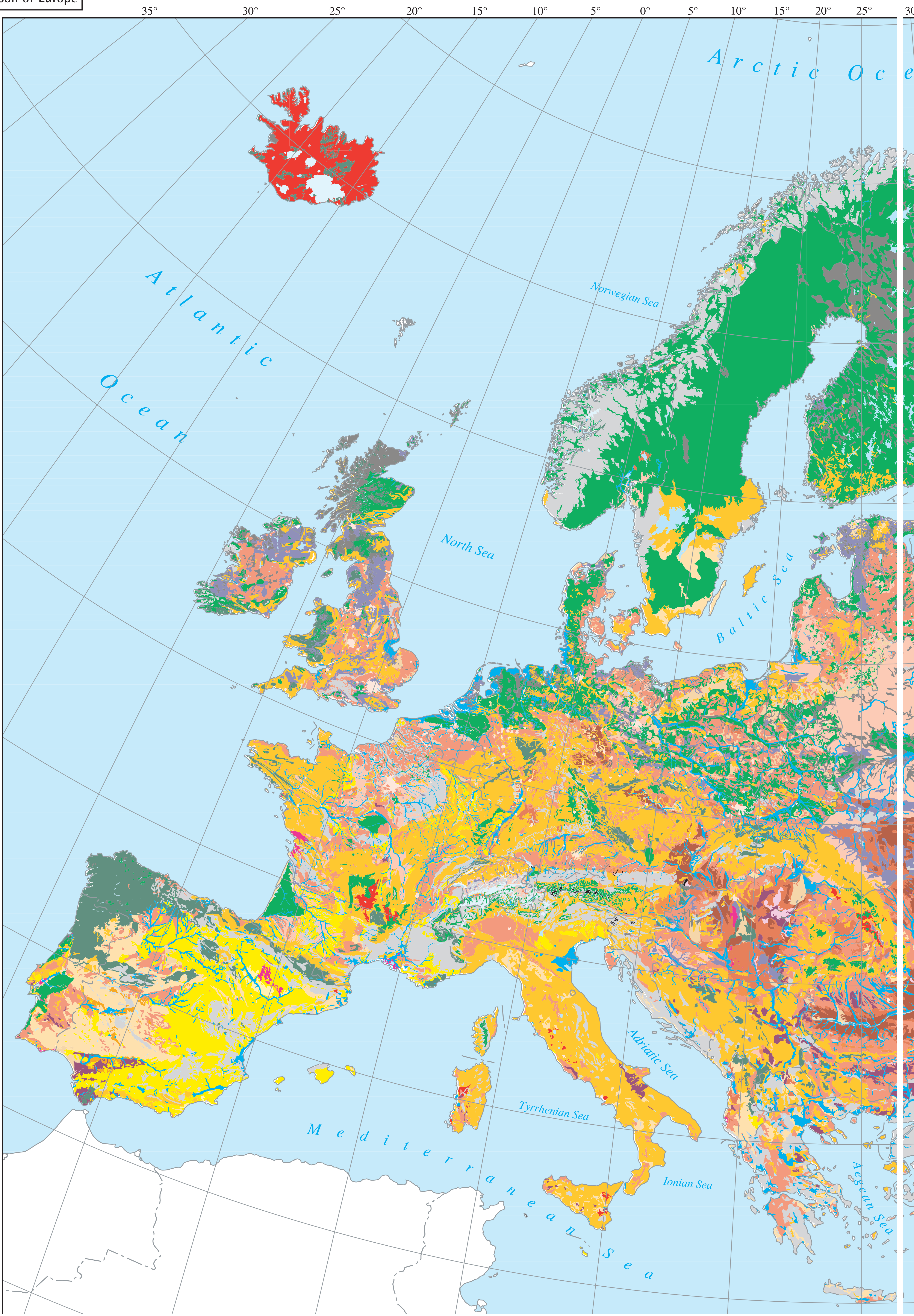
Code	Soil type
A	Acrisol
Ag	Gleyic Acrisol
Ah	Humic Acrisol
Ao	Haplic Acrisol
D	Albeluvisol
Dd	Haplic Albeluvisol
De	Endoeutric Albeluvisol
Dg	Gleyic Albeluvisol
Dge	Endoeutri-gleyic Albeluvisol
Dgs	Stagnic Albeluvisol
To	Acroxic Andosol
Tg	Gleyic Andosol
Th	Umbric Andosol
Tha	Haplic Andosol
Tv	Vitric Andosol
ATc	Terric Anthrosol
ATa	Arenic Anthrosol
Q	Arenosol
Qa	Albic Arenosol
Qc	Haplic Arenosol
Qcc	Calcaric Arenosol
Qcd	Dystric Arenosol
Ql	Lamellic Arenosol
Qld	Dystri-lamellic Arenosol
Bcl	Luvic Calcisol
Bk/Bkh	Haplic Calcisol
Bkv	Vertic Calcisol
Xk	Aridic Calcisol
Bc	Chromic Cambisol
Bcc	Chromi-calcaric Cambisol
Bd	Dystric Cambisol
Bda	Dystri-andic Cambisol
Be	Eutric Cambisol
Bea	Eutri-andic Cambisol
Bef	Eutri-fluvic Cambisol
Beg	Eutri-gleyic Cambisol
Bev	Eutri-vertic Cambisol
Bg	Gleyic Cambisol
Bgc	Calcari-gleyic Cambisol
Bgg	Stagnic Cambisol
Bgv	Gleyi-vertic Cambisol
Bkf	Calcari-fluvic Cambisol
Bv	Vertic Cambisol
Bvc	Calcari-vertic Cambisol
Ba/Bec/Ec	Calcaric Cambisol
Bx	Gelic Cambisol
Geh	Eutri-stagnic Cambisol
Gs	Stagnic Cambisol
C	Chernozem
Ch	Chernic Chernozem
Ck/Ckc	Calcic Chernozem
Ckb	Vermi-calcic Chernozem
Ckcb	Vermi-calcic Chernozem
Cl	Luvic Chernozem
Gx	Gleyic Cryosol
Rx	Haplic Cryosol
Jc/Jcf	Calcaric Fluvisol
Jcg	Calcari-gleyic Fluvisol
Jd	Dystric Fluvisol
Jdg	Histic Fluvisol
Je/Jef	Eutric Fluvisol
Jeg	Eutri-gleyic Fluvisol
Jm	Mollic Fluvisol
Jmg	Molli-gleyic Fluvisol
Jt	Thionic Fluvisol
Gc	Calcaric Gleysol
Gd	Dystric Gleysol
Gds [1]	Dystri-stagnic Gleysol
Ge	Eutric Gleysol
Gef	Eutri-fluvic Gleysol
Ges [1]	Eutri-stagnic Gleysol

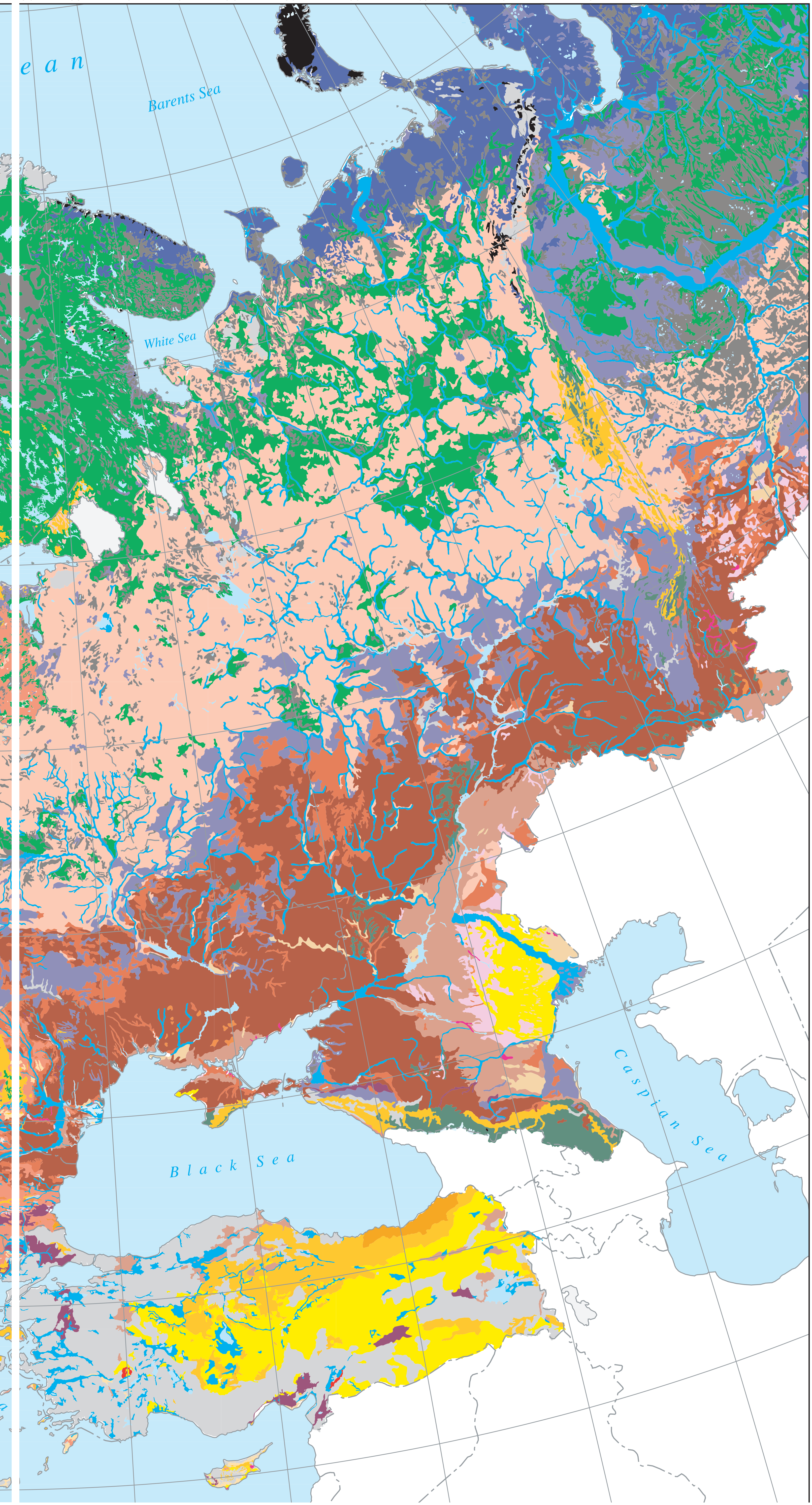
Gev	Eutri-vertic Gleysol
Gfm	Fluvi-mollic Gleysol
Gh/Ghh[2]	Humic Gleysol
Gm	Mollic Gleysol
Gmc	Calcari-mollic Gleysol
Gmf	Fluvi-mollic Gleysol
Gtz	Thionic Gleysol
Xy	Aridic Gypsisol
Od	Dystric Histosol
Oe	Eutric Histosol
Ox	Gelic Histosol
Kh	Haplic Kastanozem
Kk	Calcic Kastanozem
Kkb	Vermi-calcic Kastanozem
Kl	Luvic Kastanozem
E	Leptosol
Eh/Eo	Rendzic Leptosol
I	Lithic Leptosol
Ic/Ich	Calcari-lithic Leptosol
Id	Dystri-lithic Leptosol
Ie	Euri-lithic Leptosol
Im	Molli-lithic Leptosol
Io	Hapli-lithic Leptosol
Iu	Umbri-lithic Leptosol
Lgs/Gls	Stagnic Luvisol
La	Albic Luvisol
Lc	Chromic Luvisol
Lcr	Rhodic Luvisol
Lcv	Chromi-vertic Luvisol
Ldg	Dystri-gleyic Luvisol
Lf	Ferric Luvisol
Lg/Lgp	Gleyic Luvisol
Lga	Albi-gleyic Luvisol
Lk	Calcic Luvisol
Lkc	Chromi-calcic Luvisol
Lkcr	Rhodi-calcic Luvisol
Lo	Haplic Luvisol
Lv	Vertic Luvisol
Lvk	Calci-vertic Luvisol
Hc/Hcb	Calcaric Phaeozem
Hcf	Calcari-fluvic Phaeozem
Hcn	Sodic Phaeozem
Hg	Gleyic Phaeozem
Hgc	Calcari-gleyic Phaeozem
Hgs	Stagnic Phaeozem
Hh/Ho	Haplic Phaeozem
Hl/Lh	Luvic Phaeozem
Hlv	Luvi-vertic Phaeozem
Mo	Greyic Phaeozem
Wd	Dystric Planosol
We	Eutric Planosol
Wev	Eutri-vertic Planosol
Wm	Mollic Planosol
Pg	Gleyic Podzol
Pgh	Histic Podzol
Pgs	Stagnic Podzol
Ph	Carbic Podzol
Phf/Po	Haplic Podzol
Pl	Episkeletic Podzol
Plh/Pof	Skeleti-umbric Podzol
Poh	Rustic Podzol
Pp	Placic Podzol
Rc	Calcaric Regosol
Rd	Dystric Regosol
Re	Eutric Regosol
Rl	Leptic Regosol
Z	Solonchak
Zg	Gleyic Solonchak
Zo	Haplic Solonchak
Sg	Gleyic Solonetz
Sm	Mollic Solonetz
So	Haplic Solonetz
Sof	Fluvic Solonetz
U	Umbrisol
Bh	Haplic Umbrisol
Ud	Leptic Umbrisol
Qh	Arenic Umbrisol
Bds	Endoskeletic Umbrisol
Vcc	Calcari-chromic Vertisol
Vc	Chromic Vertisol
Ve	Eutric Vertisol
Vg	Gleyic Vertisol
Vk	Calcic Vertisol
Vp	Pellic Vertisol
Vpc	Calcari-pellic Vertisol
Vpg	Gleyi-vertic Vertisol
	Urban
sdm	Soil disturbed by man
	Water body
m	Marsh
g	Glacier
r	Rock outcrops

[1] Recent re-evaluation of this soil type has lead to a re-classification as Stagnic Cambisol, because of slowly permeable subsoil that causes stagnating water to create a perched watertable.

[2] Recent re-evaluation of this soil type has lead a re-classification as Stagnic Umbrisol in the British Islands, where they have slowly permeable subsoil causing a perched watertable.

The soil of Europe





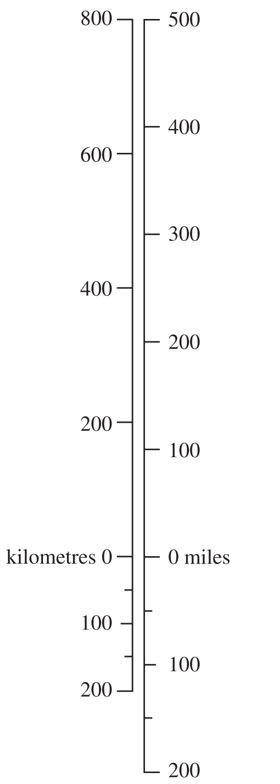
WRB Major Reference Group Legend

Acrisol	Luvisol
Albeluvisol	Phaeozem
Andosol	Planosol
Anthrosol	Podzol
Arenosol	Regosol
Calcisol	Solonchak
Cambisol	Solonetz
Chernozem	Umbrisol
Cryosol	Vertisol
Fluvisol	Rock
Gleysol	Urban
Gypsisol	Water body
Histosol	Marsh
Kastanozem	Soil disturbed by man
Leptosol	Glacier

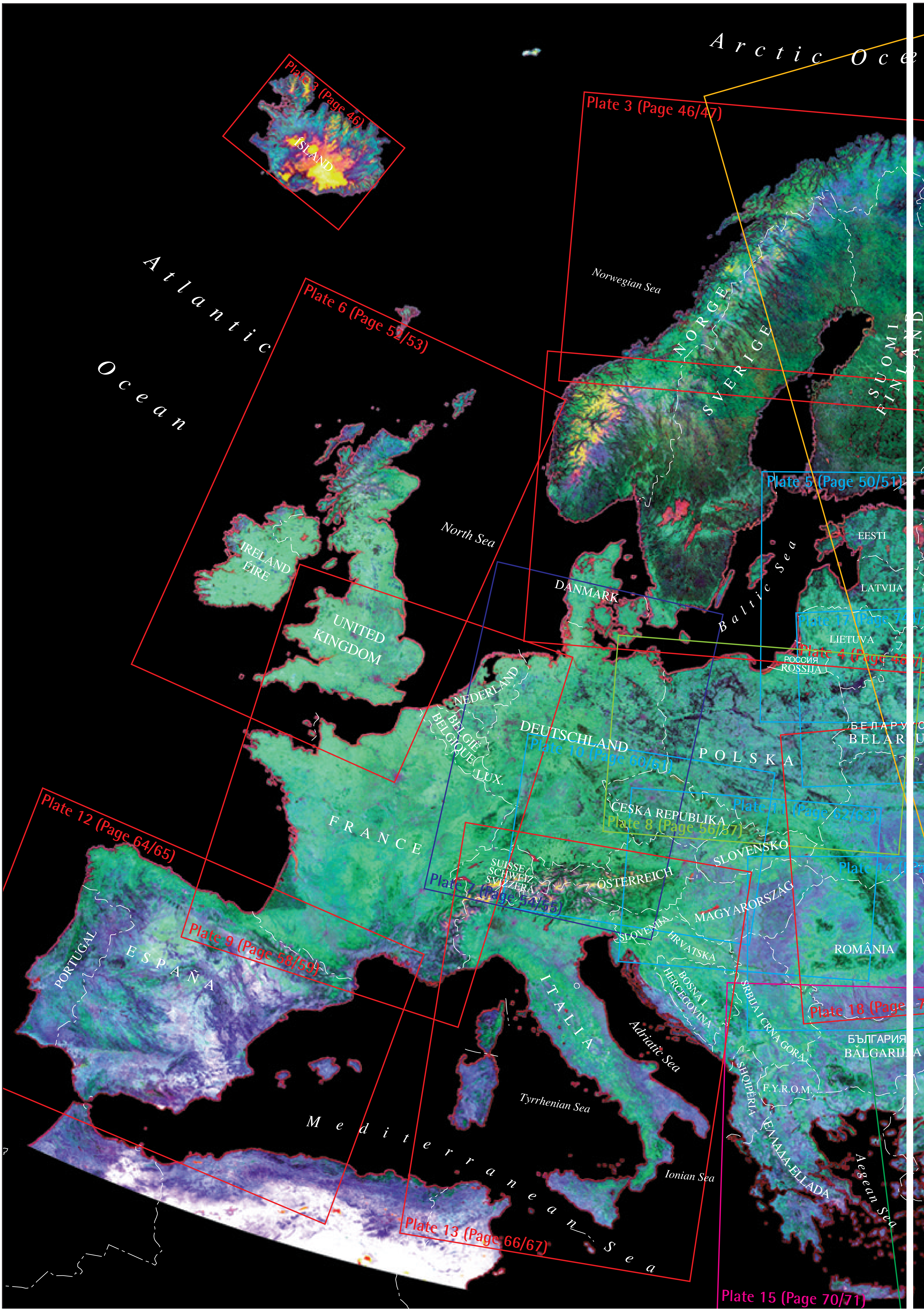
Most of southern, western and northwestern Europe is exposed to the continental seas of the Atlantic Ocean while the Arctic Ocean bounds the continent on the north. Europe neighbours the vast Asian continent in the east, southeast and the south. The boundary between Europe and Asia passes through the Ural Mountains, the Ural River, part of the Caspian Sea, and the Caucasus Mountains in Georgia. The northernmost point of the European mainland is Cape Nordkinn (72°N) in Norway while the southernmost point Punta de Tarifa (36°N) is in Spain near Gibraltar. From west to east, Europe extends from the jagged coastline of County Kerry in the Irish Republic (11°W) to the eastern slopes of the Urals in Russia (60°E). The highest point of the continent is El'brus (5,642 m) in the Caucasus Mountains of southwestern Russia. The lowest point of Europe is located along the northern shore of the Caspian Sea at 28 m below sea level.

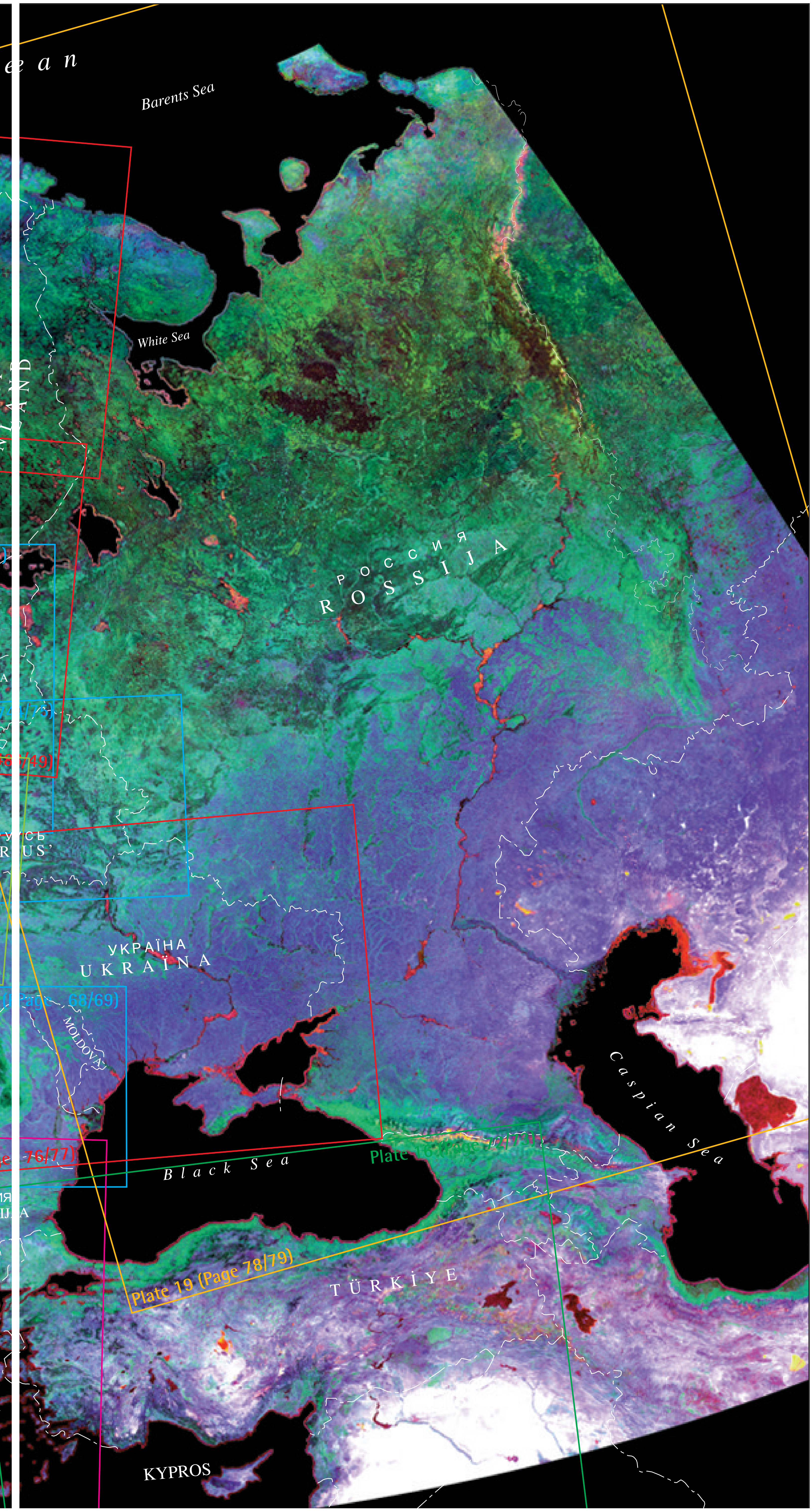
The distribution of the major soil groups is driven by the considerable extent of the continent that crosses Arctic, Boreal, Temporal and Subtropical bio-climatic zones and from west to east the reduced influence of Atlantic Ocean. The presence of vast flat areas (e.g. North European and Russian plains) together with a uniform cover of loose deposits support a latitudinal zonality for soil that ranges from the Cryosols in the tundra, Albeluvisols, Podzols and Histosols in boreal and temperate forests, Phaeozems, Chernozems and Kastanozems in the temperate steppe and Calcisols, Solnetz and Solonchaks in semi-desert of Mediterranean Basin. Soil cover of Western Europe shows a similar zonality, which is smoothed by the diversity of parent materials and the influence of oceanic climate. Mountains complicate the soil mosaic manifesting a change of soil type due altitude. Regosols situated above snow line in the high mountains are perennially frozen.

Scale 1: 11 250 000
Projection: Lambert Azimuthal



Index of regional maps



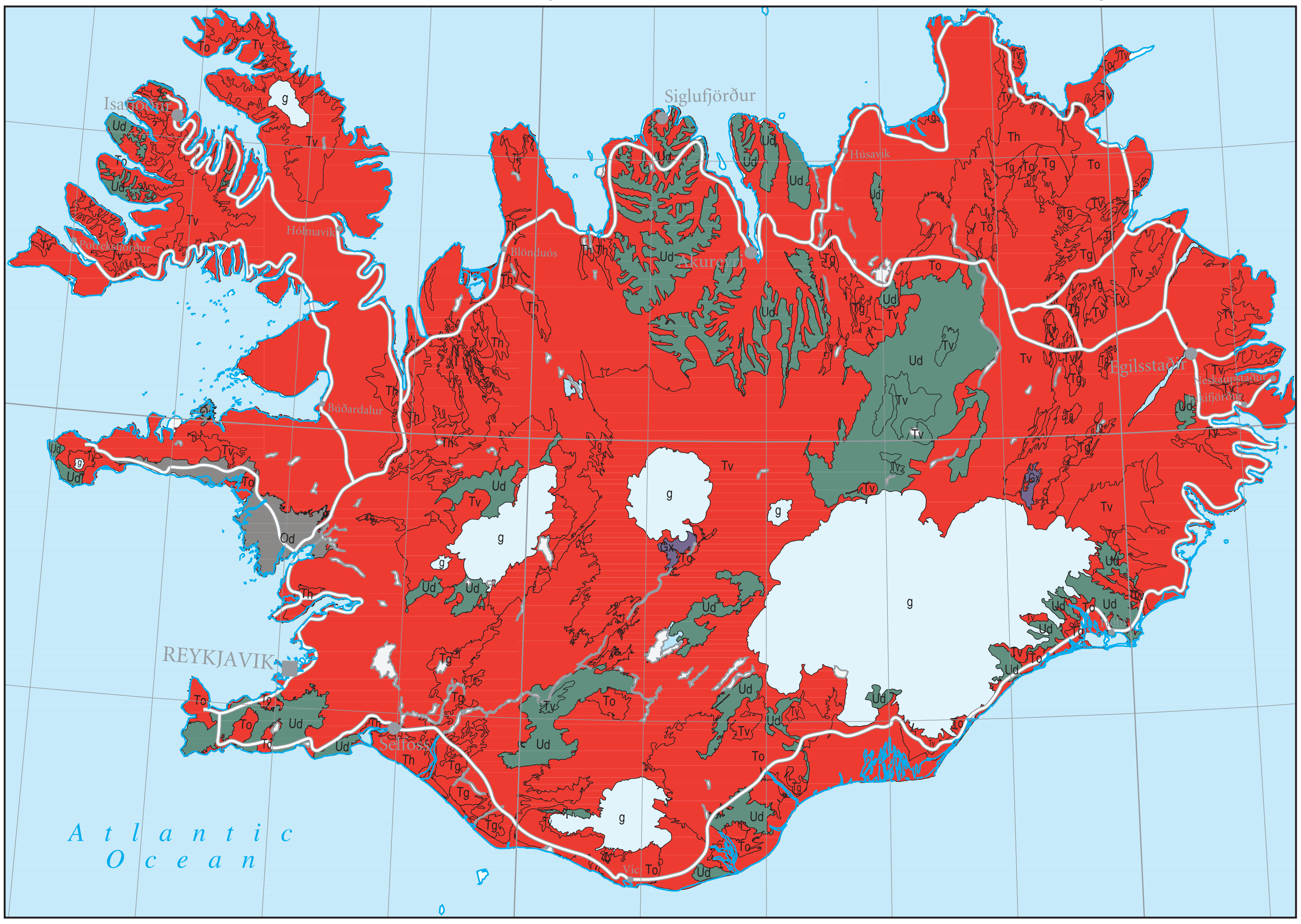


Key to map scales

- 1: 1 500 000
- 1: 1 750 000
- 1: 2 000 000
- 1: 2 200 000
- 1: 2 500 000
- 1: 3 000 000
- 1: 6 500 000

Scale 1: 11 250 000
Projection: Lambert Azimuthal

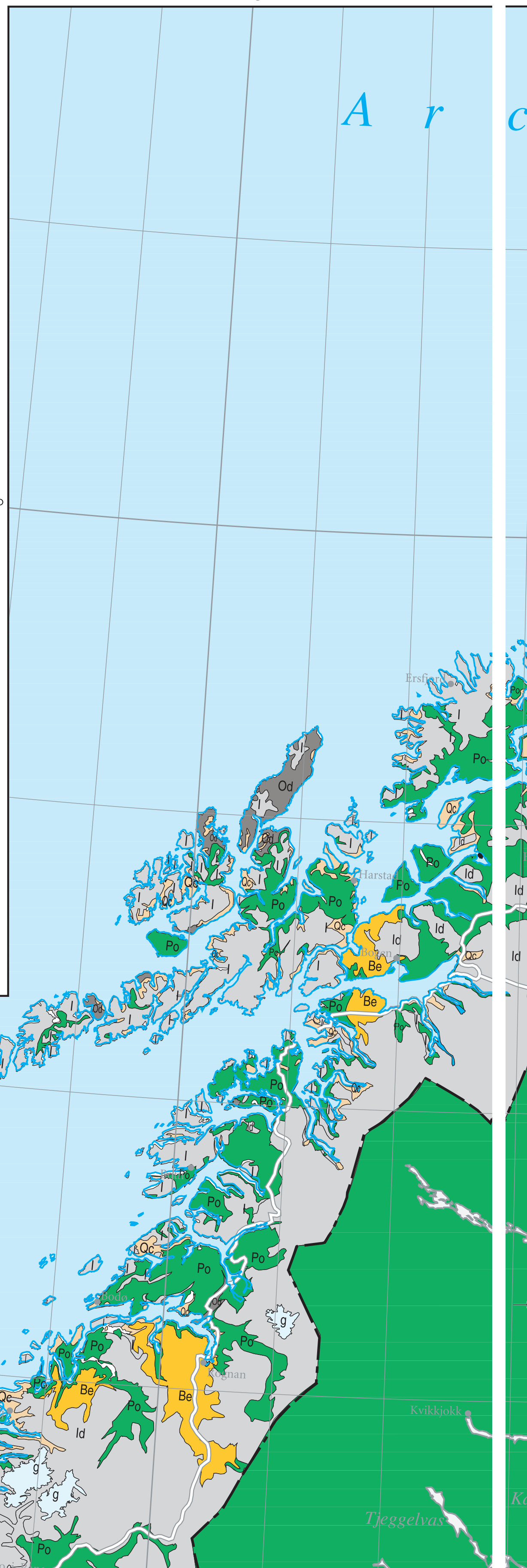
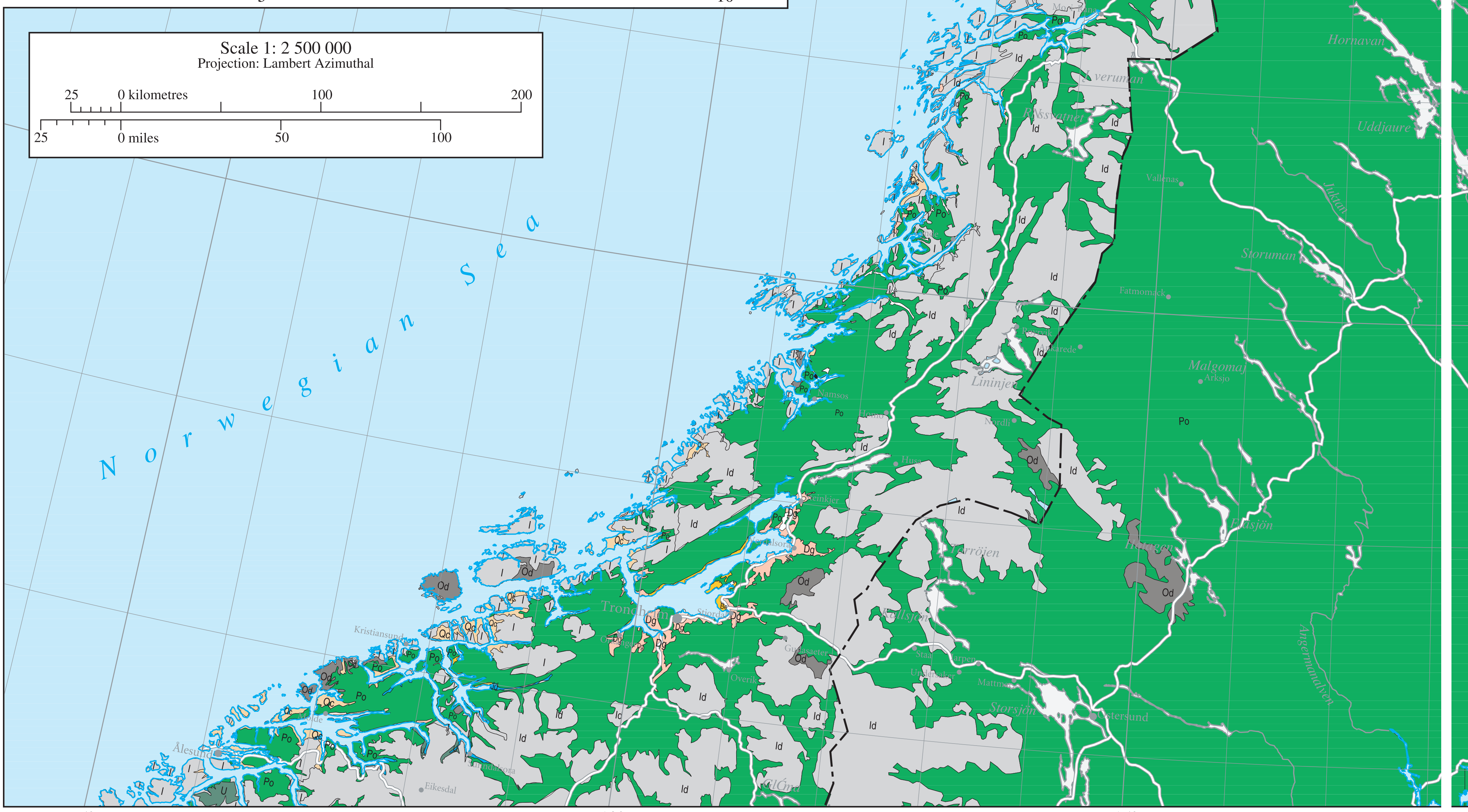
kilometres 800, 600, 400, 200, 0, 100, 200
miles 500, 400, 300, 200, 100, 0, 100, 200



Most of Scandinavia and Finland were covered by glaciers during the last ice age and most soil types in this northern area are formed on glacial materials. A continuous layer of glacial till covers large areas of Sweden and Finland while in Norway the glacial till layer is thin and discontinuous exposing large areas of bare rock. Smaller areas of sandy glacio-fluvial deposits can be found in all three countries. Silty and clayey deposits are common in the low-lying coastal areas along the Gulf of Bothnia while marine and river deposits around fjords and in valley bottoms are most important parent materials for the agricultural soils in the middle and northern parts of Norway. Large areas in Finland and northern Sweden are covered with peat. In Finland, the peat lands occupy 15% of the land area while in Norway, small areas can be found in the lower mountains and on the west coast islands. Podzols are the major soil type in the glacial till areas of Sweden and Finland. The Podzols tend to be weakly developed in the northernmost parts. As Podzols develop in relatively coarse textured glacial material, we find small occurrences of Dystric Cambisols where the glacial material has higher clay content. Orthic Podzols also dominate the forested areas of middle and northern Norway, except where the bedrock is calcareous and Eutric Cambisols are more common. The occurrence of Histosols can be linked to the Swedish and Finnish peat. The mountain areas consist of shallow Regosols together with Lithosols and exposed bedrock.

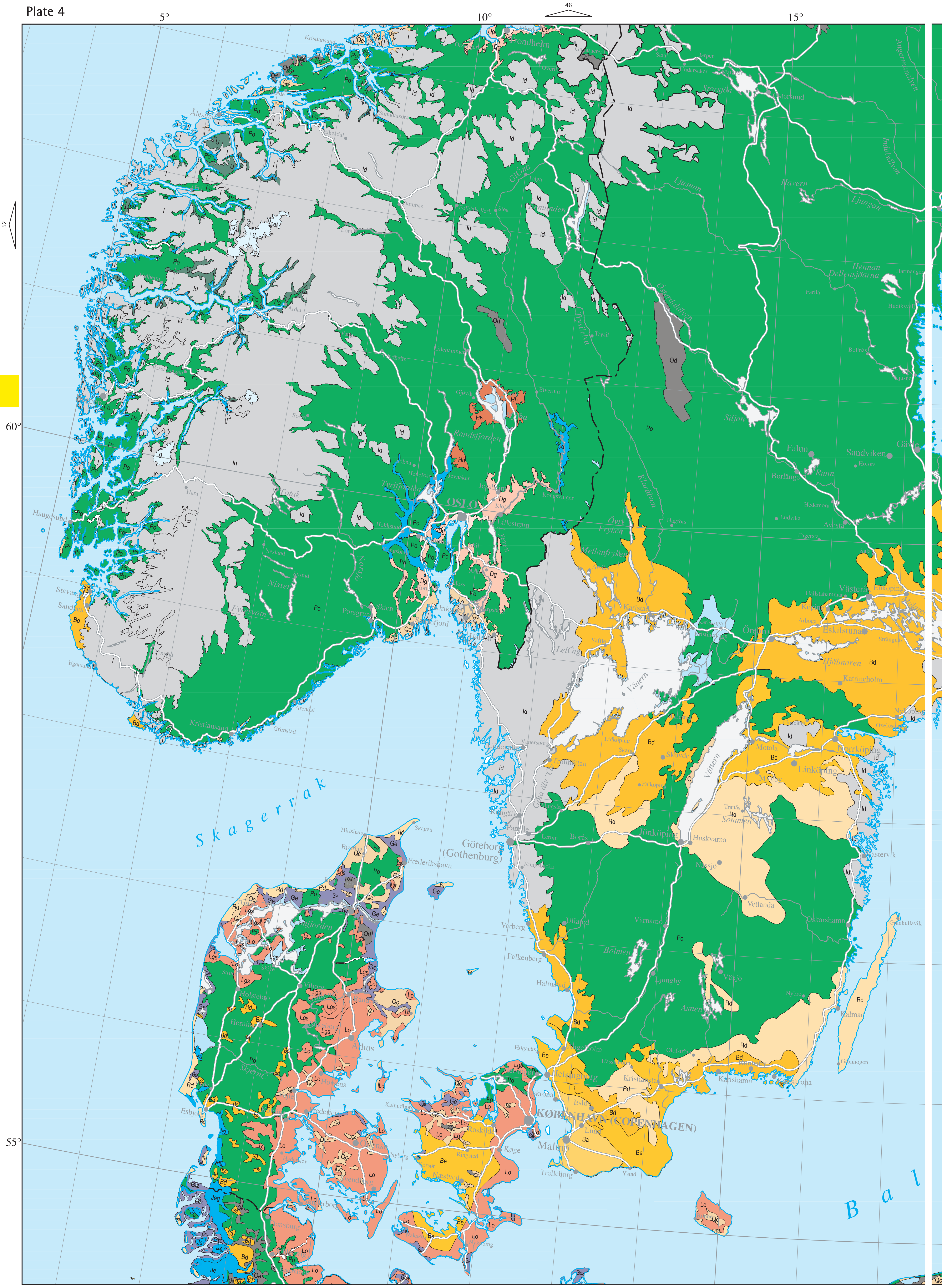
Iceland is a volcanic island located on the Mid-Atlantic Ridge between the 63rd and 66th latitudes. The soil is formed from volcanic materials from eruptions (volcanic ash and pyroclastic sediments) or the same materials redeposit by the work of glaciers, rivers or erosion. Glaciers cover more than 10% of the land area. Andosols are the major soil type on Iceland. They are formed in materials from volcanic eruptions such as volcanic ash. The soil map distinguishes four types of Andosols. Vitric Andosols are coarse texured and have low organic matter content. They form desert like landscapes and are found in regions with active volcanism and extreme erosion. They are often associated with Leptosols (shallow and extremely coarse textured soil). Humic Andosols have high organic matter content in the surface horizon, and Gleyic Andosols are wet Andosols. These soil types are minor compared to the Orthic Andosols, which occupy close to a third of the soil-covered area. Orthic Andosols are well-drained. Histosols are also minor soils on Iceland. The largest Histosol areas can be found on the western coast of the island.

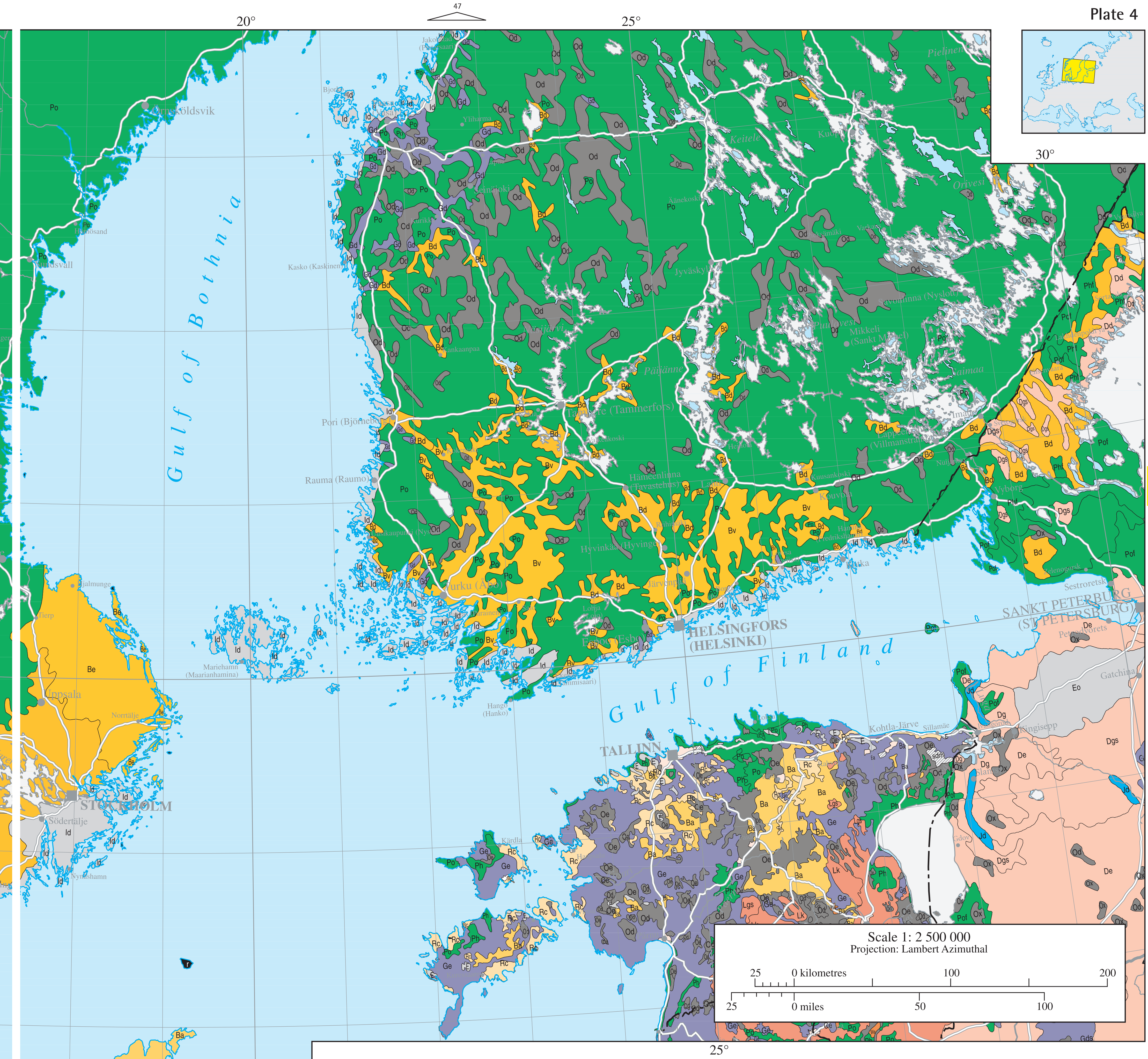
During the preparation of this atlas, a new and more detailed version of the Swedish part of the database became available. However, due to time constraints, it was not possible to include these data in this version of the atlas. These new data would have reduced the discontinuity between soil types at the Norwegian-Swedish border.

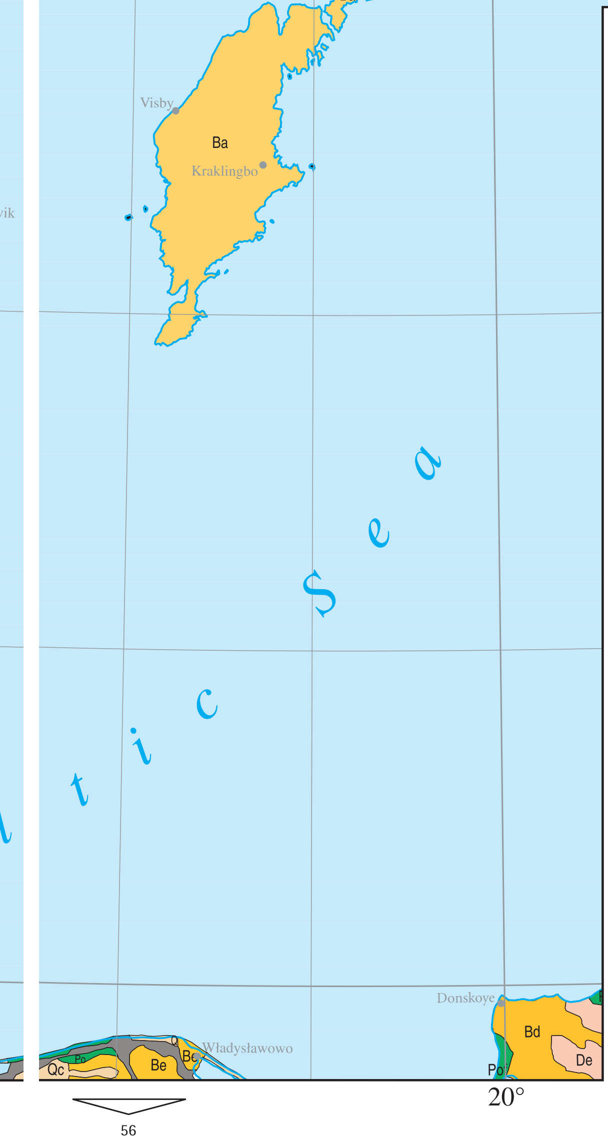



48


20°
25°
30°
35°
70°
65°
c t i c O c e a n
B a r e n t s S e a
G u l f o f B o t h n i a
Murmansk
Inarijärvi
Lokan Tekojärvi
Oulujärvi
Torneträsk
Stora Lulevatten
Randijaure
Karatjaure
Stora-Lule
Storavan
Piteälven
Torneälven
Umeälven
Skellefteå
Örnsköldsvik
Kokkola (Karleby)
Jakobstad (Pietarsaari)
Kiruna
Malmberget
Boden
Olhava
Umbozero
Kirovsk
Imandra
Apatity
Pielinen
Joensuu
Sredneye Kuito
Nizhneye Kuito
Po
Od
Oe
Ph
Phf
Ox
Gx
Rx
Bd
Gd
Id
Qc
Q
49
78


5°
10°
15°
60°
55°
46
52
54
Trondheim
Östersund
Storsjön
Ålesund
Dombås
Ljusnan
Ljungan
Indalsälven
Ångermanälven
Havern
Hennan
Dellensjöarna
Siljan
Falun
Sandviken
Borlänge
Runn
Gävle
Hofors
Hedemora
Ludvika
Avesta
Fagersta
Lillehammer
Gjøvik
Elverum
Trysil
Trysilelva
Österdalälven
Randsfjorden
Tyrifjorden
OSLO
Lillestrøm
Kongsvinger
Klarälven
Övre Fryken
Mellanfryken
Hagfors
Karlstad
Säffle
Lelång
Vänern
Västerås
Enköping
Köping
Arboga
Örebro
Eskilstuna
Strängnäs
Hjälmaren
Katrineholm
Nyköping
Oxelösund
Norrköping
Linköping
Motala
Mjölby
Vättern
Skövde
Falköping
Lidköping
Skara
Trollhättan
Vänersborg
Tranås
Sommen
Jönköping
Huskvarna
Nässjö
Vetlanda
Västervik
Oskarshamn
Värnamo
Bolmen
Ljungby
Växjö
Åsnen
Kalmar
Nybro
Karlshamn
Karlskrona
Kristianstad
Olofström
Hässleholm
Helsingborg
Ängelholm
Höganäs
Lund
Eslöv
Malmö
Trelleborg
Ystad
Halmstad
Falkenberg
Varberg
Göteborg
(Gothenburg)
Kungälv
Borås
Lerum
Ulricehamn
Göta älv
Skagerrak
Haugesund
Stavanger
Sandnes
Egersund
Kristiansand
Arendal
Grimstad
Porsgrunn
Skien
Tønsberg
Sandefjord
Fredrikstad
Nisser
Totak
Hara
Skagen
Hirtshals
Hjørring
Frederikshavn
Limfjorden
Skive
Viborg
Holstebro
Herning
Århus
Horsens
Skjern
Esbjerg
Fredericia
Kalundborg
Roskilde
KØBENHAVN (COPENHAGEN)
Køge
Korsør
Næstved
Ringsted
Nyborg
B a l





As for northern Scandinavia, the region depicted on this map was covered, or affected, by glaciers during the last ice age which ended approximately 10,000 years ago. Thus, most soil types are formed on glacial materials. A continuous layer of glacial till covers large areas of Sweden and Finland while in Norway the glacial till layer is thin and discontinuous exposing large areas of bare rock, especially in the southern mountains. Smaller areas of sandy glacio-fluvial deposits can be found in all four countries. Silty and clayey deposits are common in the low-lying coastal areas along the Gulf of Bothnia while marine and river deposits around fjords and in valley bottoms are most important parent materials for the agricultural soils in the southern parts of Norway. Large areas in Finland are covered with peat (15% of the land area) while small areas can be found in the lower mountains of Norway. Podzols are the major soil type in the glacial till areas of south-eastern Norway, Sweden and Finland.

The mountain areas consist of shallow Regosols together with Lithosols and exposed bedrock.

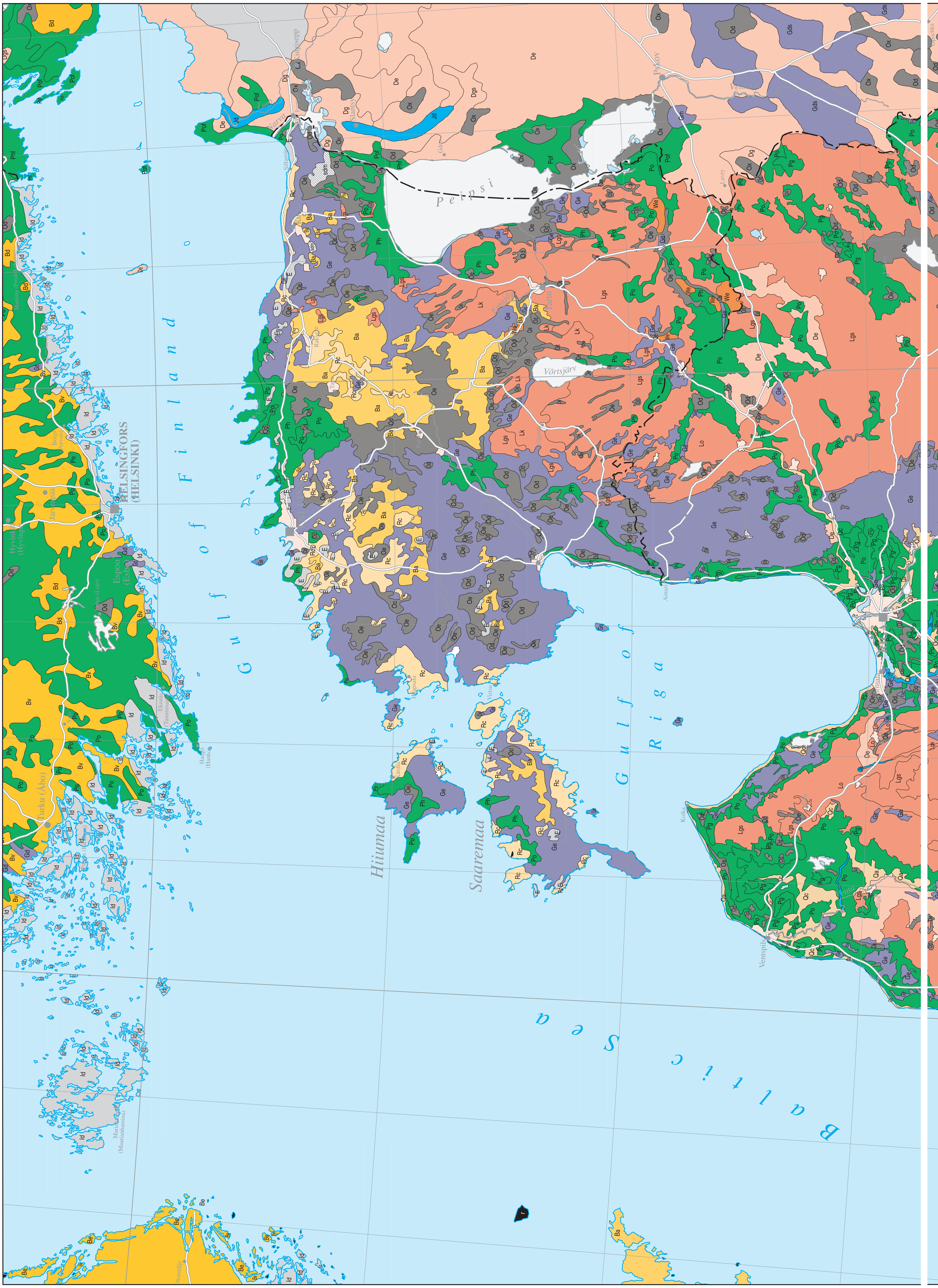
Eutric and Dystric Cambisols are very extensive in southern Finland and Sweden, often associated with the isostatic uplift of the region. Isostatic uplift is the term used to describe the rise in the level of the land relative to the sea caused by the relaxation of ice age conditions. The uplift occurs when the weight of ice is removed as temperatures rise and the ice melts. An analogy is the release of a cork held underwater. A sign of isostatic uplifting the landscape are raised beaches and rejuvenated river valleys.

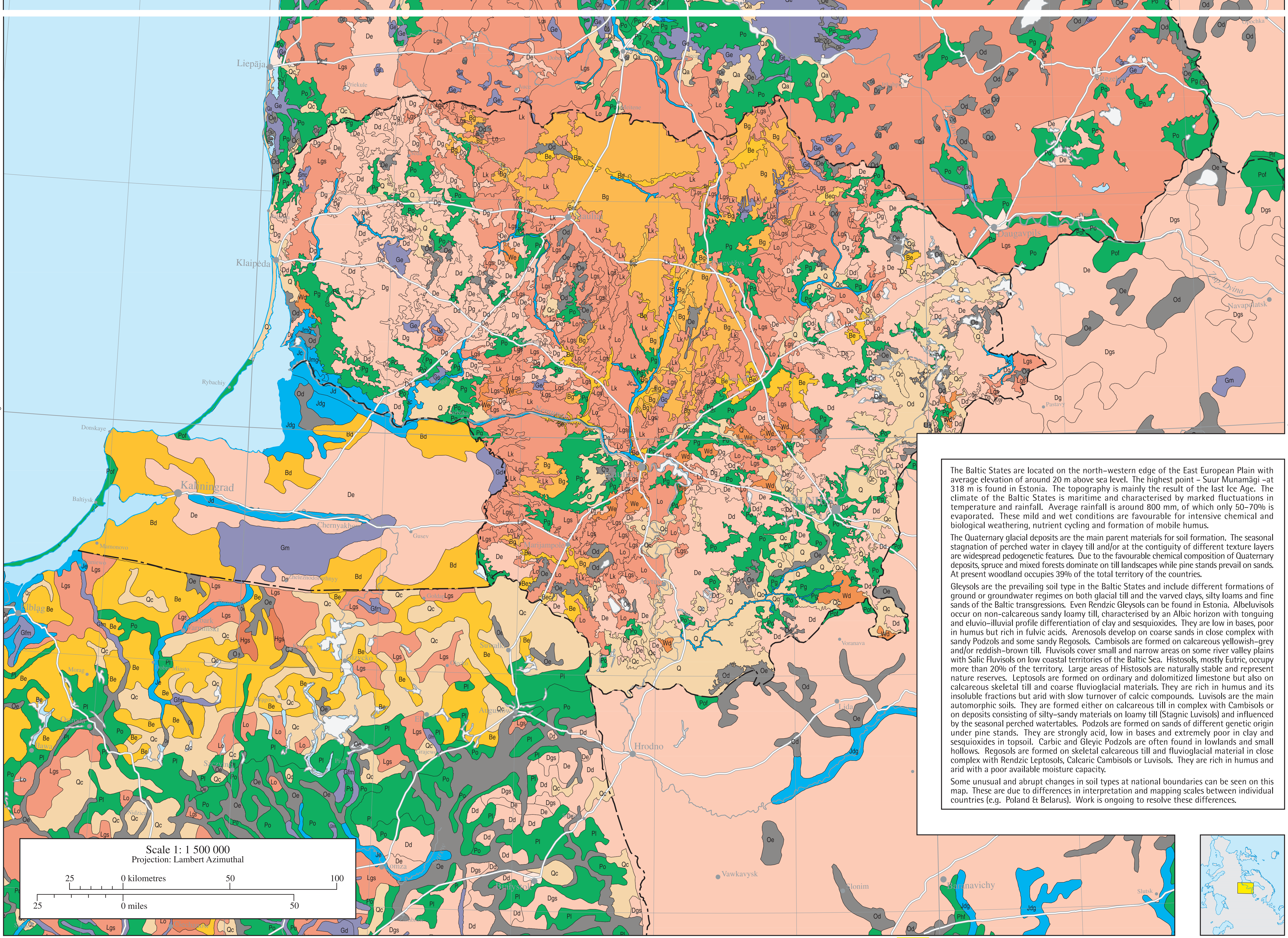
Despite its northerly location, Denmark's temperate maritime climate is relatively mild, with cool summers and generally mild winters, moderated by the warm waters of the Gulf Stream, which sweeps along Denmark's west coast. The sea is never more than 64 km from any point. The glacially derived landscape of Denmark has created rolling hills and moor land with many small streams and lakes. Denmark is a low-lying country where the average elevation is just 30 m above sea level with Yding Skovhøj (173 m), the highest point in Denmark. During the ice age, glaciers covered most of the country, but stopped for a longer time in the middle of the Jutland. Where the glaciers stopped in the middle of Jutland the underlying soil was pressed up to form a north-south running "mountain range" with "peaks" up to 173 m above sea level.

As in the other Scandinavian countries, the dominant soil type is Podzol, forming a continuous block over nearly all the western half of the country. The sandy Podzols of western Jutland are of low natural fertility and limit agricultural activity in this region unless heavily fertilized and limed. Until the beginning of the 20th century, almost all this land was covered by heath.

The western coast of the mainland is low and rimmed by dunes giving rise to Arenosols while the northern coast is characterised by the Gleysols of the coastal marshes. The eastern coast of Denmark, which is slightly higher in elevation, is deeply indented by a series of fjords. This small amount of relief changes the soil forming processes and Haplic Luvisols predominate, which is the most productive soil in the country. Locally, organic rich Histosols can be significant and important although many areas once covered with bogs and swamps have been drained and are now cultivated.

The island of Bornholm is the only place in Denmark where solid rock is exposed.


60°
25°
20°
Gulf of Finland
Gulf of Riga
Baltic Sea
Peipsi
Võrtsjärv
Hiiumaa
Saaremaa
HELSINGFORS (HELSINKI)
Espoo (Esbo)
Turku (Åbo)
Pskov
Ventspils
78
49



The Baltic States are located on the north-western edge of the East European Plain with average elevation of around 20 m above sea level. The highest point - Suur Munamägi -at 318 m is found in Estonia. The topography is mainly the result of the last Ice Age. The climate of the Baltic States is maritime and characterised by marked fluctuations in temperature and rainfall. Average rainfall is around 800 mm, of which only 50–70% is evaporated. These mild and wet conditions are favourable for intensive chemical and biological weathering, nutrient cycling and formation of mobile humus.

The Quaternary glacial deposits are the main parent materials for soil formation. The seasonal stagnation of perched water in clayey till and/or at the contiguity of different texture layers are widespread pedogenetic features. Due to the favourable chemical composition of Quaternary deposits, spruce and mixed forests dominate on till landscapes while pine stands prevail on sands. At present woodland occupies 39% of the total territory of the countries.

Gleysols are the prevailing soil type in the Baltic States and include different formations of ground or groundwater regimes on both glacial till and the varved clays, silty loams and fine sands of the Baltic transgressions. Even Rendzic Gleysols can be found in Estonia. Albeluvisols occur on non-calcareous sandy loamy till, characterised by an Albic horizon with tonguing and eluvio-illuvial profile differentiation of clay and sesquioxides. They are low in bases, poor in humus but rich in fulvic acids. Arenosols develop on coarse sands in close complex with sandy Podzols and some sandy Regosols. Cambisols are formed on calcareous yellowish-grey and/or reddish-brown till. Fluvisols cover small and narrow areas on some river valley plains with Salic Fluvisols on low coastal territories of the Baltic Sea. Histosols, mostly Eutric, occupy more than 20% of the territory. Large areas of Histosols are naturally stable and represent nature reserves. Leptosols are formed on ordinary and dolomitized limestone but also on calcareous skeletal till and coarse fluvioglacial materials. They are rich in humus and its insoluble fractions but arid with slow turnover of calcic compounds. Luvisols are the main automorphic soils. They are formed either on calcareous till in complex with Cambisols or on deposits consisting of silty-sandy materials on loamy till (Stagnic Luvisols) and influenced by the seasonal perched watertables. Podzols are formed on sands of different genetic origin under pine stands. They are strongly acid, low in bases and extremely poor in clay and sesquioxides in topsoil. Carbic and Gleyic Podzols are often found in lowlands and small hollows. Regosols are formed on skeletal calcareous till and fluvioglacial material in close complex with Rendzic Leptosols, Calcaric Cambisols or Luvisols. They are rich in humus and arid with a poor available moisture capacity.

Some unusual and abrupt changes in soil types at national boundaries can be seen on this map. These are due to differences in interpretation and mapping scales between individual countries (e.g. Poland & Belarus). Work is ongoing to resolve these differences.

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The United Kingdom and Ireland are the two largest islands of the European continent, bordered by the English Channel, the Irish Sea, the North Sea and the Atlantic Ocean. The island of Great Britain can be divided into highland and lowland zones divided by an imaginary line running through England from the River Exe on the southwest coast to the mouth of the River Tees on the northeast coast. The highland zone is an area of high hills and mountains in the north and west while the lowland zone in the south and east consists mostly of rolling plains. The The lowland zone has a milder climate and better soils for farming.

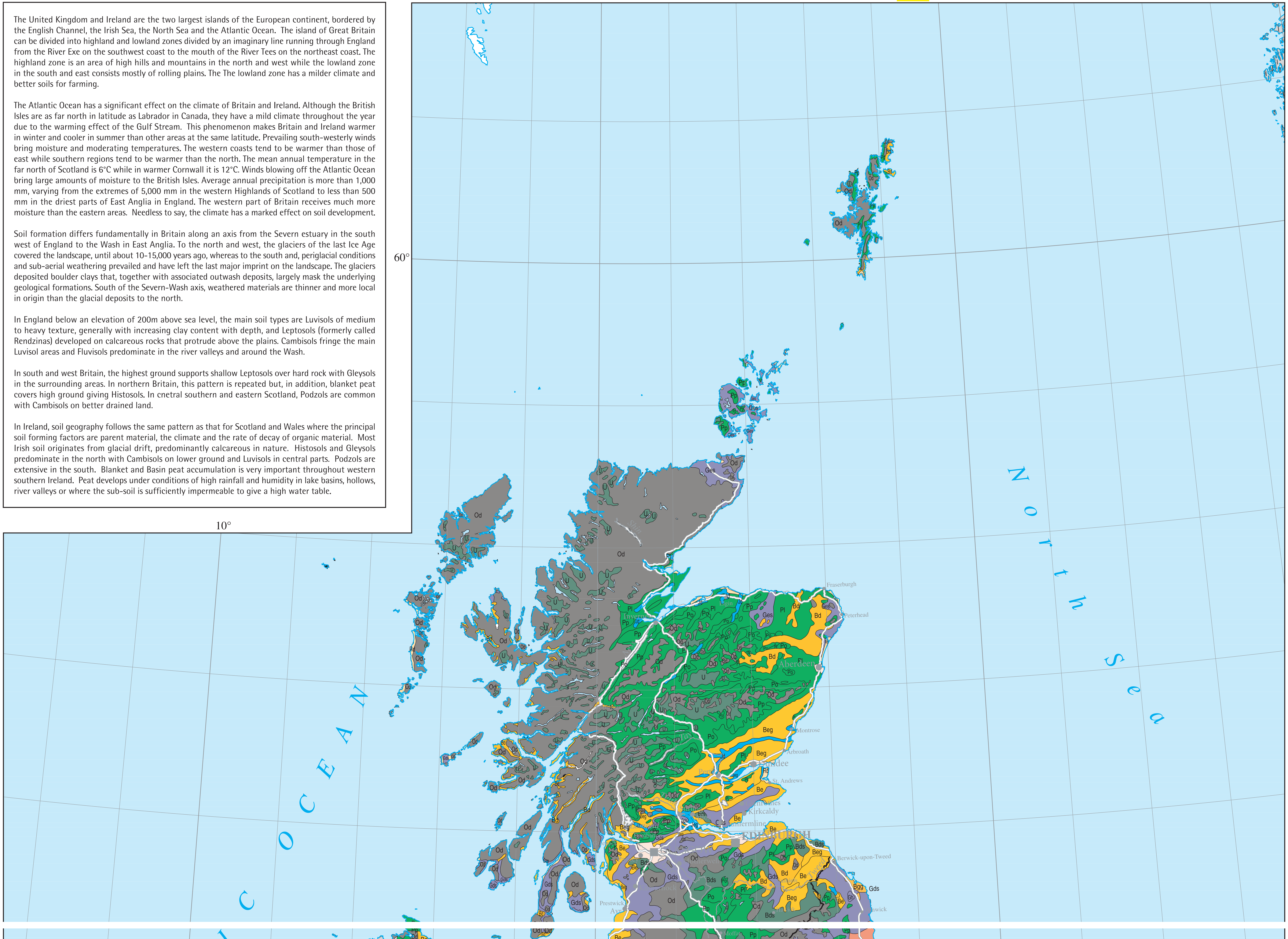
The Atlantic Ocean has a significant effect on the climate of Britain and Ireland. Although the British Isles are as far north in latitude as Labrador in Canada, they have a mild climate throughout the year due to the warming effect of the Gulf Stream. This phenomenon makes Britain and Ireland warmer in winter and cooler in summer than other areas at the same latitude. Prevailing south-westerly winds bring moisture and moderating temperatures. The western coasts tend to be warmer than those of east while southern regions tend to be warmer than the north. The mean annual temperature in the far north of Scotland is 6°C while in warmer Cornwall it is 12°C. Winds blowing off the Atlantic Ocean bring large amounts of moisture to the British Isles. Average annual precipitation is more than 1,000 mm, varying from the extremes of 5,000 mm in the western Highlands of Scotland to less than 500 mm in the driest parts of East Anglia in England. The western part of Britain receives much more moisture than the eastern areas. Needless to say, the climate has a marked effect on soil development.

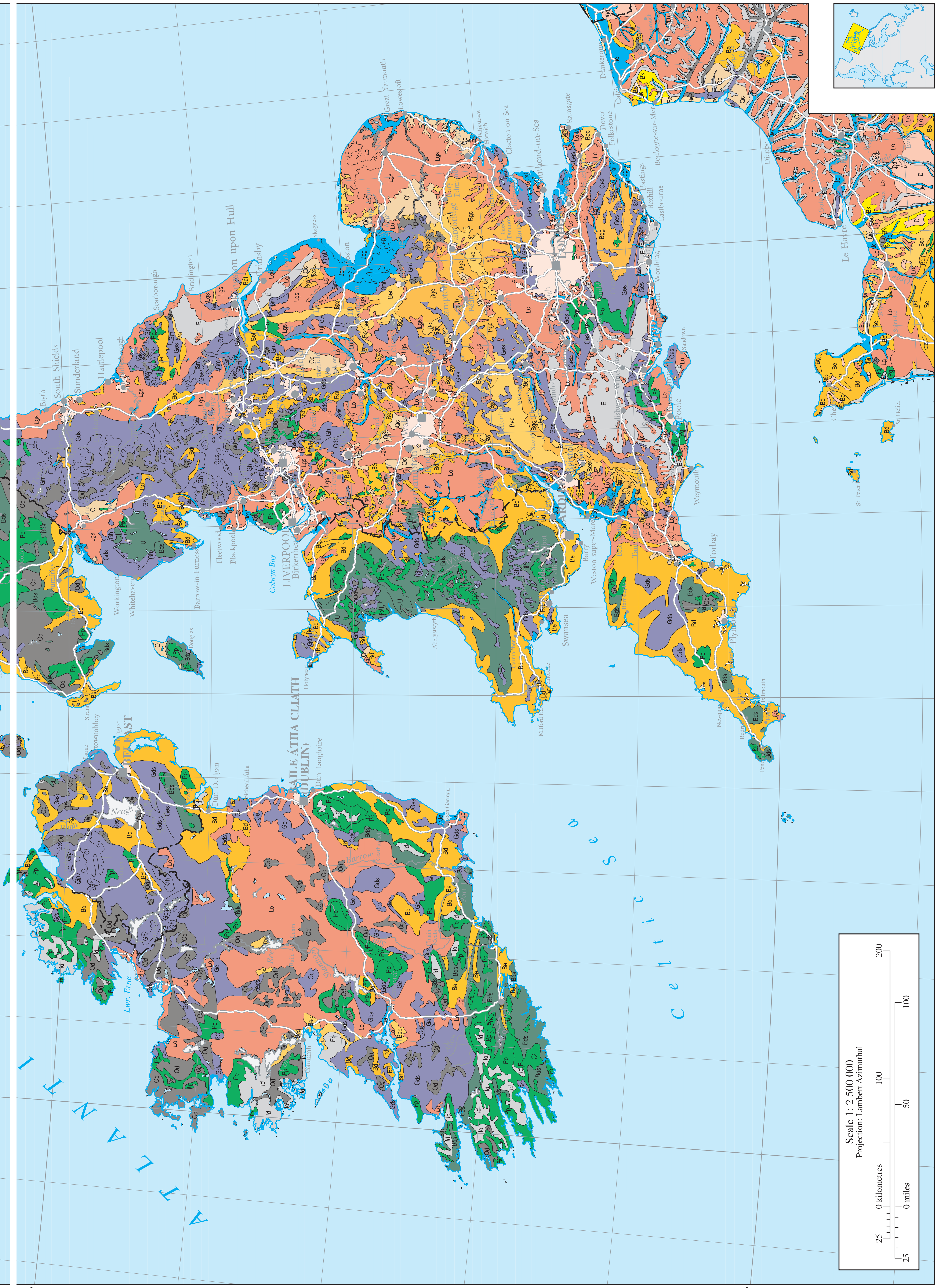
Soil formation differs fundamentally in Britain along an axis from the Severn estuary in the south west of England to the Wash in East Anglia. To the north and west, the glaciers of the last Ice Age covered the landscape, until about 10-15,000 years ago, whereas to the south and, periglacial conditions and sub-aerial weathering prevailed and have left the last major imprint on the landscape. The glaciers deposited boulder clays that, together with associated outwash deposits, largely mask the underlying geological formations. South of the Severn-Wash axis, weathered materials are thinner and more local in origin than the glacial deposits to the north.

In England below an elevation of 200m above sea level, the main soil types are Luvisols of medium to heavy texture, generally with increasing clay content with depth, and Leptosols (formerly called Rendzinas) developed on calcareous rocks that protrude above the plains. Cambisols fringe the main Luvisol areas and Fluvisols predominate in the river valleys and around the Wash.

In south and west Britain, the highest ground supports shallow Leptosols over hard rock with Gleysols in the surrounding areas. In northern Britain, this pattern is repeated but, in addition, blanket peat covers high ground giving Histosols. In cnetral southern and eastern Scotland, Podzols are common with Cambisols on better drained land.

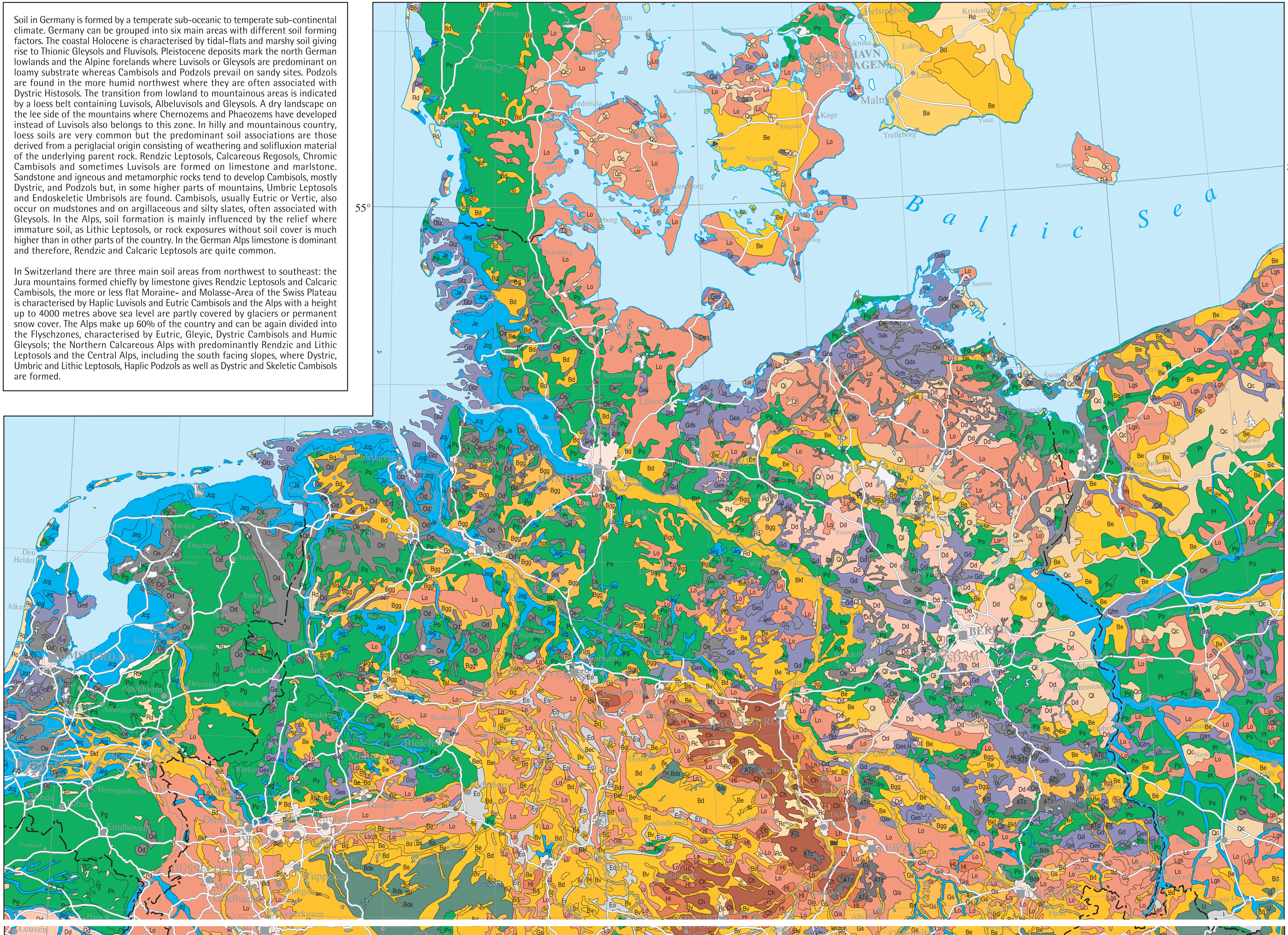
In Ireland, soil geography follows the same pattern as that for Scotland and Wales where the principal soil forming factors are parent material, the climate and the rate of decay of organic material. Most Irish soil originates from glacial drift, predominantly calcareous in nature. Histosols and Gleysols predominate in the north with Cambisols on lower ground and Luvisols in central parts. Podzols are extensive in the south. Blanket and Basin peat accumulation is very important throughout western southern Ireland. Peat develops under conditions of high rainfall and humidity in lake basins, hollows, river valleys or where the sub-soil is sufficiently impermeable to give a high water table.



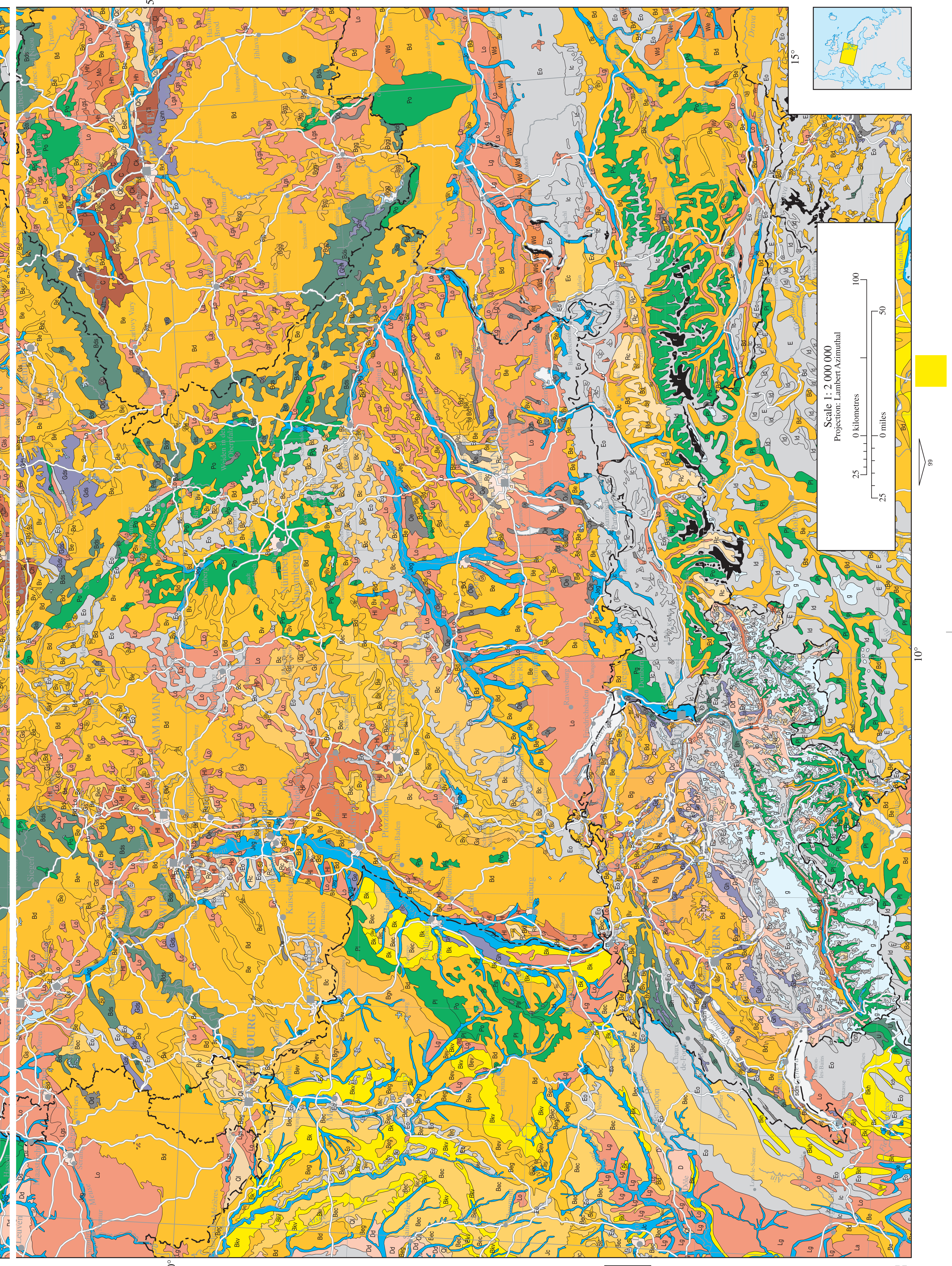

55°
50°
0°
5°
10°
58
LIVERPOOL
Birkenhead
Colwyn Bay
Swansea
Aberystwyth
Holyhead
Barry
Weston-super-Mare
Torbay
Plymouth
Falmouth
Weymouth
Poole
Worthing
Eastbourne
Bexhill
Hastings
Folkestone
Dover
Ramsgate
Southend-on-Sea
Clacton-on-Sea
Harwich
Felixstowe
Lowestoft
Great Yarmouth
Skegness
Grimsby
Bridlington
Scarborough
Hartlepool
Sunderland
South Shields
Blyth
Workington
Whitehaven
Barrow-in-Furness
Fleetwood
Blackpool
Douglas
Dieppe
Boulogne-sur-Mer
Calais
Dunkerque
Le Havre
St. Helier
St. Peter Port
BELFAST
Bangor
Lwr. Erne
Neagh
BAILE ÁTHA CLIATH (DUBLIN)
Dún Laoghaire
Dun Dealgan
Barrow
Celtic Sea
ATLANTI
Scale 1: 2 500 000
Projection: Lambert Azimuthal
0 kilometres
0 miles
25
50
100
200

Soil in Germany is formed by a temperate sub-oceanic to temperate sub-continental climate. Germany can be grouped into six main areas with different soil forming factors. The coastal Holocene is characterised by tidal-flats and marshy soil giving rise to Thionic Gleysols and Fluvisols. Pleistocene deposits mark the north German lowlands and the Alpine forelands where Luvisols or Gleysols are predominant on loamy substrate whereas Cambisols and Podzols prevail on sandy sites. Podzols are found in the more humid northwest where they are often associated with Dystric Histosols. The transition from lowland to mountainous areas is indicated by a loess belt containing Luvisols, Albeluvisols and Gleysols. A dry landscape on the lee side of the mountains where Chernozems and Phaeozems have developed instead of Luvisols also belongs to this zone. In hilly and mountainous country, loess soils are very common but the predominant soil associations are those derived from a periglacial origin consisting of weathering and solifluxion material of the underlying parent rock. Rendzic Leptosols, Calcareous Regosols, Chromic Cambisols and sometimes Luvisols are formed on limestone and marlstone. Sandstone and igneous and metamorphic rocks tend to develop Cambisols, mostly Dystric, and Podzols but, in some higher parts of mountains, Umbric Leptosols and Endoskeletic Umbrisols are found. Cambisols, usually Eutric or Vertic, also occur on mudstones and on argillaceous and silty slates, often associated with Gleysols. In the Alps, soil formation is mainly influenced by the relief where immature soil, as Lithic Leptosols, or rock exposures without soil cover is much higher than in other parts of the country. In the German Alps limestone is dominant and therefore, Rendzic and Calcaric Leptosols are quite common.

In Switzerland there are three main soil areas from northwest to southeast: the Jura mountains formed chiefly by limestone gives Rendzic Leptosols and Calcaric Cambisols, the more or less flat Moraine- and Molasse-Area of the Swiss Plateau is characterised by Haplic Luvisols and Eutric Cambisols and the Alps with a height up to 4000 metres above sea level are partly covered by glaciers or permanent snow cover. The Alps make up 60% of the country and can be again divided into the Flyschzones, characterised by Eutric, Gleyic, Dystric Cambisols and Humic Gleysols; the Northern Calcareous Alps with predominantly Rendzic and Lithic Leptosols and the Central Alps, including the south facing slopes, where Dystric, Umbric and Lithic Leptosols, Haplic Podzols as well as Dystric and Skeletic Cambisols are formed.

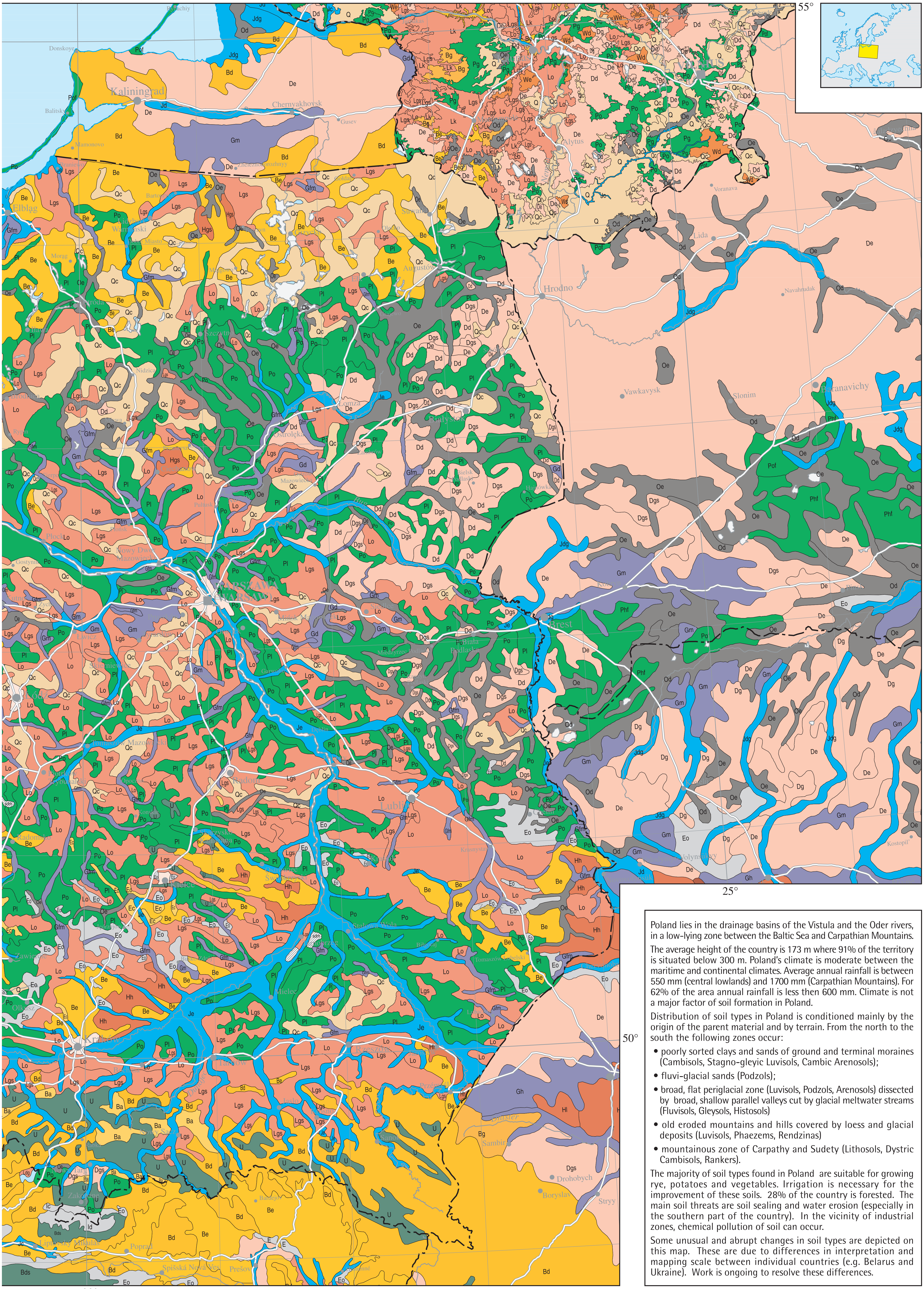


48
56
58


Scale 1: 2 000 000
Projection: Lambert Azimuthal
0 kilometres
0 miles
BERN


15°
48
Baltic Sea
Kołobrzeg
Ustka
Darłowo
Władysławowo
Gdynia
Sopot
Gdańsk
Tczew
Słupsk
Bytów
Miastko
Szczecinek
Police
Stargard Szczeciński
Piła
Bydgoszcz
Gorzów Wielkopolski
Frankfurt an der Oder
Eisenhüttenstadt
Poznań
Gniezno
Cottbus
Forst
Zielona Góra
Nowa Sól
Głogów
Legnica
Lubin
Bolesławiec
Wrocław
Oława
Brzeg
Opole
Wałbrzych
Jelenia Góra
Liberec
Jablonec nad Nisou
Ústí nad Labem
Děčín
Česká Lípa
Mladá Boleslav
Trutnov
Hradec Králové
Chrudim
Pardubice
Kolín
Kladno
Praha (PRAGUE)
Plzeň
Příbram
Strakonice
Jihlava
Havlíčkův Brod
Třebíč
Znojmo
Brno
Olomouc
Prostějov
Ostrava
Karviná
Frýdek-Místek
Vsetín
Žilina
Częstochowa
Bytom
Zabrze
Gliwice
Sosnowiec
Katowice
Tarnowskie Góry
Kłodzko
Bełchatów
Sieradz
Ostrzeszów
Krotoszyn
Leszno
Kalisz
Włocławek
Grudziądz
Chojnice
BERLIN
POTSDAM
LEIPZIG
DRESDEN
Chemnitz
Zwickau
Halle
Dessau
Brandenburg
Sassnitz
Eberswalde-Finow
Schwedt
Stralsund
50°
54
Scale 1: 1 750 000
Projection: Lambert Azimuthal
25 0 kilometres 100
25 0 miles 50
15°
60
62

49



51
76

Poland lies in the drainage basins of the Vistula and the Oder rivers, in a low-lying zone between the Baltic Sea and Carpathian Mountains.

The average height of the country is 173 m where 91% of the territory is situated below 300 m. Poland's climate is moderate between the maritime and continental climates. Average annual rainfall is between 550 mm (central lowlands) and 1700 mm (Carpathian Mountains). For 62% of the area annual rainfall is less then 600 mm. Climate is not a major factor of soil formation in Poland.

Distribution of soil types in Poland is conditioned mainly by the origin of the parent material and by terrain. From the north to the south the following zones occur:

- poorly sorted clays and sands of ground and terminal moraines (Cambisols, Stagno-gleyic Luvisols, Cambic Arenosols);
- fluvi-glacial sands (Podzols);
- broad, flat periglacial zone (Luvisols, Podzols, Arenosols) dissected by broad, shallow parallel valleys cut by glacial meltwater streams (Fluvisols, Gleysols, Histosols)
- old eroded mountains and hills covered by loess and glacial deposits (Luvisols, Phaezems, Rendzinas)
- mountainous zone of Carpathy and Sudety (Lithosols, Dystric Cambisols, Rankers).

The majority of soil types found in Poland are suitable for growing rye, potatoes and vegetables. Irrigation is necessary for the improvement of these soils. 28% of the country is forested. The main soil threats are soil sealing and water erosion (especially in the southern part of the country). In the vicinity of industrial zones, chemical pollution of soil can occur.

Some unusual and abrupt changes in soil types are depicted on this map. These are due to differences in interpretation and mapping scale between individual countries (e.g. Belarus and Ukraine). Work is ongoing to resolve these differences.

68

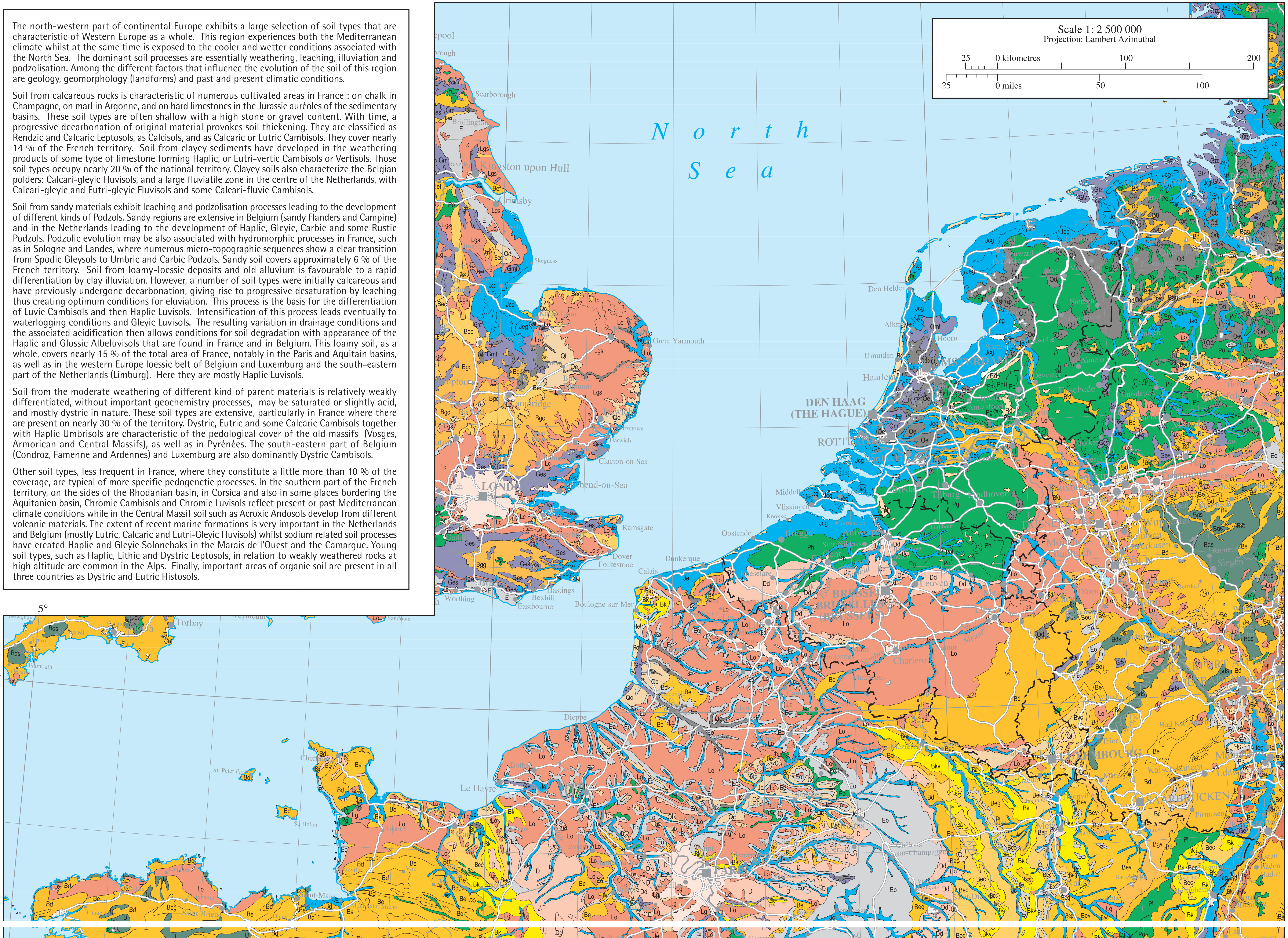
The north-western part of continental Europe exhibits a large selection of soil types that are characteristic of Western Europe as a whole. This region experiences both the Mediterranean climate whilst at the same time is exposed to the cooler and wetter conditions associated with the North Sea. The dominant soil processes are essentially weathering, leaching, illuviation and podzolisation. Among the different factors that influence the evolution of the soil of this region are geology, geomorphology (landforms) and past and present climatic conditions.

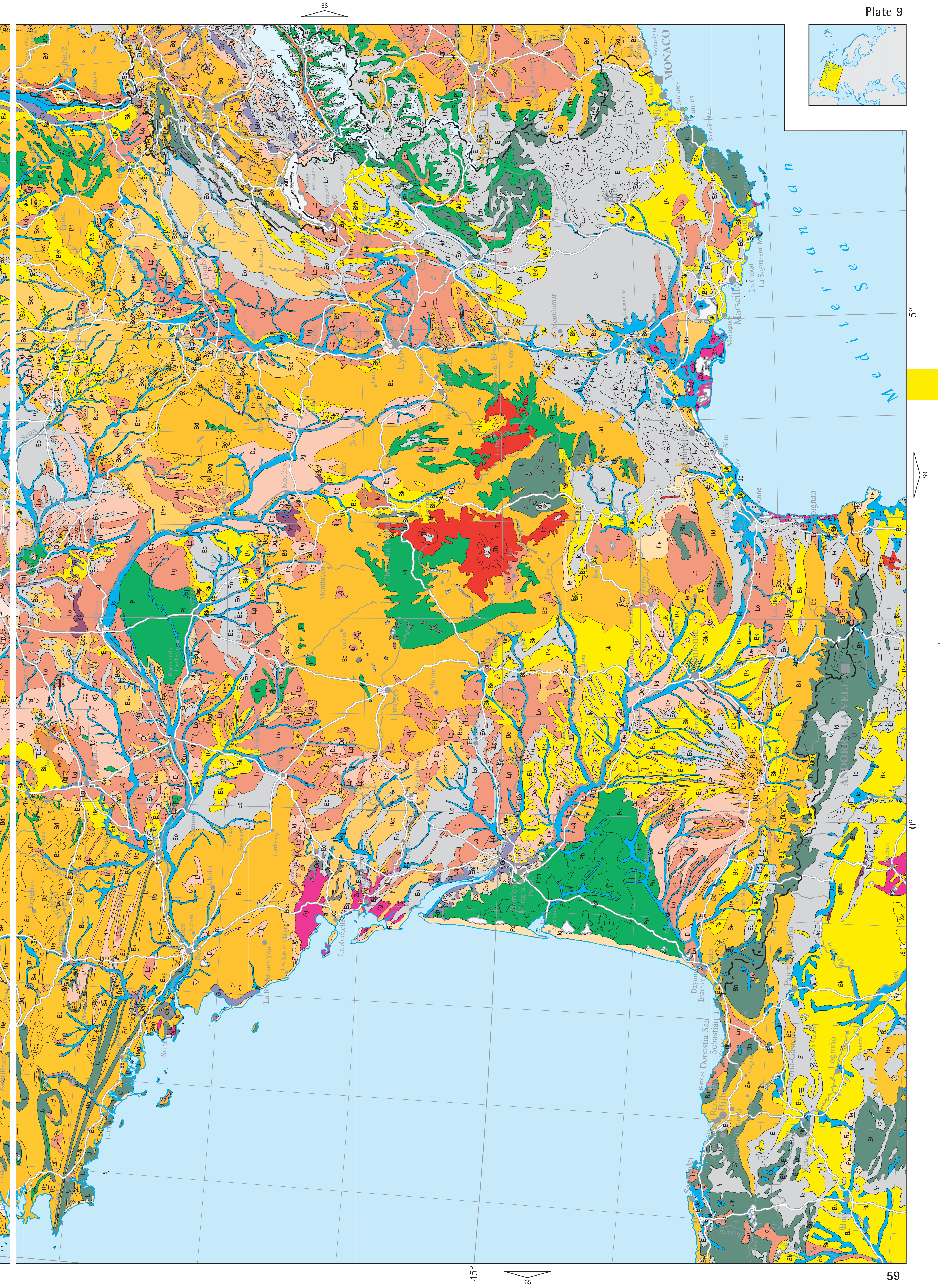
Soil from calcareous rocks is characteristic of numerous cultivated areas in France : on chalk in Champagne, on marl in Argonne, and on hard limestones in the Jurassic auréoles of the sedimentary basins. These soil types are often shallow with a high stone or gravel content. With time, a progressive decarbonation of original material provokes soil thickening. They are classified as Rendzic and Calcaric Leptosols, as Calcisols, and as Calcaric or Eutric Cambisols. They cover nearly 14 % of the French territory. Soil from clayey sediments have developed in the weathering products of some type of limestone forming Haplic, or Eutri-vertic Cambisols or Vertisols. Those soil types occupy nearly 20 % of the national territory. Clayey soils also characterize the Belgian polders: Calcari-gleyic Fluvisols, and a large fluviatile zone in the centre of the Netherlands, with Calcari-gleyic and Eutri-gleyic Fluvisols and some Calcari-fluvic Cambisols.

Soil from sandy materials exhibit leaching and podzolisation processes leading to the development of different kinds of Podzols. Sandy regions are extensive in Belgium (sandy Flanders and Campine) and in the Netherlands leading to the development of Haplic, Gleyic, Carbic and some Rustic Podzols. Podzolic evolution may be also associated with hydromorphic processes in France, such as in Sologne and Landes, where numerous micro-topographic sequences show a clear transition from Spodic Gleysols to Umbric and Carbic Podzols. Sandy soil covers approximately 6 % of the French territory. Soil from loamy-loessic deposits and old alluvium is favourable to a rapid differentiation by clay illuviation. However, a number of soil types were initially calcareous and have previously undergone decarbonation, giving rise to progressive desaturation by leaching thus creating optimum conditions for eluviation. This process is the basis for the differentiation of Luvic Cambisols and then Haplic Luvisols. Intensification of this process leads eventually to waterlogging conditions and Gleyic Luvisols. The resulting variation in drainage conditions and the associated acidification then allows conditions for soil degradation with appearance of the Haplic and Glossic Albeluvisols that are found in France and in Belgium. This loamy soil, as a whole, covers nearly 15 % of the total area of France, notably in the Paris and Aquitain basins, as well as in the western Europe loessic belt of Belgium and Luxemburg and the south-eastern part of the Netherlands (Limburg). Here they are mostly Haplic Luvisols.

Soil from the moderate weathering of different kind of parent materials is relatively weakly differentiated, without important geochemistry processes, may be saturated or slightly acid, and mostly dystric in nature. These soil types are extensive, particularly in France where there are present on nearly 30 % of the territory. Dystric, Eutric and some Calcaric Cambisols together with Haplic Umbrisols are characteristic of the pedological cover of the old massifs (Vosges, Armorican and Central Massifs), as well as in Pyrénées. The south-eastern part of Belgium (Condroz, Famenne and Ardennes) and Luxemburg are also dominantly Dystric Cambisols.

Other soil types, less frequent in France, where they constitute a little more than 10 % of the coverage, are typical of more specific pedogenetic processes. In the southern part of the French territory, on the sides of the Rhodanian basin, in Corsica and also in some places bordering the Aquitanien basin, Chromic Cambisols and Chromic Luvisols reflect present or past Mediterranean climate conditions while in the Central Massif soil such as Acroxic Andosols develop from different volcanic materials. The extent of recent marine formations is very important in the Netherlands and Belgium (mostly Eutric, Calcaric and Eutri-Gleyic Fluvisols) whilst sodium related soil processes have created Haplic and Gleyic Solonchaks in the Marais de l'Ouest and the Camargue. Young soil types, such as Haplic, Lithic and Dystric Leptosols, in relation to weakly weathered rocks at high altitude are common in the Alps. Finally, important areas of organic soil are present in all three countries as Dystric and Eutric Histosols.




66
Mediterranean Sea
MONACO
Marseille
5°
65
ANDORRA LA VELLA
0°
Donostia-San Sebastián
45°
65

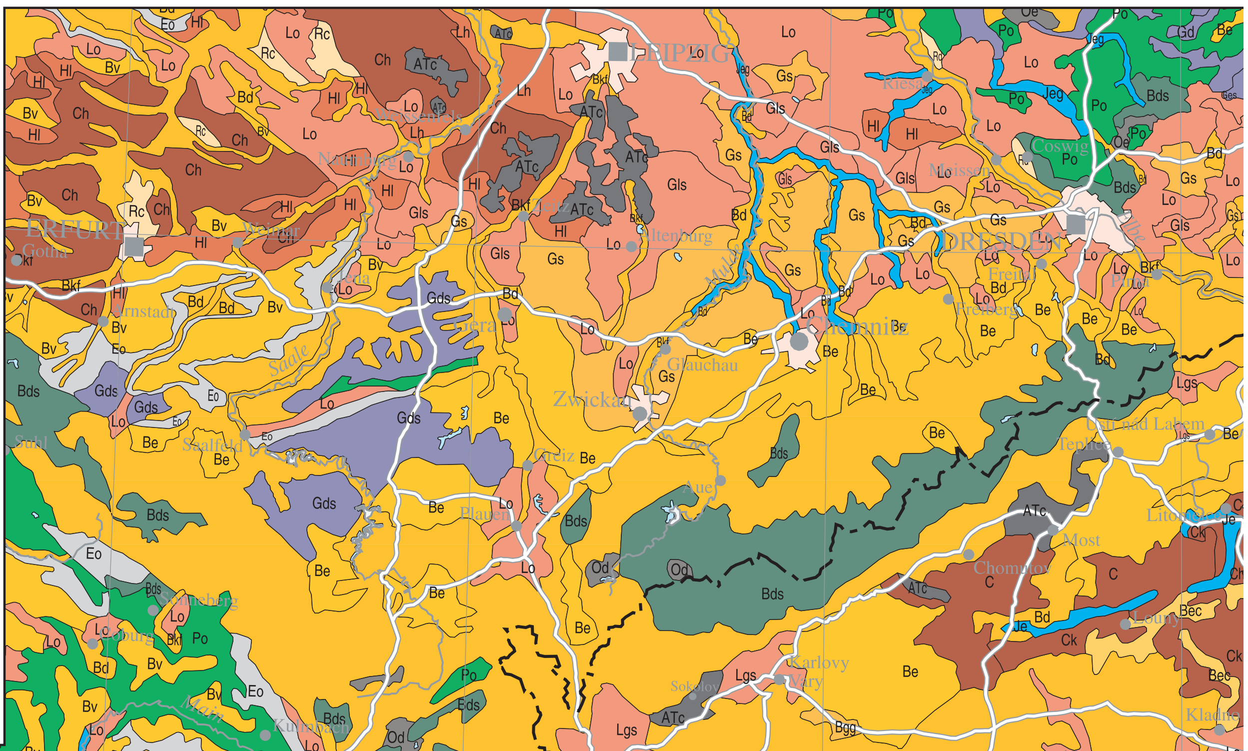
Austria is predominantly a mountainous country, with an average elevation of about 900 m with most of the land falling within the Alpine range. In general the major mountain ranges of Austria run in an east-west direction and are separated from one another by rather broad valleys. The principal areas of Austria that are not within the Alps are the northern and eastern border sections, consisting of rolling hills and the Danube River. The Austrian climate varies with elevation with mountainous regions experiencing more precipitation than the eastern lowlands, which are under continental influences.

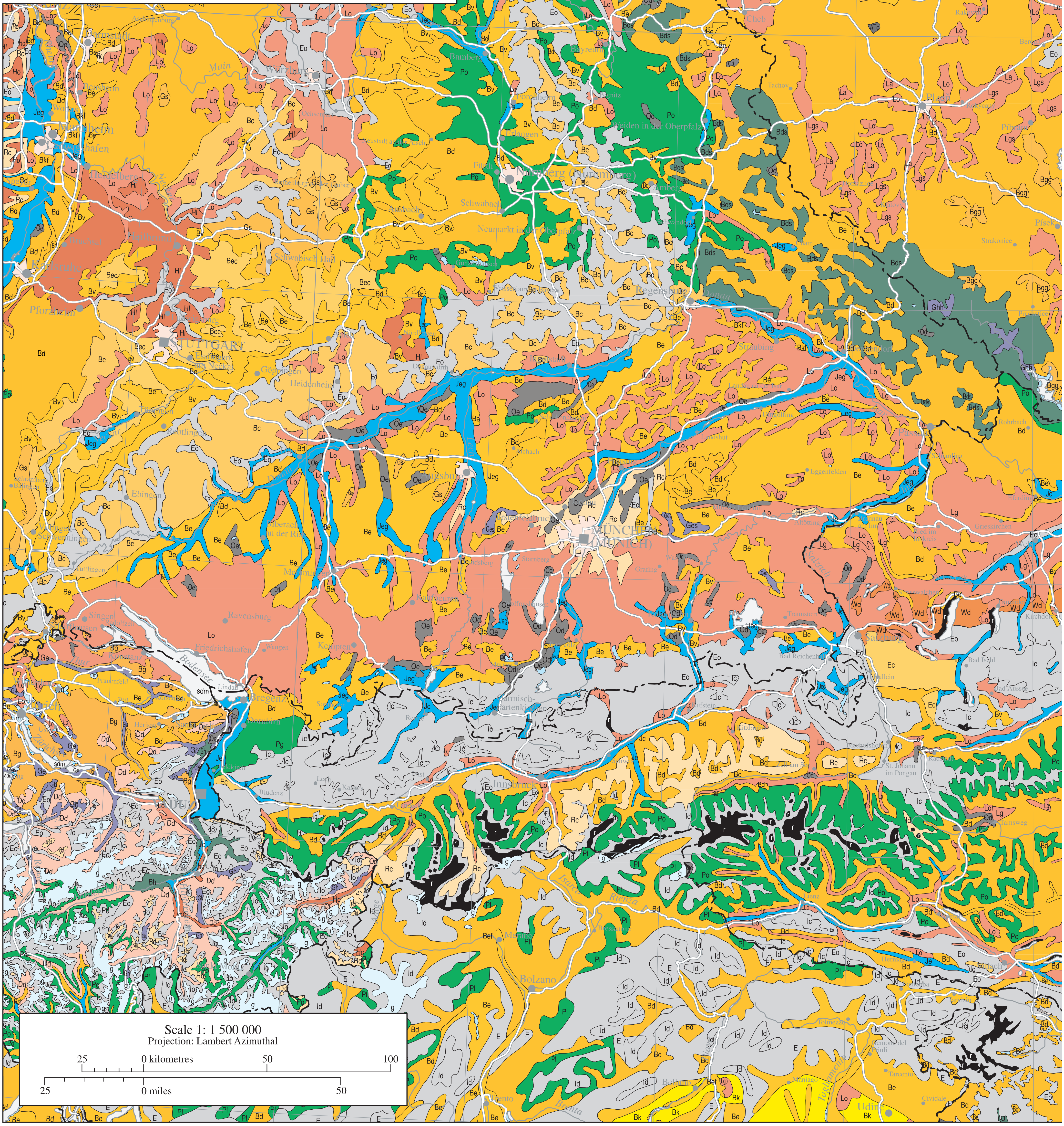
Rich terra rosa (red) Calcisols predominate in the Austrian valleys which, at higher elevations, associate with forested Podzols and, higher again, calcareous Leptosols and bare rocks. The large block of Leptosols that dominates this map sheet corresponds to the Hohe Tauern, which contains the highest point in Austria (the Grossglockner reaches 3,797 m), and the NiedereTauern mountain ranges. Alpine meadow soils are usually found in high-elevation regions and are locally important for pasture and related agriculture. Acidification of soil and erosion caused by loss of forest cover are the two main soil degradation threats in Austria.

The Czech Republic lies in the headwater area of the central European watershed. The Elbe rises near the Czech-Polish border and sweeps southwestward across Bohemia before flowing northward into Germany while the Morava River flows southwards towards the Danube. The Czech Republic rests on an elevated block, known as the Bohemian Plateau, which extends from the German border to Slovakia. This region has a primarily continental temperate climate with warm summers and cold winters while the mountainous areas endure very cold winters and receive heavy rainfall.

The soil of the Czech Republic comprises rich, black Chernozems and good-quality Luvic Cambisols in the drier and lower areas, Podzols in wetter regions and stony Leptosols at higher elevations. Fluvisols occur in the river basins and heavy Umbrisols are found in the eastern ridges.

The dramatic colours around Budapest indicate the merging of the Chernozems of the Czech Republic with those of Hungary and mark the beginning of the Chernozem belt that extends all the way to the Ural Mountains of Russia.






56
15°
20°
50°
15°
63
68
66
Odra
Wrocław
Opole
Czestochowa
Bytom
Katowice
Gliwice
Kraków
Liberec
Trutnov
Olomouc
Ostrava
Brno
Jihlava
Znojmo
Žilina
Trnava
BRATISLAVA
WIEN (VIENNA)
Donau
Neusiedler
Balaton
BUDAPEST
Székesfehérvár
Várpalota
Kecskemét
Kiskunhalas
Graz
Leoben
Maribor
Nagykanizsa
Salgótarján
Nové Zámky
Levice

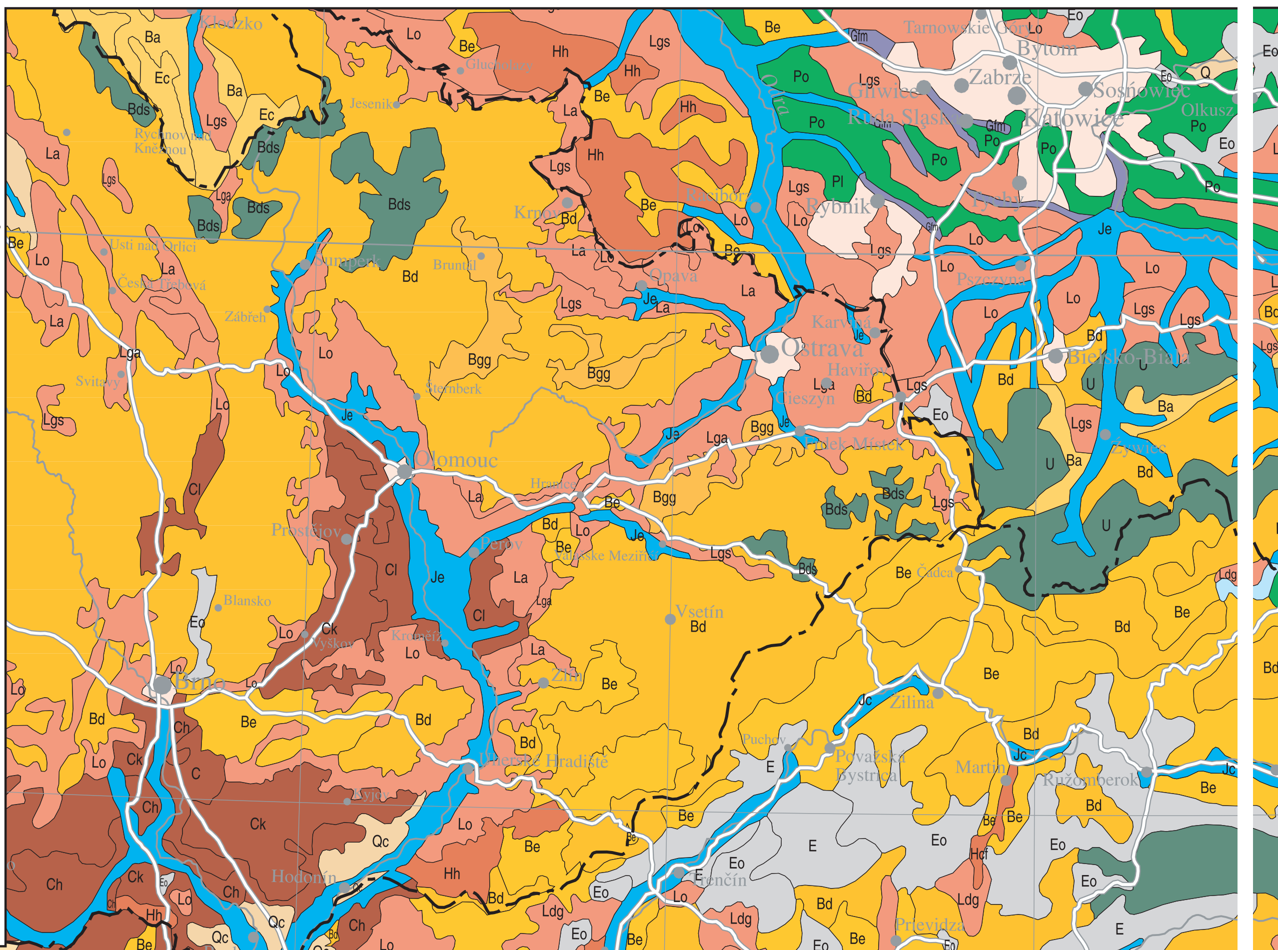
The great variety of climatic conditions resulting from latitude, physiography (elevations up to 2,654 m above sea-level) and geological conditions have caused a rich variety of soil units in this region. The great orographical structures and geological diversity of this territory is the reason that the Eurasian soil-geographical zonality practically ends in front of the arc of the Carpathian Mountains. The territory is built by two structures: the Carpathian Mountains and Pannonian Basin.

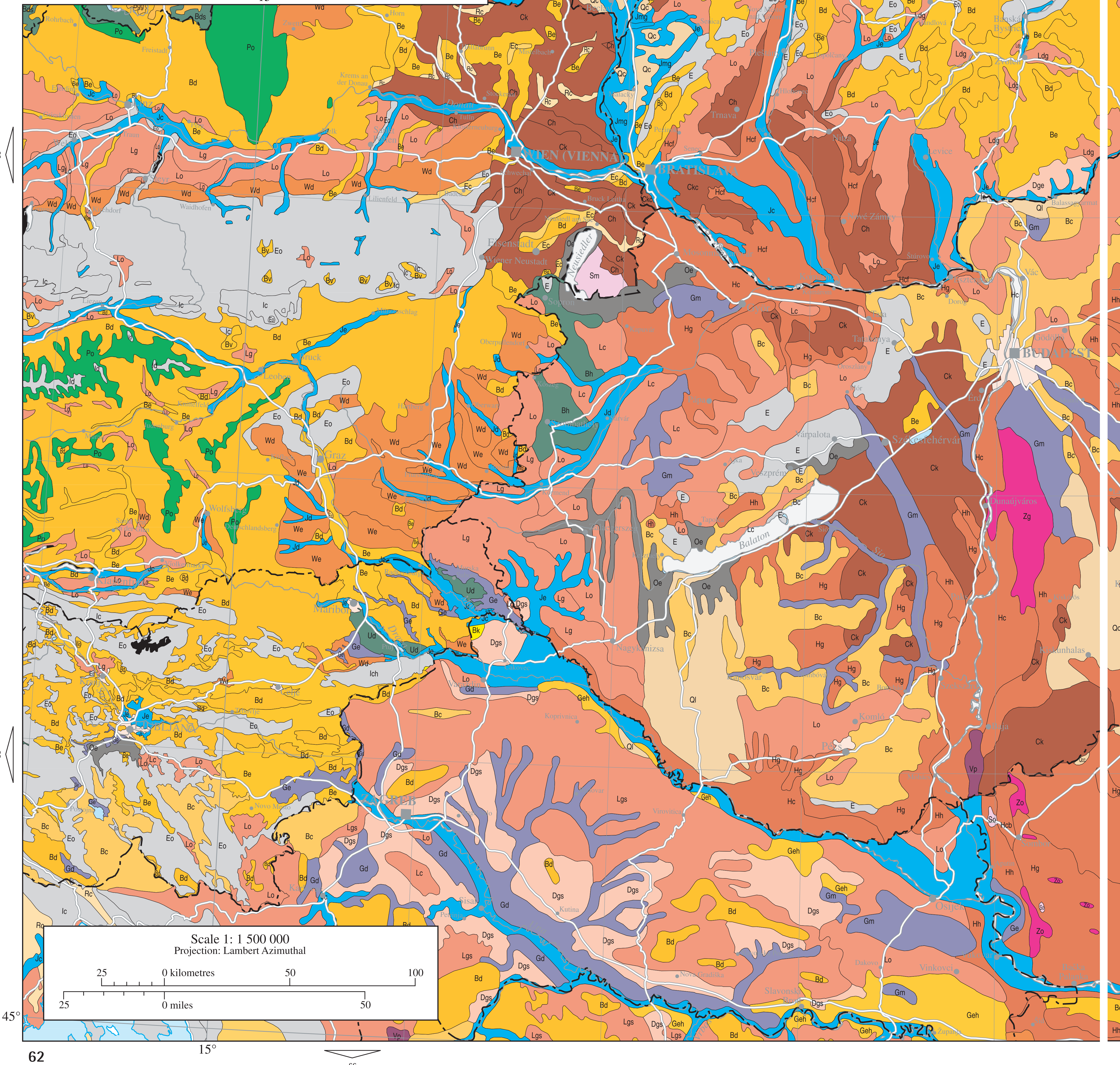
When differentiating the soils in the Carpathian area, especially the vertical and mountainside soil zonality asserts itself. In the mountains, on the same crystalline rocks, the following soil catena occurs: Eutric Cambisols – Dystric Cambisols – Cambic Umbrisols – Enti-Haplic Podzols – Haplic Podzols – Umbric and Skeli-Dystric Leptosols – Lithic Leptosols. From weathering products of recent volcanoes and their pyroclastic sediments even Andosols develop. On the piedmont belt of the Carpathian Mountains, Planosols can occur while in the lowlands hilly parts, the mountainside soil zonality reappears. So on the loessial hills, towards the mountains, the following soil catena is developed: Calcari-Haplic Chernozems – Calci-Haplic Chernozems – Calci-Luvic Chernozems – Luvic Phaeozems – Haplic Luvisols – Albic Luvisols. On the alluvial sediments of the plain close to the mountains, Eutric and Calcaric Fluvisols occur and on older alluvial sediments, where not influenced by floods, Calcari-Mollic Fluvisols and even Calcari-Haplic Chernozems have developed. Solonchaks and Solonetz can be found in shallow depressions where strongly mineralized ground waters are close to the surface. On areas affected by wind blown sands, Protic Arenosols and Arenic Cambisols are present.

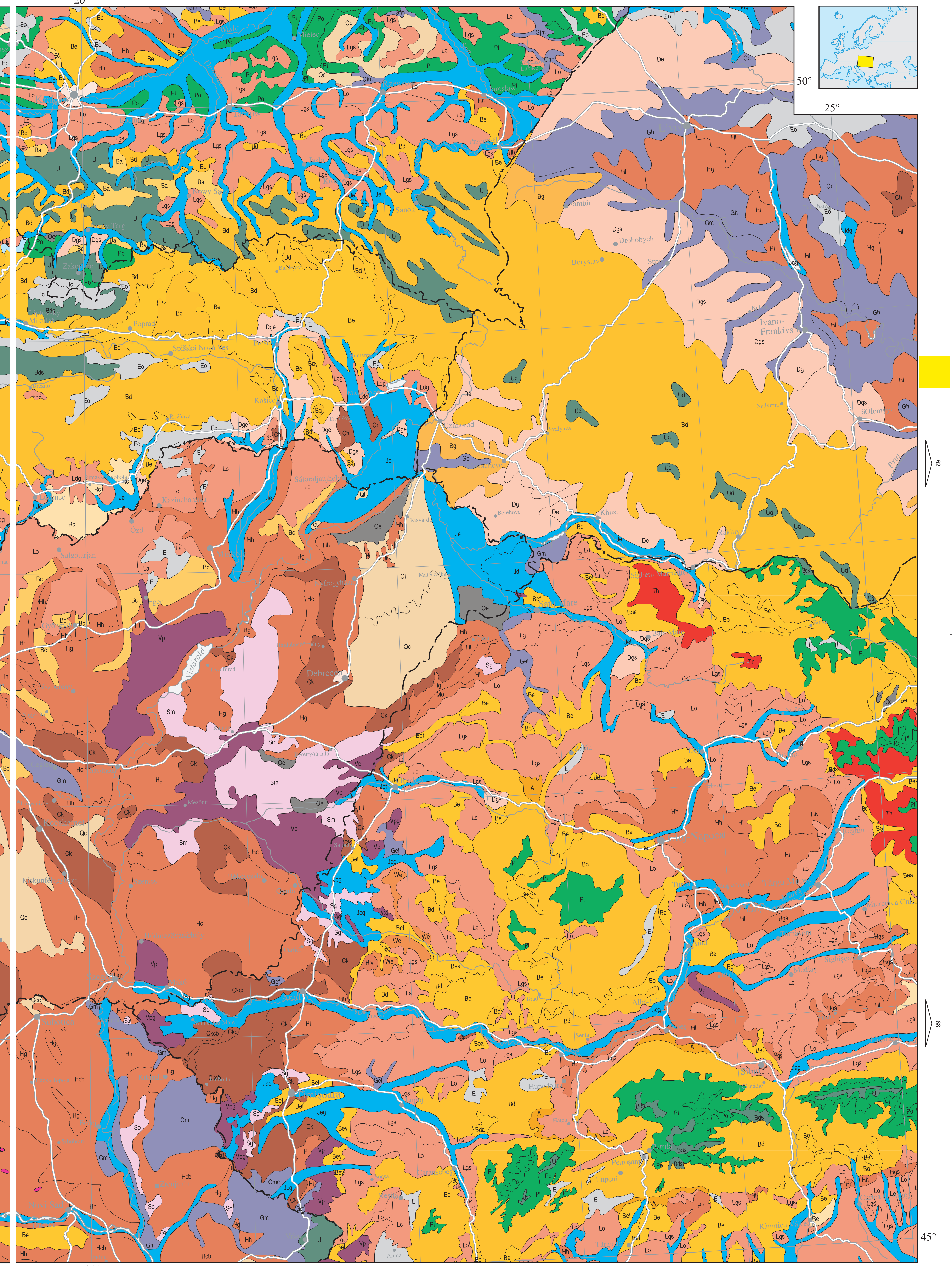
The distribution of the soil types in the Pannonian Basin has been determined by the basin characteristics. The current geomorphology and parent materials for soil formation developed mainly during the Pleistocene period. Surfaces and rocks that were formed in earlier geologic periods have been modified. The climatic changes and the tectonic activities of the Pleistocene induced erosion and mass movement from the higher elevation areas and produced sedimentation in the lower basin.

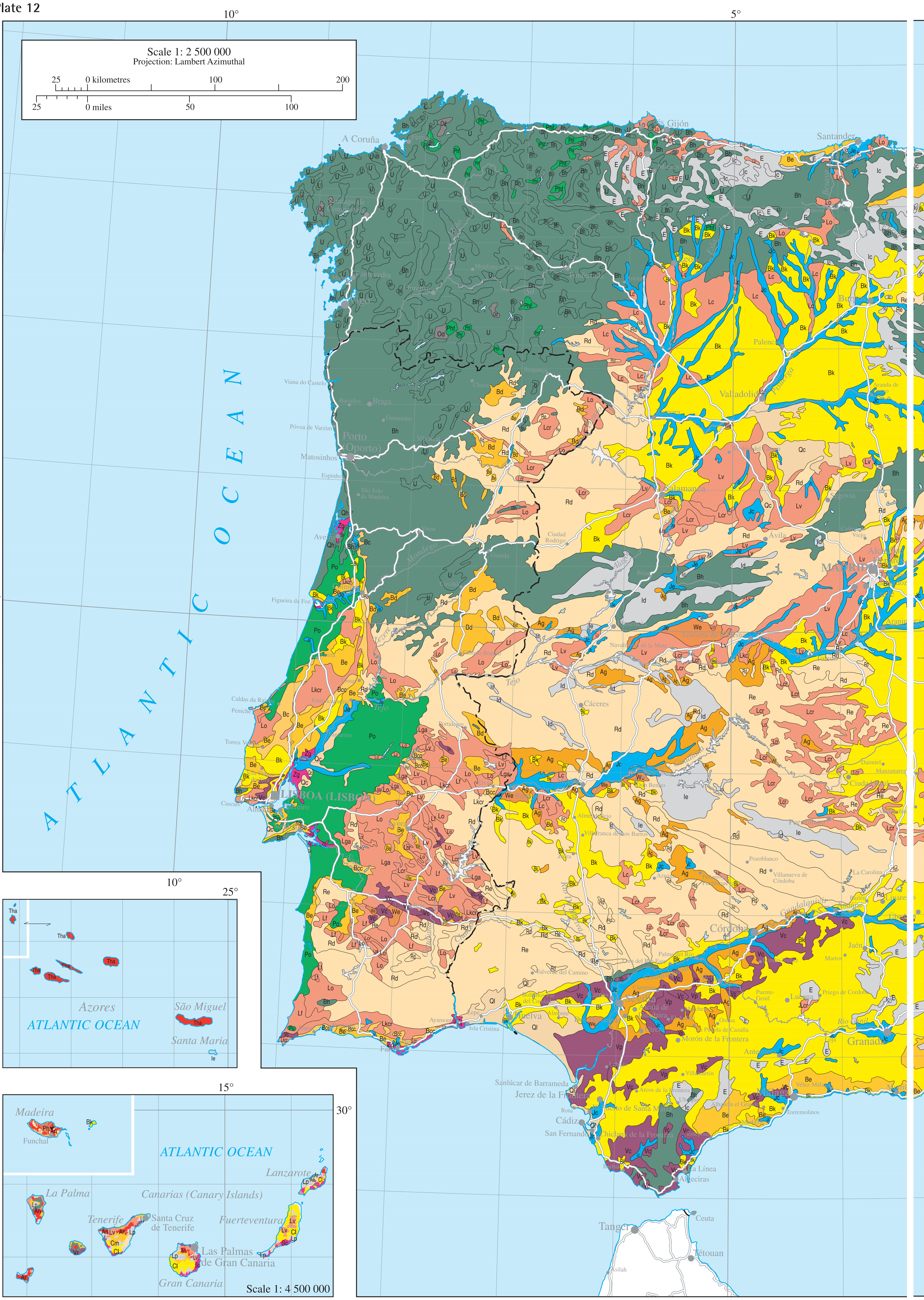
In the mountainous areas, where precipitation is higher and the downward moisture movement is dominant, Luvisols are the most common. Where soil formation has been slow or erosion influenced the surfaces, Regosols and Leptosols occur intermixed with minor areas of rock outcrops. The pediments of the mountains and the transition areas to the lowland plains are covered mainly by Cambisols developed from mixed parent materials. The best agricultural soil, the dark Chernozems and Phaeozems of the plains, are developed from thick deposits of loess. Where aeolian sands were deposited during the Pleistocene and Holocene periods, Arenosols are characteristic. In depressions, where the shallow groundwater contains soluble salts, and evaporation exceeds precipitation, salt-affected Solonchak and Solonetz soils occur. In the river valleys, depending on the age and composition of the alluvial sediments, mainly Fluvisols and Vertisols can be found.

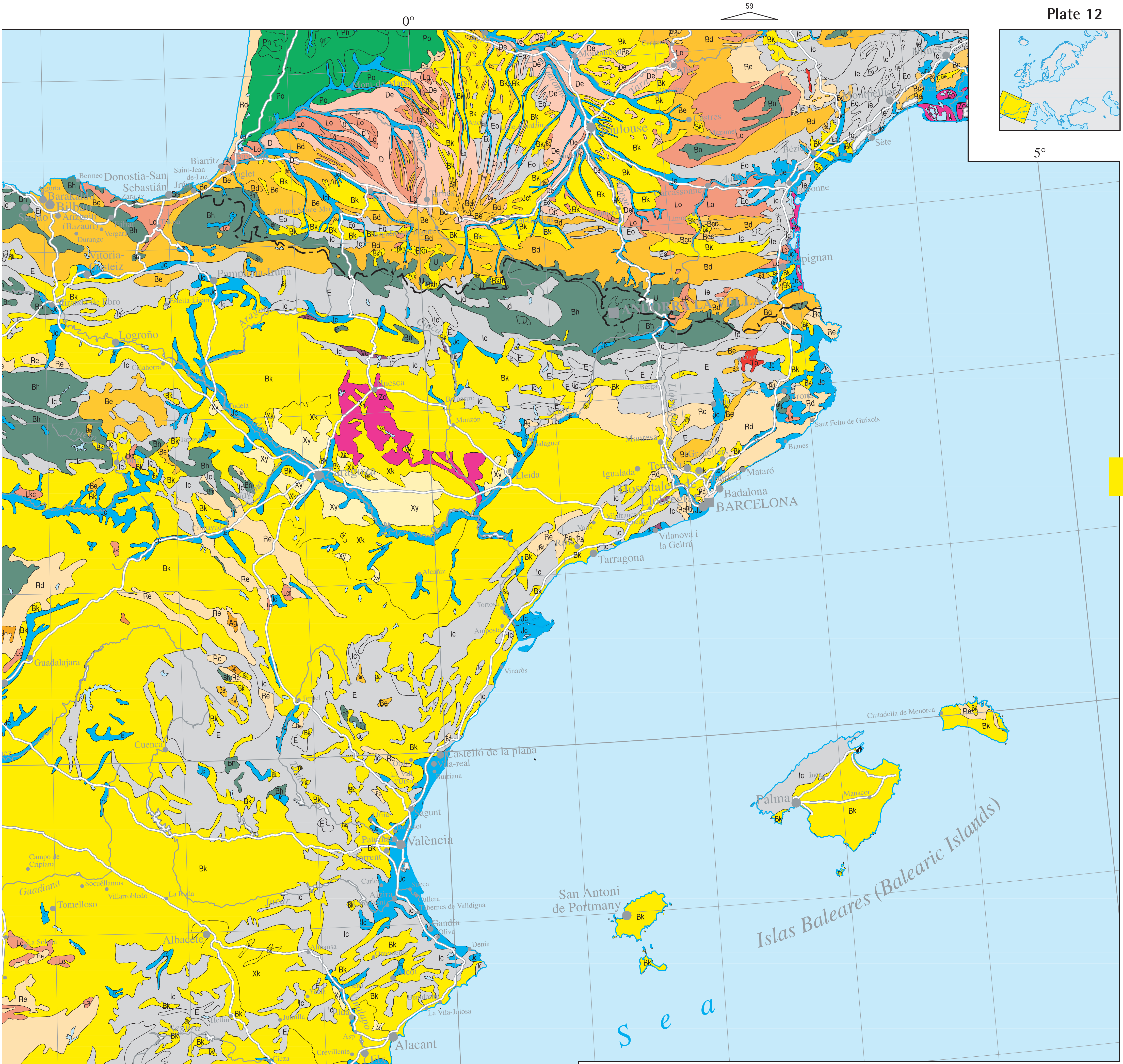
Some unusual and abrupt changes in soil types at national boundaries can be seen on this map. These are due to differences in interpretation and mapping scales between individual countries (e.g. Poland & Ukraine). Work is ongoing to resolve these differences.






20°
25°
50°
45°
Mielec
Rzeszów
Zakopane
Poprad
Spišská Nová Ves
Košice
Uzhhorod
Sambir
Drohobych
Boryslav
Ivano-
Frankivs
Nadvirna
Svalyava
Berehove
Khust
Rakhiv
Sátoraljaújhely
Kazincbarcika
Ózd
Salgótarján
Eger
Kisvárda
Mátészalka
Debrecen
Satu Mare
Timişoara
Hunedoara
Petroşani
Lupeni
Anina


10°
5°
Scale 1: 2 500 000
Projection: Lambert Azimuthal
25 0 kilometres 100 200
25 0 miles 50 100
ATLANTIC OCEAN
40°
A Coruña
Gijón
Santander
Burgos
Palencia
Valladolid
Salamanca
Segovia
Ávila
MADRID
Viana do Castelo
Braga
Póvoa de Varzim
Porto (Oporto)
Matosinhos
Espinho
Aveiro
Figueira da Foz
Caldas da Rainha
Peniche
Torres Vedras
LISBOA (LISBON)
Cascais
Cáceres
Toledo
Ciudad Real
Córdoba
Jaén
Granada
Sevilla
Huelva
Isla Cristina
Sanlúcar de Barrameda
Jerez de la Frontera
Cádiz
San Fernando
Rota
La Línea
Algeciras
Torremolinos
Tanger
Ceuta
Tétouan
Asilah
Azores
ATLANTIC OCEAN
São Miguel
Santa Maria
10°
25°
15°
30°
Madeira
Funchal
ATLANTIC OCEAN
Lanzarote
La Palma
Canarias (Canary Islands)
Tenerife
Santa Cruz de Tenerife
Fuerteventura
Las Palmas de Gran Canaria
Gran Canaria
Scale 1: 4 500 000



The Iberian Peninsula, approximately 600,000 sq km in size, is separated from the rest of Europe by the Pyrenees mountain range. Comprising Spain and Portugal, the Iberian Peninsula is surrounded on the north and west by the Atlantic Ocean and on the south and east by the Mediterranean Sea. The Strait of Gibraltar separates Iberia, and Europe, from Africa. The Iberian Peninsula is dominated by the Meseta (central plateau), a great uplifted fault block with an average elevation of 600 m that is crossed by mountain ranges. It covers about two thirds of the peninsula. Coastal lowlands, the site of the major industrial cities, surround the primarily agrarian-oriented Meseta. Climatically, the Iberian Peninsula has hot summers, cold winters, and limited precipitation. Anyone travelling through the central and southern parts of the Iberian Peninsula quickly realises the colour displayed by the soils is a key element of the landscape, ranging from striking reds (Luvisols) to pale yellows or white (Calcisols, Gypsisols).

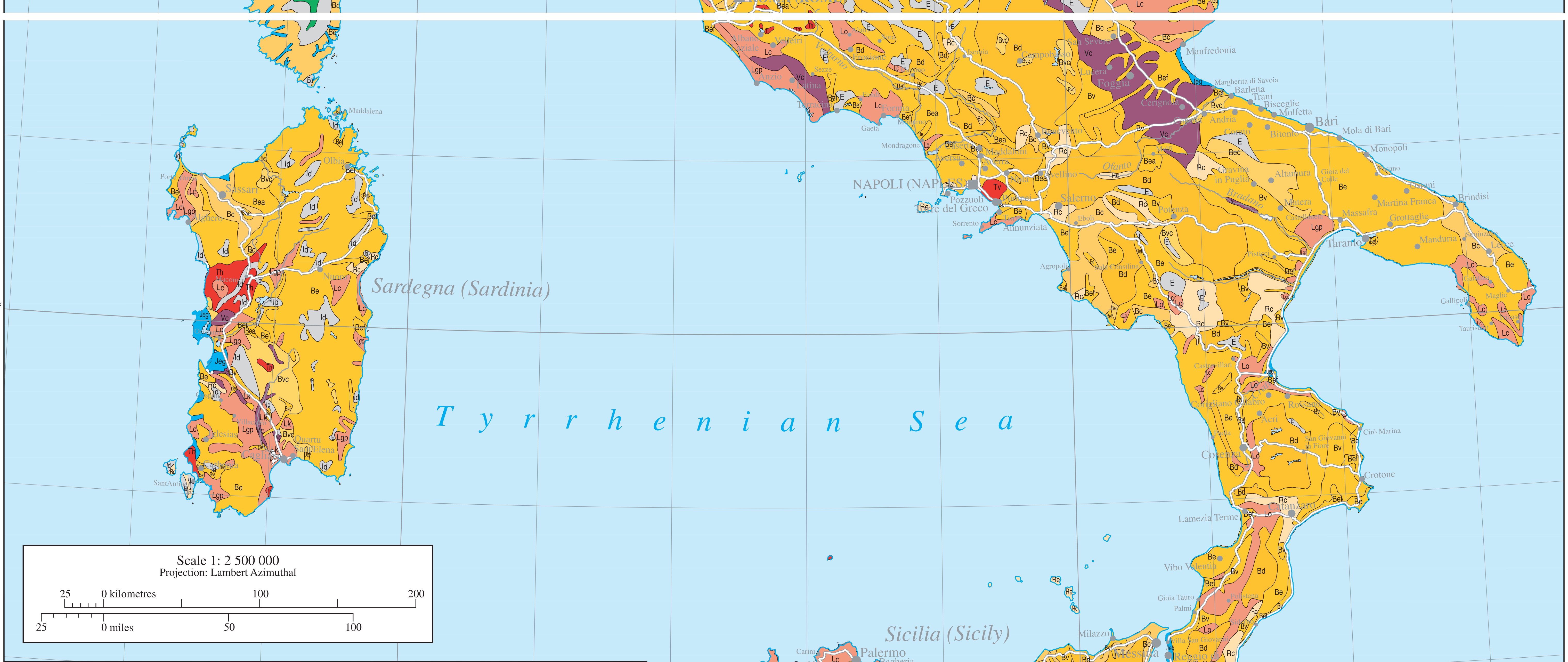
Most of the Iberian Peninsula was not covered by ice in Quaternary times and experienced little influence from glaciations and neo-tectonics, developing areas with stable landscape where exceptionally old soils may be found (the Acrisols "rañas" of Central Spain). In such stable areas surfaces from different geological ages are widespread having Chromic and Petric Luvisols and Petric Calcisols. Calcareous rocks are dominant, especially in the eastern part. Because the climate is rather dry, calcium carbonate is not leached from the soil and almost all soil types are calcareous. Igneous and metamorphic rocks are dominant in western Iberia, especially in the north (Pyrenees, Guadarrama and in other high mountains). In such areas, the soil is acidic and liming is required and (coarse) Regosols, Umbrisols, Dystric Cambisols are dominant.

Man has made, and still makes, a very intensive use of the fragile Iberian soil and this can be seen easily. Agriculture exists from pre-roman times and erosion, assisted by the arid climate, has taken place in areas affected by deforestation, overgrazing and forest fires. This has lead to an overriding extension of Leptosols and Regosols, as well as Fluvisols in the footslopes and valleys. Sustainable land use systems have developed through the irrigation of valleys (Fluvisols) and river terraces (deep Calcisols and Cambisols); terracing of land (Regosols, Lithosols) in many cases has taken place up to more than 1700 m in order to grow Mediterranean trees (vineyards, olive, almonds) as well as cereals, forming a very complex water conservation system because terracing has been done also in lower parts of the landscape (Fluvisols, Cambisols, Calcisols).

The Iberian soilscapes have an extreme diversity of soil types with Calcisols being dominant and showing a large variety of morphologies. To the ones mentioned above we have to add the southernmost Podzols of Europe, the Kastanozems specially over limestones in middle altitude Mediterranean areas, but also in the bajadas and other areas close to the Mediterranean. Gypsisols merits a special mention by their extent, unique characteristics and because are almost exclusive of Spain in Europe; they occur in large areas in the Ebro Valley under arid to sub-humid climate as well as in the more arid South East.

Natural saline areas are present in many parts of the Peninsula when the climate is drier, both inland as well as near the sea. Cultivation and especially irrigation have changed the original pattern and under present land use conditions Solonchaks appear scattered in large areas. Volcanic (Andisols) soils are dominant in Canary, Azores and Madeira Islands; in such islands also saline soils (Solonchak) are found the flat areas, with Leptosols in the limestone mountains, hills and plateaux. Anthrosols are restricted to the very intensive horticultural areas of southeast Spain or near industrial and urban areas, specially in the Mediterranean coast fringe.


Adriatic Sea
Ligurian Sea
Corse (Corsica)
Elba
45°
15°
10°



Varying climatic conditions, differences in altitude and geology have combined to produce in a wide range of soil types for the area shown on this map. Northern parts of Italy and Slovenia are regarded as Alpine and exhibit less developed soil types such as Lithosols (Lithic Leptosols), Regosols and Luvisols soils. Shallow calcareous deposits (mostly Rendzic Leptosols) are the most widespread soil type in Slovenia (approximately 24% of the mapped territory). They are formed on limestones and dolomites, which cover almost half of territory. Peat (Histosols) are distinguished in mountainous areas.

Throughout the map soils with a developed Cambic B-horizon (Cambisols) predominate. Further division can be made on the basis of parent material to give Chromic Cambisols, Eutric Cambisols and Dystric Cambisols. Eutric Cambisols, often found on the bottom of basins and valleys or in terraced hilly regions, form fertile agricultural land. Leached varieties of Chromic Cambisols and Luvisols are less widespread, but can be found on limestone and dolomite as well. Podzols, formed on siliceous parent materials, are widespread in the Alps type where high annual rainfall produces an optimum environment for leaching. Podzols are well suited for forestry.

Hydromorphic soils can be found in tectonic basins and plains areas include Fluvisols, Planosols and Gleysols (characterised by seasonal water surplus, originating from a shallow groundwater table).

The richest and most productive soils for agriculture in Italy are the alluvial soils of the North Italian Plain and the smaller river valleys of the peninsula. The delta of the River Po is one of Europe's largest areas of Fluvisols.

Regosols have developed on the weathered volcanic deposits of Tuscany while Andosols can be found on the lower slopes of active (Etna, Vesuvius and the Lipari Islands) or extinct volcanoes (Sardegna).

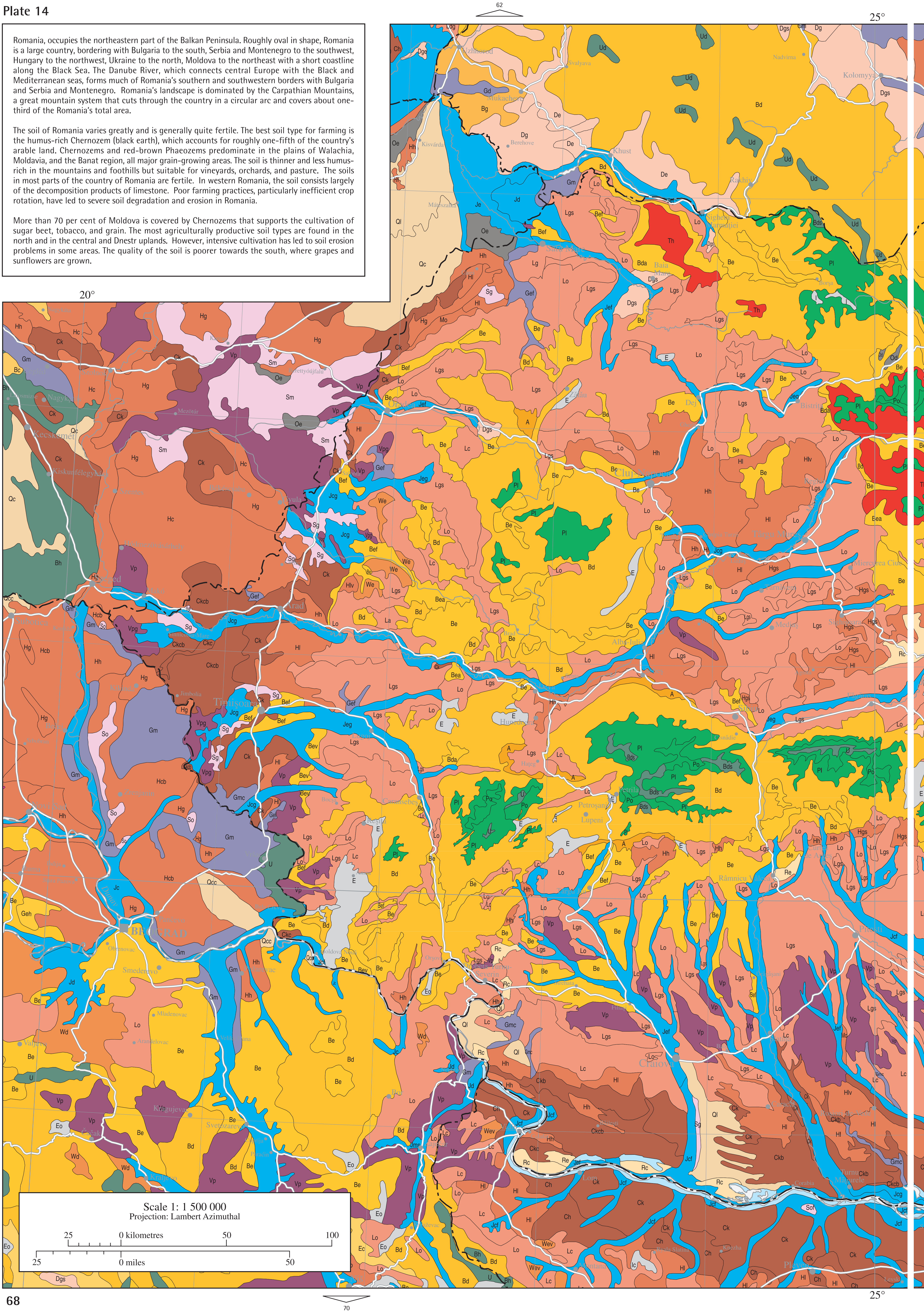
The red soil or terra rosa, distinctive of the Mediterranean are common in Puglia and other limestone areas in the south of Italy.

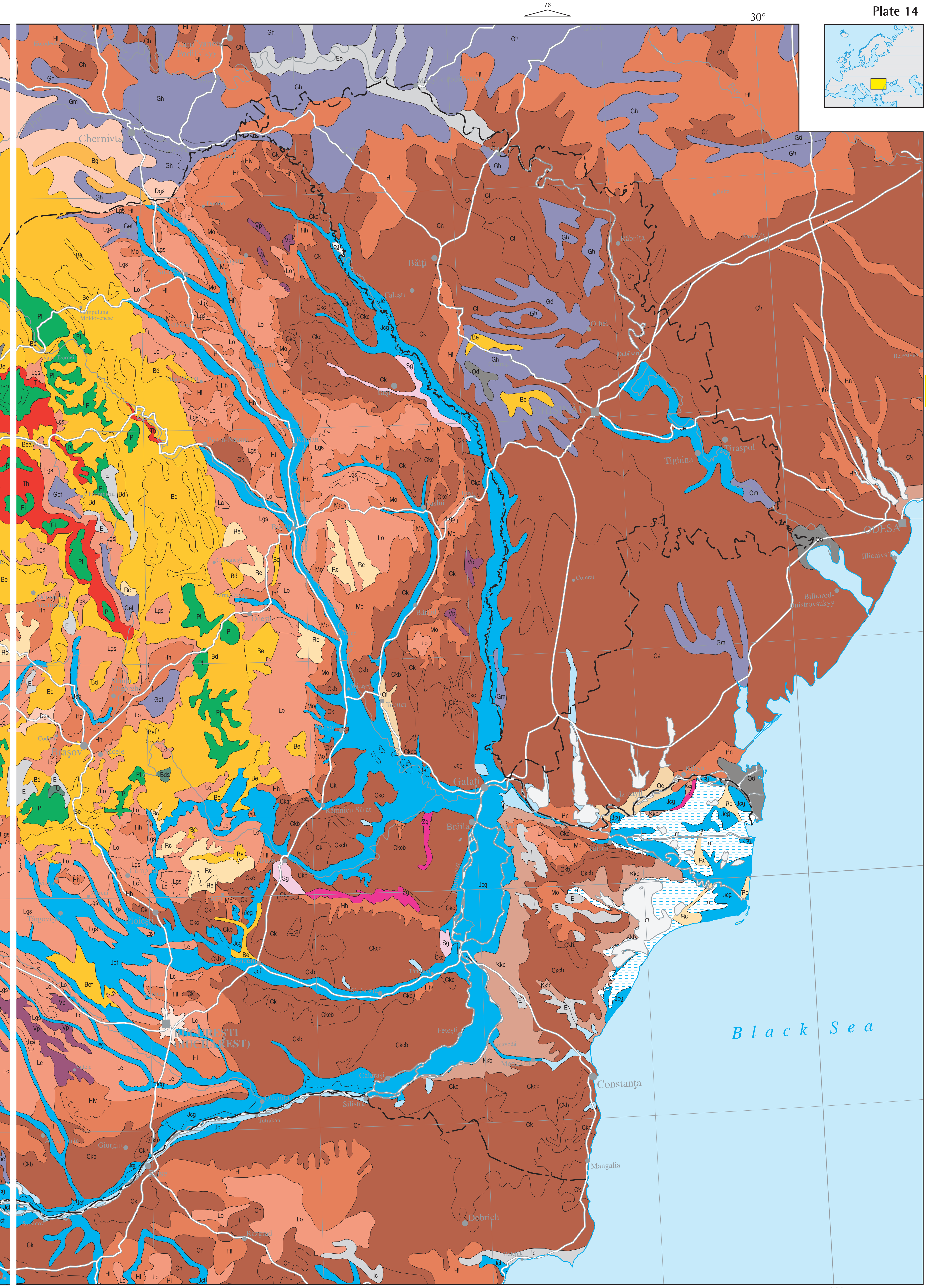
More than 90 percent of the soil surface of Croatia is exposed to erosion of various intensities. It is estimated that for 1.3 million ha of bare karst area, erosion has already reached the geological base. Central and coastal Istria are faced with the worst situation due to the high erodibility of local soils (annual amounts of eroded material can reach 200 tonnes per hectare).

Romania, occupies the northeastern part of the Balkan Peninsula. Roughly oval in shape, Romania is a large country, bordering with Bulgaria to the south, Serbia and Montenegro to the southwest, Hungary to the northwest, Ukraine to the north, Moldova to the northeast with a short coastline along the Black Sea. The Danube River, which connects central Europe with the Black and Mediterranean seas, forms much of Romania's southern and southwestern borders with Bulgaria and Serbia and Montenegro. Romania's landscape is dominated by the Carpathian Mountains, a great mountain system that cuts through the country in a circular arc and covers about one-third of the Romania's total area.

The soil of Romania varies greatly and is generally quite fertile. The best soil type for farming is the humus-rich Chernozem (black earth), which accounts for roughly one-fifth of the country's arable land. Chernozems and red-brown Phaeozems predominate in the plains of Walachia, Moldavia, and the Banat region, all major grain-growing areas. The soil is thinner and less humus-rich in the mountains and foothills but suitable for vineyards, orchards, and pasture. The soils in most parts of the country of Romania are fertile. In western Romania, the soil consists largely of the decomposition products of limestone. Poor farming practices, particularly inefficient crop rotation, have led to severe soil degradation and erosion in Romania.

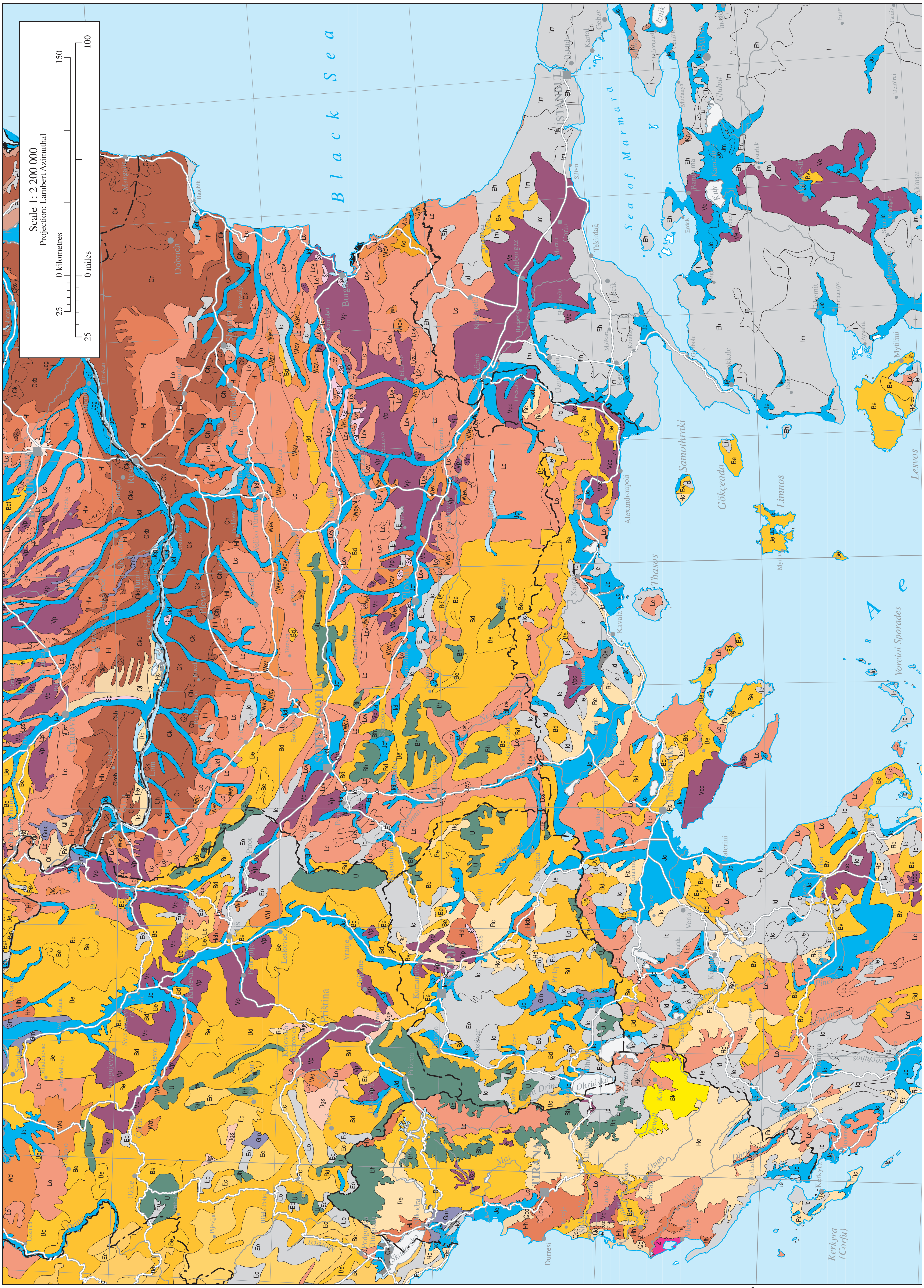
More than 70 per cent of Moldova is covered by Chernozems that supports the cultivation of sugar beet, tobacco, and grain. The most agriculturally productive soil types are found in the north and in the central and Dnestr uplands. However, intensive cultivation has led to soil erosion problems in some areas. The quality of the soil is poorer towards the south, where grapes and sunflowers are grown.



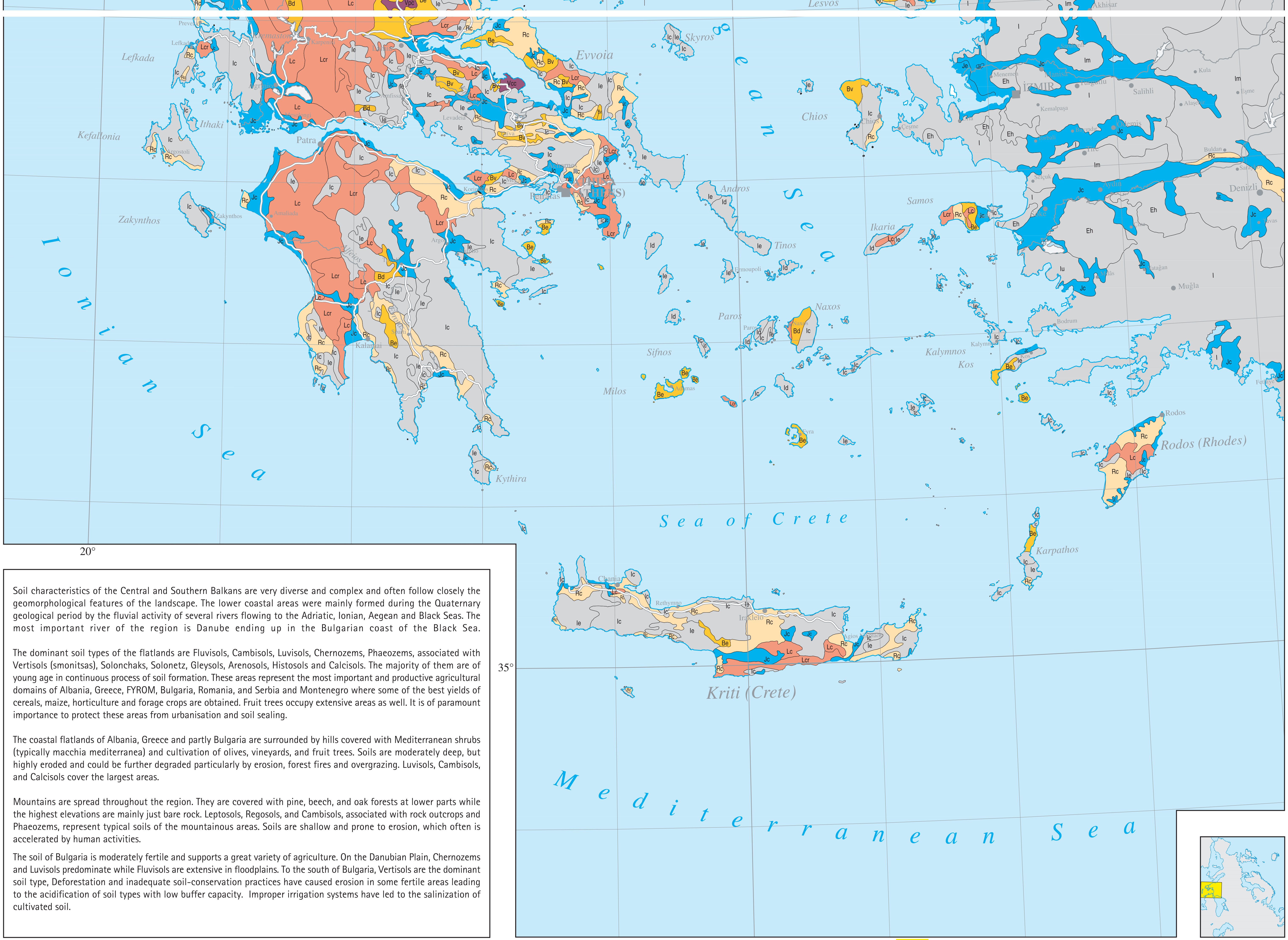

30°
45°
Chernivts
Bălţi
Făleşti
Iaşi
Râbniţa
Orhei
CHIŞINĂU
Tighina
Tiraspol
ODESA
Illichivs'k
Bilhorod-Dnistrovs'kyy
Comrat
Braşov
Galaţi
Brăila
Tecuci
Râmnicu Sărat
BUCUREŞTI
(BUCHAREST)
Constanţa
Mangalia
Dobrich
Silistra
Călăraşi
Olteniţa
Giurgiu
Feteşti
Izmayil
Black Sea

72

68


Scale 1: 2 200 000
Projection: Lambert Azimuthal
0 kilometres 25 150
0 miles 25 100
Black Sea
Sea of Marmara
Thasos
Samothraki
Gökçeada
Limnos
Lesvos
Voreioi Sporades
Kerkyra (Corfu)
İSTANBUL
SOFIA
TIRANA
Priština
Craiova
Burgas
Dobrich
Edirne
Tekirdağ
Kavala
Alexandroupoli
Durresi
40°
25°
20°

66



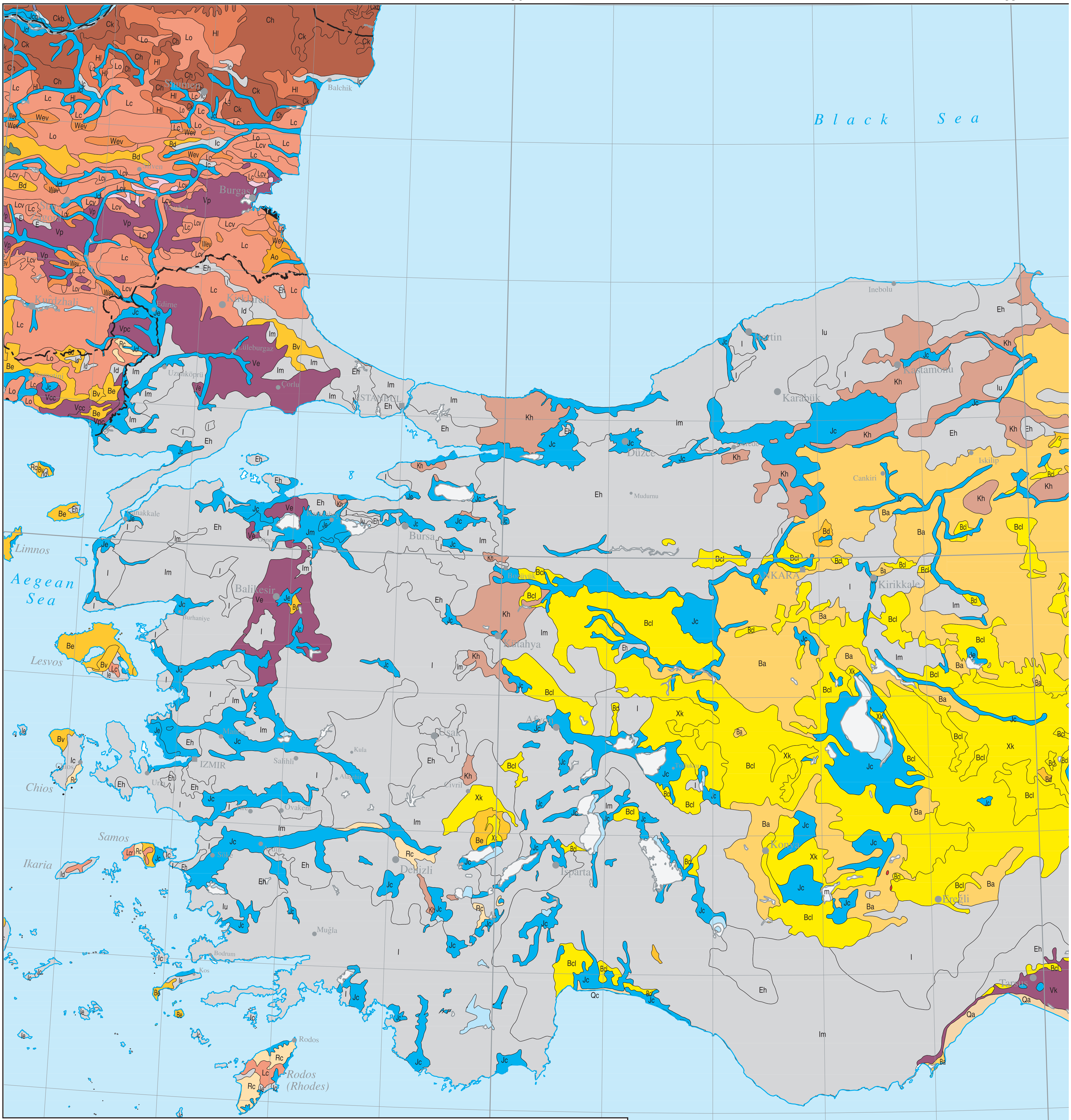
Soil characteristics of the Central and Southern Balkans are very diverse and complex and often follow closely the geomorphological features of the landscape. The lower coastal areas were mainly formed during the Quaternary geological period by the fluvial activity of several rivers flowing to the Adriatic, Ionian, Aegean and Black Seas. The most important river of the region is Danube ending up in the Bulgarian coast of the Black Sea.

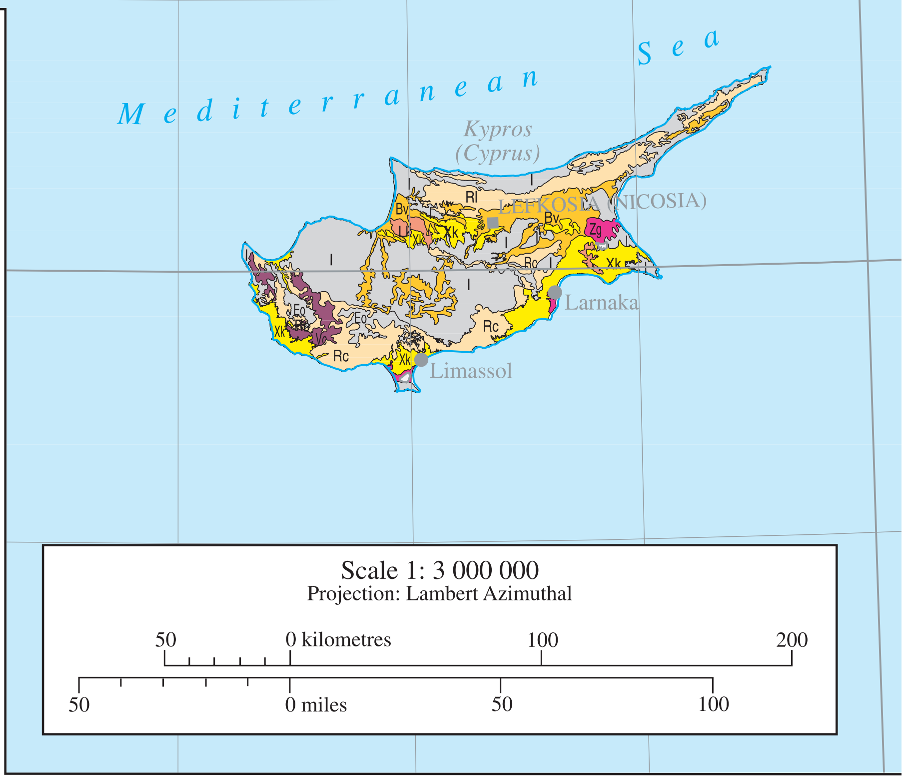
The dominant soil types of the flatlands are Fluvisols, Cambisols, Luvisols, Chernozems, Phaeozems, associated with Vertisols (smonitsas), Solonchaks, Solonetz, Gleysols, Arenosols, Histosols and Calcisols. The majority of them are of young age in continuous process of soil formation. These areas represent the most important and productive agricultural domains of Albania, Greece, FYROM, Bulgaria, Romania, and Serbia and Montenegro where some of the best yields of cereals, maize, horticulture and forage crops are obtained. Fruit trees occupy extensive areas as well. It is of paramount importance to protect these areas from urbanisation and soil sealing.

The coastal flatlands of Albania, Greece and partly Bulgaria are surrounded by hills covered with Mediterranean shrubs (typically macchia mediterranea) and cultivation of olives, vineyards, and fruit trees. Soils are moderately deep, but highly eroded and could be further degraded particularly by erosion, forest fires and overgrazing. Luvisols, Cambisols, and Calcisols cover the largest areas.

Mountains are spread throughout the region. They are covered with pine, beech, and oak forests at lower parts while the highest elevations are mainly just bare rock. Leptosols, Regosols, and Cambisols, associated with rock outcrops and Phaeozems, represent typical soils of the mountainous areas. Soils are shallow and prone to erosion, which often is accelerated by human activities.

The soil of Bulgaria is moderately fertile and supports a great variety of agriculture. On the Danubian Plain, Chernozems and Luvisols predominate while Fluvisols are extensive in floodplains. To the south of Bulgaria, Vertisols are the dominant soil type, Deforestation and inadequate soil-conservation practices have caused erosion in some fertile areas leading to the acidification of soil types with low buffer capacity. Improper irrigation systems have led to the salinization of cultivated soil.





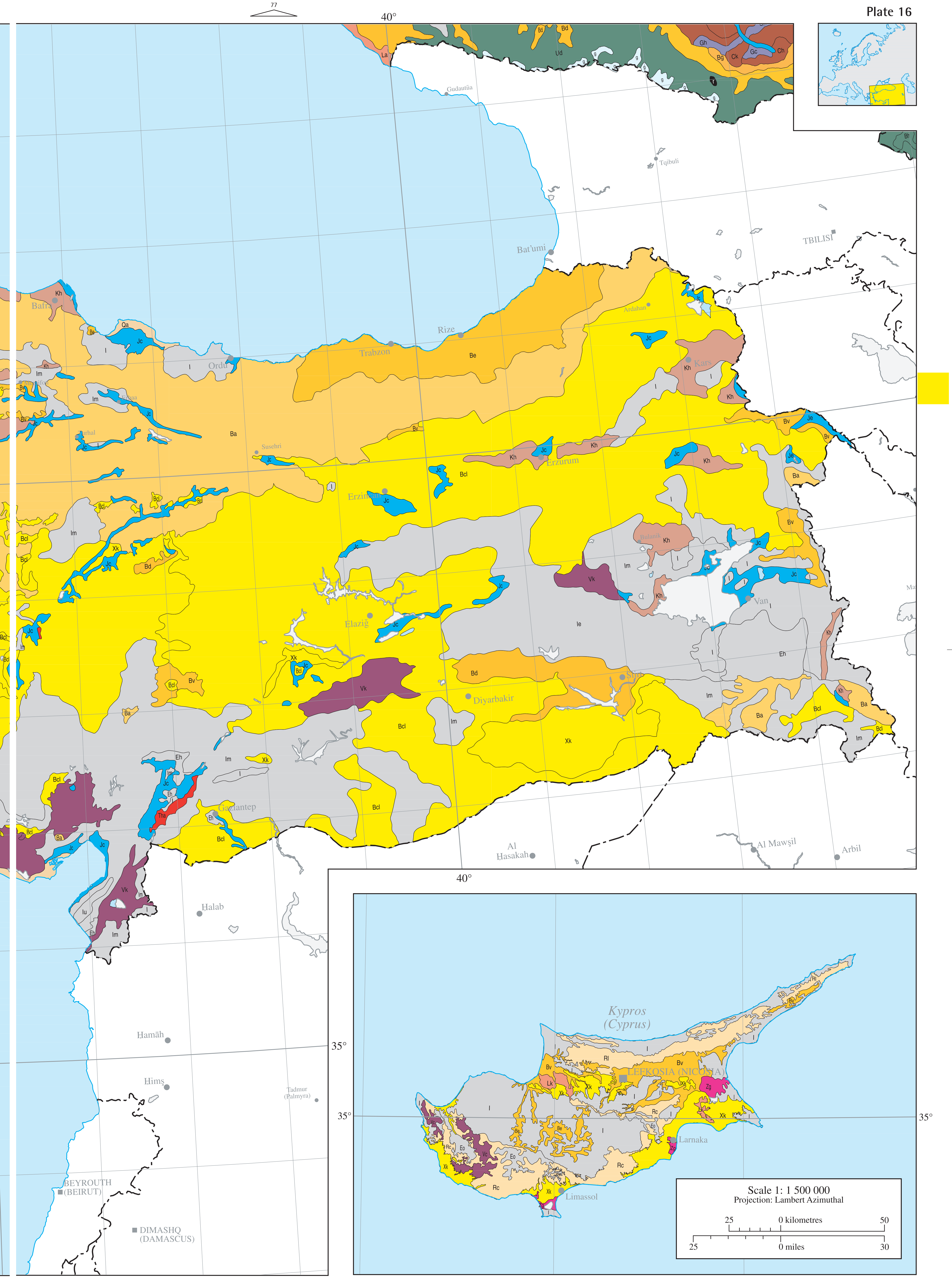
The Leptosols that characterise so much of this map sheet are the out come of the vigorous Anatolian neo-tectonic activities that lead to the development of steep slopes and their inevitable erosion. Leptosols are associated with Cambisols, Regosols and Luvisols. The impact of human activities and fluctuating climatic conditions has had a destructive effect on this soil. Calcisols of the Luvic qualifier are the next dominant soil occurring in the drier parts of the country intergrading occasionally to Aridic Calcisols. They have developed particularly on ancient lake basins and mud flow deposits, often containing calcretes (secondary limestones of pedologic origin) and are used for indigenous cereal production as well as irrigated agriculture for cash crops.

Fluvisols are a widely distributed and fertile soil type throughout Turkey, found along river valleys and lake basins and used to cultivate rain fed cereals and irrigated cash crops. Widespread Calcaric Fluvisols, associating with Vertic Cambisols and Calcaric Vertisols, were developed by the vigorous and frequent tectonic movements that caused the formation of prominent topographic features.

Cambisols occur in the more temperate areas and associate with Leptosols and Kastanozems. They are frequently found at the northern fringes of the Calcisols that embrace the coastal areas of the Mediterranean. Vertisols bearing the Calcic qualifier, with prominent cracking features and gilgai due to the clay contents, have developed from the transported Petric Calcisols of the Quaternary mudflow surfaces (known locally as 'Glacis' or colluvial sediments). Vertisols have developed on the basalts that occur in the centre and south east of the Turkey and are devoted to extensive grazing and irrigated agriculture.

Luvisols of the eastern Black Sea coast integrate with Alisols with increasing precipitation and steeper slopes and are used as tea plantations. Generally Luvisols associate with Leptosols, Cambisols, Calcisols and Regosols under dense to sparse forest vegetation and undulating topographies. Regosols with Calcaric properties associate with Calcaric Cambisols and cover a small part of Turkey with similar climatic conditions to the Lithic Leptosols and Chromic Luvisols association of the Mediterranean region. Arenosols of the Haplic qualifier represent the fixed and shifting coastal sand dunes that occur on the ancient and/or present courses of the large rivers of Anatolia, which are adjacent to the coastal beach sands of the Mediterranean. Andosols, formed on pyroclastic rocks (tephra), are covered with dense to sparse pasture vegetation.

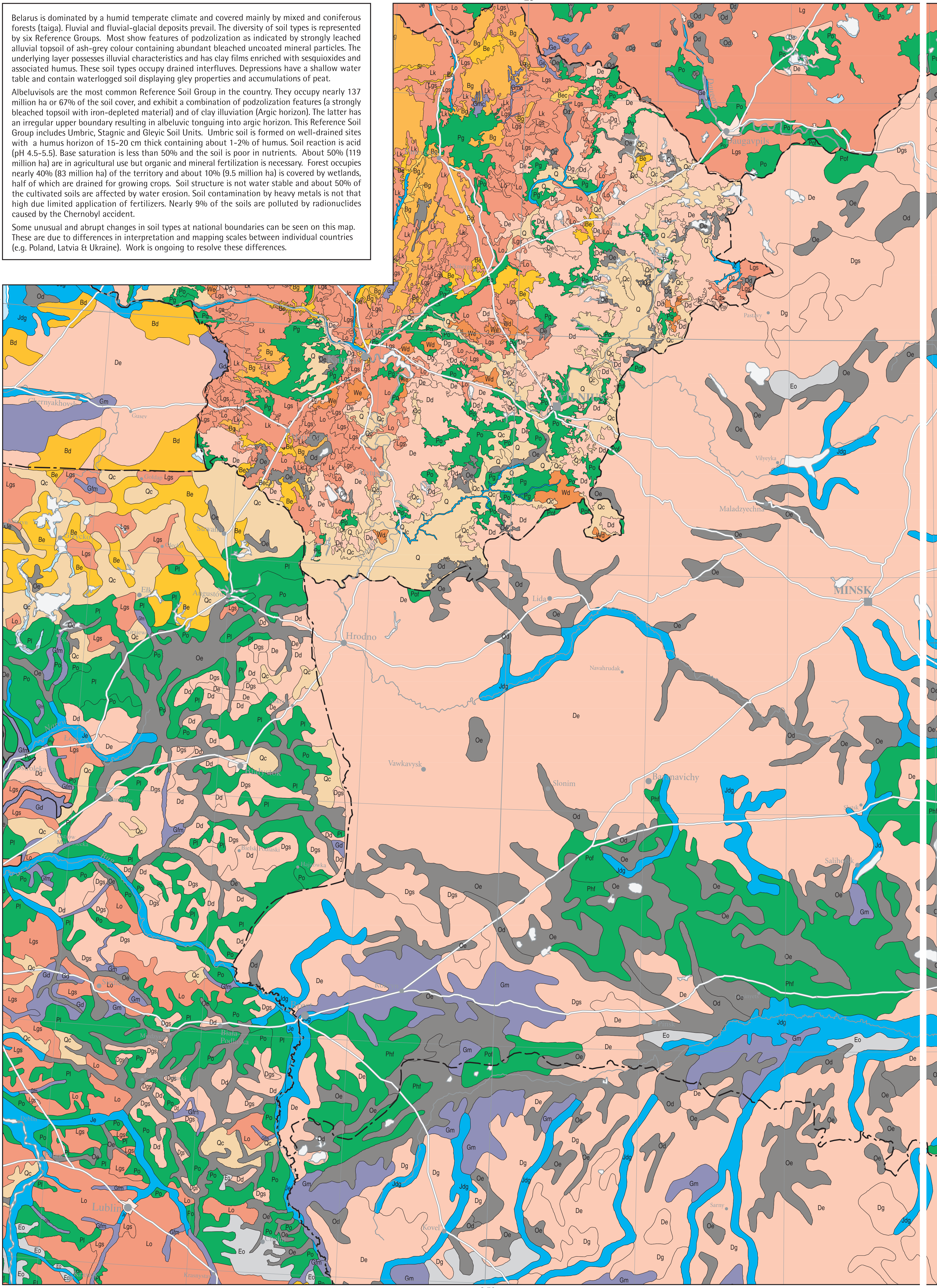
Cyprus is the third-largest island in the Mediterranean Sea, with a maximum length of about 225 km and a total area of just over 9,000 sq km. Much of the island is a flat, treeless plain, bordered on the north and south by mountain ranges. Cyprus has a typical Mediterranean climate, with annual rainfall averaging less than 500 mm. These two factors govern the major soil characteristics of the island. Shallow, stony Leptosols dominate the mountainous areas, grading to Calcaric Regosols at lower altitudes. Salinisation is a major problem in Cyprus. Gleyic Solonchaks are found in several areas adjacent to the coastline.

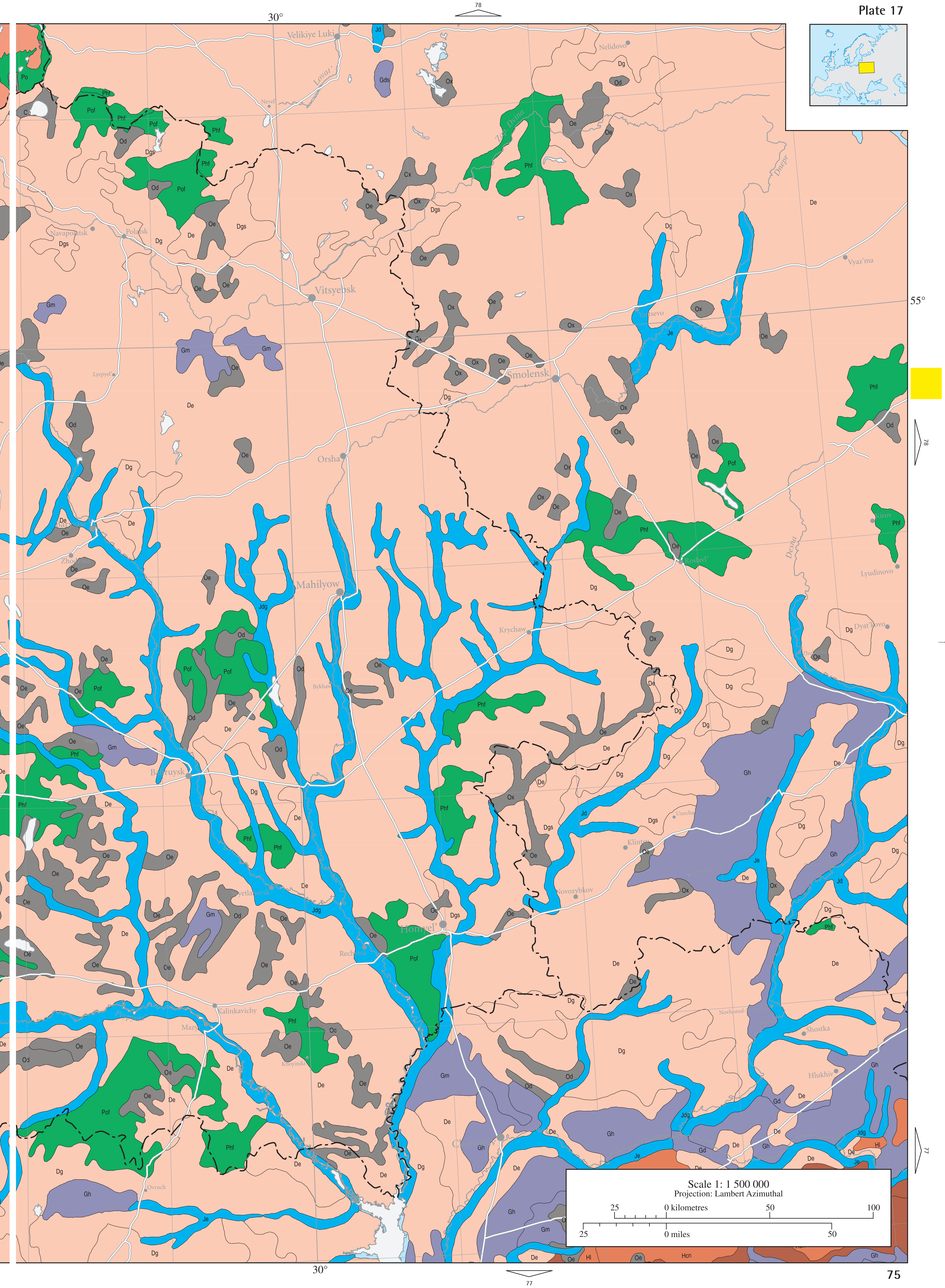

77
40°
Gudautŭa
Tqibuli
TBILISI
Bat'umi
Ardahan
Kars
Rize
Trabzon
Ordu
Bafra
Susehri
Erzurum
Erzincan
Bulanık
Van
Elazığ
Diyarbakir
Gaziantep
Al Hasakah
Al Mawşil
Arbil
Halab
Hamāh
Hims
Tadmur (Palmyra)
BEYROUTH (BEIRUT)
DIMASHQ (DAMASCUS)
35°
Kypros (Cyprus)
LEFKOSIA (NICOSIA)
Larnaka
Limassol
Scale 1: 1 500 000
Projection: Lambert Azimuthal
25
0 kilometres
50
25
0 miles
30

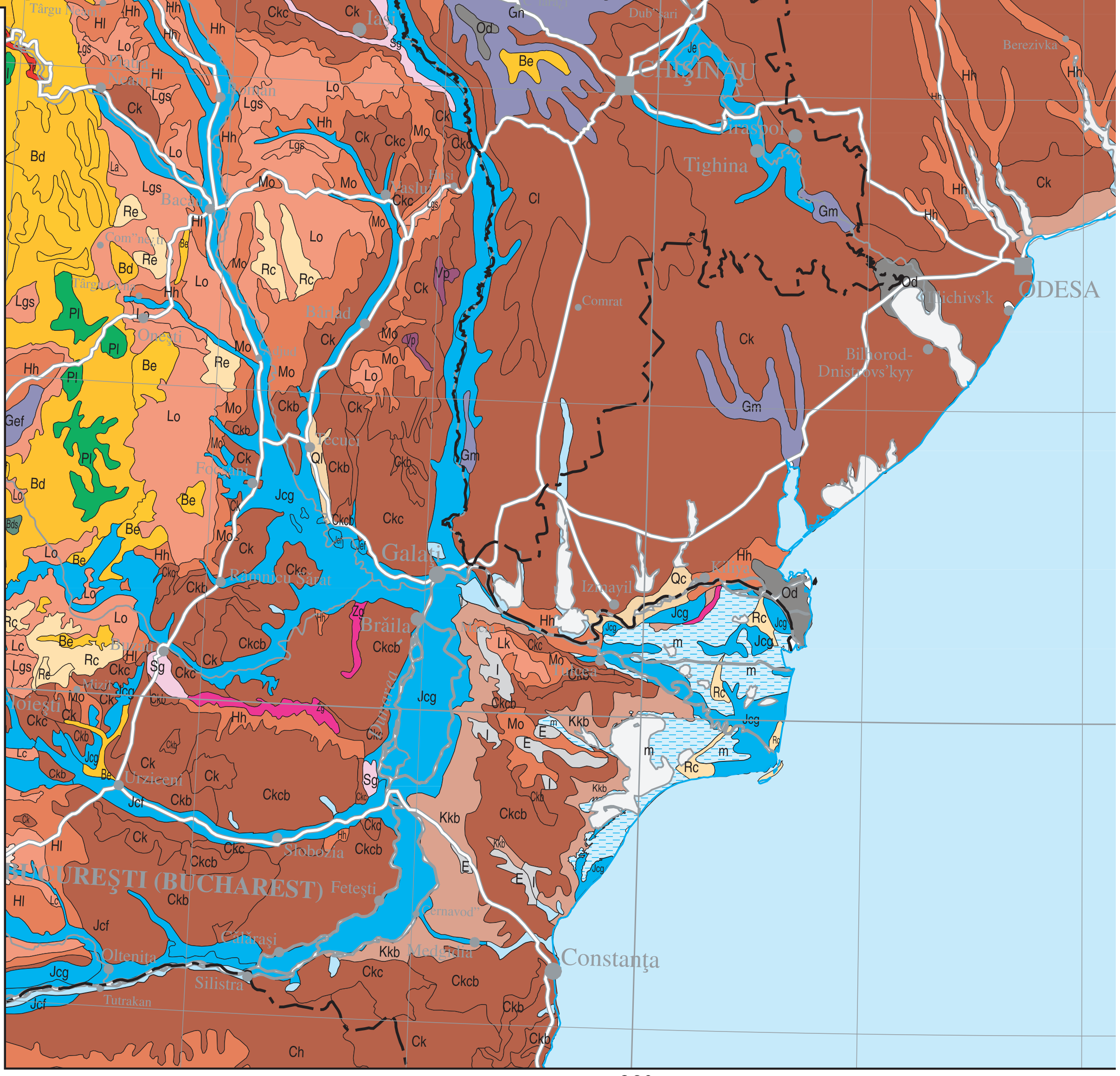
Belarus is dominated by a humid temperate climate and covered mainly by mixed and coniferous forests (taiga). Fluvial and fluvial-glacial deposits prevail. The diversity of soil types is represented by six Reference Groups. Most show features of podzolization as indicated by strongly leached alluvial topsoil of ash-grey colour containing abundant bleached uncoated mineral particles. The underlying layer possesses illuvial characteristics and has clay films enriched with sesquioxides and associated humus. These soil types occupy drained interfluves. Depressions have a shallow water table and contain waterlogged soil displaying gley properties and accumulations of peat.

Albeluvisols are the most common Reference Soil Group in the country. They occupy nearly 137 million ha or 67% of the soil cover, and exhibit a combination of podzolization features (a strongly bleached topsoil with iron-depleted material) and of clay illuviation (Argic horizon). The latter has an irregular upper boundary resulting in albeluvic tonguing into argic horizon. This Reference Soil Group includes Umbric, Stagnic and Gleyic Soil Units. Umbric soil is formed on well-drained sites with a humus horizon of 15-20 cm thick containing about 1-2% of humus. Soil reaction is acid (pH 4.5-5.5). Base saturation is less than 50% and the soil is poor in nutrients. About 50% (119 million ha) are in agricultural use but organic and mineral fertilization is necessary. Forest occupies nearly 40% (83 million ha) of the territory and about 10% (9.5 million ha) is covered by wetlands, half of which are drained for growing crops. Soil structure is not water stable and about 50% of the cultivated soils are affected by water erosion. Soil contamination by heavy metals is not that high due limited application of fertilizers. Nearly 9% of the soils are polluted by radionuclides caused by the Chernobyl accident.

Some unusual and abrupt changes in soil types at national boundaries can be seen on this map. These are due to differences in interpretation and mapping scales between individual countries (e.g. Poland, Latvia & Ukraine). Work is ongoing to resolve these differences.




30°
Velikiye Luki
Nelidovo
Nevel'
Lovat'
Zap. Dvina
Dnepr
Navapolatsk
Polatsk
Vitsyebsk
Vyaz'ma
55°
Yartsevo
Lyepyel'
Smolensk
Orsha
Roslavl'
Kirov
Lyudinovo
Zhodzina
Mahilyow
Krychaw
Dyat'kovo
Bykhaw
Desna
Babruysk
Unecha
Klintsy
Svyetlahorsk
Novozybkov
Homyel'
Rechytsa
Novhorod-Sivers'kyy
Kalinkavichy
Mazyr
Shostka
Khoyniki
Hlukhiv
Chernihiv
Ovruch
Scale 1: 1 500 000
Projection: Lambert Azimuthal
25
0 kilometres
50
100
25
0 miles
50
30°
78
77

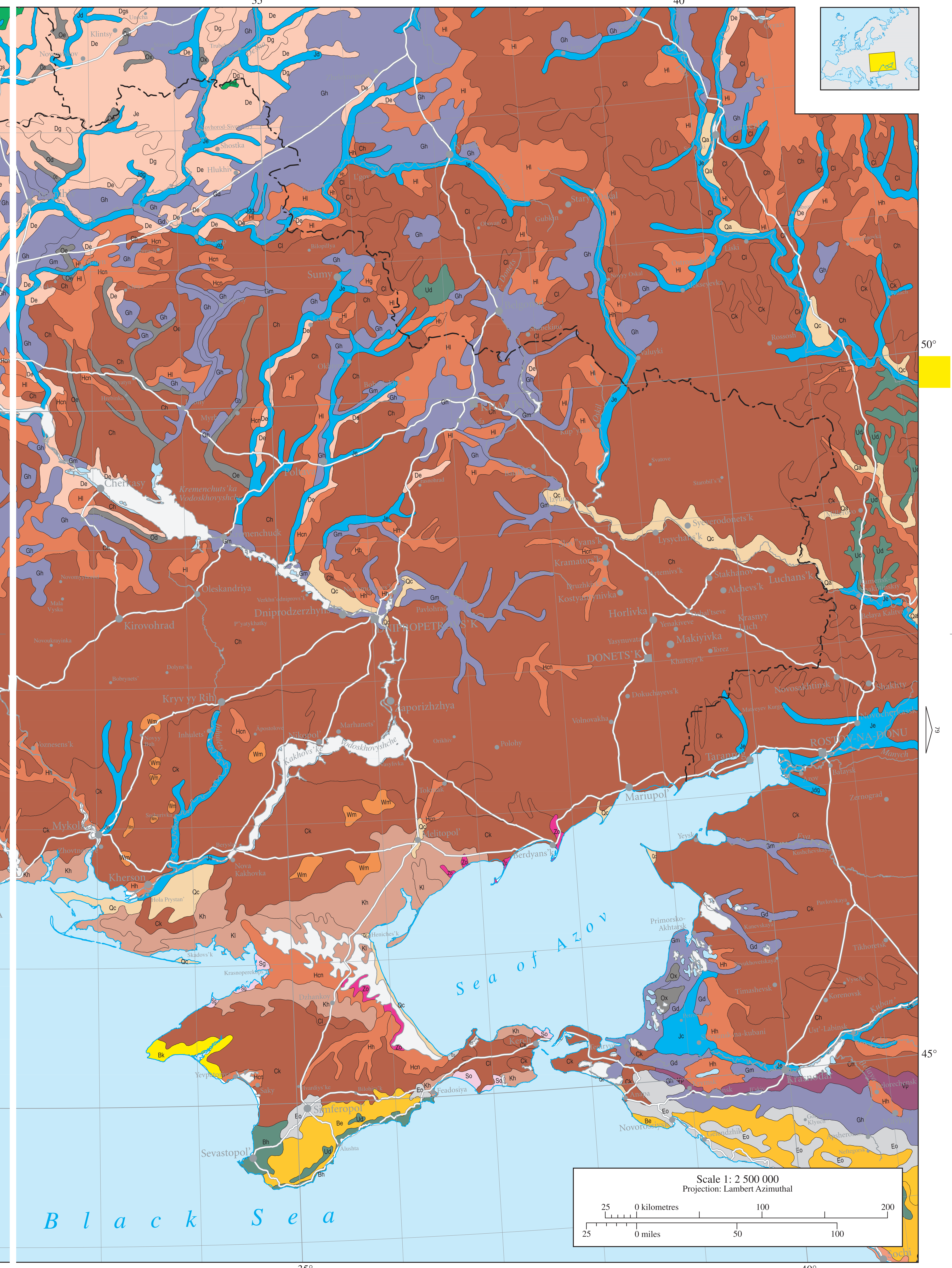


The diversity soil types in Ukraine is due to the considerable extent of the country, some 60 million hectares (ha), and the significant variety of natural soil-forming factors. Fifteen Reference Groups occur in the country, which is nearly half of the WRB total. The main features of soil geography follow natural zones and are complicated by the regional lithological and relief conditions. Albeluvisols, Phaeozems and Histosols, which are common for mixed coniferous-deciduous and deciduous forests of the cold temperate regions of the Russian plain, occupy the north-eastern part of the country. The latter has a gently sloping relief, which is dissected by flat valleys which are tributaries of the Dnepr River. Histosols predominate in the north-western part of the country and occupy a huge swampy depression that is shared with Belarus called Polesje, which is a basin of the poorly drained valley of the Pripyats River. Chernozems, in combination with Fluvisols in the flat valleys, of left-branch tributaries of the Dnepr, cover the eastern part of the middle the country. Phaeozems and Chernozems are widespread on the Podolskaja and Predneprovskaja uplands of the central part of the middle of the country. This soil region contains Cambisols that are widespread in the low Zakarpatski mountains near the middle of the country. A huge area of homogeneous Chernozems covers the flat Prichernomoskaja lowland in the southern part of the country. This region neighbours shallow Chernozems and Cambisols of the Krym peninsula mountains. The depression between the Prichernomoskaja lowland and Krym is presented by an assemblage of saline soils, which are formed from marine saline clays and are influenced by shallow saline groundwater.

Chernozems occupy about half (30 million ha) the country. Chernozems are fertile and do not have any limitations for most crops, but irrigation is needed in regions where plants are affected by the lack of water. Albeluvisols occupy 14% of the country. These soils have Albic properties (E horizon) in the topsoil that is detected by bleached uncoated mineral particles. The underlying Argic B horizon has an irregular or broken upper boundary resulting from deep tonguing of bleached material and blocky subangular structure. This soil is acid and needs applications of organic and mineral fertilizers, liming and drainage if wet. Phaeozems also occupy around 14% of the country and are slightly acid or neutral in reaction. They are characterized by favourable physical-water parameters, sufficient nutrients and are suitable for the majority of crops. Under forests these soils have eluvial-illuvial profile differentiation, abundant bleached mineral particles covering the ped surfaces (podzolization). Where there is a watertable, Phaeozems show redoximorphic features and gley features. If the ground water is saline these soils have solonetzic or solonchakous properties.

The dehumification and associated loss of soil fertility are the major soil threats. Over exploitation of natural soil fertility and insufficient application of organic and mineral fertilizers are the main causes. The loss of humus encourages soil compaction, favours sealing and crusting and reduces soil resistance to water and wind erosion. The latter is evident for about 30% of agricultural land. Pollution of agricultural soil is low due to the limited application of mineral fertilizers and pesticides (only about 9% of the lands). Some concentration of heavy metals is observed in the suburbs and around industrial centers. A considerable portion of lands (about 11%) are polluted by radio-nuclides caused by the Chernobyl accident.

Land use in Ukraine comprises about 55% croplands, some 13% haylands and pastures, and 2% perennial crops. The rest is accounted for by forests (17%), bogs (2%), built up areas (4%) and badlands (4%). Approximately 65% of the land is still managed by the State. The traditional crop are cereals, sugar beet, maize, flax, potatoes, vegetables and fruits. There is a tendency for cash crop production to increase, with sunflower, rice, and soy-bean dominating.

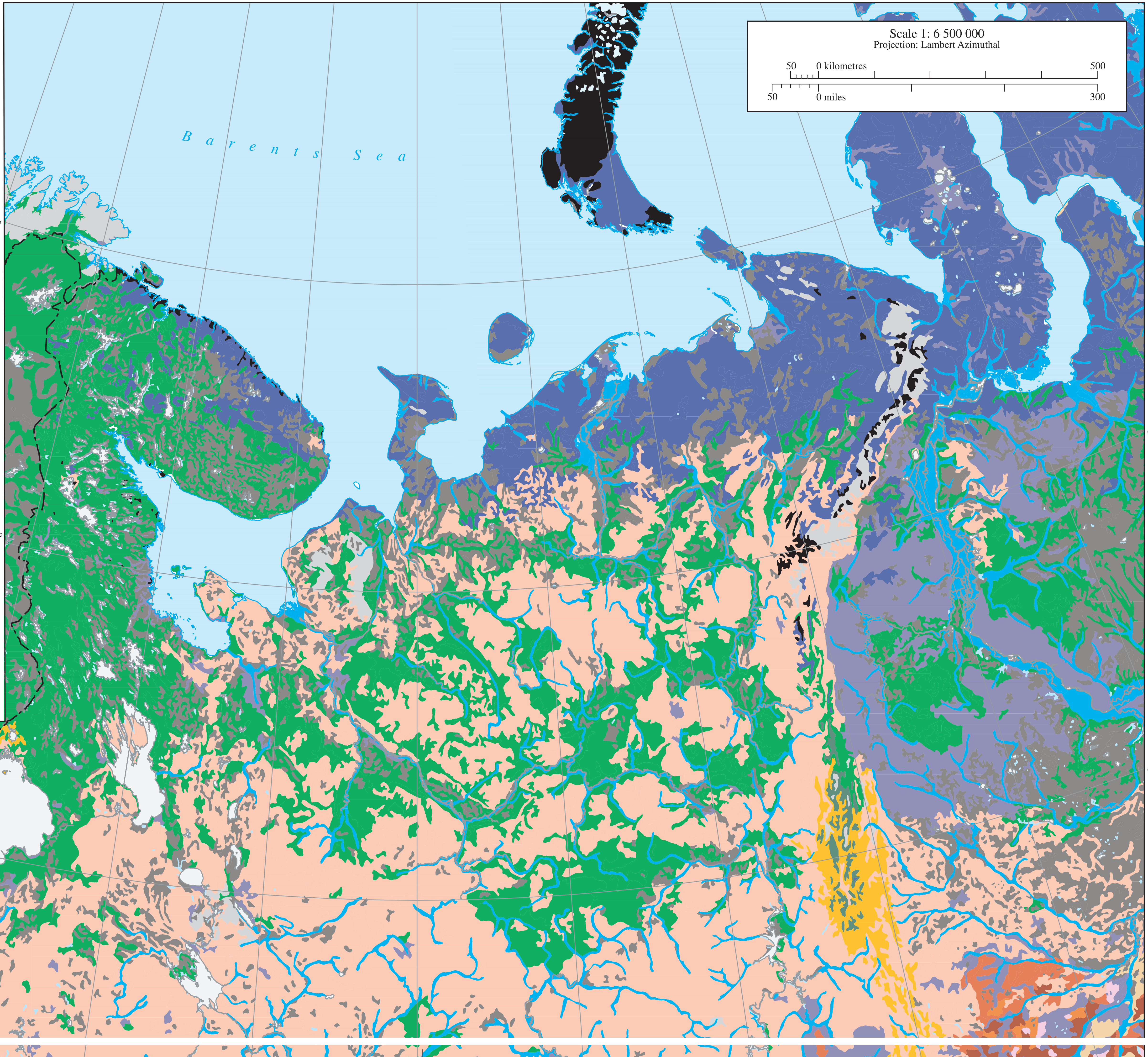

35°
40°
50°
45°
Sumy
Cherkasy
Kremenchuts'ka Vodoskhovyshche
Kremenchuk
Poltava
Kharkiv
Oleksandriya
Kirovohrad
Dniprodzerzhyns'k
DNIPROPETROVS'K
Kryvyy Rih
Zaporizhzhya
Nikopol'
Kakhovs'ke Vodoskhovyshche
Melitopol'
Mykolayiv
Kherson
Nova Kakhovka
Hola Prystan'
Skadovs'k
Krasnoperekops'k
Dzhankoy
Yevpatoriya
Saky
Simferopol'
Sevastopol'
Alushta
Feodosiya
Kerch
Berdyans'k
Mariupol'
Taganrog
ROSTOV-NA-DONU
Novocherkassk
Bataysk
Azov
Yeysk
Horlivka
DONETS'K
Makiyivka
Kramators'k
Slov'yans'k
Kostyantynivka
Lysychans'k
Syeverodonets'k
Luhans'k
Alchevs'k
Stakhanov
Krasnyy Luch
Shakhty
Novoshakhtinsk
Izyum
Valuyki
Staryy Oskil
Gubkin
Rossosh
Liski
Belgorod
Shostka
Hlukhiv
Klintsy
Krasnodar
Novorossiysk
Anapa
Gelendzhik
Timashevsk
Korenovsk
Tikhoretsk
Kropotkin
Ust'-Labinsk
Primorsko-Akhtarsk
Zernograd
Sea of Azov
Black Sea
Scale 1: 2 500 000
Projection: Lambert Azimuthal
25 0 kilometres 100 200
25 0 miles 50 100

The soil of Russia, as far as the Ural Mountains, is formed under the influence of a wide range of climates, which drive the formation of major natural zones: polar desert, tundra, boreal (called taiga) and temperate forests, steppe, semi-desert and deserts. Each natural zone has a specific bio-geochemical turnover of organic substances and essential nutrients that control major pedogenic processes and soil characteristics. The close dependence of soil on the zonality of natural factors is well-observed for many regions. However, it is particularly well expressed in the soils of European Russia, due to a uniformity of other soil-forming factors (e.g. the flat relief of the East-European plain and relative similarity of parent material). Soil zonality in European Russia is expressed by Cryosols and Regosols occupying the polar desert in the Spitzbergen Island with Gleysols and Histosols covering the tundra zone. Peat formation is limited in this zone because of the cold and shallow permafrost layer. Where warmer climates prevail, Podzols, Gleysols and deep Histosols form in the forest-tundra and the northern taiga zones. Albeluvisols, Podzols and deep Histosols dominate the Middle taiga zone, with Albeluvisols dominant in the southern taiga zone. Phaeozems and Chernozems occur in the temperate forest and meadow steppe. The latter has abundant grasses, which produce a large amount of root residue for humus formation. Kastanozems, in combination with Solonetz and Solonchaks, represent the soil of the dry steppe and semi-desert zones.

Gleysols occupy 16% (275 million ha) of the country. Shallow ground watertable or stagnating surface water causes a Gleyic horizon to form. Albeluvisols, formed from fine and medium textured parent rocks and showing Albic properties (E horizon) in the topsoil, cover about 15% (250 million ha) of the country. Albeluvisols are acid and are poor in plant available nutrients. These soils need organic and mineral fertilizers, liming and drainage if they are commonly wet. Podzols occupy nearly 22% (365 million ha) of the country and are formed from fluvio-glacial sands. They are acid, low in nutrients and unsatisfactory physical properties. The characteristics of Podzols make them vulnerable to any human-induced impacts, which limits their intensive use.

Chernozems, Phaeozems, Kastanozems cover less than 10% (164 million ha) of the country. These soils have a deep humus horizon and show an accumulation of secondary carbonates at different depths. The humus content in Chernozems varies from 3.5–5.5% and cation contents are high. Rich in plant available nutrients, Chernozems have few limitations for agriculture and can be intensively used.

A small area is occupied by the soil groups of a hot arid climate (i.e. Calcisols, Solonetz, Solonchaks). Together, these soils cover nearly 2% of the country but considerable improvements, including irrigation, leaching of toxic salt and drainage, are needed for productive agiculture. The land use structure of Russia comprises about 8% croplands, some 4% haylands and pastures. The rest is under forests (44%), grasses and shrubs (25%), bogs (12%), built up areas and badlands (8%). The total extent of land in Russia affected by soil degradation is estimated to be 243 million ha, which is nearly 15% of the country. About half of the degradation is caused by cultivation, which initiates a loss of organic matter and associated reduction in soil fertility. The loss of humus stimulates the destruction of soil aggregates and compaction. The latter accelerates runoff and reduces soil resistance to water and wind erosion, evident on about 25% of agricultural land. Pollution of agricultural soils is negligible due to the limited application of mineral fertilizers and pesticides.



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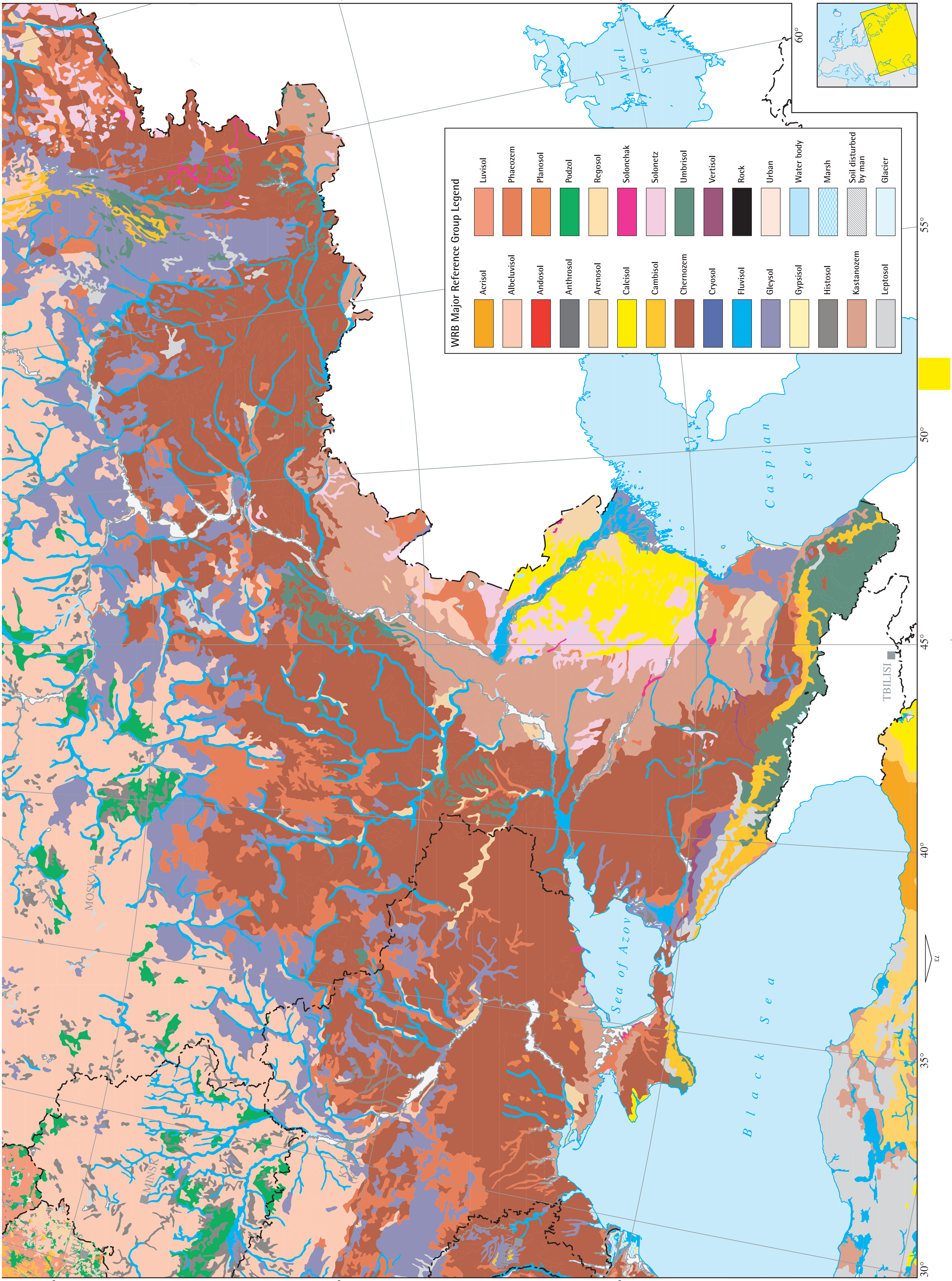
WRB Major Reference Group Legend
Acrisol
Albeluvisol
Andosol
Anthrosol
Arenosol
Calcisol
Cambisol
Chernozem
Cryosol
Fluvisol
Gleysol
Gypsisol
Histosol
Kastanozem
Leptosol
Luvisol
Phaeozem
Planosol
Podzol
Regosol
Solonchak
Solonetz
Umbrisol
Vertisol
Rock
Urban
Water body
Marsh
Soil disturbed by man
Glacier
Aral Sea
Caspian Sea
Sea of Azov
Black Sea
TBILISI
MOSKVA
MINSK
74
76
73