

The U.S.S.R.: a Geographical Survey

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PART ONE GENERAL SURVEY

CHAPTER I STRUCTURE AND RELIEF

AN understanding of the structure of the U.S.S.R. is fundamental to the understanding of its geographical and historical development.

The physical map of the Soviet Union (see Fig. 1) shows that the most outstanding feature of the country is the great Russian Plain, an extension eastward of the West European Plain, stretching as far east as the river Yenesei. Over this vast area only a few elevations rise to more than 1000 feet above sea-level, and, with the exception of the Urals, which divide the Plain into two parts, none of the elevations is mountainous in character. Although the Urals often rise to more than 3000 feet, the slopes are usually gentle, the surface of a plateau character, the passes low. Although they form a definite mountain range, they do not offer any great obstacle to movement from the East European section of the Plain to the West Siberian Lowland, its eastward extension.

The second striking physical feature of the Soviet Union is the presence of strong natural 'barrier frontiers' around the periphery of the Plain. To the south and east there are lofty mountains and plateaux. To the north there lies the Arctic Ocean, impenetrable until the opening of the Arctic sea-route a few years ago. Finally mention must be made of the rough, rocky land of Karelia, in the extreme north-west, along the Soviet-Finnish frontier, rising to more than 3000 feet above sea-level in the Khibin Mountains of the Kola Peninsula.

Thus essentially the U.S.S.R. consists of a vast plain, of generally rather low altitude, with mountains and highland [p18] around its edges. This plain provided the land within which the first Russian State was born, and over which it grew and expanded. The lack of any pronounced physical features which might have separated one part from another, and so enabled another rival State-nucleus to develop, also served to allow the expansion of the Russian State, without any natural obstacles, over very great areas, while the strong natural frontiers helped to shut off the Plain from the outside world during the period of that expansion.

Only on the west was there no strong natural frontier, and history records a continuous struggle throughout the centuries against neighbouring states in order to establish a permanent frontier where the East European Plain continues into Western Europe.

The great size of the Plain also made possible the development of large and long rivers. These were of the greatest importance to a country possessing such a vast land territory, and even today are valuable means of communication. Climatic factors have also been given an immense stage upon which to work, so that climatic regions are spread out on a grand scale across enormous areas. These in turn correspond closely to the major regions of national vegetation and to the major zones of soil, and since they extend from Arctic to sub-tropical latitudes, there are obvious and great possibilities for many diverse types of agricultural development. Near the junction of highland and plain there are important and varied mineral deposits.

It should now be clear that the Russian Plain is of more than mere academic significance.

The Russian and Central Siberian Platforms

The Russian Plain is divided by the Urals into the East European Plain and the West Siberian Lowland (see Fig. 2).

[p20] The latter extends from the Urals to the river Yenesei, while between this river and the river Lena lies the Central Siberian Plateau.

Underlying the sedimentary rocks of which the East European Plain and the Central Siberian Plateau are composed, and probably also deep beneath the West Siberian Lowland, there is a great thickness of ancient crystalline rocks, which form rigid blocks of the earth's crust. They are composed of rocks belonging to the Archrean period, denuded and metamorphosed in ancient times. Since Archrean times these blocks have remained resistant to the processes of folding and mountain-building, which have caused only slight bending and cracking, faulting, and vertical movements, so that in general the sedimentary rocks deposited upon them

have remained more or less undisturbed and almost horizontal.

These ancient rigid regions of the earth's crust have been named 'continental platforms.' The platform upon which rests the Central Siberian Plateau was covered with marine sedimentary deposits during the Palaeozoic period. Then the land was raised up *en masse*, and subsequently faulted and dislocated, eroded and dissected, by weathering and river action, so that today it has a mountainous surface. The platform underlying the East European Plain, however, was covered entirely or in part by the sea many times, while during the periods between the transgressions it was raised up and became dry land, or was covered with areas of shallow water. Thus we can find today sedimentary deposits ranging from the Silurian to the Tertiary periods. When it was finally raised above the level of the sea and assumed its present continental form at the beginning of the Quaternary period it was not elevated to a great height, and this fact, together with the relatively recent elevation, accounts for the small amount of dissection and erosion which has taken place, as compared with the Central Siberian Plateau.

Between the two platforms was a geosyncline, in which sedimentary deposits were laid down from very early times until after the Tertiary period. Even after the Quaternary Glaciation marine deposits were formed in the northern part.

[p22] When eventually the land was raised above sea-level its elevation was relatively slight, so that today the West Siberian Lowland remains as the lowest section of the Russian Plain, with the exception of the depression around the shores of the Caspian Sea. Its low level has prevented the occurrence of any considerable amount of dissection due to river-action or weathering, and it is one of the most extensive level areas of the earth's surface. Towards the south-east it is continued in the Turan Lowland, around the Aral Sea. This area was part of the bed of the sea which extended westward and embraced both the Black Sea and the Caspian Sea until the end of the Tertiary period.

The Ancient Crystalline Shields and Elevations in The Ancient Platforms

It has been established that the thickness of sedimentary deposits laid down upon the ancient platforms reaches several thousand feet, and it is clear that marine deposits of such a thickness could only accumulate, without filling the sea basin, if there was a simultaneous downfolding of the sea floor.

A cross-section of the East European Plain (see Fig. 3) shows that there is in fact an extensive downfolding of the platform, and where the outer rim of the geosyncline reaches the surface the outcrops of ancient crystalline rocks, exposed or thinly covered by sedimentary deposits, are called 'shields.' They are often considerably faulted and dislocated.

In the East European Plain two such formations are found:

- (1) A portion of the Baltic Shield, in Karelia.
- (2) The Podolsk-Azov Shield (see Fig. 4).

Similar outcrops occur along the southern edge of the Central Siberian Plateau (see Fig. 2). They form mountainous country extending to the north-east from Lake Baikal towards the Okhotsk Sea.

Faulting in the Karelian Shield has had a considerable effect upon the relief. The Gulf of Finland, the strait between [p23] the Barents Sea and the White Sea, as well as Lakes Onega and Ladoga, are all bounded by major lines of faulting.

The ancient crystalline rocks are fully exposed in Karelia, forming a smooth, low massif, composed mainly of rocks such as granite and gneiss, and almost devoid of soil cover in many [Fig. 3.] areas. The average height is from 300 to 1300 feet. In the north high altitudes are reached in the Khibin Mountains and the Lovozerski Massif, which rise to over 4000 feet. The landscape in the Kola Peninsula is one of smooth, rounded elevations, while farther south the ancient rocks form a low plateau, covered with later glacial deposits.

The ancient crystalline rocks, devoid of soil, together with the boulders and other glacial deposits which cover so much of Central and Southern Karelia (see p. 30) make agriculture [p24] extremely difficult. Thus, until recently, fishing, lumbering, and hunting were the main human occupations.

The discovery of minerals in the Khibin Mountains, however, has led to the establishment of industry in these northern latitudes, and the development of specialized forms of agriculture to supply the industrial workers with food (see p. 274).

The Podolsk-Azov Shield (see Fig. 4) is also composed of granite, gneiss, and schists, usually covered with Tertiary deposits and loess. Only a portion is exposed, mainly west of the river Dnieper, where the Podolsk Plateau has an elevation of from 600 feet to a little more than 1000 feet above sea-level. It slopes gently towards

the south-east. The central and eastern parts of the plateau are dissected by numerous valleys, with steep sides, and where the Dnieper crosses the hard rocks of the shield rapids occur.

Apart from these outcrops, the rocks of the platform come near to the surface in other parts of the East European Plain, owing to faulting and fracturing. The rocks have been raised up to form horsts or have subsided and form graben. In some cases the dislocation took place in pre-Cambrian times, in others it occurred in geological periods varying from the Palaeozoic to the Tertiary and Quaternary periods. In the following cases they exert some influence upon the contemporary relief: the Kursk-Voronezh Horst, running in a direction from north-west to south-east, across the Central Russian Upland; the Ufa Plateau, on the western flanks of the Central Urals; the Stavropol Plateau, on the northern edge of the pre-Caucasian region; the Ust-Urt Plateau, between the Caspian Sea and the Sea of Aral, and the Pwilkova Hills, to the south of Pechora Bay (between the mouth of the Pechora and the Urals).

The downfold of the ancient platform is responsible for the formation of the Moscow basin. Reference to Fig. 3 will show that this geosyncline is limited by the Kursk-Voronezh Horst, while the latter forms the northern edge of a region of faulting in the ancient rocks, which has let down the over-lying strata to form the Donetz basin. This was a gulf of [p26] the great Carboniferous sea which extended from the Arctic to the Caspian Sea. The Carboniferous strata include the Donetz coal-measures and the brown coal of the Moscow basin. The southern edge has been uplifted, and folding and dislocation in the Hercynian period of mountain-building produced the Donetz Heights, continued south-eastward, and revealed again in the heights of Mangyshlack, on the eastern side of the Caspian Sea.

The Donetz Heights rise to over 1000 feet, and are composed of faulted and folded rocks of the Carboniferous period, with some schists and rocks of the Permian and Mesozoic periods in the north-west. Beneath these formations lie ancient rocks which form an extension of the eastern part of the Podolsk-Azov Shield. The erosive action of streams has dissected the land to a great extent, providing a very varied landscape of river valleys and undulating relief.

Tectonic movements were also responsible for the formation of the Central Russian Upland, a plateau sloping gently upward from the Dnieper lowland and ending with a steep escarpment overlooking the Don lowland. Owing to its gentle slope it does not break the continuity of the Plain, although it rises to a height of 900 feet and more. Broad, mature valleys vary the monotony, and this accounts for the common description of the East European Plain: that it appears monotonous or undulating from the higher parts, but hilly from the valleys.

In addition to the Podolsk Plateau and the Central Russian Upland, there is another elevation of tectonic origin: the pre-Volga Heights, a plateau sloping gently from the Don valley and falling steeply to the valley of the Volga.

Deep borings have revealed other variations in the surface of the platform, which have a limited effect upon the relief. The anticlinal upswellings are shown in Fig. 4.

Finally, tectonic dislocation which occurred during the periods of mountain-building brought ancient rocks up to or near the surface in the Urals, the Caucasus, and in the mountains of Siberia and Central Asia.

Just as the exposure of ancient rocks described above occurs [p27] mainly around the edges of the Russian Plain, the mountains also were formed on its periphery.

The Formation of the Russian Plain

The East European Section

We have already described how the whole of the Russian Plain, based on rigid crystalline rocks, was not affected to any great or appreciable extent by folding. Thus the epeirogenic movements which lifted the land vertically, or depressed it, merely allowed marine transgressions to cover the old rocks with sedimentary deposits which have remained practically horizontal and so have brought about the creation of the Plain.

The Central Siberian Plateau became dry land in very early times, while the East European Plain was finally raised up only in Quaternary times. The Black Sea-Caspian Sea depression was for a very long period part of a great Southern Ocean which included the present Mediterranean Sea, from which the Black and Caspian Seas, at first a single sea, were separated in the Tertiary period. The final separation of the two latter seas took place towards the end of the Tertiary period, when the land surface of the U.S.S.R. began to assume a shape substantially similar to that which it has today.

During the Quaternary period the surface of the East European Plain was subjected to a whole range of geological processes which determined many of the present details of relief, and the river net as we know it today was created. The most important event, and one which has profoundly influenced the geography of the

Soviet Union, probably more than any other geological phenomenon, was the Quaternary Glaciation.

Glaciation also occurred in the Siberian section of the Plain, but owing to its special and peculiar features, that will be dealt with separately.

During the Great Ice Age there were at least three glacial periods during which the ice-sheets advanced. In the inter- [p28] glacial periods the ice receded, leaving the land-surface free. (See Fig. 6.)

On this basis, therefore, the Russian geologist Yakovlev divides the East European Plain as follows:

- (a) Those areas which were covered by the ice-sheets.
 - (1) Regions where the effects of 'Ice-ploughing' were predominant.
 - (2) Regions where the effect of the ice was chiefly the deposition of sedimentary materials.
- (b) Those areas which were not covered by the ice, but were affected by fluvio-glacial and other deposits of glacial origin.

Areas Which were Covered by The Ice-Sheets

(1) Regions where the Effects of Ice-ploughing were Predominant.

These regions lie on or close to the centres from which the Quaternary ice-sheets moved out. These centres were Scandinavia, Northern Karelia, Novaya Zemlya, and the Northern Urals.

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(2) Regions where the Effect of the Ice was chiefly the Deposition of Alluvial and Sedimentary Matter.

As the ice moved towards the south and south-east it met an obstacle – the Central Russian Upland. It was not able to proceed over this any farther than Bryansk. It was then forced to divide into two tongues, one moving down the Dnieper valley and the other along the Don valley.

At the same time another extension of the ice moved east-ward from Scandinavia, and joined the ice moving south from Novaya Zemlya to the South Urals. The combined ice-sheet then moved eastward towards Perm.

The North-central Section of the East European Plain

Everywhere the ice was moving over relatively soft rocks, with a level surface, offering little resistance to its passage, so that no great hollows were gouged out. Hence the main action of the ice was confined to creating moraines and laying down fluvio-glacial deposits. During the inter-glacial periods the waters from the thawing ice tended to destroy the moraines and bury them under alluvial material which was washed out by the glacial streams.

Hence east of a line running from Smolensk to Vologda, the landscape consists of large plains, formed from fluvio-glacial deposit, together with the remnants of morainic chains.

The most important of the moraines run in two lines across the north centre of the Plain, one extending from the Valdai Hills (from 900 to 1000 feet high) towards the north-east and south-west. This is a very important water-divide from which flow the great rivers to the north, north-west, south, and south-east. The low watersheds separating the upper courses of the rivers made this region ideal for the establishment of portages, and in the early history of Russia the small Moscow State, situated at a point from which these portages could be controlled, was able to control the entire transport system of the East European Plain. The second chain of morainic hills, running from Smolensk to Moscow and thence in a north-easterly direction towards the Urals, is not so well preserved.

[p32] But these moraines are relatively minor features in comparison with those farther to the north-west, described below.

The Great Baltic Terminal Moraine Zone

This stretches along the western side of a line commencing in Northern Poland and proceeding through Smolensk, Vologda, and farther, north-eastward towards the Timan Mountains.

There are three main lines of low hills in this zone running more or less parallel to each other and corresponding to the three glacial advances. The total width varies from 60 to 180 miles, and in the lowlands between the moraines are shallow lakes, the result of the poorly developed river net and the level surface.

These ridges are of the greatest importance. Raised above the low marshy country which separates them, the clay soil is richer and warmer and more suitable for agriculture than on the lowlands. Villages and hamlets tend

to be concentrated along the ridges, while a number of towns occupy strategic positions upon them. Even the modern road and railway net is strongly influenced by these hills, as can be seen from the prevailing direction of lines of communication—from south-west to north-east. The Great Terminal Moraine zone also forms the watershed between the rivers flowing to the north and north-west on the one hand, and to the south and south-east on the other.

Lake Deposits of the North-western and Northern Parts of the East European Plain

As the melting ice receded its edge fell back to the west of the watershed mentioned above, compelling the waters from the rivers and from the melting ice-sheet to concentrate in vast lakes which eventually found outlets in the Baltic and White Seas, leaving only remnants of the lakes visible today, but also leaving great areas of old lake-beds-level plains, covered with lake deposits.

These plains are found in a wide zone extending from the [p33] White Sea to the Baltic, through the Baltic republics of Estonia, Latvia, and Lithuania. Moraines, boulders, drumlins, etc., bring a little variety to the landscape; but these features are definitely subordinate to the plains. The flat surface and the immature drainage system have combined to produce many peat-bogs and marshes, especially in the North Dvina and Pechora basins, and near Leningrad and the southern shores of Lake Ladoga.

The ice-sheet centred on the North Urals, which also left behind a number of morainic hills and ridges during its retreat, combined with the Scandinavian ice to form one great sheet. This held up the waters of the Dvina and Pechora basins, and at one period the North Dvina drained into the Volga system to the south. The waters of these two rivers formed large lakes, divided into basins by the Timan Range.

The east-west direction of some parts of the courses of the rivers is due to the fact that they were compelled to run along the edge of the retreating ice. When eventually the Scandinavian and Urals ice-sheets, during the course of their retreat, split apart, the Pechora river was able to find a way out towards the north. Later the North Dvina made its way along the edges of the Scandinavian ice, through the lower Pinega valley, and then northward into the sea along the Kuloi valley. It established its present river-mouth at a later stage.

Many peculiarities of the river net in the north of the Plain can be traced back to the end of the Great Ice Age. For example, extensive terrace formations and alluvial deposits mark the course of former river-beds.

The lake deposits have formed vast level plains between the upper courses of the rivers, of great value in the establishment of portages between the streams. Moraines are not strongly developed on these plains.

Southern and Central Plains of Fluvio-glacial Sands and Clay Deposits

In Western Europe, during the Great Ice Age, the rivers which flowed northward from the Alps and the Carpathians [p34] were compelled, when they met the edge of the ice-sheet, to turn to the west and flow into the North Sea. These rivers received a great many tributaries from the edge of the melting ice, and carried so much water that they were able to create very large valleys. Farther east, for the same reason, the Dnieper, Don, and Volga also created wide valleys in their course towards the Black Sea-Caspian Sea depression.

The great weight of the ice which penetrated to the south in two great tongues along the Don and Dnieper valleys caused a caving in of the surface, and formed large depressions into which the surface waters flowed. As the ice melted and retreated these depressions received great quantities of water, and finally they were left as extensive lowlands, plains covered with great thicknesses of alluvial sands or clays, with a poorly developed river net, and containing large areas of marsh. The Pripet Marshes form the most outstanding example. They are connected to another lowland, representing a dried-out marsh, stretching for more than a hundred miles to the east of the Dnieper, above the rapids at Dnepropetrovsk.

The moraines in these plains have been partly washed out by running water, and partly covered over by alluvial deposition, so that only scraps remain, broken, low hills, running from south-west to north-east.

There is an interrupted zone of these sandy and alluvial plains all along the edge of the retreating ice (named "Polyessie" in the valleys of the Desna and other tributaries of the Dnieper in the Northern Ukraine), on one side of the Central Russian Upland. On the other side is the Oka-Klyazma region, stretching eastward from Moscow, while to the south there is a similar lowland in the Don valley. Two others lie to the north-west and south-east of the Oka-Klyazma region respectively, the former north of Rybinsk and the latter to the east of the Vetluga river. All of them are similar in formation, but were formed at different periods of ice-regression. For this reason the older plains are dried out, and have developed well-defined river systems, while the younger ones are badly drained, and during the spring floods are inundated, forming immense lakes, very similar in appearance [p35] to their condition during the later stages of the glacial period.

Between these lowlands, lying parallel to and south of the Great Terminal Moraine zone, there are large areas

covered with clays, probably deposited by waters from the melting ice which were compelled to spread out owing to difficulty in finding an outlet. The clay surface is slightly undulating, and much subjected to the effects of gully formation. In many districts the clays have been washed out by the water, and reformed as diluvial deposits, rich in mineral substances and salts favourable to plant growth, making good soil and so forming areas particularly suitable for agriculture.

Generally speaking, the effect of the practically horizontal nature of the underlying rocks in the northern and central portion of the East European Plain, combined with the widespread deposits of glacial material, has been to produce a remarkable uniformity of surface soils over vast areas, particularly suitable for large-scale farming. On the other hand, the cold, damp, poorly drained glacial soils have combined with climatic factors to limit the variety of crops. Rye and flax were for long the main cultivated crops.

(B) Regions Not Covered by the Ice-Sheets

The Loess Plains and Plateaux of South Russia

These are regions which lay outside the area of glacial cover, but which have had their surfaces covered by loess deposits of glacial origin. They occupy the broad valleys of the south-flowing rivers and the elevations between them.

It is evident that the loess was formed at the same time as the moraines, since humus layers found in the loess indicate that soil-forming processes were at work during the interglacial periods, and that there were two or three such periods.

Towards the north the loess becomes closely connected with the clays and fluvio-glacial deposits described above. East of a line joining the 'elbow' of the river Don with the watershed between the upper Don and the upper Dnieper, the loess gives way to loessic clays. [p36]

Generally speaking, the loess simply cloaks the underlying relief, following its contours fairly closely. On the higher ground, however, as in the case of the Donetsk Heights and the Azov-Podolsk Shield, the cover becomes thin or is entirely absent. The loess has produced some levelling, however, and there are vast expanses of gently undulating land, where the main features of relief are steep-sided gullies and ravines, worn out by the action of rains and snows. The porous structure of the loess does not permit the accumulation of water on or near the surface. Hence marshes and bogs are never found, and since the rivers are of ancient origin they form a well-defined system, possessing broad valleys, and extensive catchment areas. The left banks of the southward flowing streams have gentle slopes, while the land falls abruptly down to the rivers on the right banks. According to one current theory, this is due to river erosion, caused by the direction of the earth's rotation.

Both the physical properties of the loess—friability, porosity, permeability, absorption, and easy aeration—and the rich mineral content make it an ideal basis for the formation of soil. Hence these areas possess the rich chernozem black soils—soils which have been cultivated for centuries and still yield rich harvests, showing little evidence of exhaustion.

The origin of loess is not completely understood. In the Soviet Union, where extensive study has been made of it, there are still a number of conflicting theories. The most acceptable theory is that it is a wind-borne, or aeolian, deposit carried from the glacial clays left behind at the edge of the retreating ice and dried out into dust under conditions of desert climate.

The Lands along the Volga

The Middle Volga.

This region includes the land on either side of the river Volga, between Kazan and Saratov.

Along the entire course of the middle Volga the most outstanding feature of relief is formed by the pre-Volga Heights, stretching meridionally along the right bank, and representing a strongly dissected and gullied plateau, formed [p37] by tectonic dislocation and constructed chiefly of Permian, Jurassic, Cretaceous, and Tertiary strata. The surface became dry land and was reduced to a peneplain in Tertiary times. It was then uplifted so that a new stage of erosion commenced, and the present system of valleys was produced.

On the west the land slopes gently down towards the Don. But overlooking the Volga, the edge of the plateau is steep, often cliff-like in appearance.

The northern and lowest part, ranging in height from 490 to 520 feet, is cut up by valleys formed by glacial streams, originally flowing to a great lake depression above Kazan. These valleys are filled with sandy deposits. The Volga valley above Kazan, with its high and rather steep sides, seems to be of very recent origin. In glacial times there must have been a barrier stopping the outflow of water from the great lake depression formed along

the edge of the ice-sheet. The ridge of the Dzhiguli Heights, hills composed of Carboniferous and Permian strata, presented the obstacle. Today the Volga flows for some distance along the edge of the ridge, at its foot, in a west to east direction, and finally breaks through at the "Samara Gates" (at Kuibishev). West of the Gates, however, there are traces of an older pre-glacial valley, between Ulyanovsk and Syzran, along which the Volga flowed until, probably, the last inter-glacial period.

South of Kazan the pre-Volga Heights rise to 800 feet in the latitude of Ulyanovsk, and to about 1700 feet between Syzran and Saratov.

On the opposite bank there is a large expanse of plain, covered by a thick sheet of clay, strongly dissected and gullied, and stretching eastward to the Obschey Syrt Rills, a continuation of the Urals. The clays are yellow-grey in colour, compact and unstratified, containing a high percentage of lime. They often resemble loess in appearance, especially on the steep sides of gullies or ravines. They are thought to be the diluvial products of the weathering of chalk or limestone over a very long period.

Towards the north of this plain another physical region commences – the northern trans-Volga region. [p8] This area, including the Tartar Republic, the Bashkir Republic, and part of the Urals region, was dry land from Tertiary times, subject to the action of weathering and river-erosion. Consequently there is a well-developed river system, with wide valleys, such as those of the Kama, Belaya, and Ufa rivers. A mantle of thick clays, similar to loess in appearance, but not porous, often cut by gullies and ravines, covers over and levels out the unevenness of the older relief to a great extent, although underlying rocks are exposed in some places.

These clays are the product of the weathering of the sedimentary rocks which lie underneath them. Tiny particles of such weathered rock were gradually transferred down the slopes of the older relief, gradually filling in the depressions, and thus creating the contemporary plain. These diluvial clays, in common with loess, form the basis of fertile soils – not quite so fertile as loess, however.

The Lower Volga.

On the right bank of the Lower Volga the pre-Volga Heights are continued towards the south in the Ergeni Heights, which finally slope down to the pre-Caspian Lowland, much of which is below sea-level.

Near Saratov the pre-Volga Heights reach an altitude of more than 800 feet above sea-level. But a depression occurs at the point where the Don and the Volga come close together, and here the height falls to 325 feet, again rising, south of Stalingrad, to from 490 to 620 feet, and maintaining this elevation in the Ergeni Hills as far as the Manych depression. On the southern side of this depression, there is the Stavropol plateau, a Horst formation of the pre-Caucasus.

East of the Volga, the vast, level pre-Caspian Lowland extends to the Obschey Syrt, Mugodzhzar, and Guberski Hills. In the south, approaching the Caspian Sea, the lowest parts reach almost 85 feet below sea-level. In the south-east the land rises above sea-level in the Ust-Urt Plateau.

This great low plain, the pre-Caspian Lowland, was for a considerable period, at the end of the Tertiary and during Quaternary times, the floor of a large sea, upon which a great accumulation of marine sediments occurred-thick [p39] horizontal layers of clays and sands, which have been responsible for the exceedingly level surface that we see today.

The soils are saline, and therefore can support very little plant life, so that there is an absence of humus or plant cover to protect the surface. Hence the wind is able to break it up, carrying it away in the form of tiny sandy particles, which form moving and stationary dunes, such as are to be observed covering a great area of the coastal regions bordering upon the Caspian Sea.

Conclusion

Major Relief Regions of the East European Plain

It will be gathered from the preceding description that the East European Plain is not of a completely monotonous character. The variations in relief may be summarized as follows (see Fig. 6):

(i) *The Glacial Lowland and Moraines of Karelia.* In the extreme north-west of the U.S.S.R. Karelia forms an area of low elevation, comprising a part of the Baltic shield. The ancient rocks have been laid bare, and often gouged into hollows, occupied by lakes, by the ploughing action of the ice. There are also two important lines of terminal moraines. Marine deposits have created large areas of level country, in which extensive peat-bogs and marshes have developed. The Khibin Mountains form the most outstanding heights.

(ii) *The Morainic, Fluvio-glacial, and Lake-bed Plains.* South and east of Karelia stretches the Great Baltic Terminal Moraine Zone, with extensive plains (the beds of old lakes), lying to the west of the long lines of

morainic hills, and tracts of flat marshy country lying between them.

To the south there are great plains of fluvio-glacial and lake deposits, comprising a great deal of sand.

(iii) *The Depressions of the Upper Don and Dnieper, and Volga.* These are low-lying plains covered with much alluvial material and having wide areas of marsh. Low, broken remnants of moraines are visible in places.

(iv) *The Southern Plains, with River Valley and Gully Variation.* Outside the limit of Quaternary glaciation fluvio-glacial [p40] and loess formations, together with deposits caused by the weathering and erosion of the sedimentary rocks, have masked the older relief forms to some extent and accentuated the plain relief of the country.

There are gentle upswellings of the surface between the main rivers, rising gradually to plateaux varying from 600 to 1000 feet in height. But they do not break the plain, and have steep slopes only where they overlook the western banks of the rivers. These elevations are the Podolsk Plateau, the Central Russian Upland, and the pre-Volga Heights. The mature river system has worn broad, deep, gently sloping valleys into these elevations. On the other hand, the loess and clay cover, especially on the plateau surface, is often broken by gullies and ravine-like formations. In the south the Donetz Heights rise to a height of 1000 feet. The higher parts present a plateau surface, gently undulating, while the numerous valleys create a varied landscape.

(v) *The Caspian-Kuban Depression.* This lowland, a monotonous and level plain, lies on the ancient bed of the Caspian Sea and is connected with the shores of the Black Sea by the Manych depression, itself an old gulf which formerly connected the two seas. The level plains are covered with great depths of alluvial material and some loess.

The Siberian and Central Asiatic Lowlands

The Siberian and Central Asiatic Lowlands may be divided as follows:

- (a) The West Asiatic Lowland:
 - (1) The West Siberian Lowland.
 - (2) The Turgai Plateau.
 - (3) The Turkestan or Turansk Lowland
 - (4) The Ust-Urt Plateau.
- (b) The North Siberian Lowland and the Kolyma depression.

[p42] (a) *The West Asiatic Lowland*

(1) *The West Siberian Lowland.* This is one of the largest level areas of the earth's surface. Its breadth, between the Urals and the river Yenessei, is about 1250 miles ...

... Throughout the greater part of this lowland there is nothing to break the monotony of the landscape. The Trans-Siberian Railway runs across it for hundreds of miles in an absolutely straight line.

...

The Urals.

During the Carboniferous period the Ural-Tian Shan geosyncline, which had been covered by the Devonian sea, became the arena of the Hercynian mountain-building process. The crust of the earth was folded against the eastern edge of the platform upon which rested the East European Plain, forming the Ural Mountains. This system runs in a general north-south direction for about 1500 miles. The folding process, strongest in the upper Carboniferous period, was brought about by pressure from the east. This resulted in greater fracturing and dislocation on the eastern slopes, which rise more steeply from the plain than in the west. For the same reason the eastern slopes display many igneous and metamorphic intrusions, while sedimentary rocks, crushed between the folds, often appear as 'islands'.

The Permian sea, much narrower than the Carboniferous sea, and covering only the eastern part of the East European Plain, gradually dried. The extensive Permian sandstones which cover much of the western slopes of the Urals contain valuable deposits of rock salt, potassium salt, and copper ores.

Since the Carboniferous period the Urals have been subjected to continuous denudation which rounded off the heights and exposed mineral deposits. Hard crystalline rocks are most prevalent in the north, so it is here that the highest part of the range is found. The extreme northern part is narrow, and broken by transverse valleys, but south of the Arctic Circle it broadens out and consists of several parallel ranges, two of which have peaks over

5000 feet high. In the northern half of the Urals, which was subject to the Quaternary glaciation, glacial valleys of the Alpine type are common. [p53]

The Central Urals were less resistant, and several of the original upfolds have disappeared. The highest point attains an elevation of only 2600 feet above sea-level. Gently rounded contours characterize this section, which varies in width from 12 to 20 miles, but is no barrier to movement, as passes are low. With the intrusive rocks which are common in the eastern slopes of the Central Urals are associated large deposits of iron, copper, chrome, gold, platinum, etc. Farther east, where sedimentary rocks are more prevalent, coal, oil, potassium salts, and phosphates are the most important minerals.

Several parallel ridges appear in the Southern Urals. All have been extensively eroded, except the westerly range, which is composed of harder material and attains 5000 feet. South of 52° N., this higher land gradually gives way to low, undulating country covered with material of relatively recent origin, chiefly Quaternary loess and clays, and traversed by the Guberlinski, Mugodzhaz, and other low ranges, generally broken into a number of separate hills, below 2000 feet.

...

The Caucasus and the Crimea

The Caucasus

The Caucasian mountain system forms a bridge some 750 miles long between the Black Sea and the Caspian Sea. It may be divided as follows:

The Pre-Caucasus Upland. This upland region rises gently from the south of the Manych depression and runs parallel to the main range of the Great Caucasus. The highest part of the elevation is the Stavropol Plateau (1950 to 2600 feet).

The Pre-Caucasus Depression. This depression lies between the pre-Caucasus elevation and the foothills of the Great Caucasus. It is a geosynclinal downfold, interrupted towards its western end by an elevation caused by tectonic dislocation, which seems to have run from the Ergeni Hills through the Stavropol Plateau to Mount Elbruz. This elevation divides the depression into the Kuban basin on the west and the Terek basin on the east. These basins have level floors, covered by Quaternary deposits.

The Great Caucasus. The main mountain system consists of a number of ranges, some parallel to each other and some transverse, with heights varying between 9000 and 12,000 feet.

The greatest heights are attained in the central range, which is composed of hard crystalline and metamorphic material, [p58] while to the east and west softer rocks, especially limestones, prevail. Eleven peaks exceed Mont Blanc in height. The two most outstanding, Mount Elbruz (18,470 feet), of volcanic origin, and Kazbek (16,146 feet), lie to the north of the central ranges. Near Mount Elbruz is the widest part of the Caucasian mountains – about 100 miles from north to south.

The region of permanent snow begins at an altitude of between 8000 and 11,700 feet, and it is here that the great Dikh-Su Glacier lies – more than 9 miles in length. The snow and ice of the main Caucasian ranges feed a number of powerful rivers, of great value as sources of hydro-electric power. In the period of mountain folding, when these ranges were formed, magmatic intrusions played an important role, and are responsible for the presence of such minerals as zinc, gold, silver, molybdenum, wolfram, etc.

The sedimentary rocks which flank the main Caucasian ranges to the north contain oil-bearing strata, while the manganese ore of the Chiaturi district is of sedimentary origin.

To the south of the main ranges there are two important regions of tectonic subsidence, the depression of the Rion valley on the west, and the Kura-Arax depression on the east, running down to the Black Sea and Caspian Sea respectively. These lowlands are separated from each other by the Suran Range, which also connects the Great Caucasus with the Little Caucasus, a mountainous country lying between the depressions named above and the Soviet frontier with Turkey and Iran. The eastern end overlooks the Arax valley, a southern extension of the Kura depression.

Towards the south-west, the Little Caucasus joins an extension of the Armenian mountains and plateaux. The plateau landscape of Armenia is in some parts reminiscent of the Kuban steppe – open, level country, frequently dissected by ravines. In this region there are many examples of the volcanic action usually associated with the Alpine mountain-building process. The mountains consist of parallel and intersecting ranges, with closed or interlocking circular valleys, crater-like in appearance, the hollows often being occupied [p59] by lakes. The average height of the plateaux is from 5000 to 7000 feet. The highest point, the two-headed volcanic mountain, Mount Ararat (16,920 feet), lies in Turkey.

Stretching across an historic land route between Europe and the East, the Caucasus has been the scene of many violent battles in the past, while the mountain valleys, shut off from one another by the surrounding heights, favoured the development of numerous small isolated mountain communities, each with its own national territory, customs, traditions, and language.

The Crimea

The Crimea is a region which was folded in ancient times, reduced to a peneplain, submerged under the sea, and raised and folded again in Tertiary times.

Stretching across the southern part of the Crimean Peninsula, for a distance of about 65 miles, the width of the mountain zone is approximately 20 miles.

There are three parallel ridges, the Yaila ridge in the south being the highest. The top of this ridge is flat or slightly undulating, and is composed of calcareous strata of the Jurassic period. There is an abundance of karst formation: numerous steep-sided valleys, pot-holes, and disappearing streams. The surface is dry, and covered with a thin steppe vegetation. ('Yaila' is a Tartar word, meaning 'pasture'. The highest parts of the ridge reach 4500 to 5000 feet above sea-level.

On the southern side there is an abrupt fall to a shelf, lying about 1500 feet above the sea.

The northern slopes of this ridge are more gentle, falling gradually into a valley nine to twelve miles wide, filled with Cretaceous sands and clays. To the north of the valley, the second range rises to a height of between 1450 and 1850 feet above sea-level. It is composed of cretaceous strata, covered with limestone of the lower Tertiary period. Hewn out of the limestone are thousands of caves which were the homes of the first primitive inhabitants of the Crimea. Owing to the existence of numerous longitudinal and transverse valleys, [p60] this ridge is characterized by several separate heights, often worn into fanciful shapes.

Separating these mountains from the most northerly ridge, there is a valley, less than three miles in width. It is followed by the road and railway from Sevastopol.

The northern ridge (500-800 feet) unites in the east, near Simferopol, with the central ridge. It is composed of limestone strata.

The extreme south-western end of the Crimean Mountains is cut off sharply by the sea. The eastern extremity, in the north-east of the Kerch Peninsula, forms rather low hills, which in turn are continued across the Kerch Strait in the western foothills of the Great Caucasus. The Crimean Mountains, mainly composed of young sedimentary strata with no intrusive material, contain little mineral wealth, apart from the Kerch iron deposits (of sedimentary origin).

The mountains are of importance, however, owing to the fact that, like the Caucasian ranges on the eastern shores of the Black Sea, they protect the coastal lands from the cold winter winds from the Russian Plain. Hence the climate is mild and both the Crime and eastern shores of the Black Sea are famous for their health and pleasure resorts.

The mountains of the Alpine system offer a sharp contrast to those formed in earlier periods. The Alpine folded mountains have not been subject to denudation and erosion for such a long period. Consequently much more of the sharp features of their original relief remain – high crests, sharply defined peaks, steep-sided valleys, and so on. On the other hand, since the mountains have not been worn down to a great extent, there is not a great abundance of mineral wealth exposed near to the surface. Minerals which are found are in relatively small quantities but usually of great value (*e.g.*, gold, zinc, lead, and rare metals).

In the Caucasus, for example, minerals are confined mainly to those areas, limited in extent, where folding and subsequent erosion have exposed the older strata and magmatic intrusions [p61] which lie beneath the younger rocks. The one great exception is, of course, petroleum, found on the flanks of the mountains in Mesozoic and Tertiary deposits. The lack of minerals is, however, compensated to some extent by the great resources of hydro-electric power available in a region where the mountains are high, the river system young, and the valley gradients steep, while the Caucasus also contains valuable forests and Alpine pastures.

The mountains of the older systems, in contrast, usually have rather low elevations, with softer contours, rounded heights, smooth slopes, the mountain tops considerably flattened by denudation. Valleys are broad arid wide, typical of a mature river system. Hence, the older mountains do not usually present such a great obstacle to communications as those of the Alpine period. They are also rich in mineral wealth. Owing to long periods of denudation, large deposits of valuable minerals, particularly coal and iron, are exposed near the surface.

The Rivers of the U.S.S.R.

A country possessing a vast land-territory is indeed fortunate if, within that territory, there is a good system of navigable waterways. The Soviet Union possesses more than 180,000 miles of navigable rivers. From the earliest times these water-ways were used for transport and communication, and today they are linked by a system of canals along which large ships can pass to and from each of the five seas of European Russia. These rivers also provide a most important source of electrical power. The Volga alone gives about one and a half million kilowatts each year.

Although the construction of canals and dams has done much to increase the value of the rivers for navigation, climatic factors still exert a great influence upon the degree of utility of any particular river. The rivers of European Russia and Siberia remain frozen during the winter. The maximum flow of water occurs during and after the floods which commence with the thawing of the ice in the spring.

[p62] The monsoon character of the climate in the Far East produces a maximum flow during the summer months, when the level of the rivers west of the Urals falls considerably. In Middle Asia the heat of the sun melts the ice and snow on the mountains in summer, when the rivers become raging torrents. The Caucasian rivers have relatively short courses between the steep mountains and the sea, and great quantities of sediments are brought down and deposited in the form of banks and islands in the middle and lower courses of the streams, obstructing their courses.

The Volga.

This historic Russian river has a total length of over 2300 miles, and carries half the river freight of the U.S.S.R. It rises amid the bogs and lakes of the morainic Valdai Hills, about 800 feet above the level of the Baltic, and falls to about 80 feet below the level of the Baltic in its course to the Caspian Sea. It attains its greatest volume in the vicinity of Stalingrad. It receives most of its water, like most of the Russian rivers, from the melting snows in spring, when great floods occur. The level gradually decreases during the latter half of the summer, reaching its lowest point at the end of the winter. During the spring floods the volume of the river may be eighty times greater than that of the summer drought period. The lower course of the river retains a great volume of water for the longest period, while the ice cover does not hinder navigation for such a great length of time as in the middle and upper part. The Volga is free from ice at Astrakhan for 246 days, and at Rzhhev for only 205 days. The middle and upper course becomes very shallow during the summer, and seriously interferes with shipping. Thus the lower part of the river possesses the greatest advantages for navigation.

During the nineteenth century reservoirs were constructed in the upper valley of the Volga in order to hold the flood waters in spring and provide a surplus with which to maintain the level of the river in the summer, while canals were built in order to enable small boats to pass into the Neva basin. Within recent years the Great Volga Project has been completed. Dams have raised the level of the water, and help [p63] to maintain it during the summer. Additional supplies of water have been obtained by the construction of a great reservoir on the Kama-Pechora divide (see Fig. 48), and the Ivankov Dam has made possible the creation of the "Moscow Sea" and the ship-canal linking Moscow with the Volga. Reconstruction of the canal systems linking the Moscow with the Neva has made it possible for ships of considerable size to pass from the Volga to the Baltic Sea, while the construction of the Baltic-White Sea canal system has extended the water-communications of Moscow from the White Sea to the Caspian. With the completion of the new Volga-Don Canal Moscow will become a port of five seas.

The Dnieper.

Like the Volga, the Dnieper rises in the Valdai Hills, and flows for a little more than 1400 miles to the Black Sea. Many of the tributaries of the river are navigable, and the navigation season of the lower Dnieper lasts for 280 days – a longer season than that of any other of the great Russian rivers. The lower part of the river is divided from the upper part by rapids, which have now been drowned by the construction of the famous Dnieper Dam, which has caused the level of the river to rise behind the dam by about 120 feet. Below the old rapids the river divides into numerous branches, with extensive marshy tracts on either side.

The North Dvina and Pechora Rivers.

These rivers, 800 and 1100 miles long, flow across vast plains, and in common with the north-flowing Siberian rivers, they quickly free themselves from ice in the spring, and, flooded with water from the melting snows, become very turbulent and fast. They are of great importance for the floating of timber.

CHAPTER II CLIMATE

THE U.S.S.R. is a huge land mass – eight and a half million square miles in area – situated in middle and high

latitudes. Its position would ensure an extreme climate, and this is intensified by the limited influence of the surrounding oceans. Of this area, 73% is more than 250 miles from seas which are either enclosed (*e.g.*, Baltic, Black, Caspian) or frozen for long periods (*e.g.*, the Arctic Ocean) or have cold currents near the coast (*e.g.*, the Pacific). Moreover, the mountainous barrier of the South shuts off warming winds from lower latitudes, and the ranges of Eastern Siberia confine Pacific influences to the coast.

Thus, in general, the summers are hot and the winters intensely cold, so cold that the normal high-pressure belt of sub-tropical latitudes is intensified to produce some of the highest readings in the world. The centre of this high-pressure system lies south of Lake Baikal and provides a reservoir of air which yields outflowing winds and the winter monsoons of China and Japan, but the great cold draws the system far north and the 30.2-inch isobar cuts the Arctic Circle. In Southern Russia the high-pressure area forms a ridge approximately along 50° N which acts as a wind divide; southerly and south-westerly winds prevail in North and Central Russia, cold north and east winds in the steppes of the South. The high-pressure system persists for nearly nine months, from August to April, gradually giving way to the gentle gradients of the summer low-pressure system. North-westerly and westerly winds then prevail in North and Central Russia, while the Ukraine has north-westerly and South-eastern Russia north and north-easterly winds (Fig- 7).

These pressure conditions and the configuration of the land result in great uniformity of climate over wide areas. The prevailing westerly winds of Western Russia carry oceanic [p68] influences as far eastward as the Yenessei, for the Urals are no climatic barrier. The general levelness of the surface gives the winds free play, especially in treeless areas. In winter the mild westerly winds are predominant in the north, while cold easterly winds blow in the south, thus tending to offset latitudinal differences; in summer the westerly winds affect [Fig. 7] a wider area, but the longer hours of daylight in the north make for uniformity. Variations in temperature from north to south are less striking than those from west to east, especially in winter. The average January temperature at Leningrad is 1.1° higher than Kursk, 500 miles farther south. Taganrog has the same January mean (- 21.5°) as Vaida Gouba, on the northern shore of the Kola Peninsula. The following table (p. 70) shows the diminution of winter temperature with increased distance eastward.

On the other hand, the duration of winter is longer in the north than in the south. The winter at Leningrad may be less cold than at Moscow, but it starts earlier and lasts longer. At Moscow the temperature is below freezing-point on the average for 151 days, at Kola for 191 days.

[p69] [p70]

Place	Latitude	Mean January Temperature
Moscow	55° 45' N.	12.2° F.
Gorki	56° N.	11.0° F.
Kazan	55° 47' N.	7.2° F.
Perm	58° N.	3.0° F.
Tobolsk	58° 12' N.	-2.2° F.
Tomsk	56° N.	-3.3° F.

East of the Yenessei the westerly oceanic influence, though not completely absent, is much less pronounced, while the Pacific has little effect since the winds are predominantly offshore in winter. The cold is therefore very great. Yakutsk has a mean January temperature of -46°, while the 'cold pole' of the world is situated at Verkhoyansk, where the January mean is -59°, the mean minimum -83°, and the lowest reading anywhere (-90°) has been recorded. As a result the anomalous condition arises of a *north* wind bringing warmer weather. Except for a narrow strip along the east coast and a wider area in the south-east the very cold conditions cover most of Eastern Siberia. The clear skies, the slight wind, and the dryness of the air make the temperature supportable by human beings, and, indeed, healthy,

In summer, as the isotherm map (Fig. 9B) suggests, there is a general decrease in temperature from south to north except close to the Pacific coast. The highest temperatures are experienced in the deserts of the south, where parts of Turan have a July mean exceeding 86°. While oceanic influences from the west are less powerful than in winter, areas of water have considerable ameliorating effect. The Arctic and Pacific coasts are cooler than the interior of Siberia; the Caspian Sea changes the directions of the isotherms in the neighbourhood; the maximum temperatures at latitude 55° on the Baltic are no higher than those at the deltas of North-east Siberia.

The distribution of temperature is far more even in July than January:

[p71] [p72]

Place	January		July		Range (all in °F)
	<i>Mean temp</i>	<i>Abs. Min</i>	<i>Mean temp</i>	<i>Abs. Max</i>	
Batum.	43	18	74	95	31
Tashkent	30	-15	81	109	51
Leningrad	15	-35	64	97	49
Moscow	12	-44	66	99	54
Tomsk	-3	-60	66	95	69
Yakutsk	-46	-84	66	102	112
Verkhoyansk	-59	-90	60	93	119
Range between extreme stations	102	108	21	16	

An examination of the table shows that there is a rapid increase in the range of temperature from west to east and that the magnitude of this range is due mainly to the great cold of winter. It must be remembered, however, that it is hotter in July at Astrakhan than at Tangiers (same latitude), while Archangel has the same July average as York (60.5°). As with winter, the significant factor for man and plant is the length of the summer rather than its intensity. The northern lands have a very short summer, the south comparatively long; thus mean daily temperatures of over 64° occur on the average at Yalta for four months, Chkalov for two months, Moscow for three weeks. With ranges of temperature so great, changes from month to month must be rapid, especially in spring and autumn, which are generally short. At Moscow there is a change of 15° from March to April, at Astrakhan only a month elapses between the last frost and the attainment of a mean temperature of 48°. With the exception of Turan and the south-western steppes autumn is warmer than spring, and only the south has a prolonged autumn. A protracted spring benefits agriculture since soil and plants are then better able to absorb moisture for later use [p73]

The Freezing of Rivers and Coasts

Over most of the U.S.S.R. even the largest rivers are frozen for considerable periods, which increase from South-west Russia to North-east Siberia. The Dniester is ice-bound for seventy days on the average, Central Russian rivers four to five and a half months, northern rivers five and a half to seven months. In Siberia most of the rivers are closed for six months, some for seven or eight months. Many rivers and lakes are frozen to the bottom. The freezing of the rivers has a great influence on the lives of the people, and a serious disadvantage is the closure of most of the Russian ports. The northern coast of Siberia is ice-bound most of the year, and ice almost reaches Novaya Zemlya. Through the influence of the Atlantic Drift the Murman coast in some years has no fixed ice, and during the coldest winters ports can be kept free by ice-breakers. The southern part of the White Sea is less open to the influence of the warmer water, and Archangel is closed for 19° days. The eastern half of the Gulf of Finland is closed completely for about three months, but Libau is sometimes free throughout the winter. Even the Black Sea shores are ice-bound for about seventy days between January and March, while the Sea of Azov is frozen across in mid-winter. The northern shores of the Caspian Sea are frozen every winter, ice remaining for some hundred days in the colder parts. Vladivostock is closed from mid-December until April, and the coast farther north for considerably longer.

Precipitation

The unbroken nature of the relief ensures that the precipitation over wide areas shall be very uniform, the nature and location of the oceans that it shall be generally light. Fig. 11 shows that most of European Russia and a wide belt in Western Siberia have at least 16 inches a year. Both to north-east and south of this central zone, the precipitation diminishes – to less than 8 inches near the 'cold pole' and along the Arctic coast, to less than 4 inches in the hot, southern deserts of Kizil Kum and Kara Kum. Oceanic influences [p74] from the west penetrate the country by means of cyclones throughout the year, but particularly in summer. This causes a decrease in rainfall from north-west to south-east:

Riga	2 inches per annum
Moscow	21 inches per annum
Voronezh	18 inches per annum
Saratov	14.9 inches per annum
Astrakhan	6 inches per annum

Heavier totals occur in South-eastern Siberia and in Kamchatka, where the south-east monsoons bring up to 40 inches [Fig. 10.] a year and the heaviest rain of the Union, exceeding 60 inches a year, falls on the eastern shores of the Black Sea.

The heating of the interior in summer causes a general inflow of air from coastal areas and maximum precipitation in that season. July and August are the wettest months over wide areas; only along parts of the Black Sea coast is there a winter maximum. Elsewhere, however, winter is not without precipitation, most of it in the form of snow. Eastern Siberia receives much less snow than areas west of the Yenesei, where it falls between November and April. Nowhere is the ground permanently covered; the greatest depth occurs in [p76] the Taiga, where it does not exceed 3 feet except in drifts (Figs. 10 and 12).

Both the rain of summer and the winter snow benefit man. The former comes in heavy showers accompanied by thunder, when it is most beneficial to crops. Moreover, the additional cloud mitigates the intense heat of the sun's rays. Snow, being a poor conductor of heat, prevents the ground from freezing, and the permanently frozen subsoil occurs only where the snowfall is light or absent – mainly in Eastern Siberia away from oceanic influence. Although the melting of the snow is accompanied by many disadvantages, it does provide a most valuable reserve of water for feeding rivers and nourishing vegetation. The floods which cover wide areas in spring are beneficial in that they raise the humidity of the air; the larger lakes relieve the long dry period in the same way.

Major Climatic Regions

Several classifications of the climate of the U.S.S.R. have been attempted. Apart from those of Russian writers – Voeikof, for example – the well-known divisions of Asia as a whole by Koppen and Thornthwait are important. Kendrew has a useful, if simpler, scheme since the regions correspond with vegetational differences. The major climatic regions differentiated here (Fig. 13) are amplifications of Kendrew's and have been adopted since they correspond very closely with vegetation belts. Probably nowhere in the world do soil and vegetation depend so closely on the climate as in the U.S.S.R.

- (1) The Tundra Type.
- (2) The Taiga Type: (a) western; (b) eastern.
- (3) The Deciduous Forest Type.
- (4) The Amur-Ussuri Type.
- (5) The Siberian Pacific Coast Type.
- (6) The Steppe Type.
- [p77] (7) The Desert Type
- (8) The Mediterranean Type
- (9) The Transcaucasian (sub-tropical) Type
- (10) The Mountain Type

It should, however, be emphasized that the boundaries between these regions are zones, not lines; the transition from one type to another is generally very gradual. Moreover, [p78] data are inadequate except for the broadest division, especially in the thinly peopled parts of Asiatic Russia.

The Tundra Type

The southern boundary of this region is approximately the 50° isotherm for July. This line is significant because only farther south where the temperatures are higher and the summer longer will trees grow. ...

[p80]

....

The Taiga Type

The climatic region associated with the coniferous forest covers a huge area. It lies south of the Tundra, and extends from the western boundaries of the U.S.S.R. eastward to the high barriers of the Stanovoi and Cherski Ranges. Its southern boundary is ill-defined, but lies somewhere in the transition zone between taiga and deciduous forest in the west and in the wooded steppe of centre and east which marks the gradual change from forest to grassland. The area is so great that considerable subdivision is possible, and, with the acquisition of more data, very desirable. With the regional treatment of vegetation in mind, here only two broad areas will be distinguished – those lying approximately west and east of the Yenesei.

First the general features may be outlined. The summers are warm, with July and August temperatures averaging between 50° and 68°; the winters are cold and long – January averages 20° in the west and -50° in the Lena region. The precipitation varies between 12 and 24 inches a year with a maximum in summer, but with

considerable quantities of snow, especially west of the Yenessei. There is a very close interaction between climate and vegetation; the [p81] dense coniferous forest is limited by the adequacy of the precipitation, particularly the summer quota, and the relative humidity of the air must exceed 50%. The trees provide shelter from the wind, so that the snow lies deep for [Fig. 14] long periods, at least a hundred days, preventing the freezing of the ground and providing abundant moisture in the spring.

The Western Taiga

Here the cyclonic influences from the west are strongly felt in both seasons. The total precipitation exceeds 24 inches, and at least 30% of this comes in winter as snow (Fig. 14). As the table shows (p. 82), there is a slight diminution in quantity towards the east, and the maxima shift from late summer and autumn near the Baltic to July and August in the interior.

[p82]

Precipitation (in Inches) In The Western Taiga

Centre	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot.
Leningrad (30 feet)	0.9	0.8	0.9	0.9	1.7	1.8	2.7	2.7	2.0	1.7	1.4	1.2	18.8
Tobolsk (340 feet)	0.7	0.6	0.7	0.8	1.3	2.7	3.5	3.2	1.5	1.4	1.3	0.9	18.6
Tomsk (390 feet)	1.1	0.8	0.8	0.7	1.5	2.7	3.0	2.3	1.4	2.4	1.4	1.9	19.9

The curve of the isotherms (Fig. 9) indicates the importance of Atlantic warmth, especially in winter, and the extremely low readings of Eastern Siberia are not recorded, but the table below shows the effect of increased distance eastward on the winter temperatures.

Mean Temperatures (in °F) of Western Taiga

Centre	Jan.	July	Average	Range
Leningrad (30 feet)	15.3	63.9	38.7	48.6
Tobolsk (340 feet)	-2.2	66.4	31.6	68.6
Tomsk (390 feet)	-3.3	65.7	30.2	69.0

But mean values do not give an accurate picture of the conditions. Sudden changes in temperature from day to day are frequent; east of the Urals readings of -40° F. are quite common, and on the Volga -20° F. has been recorded. There is less variation in summer, and the cloudiness of the sky, very marked in European Russia (Leningrad has only thirty-nine days a year on the average with clear skies), helps to moderate the sun's heat and retards evaporation.

In places and on occasion winds blow with considerable force. Along the lower Yenessei winds between east and north-west laden with fine, hard snow blow from six to twelve days. These 'purga' carry the hard, driven snow through crevices into every dwelling and prevent all movement out of doors. The passage of depressions from the Baltic eastward is often accompanied by strong winds from a westerly quarter. On these occasions, because the Neva only falls twenty feet in its passage from Lake Ladoga to the Gulf of Finland, the [p83] wind is able to hold up the water and cause serious floods in Leningrad.

The rivers of the Western Taiga are frozen for long periods. The river Ob is free only 193 days at Kolyvan, 146 days at Obdorsk; the Yenessei is free 197 days at Yenesseisk and 186 days at Turukhansk. The rivers rarely thaw before April, and then huge floods result from the slow melting of masses of ice and snow, for the water is dammed back by the still solid ice of the cold lower reaches. The gentle gradients of the rivers also prevent rapid dispersal of the water, which extends over a breadth of 12 to 40 miles near the junction of the Irtysh and Ob and is frequently 30 miles wide at the mouth of the Yenessei.

The Ural Mountains form no climatic barrier, but their height is sufficient to cause local variations. The chief feature is the heavier precipitation on the western slopes. In the central portion, the west on the average has a fall 6 inches heavier than the east. The former may have more than 24 inches, and the quantity and duration of cover of snow is greater here than on the lowlands or the eastern slopes. To the north and south of the range precipitation diminishes and climate approximates more closely to tundra and steppe respectively.

Changes in altitude cause variation in temperature, not only normally but through frequent examples of temperature inversion, thus:

	<i>Jan. Mean</i>	<i>July Mean</i>
Ivanov Mine (2782 feet)	3.5°	58.5°
Zlatoust (1080 feet)	3.5°	61.0°

The January means are the same despite a difference of 1700 feet.

The Eastern Taiga

East of the Yenessei ...

...

The Deciduous Forest Type

This is a triangular region lying between Taiga and Steppe and reaching its greatest extent in European Russia. The apex of the triangle points eastward, and the forest zone, with the exception of a short break at the Urals, extends eastward as a narrow belt to the Ob. The climatic region, however, may be taken to comprise the broad area in European Russia. [p87] The main features are fairly presented by the figures for Moscow and Kazan.

The winter cold throughout the region is intense, with temperatures below -40° at Moscow. The lower average readings at Kazan illustrate the more continental aspect of the climate towards the south. The truth is that, despite the high-pressure area which develops over the interior in winter, the warmer Atlantic influences are comparatively strong, especially in the north of the region.

Winds from a westerly quarter are common, and a break in the anti-cyclonic conditions results in short, warm spells in December, when temperatures of 46° have been recorded. But winter is a trying time, with the cold more difficult to bear than in Siberia, because the air is damper. Snow begins to fall in October and lies on the ground for an average of 140 days. November is the snowiest month, but the snow lies thick until March and the weather is generally dull, gloomy, and cloudy.

Cyclonic influences from the west affect most of the region in summer, so there is less contrast between the means for Moscow and Kazan. Generally the average temperature is high – between 68° and 77° – with maximum readings over 90° . Summer is the cloudiest season, but when the skies are clear the sun beats down with great intensity. As in many other parts of continental Russia, there is a big diurnal range, the night temperatures often dropping into the lower thirties. Relative humidity at Kazan in December is between 87% and 92%. [p88]

Throughout the region summer rain predominates, with July and August the wettest months. The proportions of rain falling in the months June, July, and August are 36% at Moscow, 39% at Ufa, and 40% at Vyatka. The heaviest rain falls in the west, Byelorussia, the Pripet and Beresina basins having 27-28 inches a year, and the amount decreases towards the east. The rain comes in heavy showers, on the average every other day, frequently accompanied by thunder.

The extreme conditions and the resulting rapid changes during the short spring and autumn ensure that the lives of the people are very intimately connected with the weather. In Moscow, for example, signs of approaching summer are awaited eagerly and looked for at certain dates in which there seem to be little variation. About March 18 the first thawed patches of snow appear, the next day the first of the migrating rooks fly in. The real thaw begins in April, and within a week most of the snow has gone. This is the unpleasant season of the 'rasputitsa,' when the rapid thaw causes deep mud, widespread floods, and raw air. By April 12 Moscow river is free of ice, a few days later the first spring flowers appear, and by April 19 no snow is left. The onset of winter is heralded similarly by definite events which occur almost to a timetable every year. The first snow showers come in the middle of October; Moscow river is frozen by November 8.

The snow of winter has great significance for the Russians of this region. It provides a valuable reserve of water needed by the forest and for cultivation, it protects the soil from frost, and it gives a useful means of transport. In the past all the great fairs were held in winter because movement was easier then than in summer, when the badly made roads were impassable through mud or chokingly unpleasant from dust. The chief disadvantages from the snow cover were most patent outside the towns. The floods and mud of rasputitsa tended to immobilize workers just when they wished to attain full activity in the spring. The long winter with the deep snow kept the peasants for long periods in huts which were often ill-ventilated. The increase of respiratory complaints at this season has been very marked. [p89]

The Amur- Ussuri Type

This region comprises the lowlands of the Amur and Ussuri basins and the narrow coastal plain bordering the Japan Sea. ...

[p92]

...

The Steppe Type

The steppe type of climate is found along a broad belt south of the deciduous forest type. It touches the shores of the Black Sea in the west, includes the northern half of the Crimean Peninsula, and meets the desert in the east. This type differs from most of the foregoing regions in that the oceanic influences from the west are much less significant even in European Russia. The area is vast, and there must be considerable variation over it, but certain general features may be noted. The prevailing winds are from the north-east and dry, producing slight precipitation of between 8 and 16 inches, most of it in spring or early summer. It falls in heavy showers, accompanied by violent thunderstorms – the result of rapid heating of air near the earth's surface producing instability, since the upper air is still cold. In the black earth lands and the pre-Urals twenty storms a season is an average number. The summers are hot, the average July temperature exceeding 66°, the relative humidity is low in summer and cloud not great except in December. The snow cover is slight, especially in the south, so the ground is exposed to the full effects of frost for a long period; for five months of the year the average temperatures are below freezing-point. In general spring is short, dry, and begins vaguely, a warm day being followed by several cold ones. This is the season of the 'rasputitsa' and its attendant discomforts, all the more exaggerated in the steppes because of the rapidity with which the ice melts and the friable nature of the soil. The general conditions are illustrated in the table at p. 93.

[p93] The steppes get progressively drier towards south and east – thus Kiev has a total of 21 inches, Odessa 16 inches, Omsk 12 inches, while the proportion falling in the three summer months June to August diminishes southward – Kiev 37%, Odessa 29%. The mean July temperatures remain fairly even throughout the region, but the January figures become progressively lower towards the east.

Thus in the adjacent table Saratov has a mean of 11'5°, Orenburg 3.4°. In the south the Black Sea prevents such great extremes of temperature (Odessa means – January 25.3°, July 70.9°), but for three months the averages are below freezing-point and Odessa bay freezes in hard winters. The snow cover is very light here – less than 4 inches at the port – and lasts on the seashore only between twenty and sixty days. In the black earth lands the snow lasts between sixty and a hundred days.

The weather in many parts of the steppe is liable to sudden changes. The development of local low-pressure systems in the Black Sea area in summer causes violent winds to sweep across the flat plains. These are often of short duration, but they can do much damage to crops. In winter the Novorossisk district is often afflicted by a cold, dry north-east wind of great force, while in parts of the steppes, especially round Orenburg, the violent storms, laden with snow, can endanger the lives of men and animals. In the south of the steppes the rainstorms of early summer, though less frequent than elsewhere, are more violent, and remarkable quantities of rain fall in a short time, sometimes damaging crops. In one recorded instance nearly 1 inch of rain fell in eight minutes, [p94] in another 2.2 inches in ten minutes. These cause much gullyng in the soft soil. Crops are also damaged occasionally by dust storms; in one case a layer one and a half inches thick was spread over the fields. The high winds responsible, of the whirlwind type, can transport the fine material great distances. Dust from the steppe has been dropped in Leningrad at the rate of one or two grams to the square metre, and there is some possibility that germs of epidemics may be carried at the same time.

The Desert Type

This large region may be taken approximately as the area which has less than 8 inches of rain a year and includes the land often designated "semi-desert." From the Caucasus the region surrounds the Caspian and extends eastward to the foothills of the mountains along the Soviet frontier. A small outlier is present in the Baku district.

...

The Mediterranean Type

According to Russian geographers the typical Mediterranean climate is found only in one small area – the south shore of the Crimean Peninsular between Foros and Alushta, but we may add another small region – the north-east coast of the Black Sea between Novorossisk and Sukhum, since the conditions are only slightly different. The figures for Yalta are typical.

...

CHAPTER III THE SOILS OF THE U.S.S.R.

SOILS are not rocks but independent bodies, consisting largely of mineral substances derived from the parent rock and partly of organic matter derived from plants. Dokuchayev, who may be described as the father of Russian soil science, defined soil thus: " The word 'soil' ought to imply only such outer horizons of rocks, and

those adjoining them, as were more or less naturally modified by the mutual action of water and various kinds of organisms, dead or alive."

It is clear that in the process of weathering (the fragmentation and disintegration of the parent rock, and the accumulation of the products of weathering), and in the production and decomposition of vegetation which covers the soil, climatic factors play an important role.

From the time when Dokuchayev made his first studies to the present day, research and exploration have been carried out by Russian soil scientists throughout the vast territory of the U.S.S.R. Since the last century they have developed the climatic theory of soils, basing the processes of soil formation upon two main factors – temperature and moisture. The temperature of both soil and air is significant, since it controls rate of evaporation and hence movement of soil water. "Water in the soil is as blood in the veins," wrote Vysotsky. This is hardly an exaggeration, since it exerts influence mechanically, and chemically by acting as a solvent. The entire soil-forming process is intimately bound up with the work of water.

It has been clearly demonstrated that in the Soviet Union the major soil zones are arranged in roughly parallel belts extending from east to west, and changing in character from north to south and south-east as the precipitation decreases [p103] and mean annual temperature increases, the character of the major soil type in each belt being largely independent of the character of the underlying rock formation, and often extending across several such formations. Generally, the drier the climate, the less pronounced is the soil-forming process, and the greater the effect of relief and geology. In other words, when the parent rock exerts a strong influence the soil *as such* is not fully developed. Its full development may take many thousands of years.

Particularly important for the growth of plants is the presence in the soil of a sufficient amount of humus, the product of partially decomposed vegetation. Plants grow best in a soil composed of a complex of mineral matter and humus. The humus, in addition to containing important plant food, retains moisture and assists the integration of the soil into granules. The colour of the upper layers of the soil depends chiefly upon the presence of humus, varying from black where there is a large proportion, to grey where the proportion is small.

The final decomposition of the organic matter by means of the activity of micro-organisms leads to its mineralization – *i.e.*, to the formation of ordinary salts. According to the amount of moisture in the soil more or less of the constituent parts of the humus is carried in solution to the lower layers, where they may mix with or act chemically upon the mineral matter derived from the parent rock. There are three layers, or horizons, in a complete soil profile: the *A* horizon, the most intensely weathered, from which salts and other soluble substances are constantly being removed by percolating water; the *B* horizon, usually more compact than the *A* horizon, and containing much of the material leached out of the latter; the *C* horizon, composed largely of fragments of the parent rock below. Apart from the effects of weathering, changes effected by water and the work of plants and animals are constantly occurring in the soil.

The amount of humus in the *A* horizon depends partly upon [p104] the density of the vegetation cover (and thus indirectly upon climate), and partly upon conditions of moisture and temperature which enable organic matter to be broken down into the form of humus. Micro-organisms play an important part in this process. Under conditions of considerable or excessive moisture the humus may be washed out, or leached, depriving the upper soil of valuable plant food and transferring the leached material to the *B* horizon, leaving a poor surface soil.

Under arid conditions and a warm climate the absence of a well-developed vegetation cover limits the amount of humus in the *A* horizon. With sufficient aridity, the decay of organic matter is hindered, while evaporation causes ascending currents of water in the soil, resulting in the formation of carbonates in a layer either close to the surface or at a not very great depth below it. This is an important factor in the agriculture of dry regions.

But, in spite of what appears to be a strong climatic and vegetational control of the soil-forming processes, the major soil zones do not exactly coincide with either the major climatic or natural vegetation zones. For example, in some cases the effect of the parent rock may be so strong as to create an 'intra-zonal' type. In other cases relief may delay the complete maturing of the soil type, level land being most favourable for its full development. Long-continued cultivation and the destruction of the original vegetation also have considerable effect upon the soil.

It has not yet been possible to formulate a generally acceptable classification of soils which would take into account all the forces which are known to operate in their formation. The following scheme of major soil zones is based upon the influence of climate and natural vegetation on large tracts of land throughout a long period of time. J. N. Afanasyev writes, "The conception of soil as an independent natural body...was suggested to Dokuchayev by the Russian country. It was a new idea born in the Russian plain." [p106] This is the background of the Russian conception of major soil zones. It is understood, however, that within such a zone there may be considerable soil provinces possessing their own special characteristics developed under a variety

of conditions.

In particular it must be remembered that soil formation is in a constant process of evolution, so that any static conception of soil-climatic zones cannot give a completely truthful picture of the facts. Soils are not simply the product of existing climatic conditions, but represent the total effect of changes which have taken place throughout the entire 'history' of the soil.

The Soviet soil scientist has changed his opinion in soil geography. He no longer considers it as a sketch of the location of immovable soil varieties, but as a designation and distribution of continuously evolving processes ruled by certain laws. In this way he has established a close connection between soil geography and soil history.

AREA (IN PERCENTAGE OF TOTAL AREA) COVERED BY DIFFERENT TYPES OF SOIL IN THE U.S.S.R.

...[p107]

The Major Soil Zones of the U.S.S.R.

Tundra Soils

The Tundra zone, situated north of the limit of tree-growth, occupies about 15% of the territory of the Soviet Union. ...

...

The Light Grey Podsolized Forest Soils

These soils are characteristic of the coniferous forest zone of the U.S.S.R., and, together with the modified podsolized soils of the deciduous and mixed forests, cover about 52% of its land surface. They are poor, acid soils, usually associated with sands, but also found on clay. They present an important problem for agricultural development.

The most essential factors in the origin and development of the podsol-forming process are the presence of humus, the acid reaction of the soil, and the predominance in the soil of a downward movement of water. There is a complete disintegration of the minerals in the surface soil, from which they are removed to lower layers.

The summers are warm enough to allow complete thawing of the soil. The forest cover impedes evaporation, so that the ground is very moist and there is sufficient water to cause leaching.

The coniferous forest vegetation gives rise to a very acid "raw humus" which decomposes only slowly and accumulates as a layer of peaty material above the mineral soil. From this peaty layer, soluble humic acids are produced, which, percolating through the underlying soil, strongly attack the minerals in it, and in course of time will dissolve and remove almost everything except silica, which is little affected by humic-acid solutions.

The uppermost *A* horizon of the mineral soil of a podsol thus consists of a grey-to-white, highly siliceous, leached acid soil, containing but little plant food.

The *B* horizon consists of an upper layer, brownish in colour, containing material (including humus) washed out from the *A* horizon, and a lower layer, yellow or rust-coloured, containing iron hydroxide. The upper layer is very compact, sometimes forming a hard pan composed of soil cemented together by humus substances leached out of the *A* horizon.

[p110] At a lower level it changes to a less compact sub-horizon *B*, red-brown in colour, with isolated wedges of humus and iron oxide hydrates.

In badly drained and low-lying areas, and especially on a base of glacial clays, where the ground water lies close to the surface, there is but little downward movement of water in the soil to carry away mineral and organic substances, while there is a lack of aeration. Decomposition of organic matter does not proceed very far. Hence there is a thicker turf or peaty surface layer characteristic of bog and marsh soils. Organic matter from the remains of trees, from forest plants and mosses (especially sphagnum), accumulates slowly. The surface soil has an acid reaction. Surface evaporation causes precipitation of nodules of iron at the base of the *A* horizon. This 'bog iron' has been used for centuries in Northern Russia – for example, near Solvichegodsk, on the river Vichегда, south-east of Archangel. (See p.290.)

Bog and marsh soils are found most frequently in the coniferous forest zone, to the north of 60°N., but extending much farther south in the low, badly drained areas of the West Siberian Lowland.

Such marsh soils are rare in Eastern Siberia...

Near the shores of the Pacific Ocean ...

[111]

The Grey Soils of the Deciduous and Mixed Forests

To the south of the coniferous forest zone the relatively heavy precipitation of the deciduous forest zone causes the leaching of the *A* horizon to continue, but the surface soils have a less acid reaction. The warmer summers are more favourable to decomposition of organic matter, with the result that the soil in the *A* horizon becomes darker in colour, and has a fine nut-like structure. The humus content rises to between 3 and 6%, the depth of the layer containing humus increases from seven to nine inches, and the soils become more agriculturally productive. Below the humus-containing layer the soil granules increase to walnut size and become greyer in colour, often coated with ash-grey quartz powder. In the wooded steppe zone the entire *A* horizon may attain a thickness of thirty inches. In contrast to the podsolis there is a very gradual transition from the *A* to the *B* horizon, while earthworms and bacteria are much more active. The whole soil profile is very thick – in some places as much as sixteen feet.

The *B* horizon, four to nine feet thick in the South, consists of a compact upper layer of grey or brown soil in the form of large granular particles, and an equally compact lower layer, reddish-brown in appearance, rich in colloidal clay particles derived from the upper horizons, calcareous, and divided into irregular lumps or columns, prismatic in form.

How far the soils of the wooded steppe zone are the result of the action of man in clearing forests, replacing them by meadow, and improving what was originally a podsolized soil (a process which commenced early in the history of the European part of the U.S.S.R.), or by the extension of forest growth over an original steppe vegetation, thus degrading the black steppe soil, has not yet been fully determined. Degraded black soil is certainly found in the steppe where forests have become established near rivers and on the sides of gullies and ravines.

In Western Siberia the wooded steppe soils have not developed to any great extent. The low relief and bad drainage have resulted in an abundance of marsh soils, meadow podsolized soils, and areas of salt-saturated soil in the south. In the bog and marsh soils of the European part of the Soviet Union, as well as in the West Siberian Lowland, the leached material is deposited not far below the surface, where it forms a compact layer or pan, impervious to water.

The Black Soils of the Steppe

The chernozem, or black earth, forms the most fertile belt of agricultural land in the Soviet Union, covering about 12% of its land surface. This represents the largest continuous expanse of black earth in the world.

The formation is essentially a result of climate. During the long, cold winter, water accumulates in the soil, providing abundant moisture in the spring for rapid-growing luxuriant grasses. The hot, dry summers and the winter frosts prevent speedy decomposition of organic material, and the low precipitation, combined with a high rate of evaporation in summer, prevents any large amount of leaching in the *A* horizon. Thus the soils are neutral, not acid. The highly developed root system of the steppe grasses is favourable for the formation of humus, which may attain depths of twenty to forty inches, and sometimes even more.

The surface soil is loose and crumbly, deep black or chocolate in colour, granular in structure, with a humus content varying from 6 to 10% in the northern and central steppe, to 20% in the south and east. In the lower part of the *A* horizon the soil colour changes to greyish black and finally to brown, with a nut-like structure. Alkaline carbonates formed in the *A* horizon are carried in solution to lower levels. The high rate of evaporation in the warm dry [p113] summer produces a strong upward water current, causing deposition of mineral salts just below the humus layer. This, and the low precipitation, limit tree growth. In the true steppe, only the slopes of ravines and valleys, where the salts are washed out from the soil, bear woods.

The soils found in these situations are weakly podsolized. Similar soils are also found on sandy terraces and on small areas of flat land on the weakly dissected, plateau-like watersheds in the European part of the Russian steppe.

Towards the north there is less evaporation, owing to the cooler summers, so that there is more downward movement of soil water, and increased leaching reduces the proportion of humus in the soil. Towards the south and east the smaller amount of precipitation accounts for the less luxuriant vegetation and the consequent reduction of the amount and depth of humus in the *A* horizon.

North of the Sea of Azov there is an area which extends eastward towards the Caucasian foothills, in which the black soils are particularly rich and fertile, the humus layer being developed to a depth of more than three feet.

The thick deposits of loess which form the base of most of the area covered by black soils in the U.S.S.R. may well have assisted the growth of the original steppe vegetation. It has certainly caused an extension of chernozem into moister areas, since its porous nature allows superfluous water to drain off rapidly. But loess deposits are not now regarded as the essential cause of the formation of this type of soil, since such soils have been found upon a variety of parent rocks.

It may be said without exaggeration that the crop yields of the black earth zone are limited only by the relatively small amount of moisture which is available, and perhaps also by the ever-present danger of soil erosion, brought about by the wind or heavy downpours of rain during summer thunderstorms. ("Rain failures are acute, particularly in the eastern half. Its need is moisture rather than manure. Its period of vegetation is from 180 to 220 days. Despite the favourable soil, it is very liable to failures of crops, which are worst in the east." -Sir John Maynard)The dry soil is easily washed away, and in extreme [p114] cases this process amounts to the total removal of the A horizon.

The soils of the black earth zone have been cultivated continuously since the time when nomadic pastoralism gave way to settled agriculture, and they continue to yield rich harvests.

The Chestnut and Brown Soils

This zone is developed to its greatest extent in the Asiatic part of the U.S.S.R., where it exceeds the black earth zone in area. The brown soils, as distinct from the chestnut soils, however, are found only in a number of separate areas in the Asiatic part, and are completely absent in Eastern Siberia. On the other hand, they are not found to any great extent in the Turan Lowland, which is largely surrounded by highland, and has therefore become a region of accumulation of loess, the soluble products of weathering from these highlands, the soils being of the grey type.

Chestnut soils occur where there is an extreme continental climate, with a rather low annual precipitation, distributed moderately evenly throughout the seasons in European Russia, but displaying a marked summer maximum in the Asiatic part. The lack of moisture is further accentuated by the high rate of evaporation during the hot, dry summers. Consequently the grass vegetation is not so luxuriant as in the black earth zone, and the humus content of the A horizon falls to 5% in the chestnut soils, and to 3% in the brown soils, the latter developing under the more arid conditions. The depth of the humus varies from twelve to twenty inches, and the amount falls rapidly towards the drier south-east and east. The entire A horizon has a thickness of between twenty and thirty inches in the chestnut soils, and twelve to fifteen inches in the brown soils. In the former the upper part is of a loose stratified structure, and the lower compact. Both display a prismatic structure.

In arid soils the soluble products of weathering are for the most part retained, and distribution of soluble salts occurs mainly through the agency of ascending currents of water. (In humid soils leaching removes the soluble products of [p115] weathering and the water currents in the soil are predominantly downward.)

In the chestnut soils neither calcium sulphate nor calcium carbonate are washed deep into the soil, but remain in the upper horizons, while the degree of rock decomposition is so small that there is very little transference of the products of weathering from one horizon to another.

Since in arid regions there is practically no leaching of the products of weathering from the soil, soluble salts of calcium, magnesium, potassium, and sodium, formed by the decomposition of the parent rock, remain *in situ*, and consequently arid soils show a tendency to become saline. This is particularly noticeable in depressions and areas possessing insignificant relief and poor natural drainage, or where the water-table lies close to the surface, further hindering the washing down of salts from the surface to lower levels. In parts of the Turan lowland and the Aral-Caspian depression, for example, salts collect in hollows which are filled with constantly evaporating, and hence brackish, ground-water.

The soil salinity produced by simple weathering is seldom great enough to affect vegetation adversely, but harmful degrees of salinity are found in soils of arid regions subjected to the influence of a high water-table. The water evaporates, leaving any salts dissolved in it in the soil. Such alkaline soils are known as "Solonchak."

They are usually rather loose-textured soils, without definite structure. Sometimes the concentration of salt is so high that, a white incrustation is formed on the surface. The predominant salts are usually those of sodium. If for any reason Solonchak soils are subjected to leaching (*e.g.*, by a fall in the water-table, increased rainfall, or irrigation) the soluble salts are removed and an alkali soil or "Solonetz " is formed by the dissociation of the sodium-saturated clay into alkaline soda, or sodium carbonate, and a highly dispersed clay which forms a sticky, unworkable mass when wet, and hard, impervious clods when dry.

[p116] Alkali soils have a characteristic prismatic structure which becomes columnar in the B horizon.

The chestnut soils are generally very fertile, and in this respect are not greatly inferior to those of the chernozem

type. Crop production is, however, greatly limited by lack of moisture. Droughts are frequent, and cultivation of the land has to be carried on with great care and foresight. In planning irrigation works attention must be paid to the height of the water-table. If the level rises formation of soil alkali may take place as a result of the processes described above, and the damage to agriculture may be disastrous. This applies equally to chestnut, brown, and desert soils. It can be prevented, however, by treating the soil with calcium sulphate, which converts the deflocculated sodium clay into a flocculated calcium clay, or with sulphur, which is oxidized to sulphuric acid and neutralizes the alkalinity.

Grey Soils of the Desert and Semi-desert Regions

These soils possess a light grey colour. They are found in the lowland plains of the Central Asiatic part of the Soviet Union, to the south of the brown soils, occupying in the main an area of inland drainage, covered with loess deposits (mainly in the south) or products of the weathering of the rocks (sand deserts).

...

Red Soils

Red soils are found in the neighbourhood of Batum, under sub-tropical conditions of high temperature and heavy rainfall. ...

Soil Erosion

The fertility of the soil may be lost in two ways:

1. The proportion of humus which is such an advantage to the farmer who cultivates virgin soil is quickly reduced by continuous cultivation. The store of plant food, particularly nitrogen, is rapidly depleted, and a system of careful crop rotation, combined with the use of fertilizers, is desirable.
2. On the other hand, in those parts of the U.S.S.R. which experience a dry summer, and particularly in those regions where there is no forest and the soil has been formed on a porous loess basis, deep gullies and ravines develop, breaking up the land and destroying the fields. Heavy summer showers may wash away the surface soil. In very dry weather the wind may achieve the same result, especially where the [p120] topsoil has been finely broken up by long-continued cultivation. Soil is also often washed down slopes. In effect, the valuable soils of the A horizon are gradually removed. In the Soviet Union much has been done to combat this menace. Trees have been planted, slopes terraced, and widespread use of fertilizers, organic manures, and crop rotation has been encouraged. Further details of these measures are given in Chapter VI.

The Application of Soil Science to Agriculture

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CHAPTER IV NATURAL VEGETATION

THE influence of climate upon the natural vegetation of the U.S.S.R. is very apparent. The major zones of natural vegetation lie, like the soil belts, in a general east-west direction, the differentiation from north to south being due to the increase in the mean annual temperature and the decrease in precipitation. The increasing continentality of the climate from west to east is also apparent.

But, apart from the dominant climatic control, there are considerable variations, as, for example, the interpenetration of northern and southern types of vegetation in the central part of the East European Plain. Climatic factors act upon different geomorphological forms within a single climatic zone. There are factors such as variation in relief, elevation of the land, and so on, which may be reflected in the vegetation. The northern boundary of the steppe in European Russia, for example, is influenced partly by climatic conditions and partly by the lime content of glacial deposits.

In Eastern Siberia the extremely dry character of the air allows the forests to extend much farther to the north than in the European part of the Soviet Union. In the Yakut Republic trees withstand the most intense frosts during the winter, where there is but little wind. But in places where strong winds prevail the increase in evaporation makes it impossible for them to survive. Thus there are variations in the vegetation within the same climatic region.

Another factor which must be considered is the evolution of the climate. Types of natural vegetation may have been established in the past under climatic conditions different from those prevailing today. Changes in climate within relatively recent times may have caused the spread of new types of plants into regions where they did not grow previously. These processes have probably not yet reached their final limits. For example, where forest vegetation is receding we [p122] may find remnants of the old forest cover within a region which today is not

predominantly tree-covered. Natural vegetation is, in fact, a reflection of past as well as present climatic and soil conditions.

The present coniferous forests which cover the north of the U.S.S.R. probably spread over the East European Plain from the east. The deciduous forests probably spread from the west and partly from the south. The steppe extended its area from the east. But in addition to the expansion of plant forms since the Quaternary Ice Age we may also find relics of the vegetation which prevailed before that period.

For example, in the Altai Mountains there are considerable areas of forest of a type which was common during the Tertiary period, now forming islands in the sea of coniferous forest. Examples are also to be found in the Southern Urals, while in the central black soil region, Alpine and sub-Alpine plants are found, which plainly have no connection with the present climatic conditions.

Finally, man has played a great part in changing the landscape. In the East European Plain the mixed and deciduous forests have been cleared for agricultural purposes since very early times. In the deserts the removal of plants which bind the sands together has resulted in the extension of wind-borne sands over large areas which were previously cultivated.

Therefore it must be realized that when we define major regions of natural vegetation we are, as it were, attempting to assess on an average the stage at which a dynamic process, still continuing, has arrived today. In every major zone we may find remnants of the old, and indications of the new progressive forms of vegetation.

The Tundra Zone

...

The Taiga, or Coniferous Forest, Zone

The forests of the U.S.S.R. occupy about 38% of its surface, the coniferous forests alone comprising about one-third of the forest lands of the world, extending 3600 miles from west to east and 600 miles from north to south. In Siberia almost the whole of the land is covered by trees, and [p126] in Eastern Siberia (east of the river Yenesei) they extend farther to the north than in any other part of the Soviet Union. This is partly due to the fact that the waters of the great rivers, flowing from the south, are relatively warm and have a noticeable effect upon the vegetation near the rivers.

In the north there is evidence of the penetration by the Tundra. The ground is often covered with mosses and lichens, while berry-bearing bushes extend far to the south.

The short period of vegetative growth (three to four months) limits the number of tree species to spruce-, fir-, and larch-trees, which have little leaf surface, so that transpiration is reduced. Although the amount of precipitation is low, the rate of evaporation, owing to the cold climate, is also low, so that there is enough moisture for tree growth. The winters, however, are not cold enough to prevent the growth of trees, the snow cover offers some protection to the soil, and the summers are very warm (see Fig. 12).

In the European part of the coniferous forest zone the spruce and fir are the dominant trees, growing mainly on moist clayey soils, while there are considerable areas of pine in drier sandy situations, especially towards the north. The soils are acid, cold, infertile, and badly aerated. The moss cover which is so common prevents aeration and limits the growth of grass, and often reduces the quantity and quality of meadows, especially in those parts which are not subject to flooding in spring.

The highest points in the Urals have a Tundra vegetation. But the greater part of the slopes are forested, with spruce and larch predominating in the north, and pine, birch, and larch in the south.

The Siberian forests extend in the south to 56° N., covering the slopes of the Altai and Sayan Mountains, and much of the highland regions of Transbaikalia and the Amur basin. The chief trees of Western Siberia are fir, cedar, spruce, stone pine, and Siberian larch. The "Urami," a mixture of marsh and forest, covers large areas. In South-western Siberia, and especially on the slopes of the Altai, the fir and [p127] cedar are the typical trees. The 'leaf' trees, birch and aspen, are very common, and, together with alders, willow, and mountain ash, often form considerable thickets.

The most valuable tree of the coniferous forest is the larch. It is a large, tall tree, with hard wood, and is often called the Siberian oak. It is most abundant in Eastern Siberia, where it is found farther north than any other tree, and provides a continuous unbroken mantle over the mountains. Highly resistant to decay, it is greatly valued for housing construction. It accommodates itself very well to frozen, dry, wet, or turf soils.

In the deep valleys of Transbaikalia pine forests are frequently seen, and they occur also in the valley of the middle course of the Lena. In the extreme north of Siberia the Siberian fir is never seen.

The spruce and fir forests of European Russia and Western Siberia have a gloomy and mournful appearance. The thick cover of trees shuts out the light of day and favours the growth of moss in damp situations and on the decayed stumps of trees and fallen branches. Lichens with long, trailing grey tendrils hug the tree-trunks.

Where bushes and grasses are able to grow they are usually of a bleached, pale character. The flowers lack colour and are often white. These gloomy forests are also silent. The cries of birds and animals are rarely heard, and the deep stillness is broken only by the squirrel as he cracks his nuts, the tapping of the woodpecker in search of insects, or the cracking of branches and twigs under the heavy tread of a bear. In South-western Siberia, birch and aspen bring variety to the forest; there are more open spaces in which tall, rich grass and ferns, juniper, bilberry, raspberry, crowberry, and strawberry grow, and the atmosphere is altogether lighter and happier than in the black forests of the north.

Exploitation of the interior forest lands is limited by lack of transport; and although this has to some extent been overcome by the utilization in summer of the Siberian rivers in conjunction with the Arctic sea route, large forested areas still remain untouched.

[p128] Climatic conditions limit agriculture to the growth of rye, flax, and vegetables in forest clearings, together with some cattle-rearing in meadow regions. Settlement is confined almost entirely to river valleys and the shores of lakes and seas. Hunting, fishing, and lumbering usually predominate over agricultural occupations.

The Mixed and Broad-Leafed Forests

The more open character of the forests along the southern border of the coniferous forest zone, and the prevalence of trees of the leafed varieties, mark the transition to the broad-leafed, deciduous forest zone. Whereas the coniferous forests give an undergrowth of Tundra character (mosses, etc.), the leaf-forests provide a thick cover of decayed leaves on the ground, antagonistic to the growth of moss. There is a greater development of humus, and the soil has a less acid reaction. Consequently the undergrowth consists mainly of perennial grasses, introducing into the forest the beginnings of the steppe vegetation which prevails still farther to the south. ("The oak region is a field of battle between forest and steppe where under natural conditions the forest will obtain the upper hand." - B. A. Keller).

In Eastern Siberia the increasing continentality of the climate prevents the development of the leafed forests. In Western Siberia lack of moisture and severe winters restrict the development to a narrow belt of small-leafed trees such as the birch and aspen. In European Russia, however, the penetration of oceanic influences results in a more humid climate, which at the same time is slightly more temperate, so that the transitional zone of mixed forests is followed by a large area of broad-leafed deciduous forests, contained roughly within the Leningrad-Kiev-Moscow triangle. The oak, lime, maple, and ash are the most common trees. The oak is found mainly on clayey, semi-podsolized soils. The lime extends farther to the north than the others. The limit of the growth of the oak is a line drawn between Leningrad [p129] and Perm. Maple- and elm-trees are found a little to the north of this line, while the ash flourishes towards the south. Across the Urals the lime is occasionally to be seen, but as we have already pointed out, the broad-leafed trees are confined mainly to a zone west of the Urals.

The deciduous forest region has played a most important role in the early development of the Russian State. It may be said that the Russian State was, in fact, born in the broad-leafed forests. Thus from early times the land has been used for agriculture, and a great deal of the forest cover has been removed.

Because of the protection afforded to the Slav peoples against the attentions of neighbouring tribes, the forests provided a favourable environment for the growth of the first agricultural (and hence settled) communities, since the higher areas of land upon which the people first settled were separated from one another by extensive areas of bogs and marsh (see Chapter I).

Later these areas created difficulties for the expansion of agriculture, especially great since nearly 50% of the coniferous and deciduous forest zones of the U.S.S.R. is occupied by marsh or bog. Many of the marshes occupy the sites of old lakes, which gradually filled up with alluvial deposits and became overgrown with successive types of marsh vegetation. Others have been caused by the irrational system of tree-felling often practised in the past, when the stumps were left in the ground, and dead trees and branches were allowed to lie and decay, so that a moss cover gradually spread over the soil, raising the ground-water towards the surface. The process by which marshes gradually encroach upon forests has been described above.

The greatest areas of marsh are found in Western Siberia, in both the coniferous and leaf forests. East of the Yenesei the higher and better-drained land, together with the low amount of precipitation, brings about the almost complete absence of marsh and bog. In the East European Plain, however, they are very common.

The Soviet Union possesses a greater area of bog- and [p130] marsh-land than any other part of the world of similar extent. In the past this was regarded as a serious disadvantage. But within the past few years great

achievements have been recorded in the utilization of peat from bogs. Some of the most important electric power stations now work entirely on this type of fuel. Manure, litter for animals, and chemical products are obtained from peat. When the lands have been suitably drained, and fertilizers applied, large crops of vegetables have been raised on former bog-land.

While large areas of the deciduous forests have been cleared for agriculture most of the coniferous forests remain today in their virgin state, agriculture being confined to the natural meadows of the river valleys. The value of the coniferous forests lies chiefly in their supplies of timber and valuable fur-bearing animals.

The Steppe Zone

Between the forest zone of the north and the steppe zone of the south there is a transitional region, usually known as the wooded steppe zone. The forest gradually becomes more open, light, and sunny; there are woods and coppices with grassland between them. In favourable positions, especially on the sides of ravines and valleys, thick woods may develop, consisting of a cover of oak, lime, maple, and elm, with an undergrowth of hazel and spindle-trees, mixed with briar on the outskirts of the woods. In the west hornbeam-, plantain-, pear-, and cherry-trees, and blackthorn- and hawthorn-bushes, are very common. In the south the woods and coppices become more and more infrequent. The expanses of open steppe between the woods become greater, until finally trees occur only along the sides of valleys and ravines.

The zone of true steppe occupies about 12% of the territory of the Soviet Union and corresponds to the fertile zone of black earth. The climate of the steppe is characterized by great annual variation in temperature and rainfall. The rainfall is about 16 inches in the west (near Odessa), but decreases rapidly towards the east. It falls mainly in spring or early summer. Tree-growth is therefore limited [p131] both by drought and great heat in summer, when dry winds parch the soil, and by the fact that in winter, owing to severe frosts, the ground is physiologically dry. Trees, therefore, are found only near lakes and rivers, and it is in the valleys that human settlement is most dense.

The country is generally level or rolling, open, and treeless, often lying on a plateau surface from 600 to 1000 feet above sea-level.

...A boundless, rolling plain, a sea of herbage scarcely broken by hills of any size, and transected here and there by great rivers

...The houses and townships are few and far between, and they, and such grass and trees as can grow, are hidden in the hollow, so that the eye can pass from one ridge of grassland to another, until all melts into the distance.

The level surface, however, is often dissected by gullies and ravine-like valleys, along which, as also along the sides of the valleys of the main rivers, the trees of the wooded steppe zone penetrate.

The present open steppe country was never forested, although it is probable that forest growth has extended over the northern parts of the original steppe zone since the end of the Ice Age.

The vegetation of the steppe responds very closely to the change of the seasons. The spring thaw comes suddenly; the warm sun and showers of rain which fall at intervals favour the growth of flowers, and before the shade of the tall grasses is established the soil is carpeted with the hyacinth, the purple and yellow iris, the crocus, and red and yellow tulips. The song of birds fills the air. At night the nightingale breaks the silence with its song.

The spring flowers gradually give way to the growth of various types of grasses, the exact types varying with local conditions. In late spring the colour of the landscape is fresh and green, but with the commencement of summer it changes [p132] to grey. By the middle of July the grasses have reached their full growth. Feathergrass, greyish-silver in colour, gives the steppe its characteristic appearance of a sea upon which the breeze stirs up gentle waves. Among this waving sea of grass there stand out spots of cornflower, bluebells, and sage, or the dull green of steppe bushes.

During the second half of the summer the sea of grass begins to fade under the scorching rays of the hot sun. New types of growth appear, dull and insignificant in appearance, but well able to withstand the heat and drought. The steppe becomes cheerless. Under the dull blue sky the birds are silent, and only the chirp of the grasshopper can be heard. A whirlwind may sweep across the plains, twisting and turning as it carries earth and dried grass high into the sky, only to scatter them again over the land. The streams shrink and dry. Rain seldom falls, except in occasional thunderstorms, which rapidly change the landscape into a sea of mud but give little moisture to the parched earth, since the water runs off the slopes very quickly.

In the winter the steppe is swept by cold, bitter winds, and the landscape assumes a monotonously white

appearance.

Today there remain very few large expanses of virgin steppe. The fertile black earth has been ploughed up. The remnants, together with the rich farmland which was originally part of the steppe, extend from the European part of the U.S.S.R. across the Urals into the vast level black-soil plains of the southern part of Western Siberia. These plains are characterized by the occurrence of thousands of small fresh-water or salty lakes, while groves of birch-trees are common in many parts.

Finally, mention should be made of the mountain steppe regions. They extend along the lower slopes of the Altai to a height of more than 1000 feet, while along the valleys they continue up to about 3250 feet. In Eastern Siberia the intermontaine plains possess a cover of steppe vegetation which forms islands amid the sea of forests. Each island, has its own particular name – the Minussinsk Steppe, the Abakan Steppe, etc. In Transbaikalia steppe vegetation [p133] covers the slopes of the mountains, often in conditions of perpetually frozen subsoil. In the Tian Shan and the Pamir the steppe extends on the drier slopes to over 10,000 feet.

The Dry Steppe or Semi-Desert Zone

A wide strip of dry plains extends to the north of the Caspian on both sides of the Volga, and farther east as far as the Chinese frontier. The surface is very even, with only a few low hills rising here and there. These plains occupy about 9% of the Soviet Union.

Large areas of the soils are saline, with the salts often coming close to the surface, especially in the Aral-Caspian depression. On the "Solonetz" and "Solonchak" types of soil there is a cheerless growth of plants especially adapted to the saline conditions and lack of moisture. They have thick, juicy leaves, often bearing prickles. Even in those parts of the plains where the soils are not saline, vegetation is dry and scant, with bare areas between patches of grass, and bushes of tamarisk. In other parts large areas of the plains are covered entirely with wormwood. Plants in these arid regions usually have a very short cycle of growth. Many of them have a completely dead appearance during the heat of summer, but after a shower of rain they seem to revive, and the parched grey colour changes quickly to a fresh green.

The dry steppe supports enormous numbers of cattle, horses, sheep, and camels. A great expanse of the poor dry steppe is required to feed a herd, so that the nomadic herdsmen are compelled to wander from one pasture to another. Deep wells are very important, since rivers and streams are few and often dry up during the summer.

The Desert Zone

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Special Types of Vegetation in Mountainous Regions

Western Transcaucasia

Along the coast of the Black Sea, between Sochi and Batum, there is a small region known as Kolkhiz, where the climate is distinguished by extremely heavy rainfall and a high average annual temperature. The vegetation is thick, luxuriant, and almost impenetrable. There is a great variety of plants, including trees such as the beech, hornbeam, and white poplar, overgrown with lianas, wild grapes, and ivy. The thick green forest cover shuts out the rays of the sun, and between the trees there is a dense undergrowth of prickly and evergreen bushes – hawthorn, holly, cherry, laurel, and rhododendron. There are ferns which grow to the height of a man, and others which are tree-climbers. In the spring the lianas and bushes are covered with flowers possessing a strong aromatic scent.

Some trees grow to a height of from 40 to 50 feet before they are eight years old. Near Batum the Japanese bamboo reaches a height of 20 feet within five weeks.

The South-eastern Caucasus

An area possessing similar climatic conditions is found near the shores of the Caspian Sea. It is called Talish, and is situated near the town of Lenkoran. The typical trees of the forests of this region are the chestnut, oak, and the ironwood, with an undergrowth of box, wild quince, pomegranate, and mulberry.

These two areas are of great importance to the agricultural economy of the Soviet Union, since it is possible to grow olives, grapes, lemons, oranges, mandarins, and tea. These regions are usually referred to in Russian works dealing with agriculture as the "sub-tropical regions." In addition to the [p137] luxuriant growth of vegetation such animals as the tiger, hyena, panther, jackal, and porcupine are found.

The Amur-Ussuri Region

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The Poorer Forest Zones of the Crimea, Caucasus, and Middle Asia

The Crimea. The northern slopes of the Crimean Mountains are forested to a height of 500 feet, with oak and the small-leaved hornbeam on the lower slopes, and beech forests on the higher mountains. The highest slopes are covered with pines. In the Yaila the forests attain a height of 2600 to 5200 feet. The dry limestone surfaces of the tops of the ranges are treeless.

[p138] There is a marked difference between the forest cover of the northern and southern slopes in the Crimea. The southern slopes have a definitely Mediterranean type of vegetation: with many evergreen trees, including the juniper. The lower slopes have forests of cypress and Lebanon cedar, the middle slopes are clothed with oak, and the highest parts with pines.

The Caucasus. The finest forest growth occurs in the wetter western part of the Caucasus, where the lower slopes are covered with oak and ash, pear, apple, and maple, wild alder and willow in low-lying and damper situations. Beech forests cover large areas of the upper slopes, while the oak hornbeam, ash, lime, and maple are commonly found. The beech forests themselves, however, rarely contain other types of tree. They provide a thick cover overhead, shutting out the light from the ground, which is covered with mosses, and, in places, with bushes of azalea and thick ferns.

The very high mountain-sides are clothed with pine forests or giant firs, such as those on the steep approaches to Mount Elbruz, which grow to a height of 180 feet.

Middle Asia. ...

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Distribution of Forest Resources of the U.S.S.R. (1935)

Republic, Region or Territory	% of forested land	% of standing timber in the USSR
Northern Region	45.6	8.8
Karelian Republic	56.5	1.4
Leningrad Region	30.8	1.7
Western Region	23.5	0.5
Kalinin Region	14.6	0.3
Moscow Region	27.1	0.6
Ivanovo Region	31.3	0.7
Gorki Region	41.1	0.9
Kirov Region	37.3	0.9
Kursk + Voronezh Regions	6.4	0.2
Sverdlovsk Region	58.2	3.3
Cheliabinsk Region	18.6	0.5
Omsk Region	10.8	2.8
Bashkir Republic	33.2	0.8
Tartar Republic	15.6	0.2
Kuibishev + Orenburg Regions	11.8	0.5
Stalingrad + Saratov Regions	2.7	0.2
Azov-Black Sea Territory	10.9	0.3
North Caucasus Territory	5.5	0.2
Crimean Republic	7.2	0.0
Kazakh Republic	6.5	3.2
Kara Kalpak Republic	55.7	1.2
Kirghiz Republic	4.9	0.2
West Siberian Territory	37.1	5.2
Krasnoyarsk Territory	36.1	13.2
Yakut Republic	47.7	24.7
East Siberian Territory	39.7	12.1
Far Eastern Territory	3.4	11.9

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CHAPTER V THE GEOGRAPHICAL BACKGROUND OF RUSSIAN HISTORICAL DEVELOPMENT

RELIEF, rivers, vegetation, and soils have all played an important part in the growth of the Russian State.

The immense extent of the Russian Plain provided an area throughout which the state was able to expand without meeting any serious natural obstacles, and at the same time provided no region separated from the rest of the plain by physical features, which might have become the nucleus of another, rival, state. The original Russian State grew up in, and expanded from, the deciduous forest zone.

The essential factor in this growth was the strong differentiation between the Leningrad-Moscow-Kiev triangle of deciduous and mixed forest lands (covered with morainic hills, marshes, and lakes, and forming the sources of the main rivers of the East European Plain), and the remainder of the Plain (the coniferous forests and Tundra to the north, and the Steppe to the south and east). Across the whole of the East European Plain the rivers and river valleys provided the main ways of movement and expansion and served as transport arteries which bound the whole country together,

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These townships and villages [i.e. in the 'triangle'] were frequently established upon the sides of morainic hills, where the soil was drier, warmer, and better drained than in the low, lake-strew marshy country between them. Today one may observe concentration of villages upon these hills, while roads and railways follow them in a general south-west – north-east direction, and canals run in the lowlands between the hills. The line of older and more eroded moraines separated the rival states of Tver and Moscow, while this was also the line of advance of the invasion of 1812, and it was later followed by the Warsaw-Moscow Railway.

This type of forested marshy country was particularly difficult for cavalry invasions by the nomads.

Along the southern borders of the deciduous forest lands, the transitional zone of wooded steppe was for long the scene of the struggle between the sedentary, agricultural way of life and the wandering nomad way. The Russians set up series of forts in this zone, and it was along the narrow belt wooded steppe that they eventually moved into and colonized Siberia.

The Russian communities were at first confined to the morainic heights and the plateaux between the upper courses of the great rivers. The low-lying plains of the upper Don and Oka remained as battlegrounds in their struggle with the nomads. The right bank of the upper Don was particularly useful in this struggle, since it consists, for about 200 miles, of high calcareous cliffs, ideal for defence.

[p145] We have already observed in Chapter IV that the wooded steppe country penetrates into the true steppe along river valleys and ravines. The valleys provided trade routes from north to south, and from the Middle Ages the chief commercial centres were towns situated at bridgeheads, where the rivers were crossed by east-west overland routes. Examples of such towns are Saratov, Rostov, Kuibishev, Gorki, and Kiev.

It was along the valleys that the Russians gradually penetrated into the south. Peter the Great built his famous Don flotilla on the river Voronezh, a tributary of the Don, and used it to assist his southern expansion. The forests provided timber for the construction of these ships. Today timber is carried down the Volga from the north, so that near the river one may see timber houses in the midst of treeless steppe.

In the south of European Russia the steppe between the Dniester and the Don received the name of "Ukraine," which means "on the frontier," or "on the border." Towards the west of the East European Plain the low, marshy lands of Byelorussia also formed a frontier zone, where the Russians struggled for long against the Polish, Lithuanian, and other states. Thus today the peoples of the Ukraine and Byelorussia have languages and traditions rather different from those of the Russians.

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The historical development of the Russian State is reflected in the present distribution of the population, the arrangement of administrative divisions, and the types of cities and villages. The most dense areas of population are to be found in the central and southern parts of the East European Plain – in the main industrial areas – and in the rich black earth lands. The importance of the waterways and the portages is reflected in the number of towns situated on the rivers or at points controlling the portages or bridgeheads – Moscow, Vyatka, Vologda, Kuibishev, etc. The concentration of towns and villages of the north-west upon the morainic hills has already been mentioned. In the south the Russians penetrated along the river-valleys into the steppe. The importance of the rivers as sources of water in these dry lands is shown by the present concentration of settlements close to rivers and streams and places where wells could be sunk. (There are practically no single scattered farmsteads in the north, and few in the south. The desire for protection against invasion, wild animals, and the weather caused people to congregate in villages in the north. In the south, water-supply tends to control settlement.)

The necessity to build towns as fortified points in elevated positions on the plain is obvious everywhere.

Moscow, Tula, and Ryazan each possesses its Kreml, or ancient fortified centre, the fort, arsenal, and sanctuary of the town. Rostov, Vladimir, Gorki, [p168] and Kazan also possess such ancient fortified centres, known as *Detinetzi*. The plan of many of the towns often show their growth from the original fortified strong point. As the town expanded a new circle of ramparts was constructed, and these remain today as circular boulevards or roads, intersected by other roads which radiate like the spokes of a wheel from the centre.

The Present Distribution of Nationalities

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CHAPTER VII AGRICULTURAL AND INDUSTRIAL DEVELOPMENT

Agricultural Development

NATURE has given the Soviet Union a great variety of climatic conditions and soils, and hence a variety of agricultural possibilities. From early times timber and furs were obtained from the coniferous forests, flax, honey, and rye from the deciduous forest lands, and silk and fruits from the south. But as soon as the Slav peoples colonized the black earth lands these former steppe regions rapidly became the most productive areas of Russia. The fertile soils had lain uncultivated for centuries, and where the rainfall was sufficient the land yielded rich returns of grain. In the western half of the Ukraine, where moister conditions prevail, sugar-beet has been introduced, while the drier steppe areas have for long supported large herds of cattle.

Although we speak of the black earth lands as having been cultivated, it would be more correct to say that they were plundered, for year after year the harvests were reaped, without any thought being given to the replenishment of the soil by means of fertilizers or crop rotation. Little attention was given to the protection of the fields from the hot, dry winds of summer, when the parched earth was often swept away in clouds of dust. Trees were cut near the banks of streams and gullies, and the latter gradually extended. At first this rapacious plundering of the land was confined to European Russia.

For long the Russian peasants were serfs under feudal overlords. Many of them escaped and made their way to the 'free' lands of the south or across the Volga. Even after the abolition of serfdom the land available for the peasants, especially in the richer southern regions, was not sufficient to support their families, so that there was continual land-hunger, and migration continued, extending into the Siberian [p180] Steppe, where the same backward methods of farming were practised. Between 1897 and 1917 the population of Siberia doubled, and for this reason the population today is 90% Russian.

Because the easy development of wheat farming provided a large amount of grain for export, in addition to the furs, gold, flax, and timber from the north, products of the land were exported in large quantities, and manufactured commodities were imported. This meant that the mineral and industrial resources of the country remained almost untouched. From the time when Peter the Great built St Petersburg as Russia's western port foreign trade was regarded as being of the greatest importance. Large wooden ships with a displacement of up to 2000 tons carried grain up the Volga. It was transhipped to small barges for the journey along the system of canals and rivers linking it with Lake Ladoga and the river Neva. At St Petersburg ships from foreign countries were loaded with grain and timber, furs, flax, and hemp.

But this growth of the grain and agricultural export trade did not transform Russia into a modern agricultural country. The standard of life of the peasants was so low that the landowners found it cheaper to use human labour than machinery. Low quality in agricultural technique was counterbalanced by the quantity of land and the arduousness of labour. The peasants could not read or write, let alone appreciate modern scientific ideas about farming practice. Their small strips of land were not suited to the employment of machinery. In most parts of Russia the ancient three-field system was the basis of cultivation, the *Mir*, or parish council, having the authority to redistribute the strips of land amongst the peasant households from time to time. After the eighteenth century, however, it became possible for the individual peasant to make personal profit by selling his produce to the towns. The desire for private ownership of a fixed and definite area of land gradually brought to an end the redistribution of the strips, although the rotation of crops was still carried on according [p181] to ancient custom, and most of the cattle were herded in common. The result of the change from communal to private ownership was that the strips of land which the peasant received became divided among his family at his death, and after several generations many of the strips were so small as to be uneconomical. The peasant was driven off the land, being compelled to sell his small fields to some wealthy neighbour who was able to buy land, increase the size of his holding, and employ poor peasants as labourers.

But even this degree of consolidation of the small strips did not produce farms capable of using modern machinery and methods. The old three-field system of rotation could not be accommodated to meet modern ideas of crop rotation and replenishment of the soil. Even the most simple improvements were not adopted. Ten

million wooden ploughs and seventeen and a half million wooden harrows were in use in 1910.

Although 80% of the population of Tsarist Russia depended upon agriculture, after the emancipation of the serfs in 1861 15% of the peasants were left without land and became agricultural labourers. The average size of the peasant holding was seven to ten acres.

In pre-Revolutionary Russia, out of 907 million acres of land more than 376 million acres were in the hands of owners of large estates, about 198 million acres belonged to the more wealthy peasant-proprietors, and less than one-half of the land was left to be divided among several million middle, and poor peasant families.

In the north and elsewhere where communications were poor, farming was of the subsistence type. The yield from the soil was low. Only the vast amount of land in the black earth belt established Russia as the foremost producer of grain in the world. Yet in a country so rich in wheat black rye-bread was all that most of the people could afford to buy. In a country rich in coal and iron and the minerals needed for the manufacture of chemical fertilizers there was no fertiliser [p182] industry, and very little manufacture or agriculture machinery or of modern farm implements. Grain was produced where it was most easy to cultivate it. This, combined with the poor system of transport and periodic droughts in the south-east, resulted in the occurrence of frequent and regular famines in certain areas where there was a deficiency of grain, while at the same time there might be an abundance in another area.

After the Revolution of 1917 ...

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Agricultural Regions

(see Fig. 19)

In the European part of the Soviet Union the types of crops grown vary from north to south, the change from the dominant cultivation of one crop to another being due partly to the less severe winters and longer and warmer summers experienced in the south, and partly to the improvement in the fertility of the soils and the increasing dryness of the summers.

[p192] Towards the east, especially across the Volga, and towards the south-east, drought becomes a factor of increasing importance, while there is the additional difficulty of the carbonate accumulation in the upper layers of the soils. In Western Siberia the low density of population has restricted

Livestock (Million Head).

	1913	1938 (<i>July</i>)	On State Farms (1938-39)
Cattle	60.6	63.2	2.6
Sheep and goats	121.2	102.5	5.7
Pigs	20.9	30.6	1.8
Horses	35.8	17.5	2.0

Percentage Increase In Agricultural Production (1913-39)

Total Sown Area	Area Under Cereals	Production Of Cereals (<i>By Weight</i>)
30.4	8.5	18.0

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[p193] agricultural expansion in the past. This is now being overcome by the widespread use of machinery. In Eastern Siberia much of the land is forested highland. Along river valleys in the south, and in the separate small areas of steppe described in Chapter IV, the warm summers, drier than in Western Siberia, allow agricultural enterprises to flourish to a surprising degree, in spite of the severe winters. The Far East has an agricultural region with special characteristics, in the middle Amur and Ussuri valleys. The semi-monsoon nature of the climate has made possible the growth of such crops as rice and soya bean, in addition to grain and sugar-beet.

Although certain areas tend to specialize in the production of agricultural commodities for which the soil and climate are particularly favourable, the element of regional specialization in Soviet agricultural economy should not be too strongly stressed. The general trend in agricultural policy was outlined by Stalin in 1934, when he declared:

We no longer have regions which are exclusively agrarian, which would supply grain, meat, and vegetables to the industrial regions; nor have we exclusively industrial regions which can calculate on receiving all the necessary supplies from other regions. Development is proceeding towards the position when all our regions will be more or less industrial....From this it follows that every region will have to develop its own agricultural base in order to be able to supply itself with vegetables, potatoes, butter, and milk, and to some degree with grain and meat....

The Tundra and Forest-meadow Regions

The long, severe winters, short growing season (70 to 125 frostless days), poor soils, and a subsoil which is permanently frozen everywhere in the Far North, and in numerous areas east of the Yenesei, provide serious obstacles to agriculture.

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[p194]

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The short summers and poor podsolized soils of the forests provide difficulties for the extension of farming on a large scale. But towards the south of the coniferous forest zone [p196] cattle are reared in the meadows, especially in the flood-meadows, and in the valleys barley, rye, and vegetables are cultivated. The yield of hay is often poor, but it has been doubled by sowing selected varieties of seed. At present, meadows occupy only 2% of the zone, and about half of this area is sown with grass for hay. In European Russia winter rye and oats are the main crops wherever agriculture is practised in the northern forest belt. With the employment of selected varieties of grain, the cultivation of these crops, together with spring wheat, has been extended into the southern half of the Archangel region, and beyond the Arctic Circle in the Komi Republic and the Nentsi National Region, where the climate is drier. In these Far Northern lands, barley occupies the greatest proportion of land devoted to grain. In Western and Central Siberia the grain crops mentioned above extend only to 60° N. The native people of the Yakut Republic have for long been renowned for their hay production and the rearing of cattle and horses in a most severe climate. Within recent years science has come to the aid of these people, and crops of spring wheat, rye, oats, and barley are now grown. The long, dry summer days, with a temperature remarkably high for the latitude, assists the ripening of the crops and compensates to some extent for the short growing season (see p. 319).

The Flax-Dairy-Grain Belt

From the early times when the Slavs cleared the deciduous forest lands and cultivated the soil, rye provided the main article of food, and flax was the basis of the homespun linen industry which later developed into an industry known throughout the world. The damp climate is excellent for flax, and since this crop makes heavy demands upon the soil, fodder grasses are grown in rotation. Thus flax cultivation and dairy farming generally occur together. Potatoes also form an important crop in this region.

The relatively heavy rainfall (20 - 40 inches), and the summer showers which often accompany thunderstorms, made the ripening of wheat somewhat difficult. Rye, however, can [p197] withstand a damper climate as well as more severe winters, and oats can be grown where the summer is cool and damp. In European Russia rye is most often the main winter crop, and oats, barley, and some wheat the spring crops. Much of the land is still under forest, and houses are practically all made from wood.

Within recent years the productivity of this region has been raised. The soils are not exceptionally fertile, and lime and fertilizers are necessary. With the introduction of varieties suited to the climatic conditions the amount of wheat grown has been considerably increased, mainly upon the glacial clays. In European Russia spring wheat is now grown in appreciable quantities as far north as 62° N., where the frost-free period is eighty days. Vegetable, potato, and dairy farming are also of importance, especially near the large towns, while in Byelorussia potatoes are grown for the potato alcohol industry. In North-west and Central European Russia about 16 million acres of potatoes were sown in 1937. The area devoted to flax (long-fibre) was more than 4 million acres (in North-western European Russia and Western Siberia). This is the largest area in the world devoted to the production of this crop.

In the wooded steppe zone of European Russia the warmer summers, milder winters, and more fertile soils provide greater opportunities for the farmer. Winter rye, spring and winter wheat, sugar-beet, hemp and potatoes, are important crops to the west of the Urals. There are considerable areas of natural valley-meadows and sown meadow-grasses, both in the northern part of the wooded steppe zone and in the deciduous forest zone. Farther south, most of the land is under crops, and intensive cattle-, pig-, and poultry-rearing (based on sugar-beet waste, grain, and potatoes for fodder) is carried on. West of the Volga the country is thickly

populated, and the climate relatively damp. Hence farming is on an intensive scale. The absence of drought and the high [p198] natural fertility of the soil favour a high yield of grain and a stable harvest. The summers, long and warm, and sufficient rainfall favour the growth of sugar-beet.

East of the Volga the climate is semi-arid, and there is an abundance of land, thinly populated. Hence cattle-rearing and grain production are less intensive. In Western Siberia extensive wheat farming is accompanied by intensive flax and hemp cultivation. Dairy farming and cattle-rearing are based on natural pasture.

The Winter Wheat and Major Spring Wheat Region

This region almost coincides with the fertile black earth lands, now almost completely cultivated west of the Urals. Here the whitewashed thatched cottage, surrounded by fruit-trees and kitchen-garden, replaces the log house so common in the forest lands. Upon these soils the greatest degree of crop specialization has been attained. While from 50 to 70% of the flax and rye region is devoted to cereals, from 75 to 90% of the black earth lands are cultivated for cereal crops. The frostless season lasts from 140 days in the north to 200 days in the south, and the warm, dry summers, with July average temperatures of from 70° F. to 75° F., together with an annual precipitation of 15 to 20 inches, provide excellent conditions for the growth of grain. Winter wheat, winter rye, and sunflower are the main crops in the Ukrainian steppe and the Azov-Black Sea territory, and more root crops are grown in these regions than elsewhere in the U.S.S.R. Sugar-beet is planted in rotation with wheat, since it allows the soil to regenerate after the previous crop, and so increases the yield of the wheat which follows. On the light soils around the shores of the Black Sea lies a concentrated area of barley production.

Within recent years cotton has been introduced into the Southern Ukraine. Maize is also grown, and is a particularly important crop in the warm southern part of the Azov-Black Sea territory and in the Northern Caucasus region. Here, the [p199] frost-free period is up to 240 days, and the July average temperature exceeds 75° F. To the north it is too cool for the growth of maize, and in the south it is too dry. Intensive cattle-, pig-, and poultry-rearing, together with the cultivation of the vine and tobacco, are also of importance in the territories mentioned above.

Owing to the absence of natural pasture, livestock is usually fed on grain, potatoes, and sugar-beet waste.

East of the Don, and to a great extent east of the Volga, the lack of moisture is more pronounced. The annual precipitation is from 8 to 10 inches, with an early summer maximum. The only limitation to the yield of the grain crops is drought. The black soils are everywhere exceedingly fertile, and extend as far east as the river Yenessei. Large new areas have been brought into cultivation, and large-scale mechanized wheat farming is the main occupation. The relatively light snowfall gives little protection from the severe frosts, so that wheat is usually spring-sown. It occupies up to 90% of the sown area. Millet is a popular 'insurance crop' in dry areas. Sugar-beet, however, is rapidly becoming a very important secondary crop. The cultivation of rye is widespread. In the highlands east of the Yenessei cultivation of both wheat and sugar-beet is limited to relatively small steppe and valley areas. There is abundant pasture in the valleys, and cattle-rearing is an important occupation.

Cattle and sheep are reared for milk, meat, and wool throughout the Siberian steppe, especially near the drier southern border. Dairy farming for butter production is an important occupation in Western Siberia. Fodder grasses are commonly planted in rotation with wheat. Near the big industrial centres vegetable farming and pig-rearing are the most important sections of agricultural economy after wheat.

A secondary area of wheat production is found in those parts of the Asiatic republics lying close to the mountains and in and near the valleys of the Syr Darya and Amu Darya rivers. The annual precipitation is above 10 inches, and the [p200] July average temperature exceeds 80° F. Rice, hemp, and sugar-beet are also grown. Cattle are reared in the mountain valleys, and on the dry steppe to the north of the main areas of cultivation.

East of the Volga farming is of the extensive type, large areas being sown to wheat, but the yield being rather lower than in European Russia. Dry-farming methods and the sowing of the crop relatively thinly in order not to make excessive demands upon the available moisture are responsible for this along the southern edge of the region. The relatively slight density of population is also an important factor. The farms are large and highly mechanized. Indeed, in all the grain farms of the U.S.S.R. there are four to five times as many tractor stations as in those of any other type. The extensive areas of uncultivated steppe land in the more arid parts of the Trans-Volga and North Caucasus regions support large numbers of cattle and sheep.

The Pastoral Region

This corresponds to the natural vegetation zone of dry steppe and semi-desert. The annual precipitation is below 10 inches, and tends to be irregular from year to year. This region supports large herds of cattle, sheep, horses, and camels. It supplies about 40% of the meat consumed in the Soviet Union. Originally the land was the home of nomadic herdsmen, large numbers of whom have now been organized into large state and collective cattle

farms. Very little of the land is actually sown with grass. About 70% remains as rough pasture. Owing to the sparse vegetational cover, the herds need very large grazing grounds, while wells are of the greatest importance as sources of water. Thus farming in this region is most extensive in character.

The Caucasus and Trans-Caucasus

The agriculture of the Caucasus will be treated in some detail in a subsequent chapter. The mountain meadows and [p201] intermontaine valleys and plains provide pastures for large herds and flocks, while in the lowlands, especially in the damper river valleys of the west, wheat, maize, barley, cotton, tobacco, grapes, and fruit are grown. The areas which specialize in sub-tropical cultivation are described below.

The Regions of Sub-tropical Cultures

These regions are distinguished by highly specialized and intensive types of agriculture, mainly of plantation character.

The Dry Region.

The southern and eastern parts of the Asiatic republics, together with an area extending from Azerbaijan, in the Caucasus, to the Aspheron Peninsula, occupy the most southerly parts of the U.S.S.R. The winters are short, with average January temperatures from 32° F. to 40° F. – the highest in the entire country. The July average is from 75° F. to 85° F. The summers are long and very dry. The annual precipitation varies from 8 inches in the lowlands to more than 20 inches near the mountains. Irrigation is practised on a large scale, and cotton is the most important crop. In Tajikistan and Turkmenia plant growth occurs between November and May, so that winter crops are grown, especially vegetables. Many Mediterranean fruits have been introduced, and almonds, pomegranates, olives, apricots, peaches, and some quinine are cultivated.

The Humid Region.

Close to the shores of the Black Sea, between Tuapse and the Turkish frontier (and including the Krasnodar district, Western Georgia, and parts of Azerbaijan), not only are there mild winters and hot summers, but the precipitation exceeds 40 inches. The soil conditions and the general tropical appearance of the natural vegetation have been described in Chapters III and IV. The hillsides and coastal lands support most of the Soviet tea-plantations, while citrus fruits and bamboo are also cultivated.

Tea.

Large-scale tea cultivation in the Soviet Union is of recent origin. The plantations along the Black Sea coast did not exceed 2225 acres in 1913. By 1938, however, in West Georgia and the Galski district of Azerbaijan, large areas of [p203] the Talish region there is a small area of rice-fields. Near Poti large tracts of the Kolkhiz marshes have been drained. They now support plantations of camphor-trees and mandarin oranges.

The Far East

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The Relative Importance of Various Sections of Agriculture

In almost every part of the U.S.S.R. where agriculture is practised grain crops – so important in agricultural economy as a source of food for both man and animal – occupy from 50 to 90% of the sown area. Grain crops as a whole occupy twice the area of land under all other crops. Their greatest concentration is to be observed in the steppe and wooded steppe zones, especially in the Ukraine and the pre-Caucasus. The Ukraine is especially important, since it lies close to the great centres of population and industry, and has a greater length of railways per square mile than any other area of the Soviet Union.

There is a dense agricultural population, and practically no unoccupied land. Hence collective rather than state farms were established here, and machine-tractor stations played an important part in the introduction of new farming technique. There is sufficient precipitation, and the summers are long, warm, and dry. Hence the yield per acre is high, with [p204] little variation from year to year, and a stable harvest. Since there is no new land to be brought under cultivation increased productivity has resulted only from the employment of improved technique, which has brought about a steady increase in the yield of grain each year.

The second great grain-producing centre lies farther east, where there is a general deficiency of moisture and periodic droughts are usual (especially in the Trans-Volga, Stalingrad, Saratov, Kuibishev, Chkalov, or Orenburg, and Cheliabinsk regions). The less favourable climatic conditions are reflected in the lower yield per acre and the less stable harvest. At the beginning of the period of agricultural reconstruction there was more uncultivated land in these regions than in the west, and so large mechanized state farms were established. These

are especially common in Western Siberia. Drought is being fought by means of irrigation, and in the Trans-Volga regions each year sees an increase in the area of irrigated land.

In Tsarist Russia wheat-growing was concentrated to a great extent in the black and brown earth zones – the 'producing regions', in contrast with the densely populated northern 'consuming regions'.

The strain on the transport system and the occurrence of drought in the south were factors which influenced the Soviet Government in its decision to promote wheat cultivation in those areas which lie outside the black and brown earth zones. To the north there is much uncultivated land, while the moister climate enables a higher yield per acre to be obtained. The summers are sufficiently warm, and in fact the actual limit of the economic growth of wheat is now about 60° N. The poor soils, however, need lime and artificial fertilizers. The shorter growing season and the more severe winter conditions are being overcome by the introduction of new, quick-growing types of spring wheat, and frost-resistant types of winter wheat. The deeper snow cover and the protection of the fields from biting winds by forests and woods are factors which to some extent offset some of the more unfavourable conditions for wheat cultivation in the north and centre.

[p206] Wheat is the most important grain crop in the U.S.S.R., and has rapidly superseded rye in the making of flour for bread. The latter, usually a winter-sown crop, is cultivated throughout large areas of the northern regions of the Soviet Union. Wheat, more sensitive to cold winters and cool, short summers, becomes the dominant crop farther south, and here winter wheat prevails only towards the west, where the winters are less severe and the snow cover deeper than in the east. Spring wheat prevails east of the river Don. Winter wheat, limited by climatic conditions to the Ukraine, Crimea, pre-Caucasus, and Transcaucasia, is the more valuable on account of its higher yield per acre and more stable harvest.

Within recent years the use of new varieties has brought about an extension of the area sown to this crop to the north and east. At the same time spring wheat is now grown farther to the north than in pre-Revolutionary Russia, both on newly-cultivated land; and in place of rye in those regions where agriculture has been practised for some time. Over the whole of the U.S.S.R. wheat now occupies on an average about 30% of the sown area. Over 3.75 million acres are on land where none was grown before. The areas devoted to this crop in 1913 and 1938 are given in the table at p. 190.

Rye is less susceptible to climatic variation and consequently, apart from its importance in the north, is grown practically everywhere. Only in Eastern Siberia and the Far North, where the winters are exceptionally severe, is it a spring crop.

Oats can be grown on poor soils, and, like barley, is a remarkably hardy crop. Its cultivation extends as far north as that of rye, but not so far north as barley. The latter takes the place of oats in drier regions both in the north and south, since oats require more moisture. The greatest production of oats is concentrated within a triangle bounded by lines joining the towns of Tula, Penza, and Kiev.

Barley, grown mainly for animal fodder (especially for pigs), and also for use in malting, is a crop which grows rapidly. Thus in the south it is able to complete its growth [p207] before the hot, dry summer is established, while in the Far North it is able to mature during the short growing season. Hence it is important both in the extreme north and extreme south. About 50% of all the barley grown in the U.S.S.R. is cultivated in the Ukraine (especially on the light sandy soils near the coast of the Black Sea) and in the Caucasus.

Millet, even more resistant to drought than barley, is more sensitive to frost than the latter. It is grown chiefly in the Kursk-Tambov area of the central black earth region, where it replaces wheat in crop-rotation. It is the most important grain crop in the arid steppe region of Central Kazakhstan, where lack of moisture makes the cultivation of other grains practically impossible.

Maize, used mainly as fodder, is essentially a southern crop, requiring high summer temperatures. The chief areas for the cultivation of this crop are in the Ukraine and pre-Caucasus, where very high yields are obtained. During the last few years it has been introduced successfully to regions farther to the north.

Rice gives the highest yield per acre of all the grain crops. Climatic factors limit its growth to the south. Since the fields must be flooded at the time of planting irrigation channels must be constructed. About 300,000 tons of rough rice are produced annually in the U.S.S.R.; cultivation being concentrated in Transcaucasia, the southern parts of the Asiatic republics, and the Ussuri region of the Far East. With the introduction of cotton into the two former regions, rice cultivation has declined, and has moved somewhat farther north – into the pre-Caucasus and Southern Kazakhstan.

After cereals, industrial crops – those which provide industry with raw materials – are most important. They supply the textile factories with flax and cotton, the food industry with sugar-beet and vegetable oil, and potatoes for the production of starch and alcohol.

Obviously, the expansion of the area under these crops is inevitably bound up with the general expansion of industry, and the more efficient production of crops for human food [p208] and animal fodder, since an increase in the area of industrial crops often implies a relative decrease in the area devoted to other plants.

Cotton is the most important raw material for the textile industries. Pre-Revolutionary Russia was obliged to import nearly one-half of the raw cotton required by the textile mills. Today most of it is grown within the borders of the Soviet Union, and the area devoted to this crop is almost eight times that of 1913. Nevertheless it occupies only about 1.5% of the total sown area as compared with 8.4% in the U.S.A. Production has increased rapidly, as is shown in the table at p. 190.

Although the cotton plant does not require an abundant rainfall, its roots need a considerable amount of water. This is supplied by irrigation in Soviet Central Asia, where most of the crop is grown. The hot, dry summers and long, sunny days common in the Asiatic republics are most favourable for cotton cultivation. The yield is high, and an ever-increasing area is devoted to fine Egyptian cotton (340,000 acres in 1938). Cotton is also grown, without irrigation, in new areas – the pre-Caucasus, the lower Volga, the Crimea, and Southern Ukraine. Lucerne is generally sown in rotation in order to restore soil-fertility, and provides an important supply of cattle-fodder.

Flax, in contrast to cotton, is a northern crop, growing best in damp regions, where the summer is cloudy and the average temperature is below 68° F. Hence it is concentrated in the deciduous forest zone, and to a lesser extent in the southern borders of the coniferous forest zone. It is not a suitable crop for the old three-field system. It makes heavy demands upon the soil, and must therefore be grown as part of a well-planned system of rotation, in which grasses, especially clover, play an important part. Hence flax cultivation and dairy farming, both suitable for relatively damp and mild climatic conditions, are usually associated in the same district or region.

The cultivation, harvesting, and processing of the crop require a great deal of heavy labour. The U.S.S.R. now [p209] leads the world not only in the quantity of flax produced – 80% of the world's production – but also in the widespread use of machinery for dealing with this crop. It is grown chiefly in Byelorussia, the Kalinin, Leningrad, and Smolensk regions, and to the north-east of these regions as far as Vologda and Kirov. Large new areas have been brought into cultivation on the southern borders of the Siberian forest zone. In the south (the black earth zone) flax is grown for seed- and oil-production. Hemp, which requires a warmer climate, is cultivated to the south of the main flax producing zone, in an area bounded by lines joining the towns of Chernigov, Bryansk, Orel, and Kursk, and within a triangle between the towns of Penza, Ryazan, and Gorki.

The cultivation of the silkworm has been greatly improved. In 1938 approximately two to three tons of mulberry-leaf were produced per acre, and the annual output of silk cloth has now reached more than a hundred million yards. The chief areas of silk production are in the Turkmenian, Armenian, and Azerbaijan republics, the Melitopol and Odessa districts in the Ukraine, the Crimea, the Kara-Kalpak Republic, and other parts of Uzbekistan, the Kirghiz Republic, and other parts of Soviet Central Asia. There are twelve state farms devoted to silkworm culture.

The production of wool, unlike that of silk, is widespread. Sheep are reared in many parts of the U.S.S.R. The fine wool of the Astrakhan and caracaul sheep of Central Asia is known throughout the world.

'Southern hemp' has been introduced to several new districts – the Krasnodar region, Southern Ukraine, the Kazakh and Kirghiz republics. About 60% of the total world output is produced in the Soviet Union. Jute is also cultivated (in Uzbekistan), although on a small scale.

In the production of vegetable oils the sunflower is the most important plant. It requires a warm, dry, sunny climate and is cultivated on a large scale in the pre-Caucasus (especially in the Kuban lowland), South-eastern Ukraine, the Voronezh, lower and middle Volga regions, and the [p210] steppe lands of the Southern Urals, Western Siberia, and Kazakhstan.

The U.S.S.R. now takes first place in the world in the production of sugar-beet. The main producing areas are in the wooded steppe zone of the Ukraine, especially in the lands along the western side of the Dnieper, and in the Kursk region, where there are rich black soils and there is sufficient warmth and moisture. In 1913 sugar-beet was almost confined to the Ukraine. Today nearly 150,000 acres are under this crop in the pre-Caucasus, Transcaucasia, the middle and lower Volga regions, the Bashkir, Kirghiz, and Kazakh republics, in the West Siberian steppe, near the Altai, and in the Southern Ussuri basin of the Far East. In 1937 three million acres of sugar-beet were harvested – twice the acreage harvested in 1913.

Potatoes are grown universally for human and animal consumption, and provide raw material for the treacle starch, and alcohol industries. Intensive cultivation and high yields require a well-worked soil and heavy application of manures. Light, friable, well-drained soils – sands, light clays, or black earth, in regions where there is sufficient moisture – provide the best conditions. Lack of moisture, reduces the yield. Hence the most

intensive cultivation is carried on to the north of the sugar-beet areas – between the latter and the centre of the flax-producing districts, in Byelorussia, and the Moscow, Voronezh, and Kuibishev region. The acreage devoted to potatoes is now more than twice that of 1913.

Fruit, Wine, Tobacco, and Tea

Practically every state and collective farm has its orchards. The total area is second only to that of the U.S.A. More than twenty-two times the area devoted to fruit culture in 1913 now supports orchards. The total production of fruit in 1938 was 21 million tons. (See also p. 201.)

The main centres of apple production are in the western part of the Ukraine, especially around Podolsk and Kiev and in the Crimea, the Leningrad region, Byelorussia, and [212] the central uplands between the Moscow region and the Ukraine. There are important state apple farms in Azerbaijan, and in the Ryazan district, in the R.S.F.S.R.

The work of the botanist Michurin has resulted in the production of new and improved varieties of apples to suit almost every climatic condition in the Soviet Union. Hence flourishing orchards have been established in many new districts-near Alma Ata, for example, and on the slopes of the Altai, where the snow cover is 1½ to 2 inches thick and lies on the ground until the middle of June. In the experimental farm at Minussinsk, in the south of Central Siberia, there are 10 acres of apple orchards, in which the trees are trained to trail over the ground in order to avoid the killing frosts and biting winds of winter.

Similarly, the introduction of special varieties of vine has enabled its commercial cultivation to spread towards the north (see Fig. 22). The areas of greatest production are to the west of the Dniester river, near Odessa, in the Don valley, to the north-east of Rostov, in the Caucasian republics, especially along the Black Sea coast between Sukhum and Batum, and near Bukhara, Samarkand, and Tashkent, in the Asiatic republics. There are secondary areas in the central part of the East European Plain, especially in the Voronezh and Kuibishev districts.

Yellow, or "Turkish" tobacco, which needs a warm climate and damp soil, is grown near Maikop and in Abkhazia, in the Caucasus, and on the southern shores of the Crimea. The coarse tobacco known as "Makhorka" is grown in North-western Ukraine (the Poltava and Chernigov districts), and the Tambov and lower Volga regions.

Tea is grown near Batum, on the east coast of the Black Sea, and in the Lenkoran lowland, on the eastern shores of the Caspian. (See pp. 201 and 202.)

Vegetable Crops

It is clear from Fig. 21 that vegetable crops predominate in the Leningrad region, Byelorussia, and the Northern Ukraine – that is to say, mainly in the damper areas of the [p213] East European Plain, and particularly near the large towns. There are also considerable areas devoted to these crops near the industrial regions of Siberia and in the Caucasian and Asiatic republics. (It should be noted, however, that the large crops of potatoes grown in Byelorussia are not entirely for human consumption. Large quantities are converted into alcohol.)

In the Murmansk and Archangel districts, as well as on the new northern state farms (*e.g.*, at Igarka, within the Arctic Circle), relatively high yields of vegetables and potatoes are obtained, averaging from 4 to 6 tons per acre. One farm in Yakutia has obtained a yield of 10.8 tons per acre of cabbage.

Fodder Grasses

Fodder grasses, the dominant crops after grain in many areas, occupy 56 million acres (1940) – as compared with 5 million acres in 1913. Red clover mixtures constitute about 50% of the sown grasses, especially in the north-west, within a triangle formed by lines through the cities of Leningrad, Ivanovo, and Minsk, and in many parts of Siberia, between Omsk and Khabarovsk. Lucerne is important as a crop sown in rotation with wheat. It is also used for the grazing of cattle and hogs. In areas where limy soils prevail and where it is impossible to grow lucerne (south and west of a line passing through Gomel, Kursk, Voronezh, and Elitsa) esparto grass is commonly grown.

New Crops

Mention has already been made of the increasing cultivation of tea, cotton, and other sub-tropical crops. But in addition to these several entirely new plants, such as tung, described above, have been introduced – plants not previously cultivated commercially. New fibre plants have been introduced in order to supplement cotton as a raw material of the textile industry and to avoid dependence upon imported supplies of jute. Many rubber-bearing plants now occupy considerable areas. Perhaps the most remarkable achievement has been the large-scale cultivation of rubber plants, such as [p214] kok-sagyz, a close relative of the dandelion discovered in 1931

in the Tian Shan Mountains, tau-sagyz, and khondrilla. Kog-sagyz will grow on cultivated soils or peaty lowlands, and can be successfully cultivated in semi-deserts or as far north as 60° North Latitude. This plant is now grown in the northern half of the East European Plain as well as in the Ukraine, Transcaucasia, and Western Siberia. It yields about 2½ cwt. of rubber per acre (from 2 to 2½ tons of roots) in the second year, on good, well-cultivated soils. Recently, several thousand acres have been planted in Kazakhstan and the Central Asiatic republics. Altogether, there were in 1938 62,270 acres devoted to the kok-sagyz, and there are also several important plantations of other rubber-bearing plants. The soya bean, introduced first into the Far East, is now grown also in the Ukraine and North Caucasus. Among other new crops grown in the U.S.S.R. are rami, kendir, and kenaf, relations of the cotton plant, which provide fabrics for a number of industries, including the aircraft industry. (*Rami, or Chinese Nettle*: A sub-tropical plant, the fibre of which is used alone, or together with cotton or silk, in the manufacture of fine or coarse fabrics. *Kendir (Apocynum venetum)*: A plant which produces very strong fibre, of great value in the manufacture of hard-wearing cloth. It is grown mainly in the Asiatic republics. *Kenaf, or Bombay Hemp (Hibiscus cannabinus)*: A plant grown in the Southern Ukraine, the Crimea, West Georgia, and Tajikistan. The fibres are used in the textile industry as a substitute for jute.)

Kendir is grown in the valleys of the Syr Darya, Amu Darya, Chu, Volga, Dnieper, Kuban, and Terek rivers. Sixty-five thousand acres were planted in 1933, including 25,000 acres in the Chu valley (Soviet Central Asia). One hundred and seventy-five thousand acres of land in the North Caucasus plains, Azerbaijan, and Uzbekistan, were devoted to the cultivation of kenaf in the same year. This plant yields a fibre used in the manufacture of sacks. Rami is grown in the damp sub-tropical regions near Batum and in the Lenkoran Lowland (1200 acres in 1935).

The table at p. 190 summarizes the relative importance of the various crops, and shows that in the Soviet Union a large part of the land is devoted to the growth of cereals. Of the [p215] other crops we can distinguish certain areas where there is a specialization in one type. But if the soil is not to be exhausted other crops must be planted in rotation, and in fact there is a good deal of mixed farming, not apparent, perhaps, when we confine our attention to those crops which are particularly predominant in a given area.

Livestock

The most essential requirement for successful stock-rearing is a stable supply of fodder-grain, root crops, silage, meadow and pasture, or temporary grass, one of the most important features of modern crop-rotation. Waste from industrial processes such as the manufacture of sugar-beet often provides large amounts of feeding-stuff.

Tsarist Russia relied mainly upon 'natural fodder' – meadows and permanent grass. Today the type of fodder varies from region to region according to the type of crops. The mountain pastures of the Caucasus support sheep and cattle. In Byelorussia pigs are reared on a large scale, and are fed on potatoes. In the black earth zone of European Russia, where there is practically no grassland, nearly all the land being under crops, pigs are fed on potatoes, and large numbers of grain-fed poultry are reared.

Meadows and rough grazing land are found to the greatest extent in those parts of the U.S.S.R. where the percentage of land under sown crops is relatively small – in the deciduous forest region to the north, the dryer steppe areas of Kazakhstan and the lower Volga, and the Alpine regions of the Caucasus and Central Asia. Between these northern and southern areas there is less meadowland and rough grazing, but sown grasses form an important part of agricultural economy, especially in the damper western regions of Byelorussia, and the Smolensk, Kalinin, Moscow, Yaroslavl, and Ivanovo regions. In the black earth zone livestock is fed almost entirely on grain, potatoes, sugar-beet 'waste', etc. Stock-rearing based upon this type of fodder was impossible in Tsarist Russia, except on large estates. It is well suited to the well-organized economy of the collective farm or state [p216] farm. Scientific crop-rotation, intensive animal-breeding, and therefore a steady supply of farmyard manure, are interdependent, one benefiting the other. They are common features of farming practice in the black earth lands of the U.S.S.R.

Since 1917 there has been a sharp increase in the area devoted to sown grasses. There has been a similar increase in the production of maize and root crops for fodder, while silage, unknown in old Russia, is now in common use (see table at p. 190). For the first time in Russian agricultural history mowing is carried on in the dry lands of the Trans-Caucasus, the pre-Caucasus, the lower Volga, Kazakhstan, and the Trans-Baikal area, providing hay for winter fodder, and allowing the farmers to maintain larger flocks and herds throughout the year.

The type of stock-rearing varies from one region to another according to the type of fodder available (depending largely upon climatic factors), the location of Government marketing and meat-packing centres, transport facilities, and the location of large urban markets.

Dairy farming is concentrated in the damper and formerly forested areas, in the north-west of the U.S.S.R. – in

the Kalinin, Moscow, Yaroslavl, and Ivanovo regions, Byelorussia, the greater part of the Urals, the southern fringe of the coniferous forest belt, and in the valleys of Transcaucasia. Stock-rearing for meat production is confined mainly to Byelorussia, the Ukraine, the Smolensk and central black earth regions of European Russia, the middle and lower Volga, and the steppe lands of the southern Urals and Siberia. The production of wool and leather, in addition to meat, is important in Kazakhstan and Central Asia.

The dairy farms of the north depend largely upon meadows and permanent grass for pasture, although there are considerable acreages of sown grasses in the west. Milk production is important near the towns, while farther away the milk is used for making butter, which is better able to withstand the longer journeys. Thus in the Leningrad, Ivanovo, Moscow, Kalinin, and Smolensk regions only one-tenth of [p217] the total production of milk is used for the manufacture of butter, as compared with one-half in the Vologda region and Western Siberia. The Caucasian and Altai valleys specialize in cheese production.

Meat production in the drier regions depends upon the extensive areas of natural grazing land, while in the pre-Caucasus and the Ukraine cattle are fed upon grain and root crops and certain 'waste' products of industry.

Pig-rearing is most strongly developed in Byelorussia, and the Smolensk, Moscow, Tula, Orel, and Kursk regions. The chief source of fodder is the potato. This branch of agriculture is important also in the Ukraine and in the pre-Caucasus. In the latter the pigs are fed chiefly upon maize.

In the early days of agricultural reconstruction the more wealthy type of peasant opposed collectivization of the farms, and opposition often took the form of the wholesale slaughter of livestock. Hence the building up of new herds of animals has been a major task. The greatest successes have been achieved in pig-breeding.

Numerous state farms specialize in the breeding of cattle and pigs, and near the large consuming centres many collective farms specialize in meat production.

Near the cattle-breeding regions, and close to focal points on the transport system, as well as in the large towns, great 'meat combines' and refrigeration centres have been established, where carcasses are prepared for market, meat and meat extracts are packed or canned, and a variety of meat products, such as hams and sausages, produced.

Sheep-rearing for wool production is important in Kazakhstan, the Asiatic republics, the Caucasus, and Siberia. The largest flocks belong to state farms. The greatest proportion of leather comes from the cattle farms of the Volga, Kazakh, and Siberian steppe. Draught-horses and oxen are bred in the Ukraine, the pre-Caucasus, and the lower Volga region. In Transcaucasia the buffalo is often used, while the camel is common in the arid regions of Central Asia, and in the Tundra zone deer-breeding is an important occupation.

Hunting and Fishing

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[p219]

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Some Special Problems of Soviet Agriculture

Marshes and Bogs

About 6% of the entire surface of the U.S.S.R. is covered with marsh or bog. (According to A. A. Yavrilov, in 1927 in European Russia alone 80 million hectares of land were unfit for cultivation and in need of improvement if they were to be made productive. One-fifth of this area was in the north-west, with a superabundance of water and badly drained soils. About one-sixth was in the arid districts of the south and south-east.)

A great deal of attention has been paid to utilizing the marsh and bog lands agriculturally. Apart from the enormous growth of the peat industry, for the purpose of fuel and chemical by-products, peat is extensively used in the northern lands as mulch and cattle litter, and also as manure. In some cases it is previously saturated with a chemical solution containing the necessary fertilizers; in others, phosphoric iron oxide, found in the lower layers of peat bogs, renders the peat a natural fertilizer. In 1939 43,000 collective farms were using peat fertilizers.

The draining, drying, and ploughing (largely by mechanical means) of large areas of bog has taken place on a large scale, and near Murmansk, Leningrad, Archangel, and in the Kirov and Kursk districts excellent yields of vegetables are obtained from former bogs. In the Kursk district, and [p220] in Byelorussia, hemp and the kok-sagyz plant are successfully cultivated in such areas.

Soil Erosion, Afforestation, and Irrigation

In the black earth lands soil erosion, caused by the action of the wind, or by heavy downpours of rain during the dry summers, with the development of gullies and ravines, present the farmer with very serious problems. ("During the last twenty-five years 135,000 acres of fertile black earths have been so removed and replaced by river sand. The Soviet Government has established a research station at Novosil, in the province of Tula, to consider these problems." – R. M. Fleming)

It is important, especially towards the east, to conserve moisture in the soil, and in semi-desert regions valuable pastures may be lost on account of overgrazing, when the grass cover is broken by the hooves of the animals, and the soil becomes little better than drifting sand.

It has been found that many of these difficulties can be overcome by the planting of trees and woods. The trees act as wind-breaks, and prevent the removal of the soil in summer and of the snow, a valuable source of moisture as well as protection from severe frosts, in winter. Woods and forests raise the humidity of the atmosphere and retain moisture in the soil. Where trees have been planted on a large scale it has been found that the yield of grain and grasses increased considerably. Tree-planting also prevents the extension of gullies and ravines. Within the last ten years more than 740,000 acres of new woods have been planted by the farmers in the U.S.S.R.

On eroded and also on overcultivated or "spent lands" with marked deficiency in nitrogen, grasses and legumes are now introduced as part of a six-course rotation designed to restore the structure and fertility of the soil. Where soil erosion takes place on steep slopes terracing is usually practised.

Where the soil is light or sandy it is especially important that trees should be planted. Large areas of steppe near Stalingrad provide an excellent example of this practice, and close to the city large apricot orchards have been planted [p221] on the light soils. In semi-desert regions tamarisk and other grasses and plants have been sown, increasing the area available to pasture. In this way, about 61,000 acres of sands have been reclaimed.

Finally, dry-farming methods have been adopted throughout the dry regions, and in the lower Trans-Volga and the Asiatic republics large new areas have been brought under cultivation by means of irrigation (Figs.42 and 48). In order to select suitable areas for irrigation, extensive soil surveys were carried out in Central Asia between 1925 and 1926.

Sown Area, Number of Peasant Households, and Number of Workers Per Collective Farm by Regions, 1938

Region	Collectively sown area (in 1,000 acres)	Peasant households	Active workers
Total Soviet Union	1.2	78	169
North Caucasus	3.3	151	–
Ukraine	1.9	141	291
Eastern Russia:			
Lower and Middle Volga	4.1	136	278
Ural	1.9	83	183
West Siberia	1.5	63	147
East Siberia	1.2	62	160
Far Eastern Siberia	1.4	47	121
Kazakhstan	1.7	79	161
Uzbek Republic	0.7	89	210

(Figures for 1937)

The tables at pp. 222-26, which do not include data for Byelorussia, the Transcaucasus, or the European part of the R.S.F.S.R., are based upon statistics taken from ... L. Volin.... They show clearly the effect of climate and density of population upon agriculture east of the Volga as compared with that of European Russia. Winter-sown grain decreases from 37% in the Ukraine to only 3% in the Altai region, owing to the more severe winters and lack of snow cover in the east. Beyond the Volga farms are larger and more highly mechanized, and about 50% of the land is on state farms. Extensive grain-cultivation predominates, and there are large numbers of livestock. In 1938 the eastern part of the U.S.S.R. possessed 40% of all cattle, 50% of sheep and goats – but less than 25% of the pigs of the Soviet Union.

[p222]

Area (In Thousand Acres) Under Certain Crops, by Regions, 1938

Region	Winter	Spring	Oats	Spring	Sunflower	Potatoes	Vegetable	Legumes	Other	Total
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	Rye	Wheat		Barley	Seed					
North Caucasus	1,302	2,895	1,467	3,810	1,813	523	361	101	19,105*	31,377
Middle and Lower Volga:										
---Kuibishev	2,195	3,242	1,047	171	465	357	46	300	1,381	9,204
---Tartar	2,494	1,375	1,454	71	62	449	36	623	1,402	7,968
---Saratov	1,732	3,054	725	319	517	152	39	229	1,503	8,270
---Stalingrad	2,052	3,807	385	669	345	121	50	14	2,404*	9,847
---German Volga	664	1,566	101	209	122	45	14	16	792	3,529
Total	9,137	13,044	3,712	1,439	1,513	1,124	185	1,182	7,482	38,818
Ural:										
---Perm	999	576	1,099	246	-	187	25	108	628	3,868
---Sverdlovsk	461	741	687	131	-	174	26	119	298	2,637
---Bashkir	2,047	2,609	1,635	79	186	368	43	253	1,356	8,578
---Orenburg	1,397	4,345	925	268	428	142	24	29	1,163	8,721
---Cheliabinsk	911	4,160	1,669	246	81	236	41	251	676	8,271
Total	5,815	12,431	6,015	970	695	1,107	159	762	4,121	32,075
West Siberia:										
...										
East Siberia:										
...										
Far Eastern Siberia ...										
Kazakhstan ...										
Soviet Central Asia										
...										
Total Soviet Union	52,337	66,538	44,187	21,033	7,770	18,199	3,261	6,224	118,837	338,386

* Including 378,000 acres under mustard seed.

* Other crops here includes winter wheat 8,665, winter barley 703, maize 2,480, rice 26, melons 354, castor beans 391, tobacco 67, cotton 525, fodder and hay 4,573 and others 1,321 (thousand acres).

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Industry

The essential requirements of industry are raw materials, power, or fuel, and transport to bring them together for the manufacturing process,

The U.S.S.R. possesses a large proportion of the power resources of the entire world, (See table at p. 234.) Much of the country's mineral wealth was unknown to Tsarist Russia, since only 0.25% of the Russian Empire had been covered by geological maps on the scale of 1/200,000 and 0.45% on the scales of 1/100,000 and 1/10,000,

By 1937, however, 43.2% of the U.S.S.R., had been geologically mapped – 8.5% on the scale of 1/200,000 and 4.3% on the scale of 1/100,000 and on larger scales. Not only has geological survey revealed widespread and large mineral deposits, but many of them are today being exploited, so that the modern map of the distribution of industry in the Soviet Union is very different from that of 1913.

In spite of the rich resources of raw materials and power [p227] Russian industrial development had not proceeded very far before 1917. What industry there was remained concentrated in the European part of Russia, and even here was confined to a relatively small number of areas around the cities of St Petersburg and Moscow, and in the Donbas (about 90%), with secondary industrial centres in the Caucasus, some towns on or near the Volga, and in western towns such as Minsk, which took advantage of transit trade between Russia and the Baltic coast.

The factory production of consumer goods was so small, and transport so poorly developed, that large sections of the population, especially among the peasantry, depended for clothing and household necessities upon peasant handicraft industry. Tula has long been noted for its samovars, Yaroslavl for homespun linen, the Nizhni Novgorod (Gorki) district for felt boots, caps, and so on. Exchange of products between one district and another was carried on at fairs, such as the famous Nizhni Novgorod fair.

The food and textile industries – the only ones developed to any considerable extent – depended largely upon agriculture for raw materials, and the colonial lands, which had practically no industries of their own, supplied a large proportion.

The output of coal and iron was exceedingly low. Britain produced thirty times as much coal (and seven times

as much iron) per head of population.

Nearly 90% of the coal came from the Donetz coalfield. There are about 90 milliard tons of it here – coking coal in the west and anthracite in the east. The seams are rather thin (average thickness 1.6 feet) and consequently not cheap to work. But they lie close to the most densely populated parts of Russia, and within 250 miles of the Krivoi Rog and Kerch iron mines. About three-quarters of the production of pig-iron was smelted in the Don basin, although it was not used to any great extent near its place of origin since there was very little engineering and machine construction carried on there. These industries were confined to the centre and north-west of the East European Plain, in regions which produced less than 5% of the total output of [p228] pig-iron, and only 10% of the coal. This obviously brought about a most irrational use of the already inadequate transport system.

The Expansion of Industry since 1917

Coal. Today Donetz coal and coke supply many new centres of metallurgy and heavy industry in South European Russia, while the by-products of the coke industry are used by the Ukrainian chemical works.

In the past, 10 to 15% of the coal from the Don basin was transported for distances as great as 900 miles, and absorbed in the process about 40% of the capacity of the railway system. It was used in the Urals, while local coal and the Kuznetsk deposits remained neglected. It was carried to the Asiatic republics, when the Karaganda coalfield could have supplied the need. Locomotives hauling coal to Turkestan actually consumed 20% of their load on the journey.

The exploitation of new coalfields (Fig. 23) has not only increased the total output but, by enabling local resources to be more widely employed, reduces the amount of transport it required.

In European Russia the highest quality coal comes from the Don basin. (It gives 7000 calories per kilogram of coal.) But in districts far away from the mines transport costs may offset this factor to a considerable degree. In the case of other coal deposits of lower quality (*e.g.*, Moscow coal, giving 3500 calories per kilogram) and with a high ash-content, transport would definitely be uneconomical. But it is now used locally, particularly since it yields valuable by-products for the chemical industry, while electric power-stations which have been built close to such coalfields are connected to the regional 'grid' transmission system and thus overcome the economic difficulty of carrying low-grade fuel for any considerable distance.

The industrial district of Leningrad saves annually some 4½ to 5 million tons of coal which previously came from the Don Basin ...

...

In production the Baku oilfields occupy first place, and about half of the estimated resources of the U.S.S.R. are to be found here. Some of the oil is sent to the Batum refineries, from which petroleum is exported. The greater part is sent via the Caspian Sea and the Volga and its tributaries to the industrial centres of the U.S.S.R. The Grozny district is the second largest producer of oil, and from Grozny it is exported via Tuapse. The greater part, however, is transported overland, through Armavir to the Don basin and the Ukraine (see p. 469). The largest reserves of oil in the U.S.S.R. are now known to lie in the 'Second Baku' region between the Urals and the Volga, and in the Emba district. Wells are also being worked in the Arctic (in the Nordvik area) to supply Arctic aviation and shipping.

Improved methods of oil-extraction, together with the opening of new fields, have raised the annual output from 9¼ million tons in 1913 to more than 32 million tons in 1940.

The oil-refining industry has also been rationalized. Refining is carried on both close to the oil wells (at Baku, Grozny, Armavir), in the industrial regions where it is used (*e.g.*, Orsk, the Don basin, Moscow, Ivanovo, Gorki, Saratov, Leningrad, etc.), and at the export ports (Batum and Tuapse).

Production of Oil and Gas (In Thousand Tons)

Region	1913	1933	1938
U.S.S.R.	9,234.1	22,458.0	32,230.8
Baku	7,669.1	15,981.5	23,980.0
Grozny	1,208.2	5,053.0	2,763.6
Volga-Urals	–	36.3	1,298.4
Krasnodar	86.8	766.0	2,250.3
Far East	–	196.4	360.9
Turkmen S.S.R.	129.5	154.7	436.7
Uzbek S.S.R.	13.2	35.8	} .
ajik S.S.R.	9.7	15.9	} 225.3

Kazakh S.S.R. 117.6 198.1 652.0

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CHAPTER XIV THE URALS

THE Ural Mountains, together with the land close to them, not only occupy a central position within the territory of the U.S.S.R., but also a most important position in the economy of the whole country.

This region is in many respects transitional in character between north and south, east and west. In the past it was regarded as the frontier between civilized Europe and backward Asia, almost an outpost of European Russia. Physically, it has been wrongly regarded as the frontier between Asia and Europe, although it has never in any sense constituted a barrier to communications; and climatically there is little difference between its eastern and western slopes. The ancient Finnish tribes crossed the Urals on their way to Northern Europe. The early Russian explorers and traders found no difficulty in making their way across the Urals into Siberia.

Along the ridges and slopes of the Urals the cold north pushes its icy fingers deep into Russia. Severe frosts and deep snows are characteristic of the Northern and Central Urals, which are covered with coniferous forests. In the south the transition to the Asiatic lands is marked by drought, hot summers, and steppe vegetation.

The northern part of the region has already been described in Chapter VIII. Like all the lands of the Far North, it is sparsely peopled, the inhabitants being occupied mainly with hunting and reindeer-breeding, or with lumbering and forestry.

The centre and south together comprise a region very similar to those regions of Southern Siberia described in Chapter XII – regions which embrace coniferous forest, wooded steppe, and steppe lands, lying astride the great east-west line of communication served by the tributaries of the larger rivers and by the Trans-Siberian Railway.

Just as the Novosibirsk region is closely linked, economically [p423] and by virtue of its physical position, with Eastern Siberia, Central Asia, and the Urals, so are the Urals linked with the Novosibirsk region by means of the new Ural-Kuznetsk industrial "Combine" and also with Central Asia, and European Russia, as well as lying close to that great transport artery, the Volga.

In fact, the Urals, once the symbol of the transition from civilization to more backward ways of life, have become the symbol of a powerful wave of industrialization which is sweeping into Siberia and Central Asia.

The Urals now mark the beginning of vast new industrial areas which include giant industrial undertakings and modern cities.

Physical Characteristics

The general structure of the Urals has been described in Chapter I. The mountain system consists of a number of parallel ridges, divided by depressions and valleys, much denuded and worn down by the action of the weather, rivers, sea, and ice.

Thus there is nothing very grand or majestic about the Urals. From the top of the ridges wide views can be obtained of forested hills, with smooth rounded contours and wide, deep, gently sloping valleys. Like gigantic dark green waves the country extends on all sides, broken only by an occasional mountain top, bluish in colour, peeping out above the dark forest mass. Owing to the severe winters and poor stony soil, the forest gives way to vegetation of the Tundra type at a height of about 2500 feet.

The northern ranges (four parallel ridges) are not very high or very wide. The central section of the Urals bears the remains of five ranges, which, however, have been almost completely worn away and broken into separate blocks, so that between Sverdlovsk and Cheliabinsk communications across the Urals are particularly easy, and the landscape can hardly be described as mountainous (Fig. 44). The south is quite different. The ranges are longer and higher than in the north, and are separated by deep valleys. Limestone outcrops [p424] and karst formations are common. The Mugodzhar Mountains form the most southerly and very low extension of the Urals.

The Pre-Ural region, lying to the west of the main range, consists of a hilly plain, the surface worn into wide rolling valleys; the general elevation of the land rises very gradually towards the east. Towards the south the Obschyy Syrt consists of a system of ancient folds, so much destroyed or denuded that the folding is noticeable only where the surface is deeply dissected by valleys (Fig. 45).

The eastern slopes of the Urals are relatively steep, with a much more truly mountainous type of landscape, overlooking the Trans-Ural region, a very level lowland, representing the edge of the West Siberian Lowland, once the floor of a sea which washed the mountain slopes. Close to the mountains there are numerous lakes,

deep, often with steep banks, and containing fresh water. Farther south, in the steppe, they are shallow and saline.

The Urals form the divide between those rivers which drain towards the Pechora and the Volga and those which drain into the Ob. The latter, falling rapidly from the relatively steep slopes of the mountains, are of use for navigation only when they reach the plain. The former are much deeper and are usually broad and slow-flowing. The Kama, a large, deep, and wide tributary of the Volga, is the most important. Large boats use this river as far upstream as Perm. Above Perm both the Kama and its tributary the Chusovaya are used by smaller vessels. Farther south is the Belaya, the only other tributary of any importance.

Climate and Vegetation

The climate of the Urals region is the most continental of all European Russia. The winter is typically Siberian in character, with severe frosts, and lasting for five or six months. But except in the open steppe country of the south there are no strong winds, so that the cold is tolerable from the human point of view. [p425]

The summer is very warm, even in the north. July temperatures increase from 64° F. in the north to 72° F. in the south, where hot south-easterly winds, reminiscent of Central Asia, are experienced.

Precipitation is generally light, especially in the south-east. The distinction between north and south is reflected in the vegetation, changing southward from coniferous forest to [p426] wooded steppe and open black earth steppe lands. Along the mountain ridges the forests penetrate into the steppe in long tongues, while in the forested lands there are the usual valley meadows. In the Central Urals there is a great deal of open birch and aspen woodland, while towards the south-west, in the pre-Urals district, there is the eastern extension of deciduous forest zone of Central Europe.

In the open steppe country of the southern Urals, there is an abundance of small lakes, and 'solonchak' formations, with occasional birch-woods. Towards the east the transition into Siberia is marked by an increase in the 'solonchak' formations and in the number of salt lakes.

Mineral Wealth

The folding of the Urals, which took place during the Hercynian period, was accompanied by considerable faulting and fracturing, especially in the eastern part of the range. Ancient rock formations were brought up close to the surface, and the prolonged denudation which followed has exposed a great variety of valuable mineral deposits, especially in the southern and central parts. There is an amazing variety of these deposits, which probably constitute the greatest concentration of mineral wealth in the world. There is an old saying, common in the schools and universities of Russia, "If you are asked in an examination where some useful mineral is found, point to the Urals. Everything is found there."

Deposits of iron ore constitute the most important mineral resources. There are entire mountains of high-grade magnetite ore – Mount Blagodot, Mount Visokaya, and the Magnetnaya Mountain – ore which has an iron content of 60%. The Magnetnaya Mountain deposits alone amount to 450,000,000 tons. To the north-west of Magnetnaya Mountain are the Zigazin deposits, in the Bashkir Republic, with ore reserves of 150,000,000 tons; to the north [p427] the extremely pure high-grade ore of the Bakal mines. Titano-magnetite ore is found here, together with deposits of copper and vanadium. Other minerals, the distribution of which is shown in Fig. 44, are manganese (2,600,000 tons), nickel, wolfram and copper (found together with zinc), lead, silver and platinum, bauxite, rock salt, potassium salts, limestone, dolomite, quartzite, and precious stones such as amethyst, topaz, and emerald. (See also pp. 241, 244.)

On the western slopes of the Urals coal, which is used in conjunction with coal from Karaganda (Kazakhstan) for coking, is found, and is mined at Kizel, north-east of Perm. Brown coal is mined at Yegorshino, east of Sverdlovsk, and at Cheliabinsk, for use locally as a fuel. It should be noted, however, that the coal deposits are small and the reserves constitute only about 6% of those of the Don basin. Oil is found in the north at Chusovsk, near Perm, and in the south at Ishimbayev, in the Bashkir Republic.

Partly owing to the low precipitation of the region, and partly owing to the low elevation of the mountains and the absence of glaciers and large snowfields, there are no great reserves of water-power, and, indeed, while possessing great resources of metal, the Urals is deficient in fuel resources. This deficiency is to some extent being overcome by the development of new oilfields, known in the Soviet Union as the "Second Baku." Oil is known to occur in the carboniferous strata throughout a large area between the western slopes of the Urals and the Volga (see Fig. 44) while a large proportion of the production of the Emba oil-wells is also sent to the Urals.

Industry

The industries of the Urals have been built up primarily upon the basis of the excellent iron ore which is mined

in [p428] the region. As early as the sixteenth century, when the army of the expanding Moscow State needed guns and ammunition, and Tula became Russia's first armoury, the need for more supplies of iron led the Tsar to grant to the aristocracy rights to exploit the Urals.

The landowners were empowered to take with them their serfs, who thus became forced labourers. From year to year production of iron increased, until in 1827 the annual output of pig-iron was 155,400 tons. Smelting was carried on by means of charcoal, and as this is a fragile material, easily crushed under the weight of large quantities of ore, the size of the furnaces was severely limited. The rivers were used for the purpose of floating timber from the forests, and as sources of power. Each little industrial undertaking had its mill-pond and water-wheel, and an enormous amount of labour had to be employed in the mines in hauling the ore to the furnaces (horses were used) and in felling trees, sawing timber, and making charcoal. But serf-labour was plentiful and cheap, and it was not until the abolition of serfdom and the introduction of coke-smelting that the Urals lost its position as Russia's chief producer of iron. When there was no longer any forced labour, and when in the Don basin foreign companies had installed larger and more modern furnaces, making use of the excellent coking coal which lay close by, the industries of the Urals declined. Apart from the lack of ----r, there were no supplies of coking coal.

After ----- the Soviet Government decided to introduce a bold ----- the exchange of iron ore from the Urals for the coking ----- of the Kuznetsk basin, some 1200 miles to the east, and ---- the utilization of coal from Karaganda, 600 miles to the --- -east. Thus the Urals became linked as part of a gigantic industrial organization with both Siberia and Asia.

Coal from Kizil, on the western slopes of the Urals, combined with Karaganda coal, is also used for the making of coke.

The power reserves of the region have been supplemented by the development of local oil-wells, in conjunction with the use of oil brought by pipeline from the Emba oilfields, [p429] the construction of a hydro-electric station near Perm, and electric-power stations burning peat or coal at Perm, Berezniki, Sverdlovsk, Magnitogorsk, and Orsk, and at Kizil and Cheliabinsk, where local coal is used. All these stations are linked by high-voltage transmission cables, forming a power-net which serves the entire Ural industrial region.

Magnitogorsk is today a modern city of 200,000 people, which rose within the short space of three or four years near the site of a small village by the banks of the Ural river, at the foot of the Magnetnaya Mountain. The river Ural had to be dammed in order to create a water supply, and a branch line was constructed to connect the town with the main railway line to the north. At Magnetnaya Mountain modern mechanized mines were constructed. Giant blast furnaces and steel-mills were erected. These furnaces now produce more than 2,000,000 tons of pig-iron each year and nearly 2,000,000 tons of steel, equal to one-half of the output of all the furnaces and mills of Russia prior to 1917. The steel mills supply large machine-building and machine-tool works both at Magnitogorsk and in other towns of the Urals. Using the by-products of the coking process, a great chemical industry has been established. The entire Magnitogorsk Combine covers an area of 27 square miles in the valley of the river Ural.

The lonely open steppe has come to life, and where the nomads of yesterday pastured their flocks trains loaded with coal and iron ore journey to and from Kuznetsk, and great blast furnaces rise in the midst of rolling open country.

Cheliabinsk, long noted for its flour-mills, today possesses a big regional electric-power station, which utilizes local brown coal, and an enormous tractor factory with an annual output of more than 40,000 heavy Diesel tractors. Zlatoust (one of the older industrial towns), Bakal, and Beloretsk, produce high-quality steels and alloys, from the titanomagnetite ores of the Bakal mines, and the iron and manganese deposits near Beloretsk. Copper-refining is carried on at Karabash, on the basis of local supplies of ore.

[p430] To the south lies the Orsk-Khalilov industrial district, with oil refineries connected by pipeline to the Emba oilfields, iron and steel, nickel, and machine-building works, and a large meat-processing and packing centre. Chromite, nickel and magnetite iron are mined. In association with the iron is a combination of gold and copper deposit. The gold is extracted, and the copper refined at Orsk. Sulphur compounds found in the copper ore are used in the chemical industry, for the manufacture of sulphuric acid. Iron and steel works at Orsk supply materials to a large new locomotive-building plant. (Other industries are the mining of lignite, to the south-east of Orsk, salt at Iletsk, and phosphorites to the south and south-west of Chkalov.)

The industrial centres described above together form an industrial region situated around the flanks of the Southern Urals. Between this region and the second group of industrial towns farther north – that is, between Cheliabinsk and Sverdlovsk – lies the low central section of the mountain system. This is the most denuded part of the Urals, and it provides an easy passage across them, followed by the two trunk lines from European Russia

to Siberia, passing through Cheliabinsk and Sverdlovsk respectively.

Just as the industries of the Southern Urals depend largely upon the immense resources of iron ore found in the Magnetnaya Mountain, so those of the Central Urals depend upon the iron ore of Mount Blagodad and Mount Visokaya. Kuznetsk and local Yegorshino and Kizel coal, oil from wells situated to the north-east of Perm (Fig. 44), and peat are used in factories and power stations.

Sverdlovsk supplies practically all the industries of the Urals and the entire U.S.S.R. with machinery and machine-tools, in addition to furnace equipment. Copper is mined and refined at Revda, near Sverdlovsk, and at Kirovograd and Krasnouralsk to the north. At Nizhni Tagil are the largest wagon-building works in the world. One million tons of pig-iron is smelted annually. High-quality steels and alloys are produced, and non-ferrous metallurgy is carried on (including the production of zinc). The manufacture of [p431] machinery for heavy industry and the production of paints and varnishes are also among the industries of the town.

Prior to 1917 the only source of bauxite exploited in Russia was at Tikhvin, to the east of Leningrad. But new deposits at Nadezhdinsk, Alapayevsk, and Kamensk are now utilized, and the latter town is the centre of the Urals aluminium industry. Asbestos too is found in the Urals. The deposits are worked in huge quarries near the new town of Asbest, and occur in workable bodies from 20 to 200 metres thick. About 120,000 tons are produced each year. The output of platinum has increased to such an extent that it now occupies a position of world importance. It is mined to the north of Nizhni Tagil. Another valuable metal which is mined is gold. The Beresovsk gold-mine, situated to the north-east of Sverdlovsk and discovered in 1745, was the basis of the first Russian gold industry.

To the north-west of Sverdlovsk are the industrial centres of the Perm region. The salt and potassium deposits at Solikamsk and phosphates to the north provide the basis for the chemical industry at Berezniki, while at Perm the most important industries are concerned with non-ferrous metallurgy, the manufacture of phosphatic fertilizers, and the building of ships for river traffic. Coal is mined at Kizel, and oil at Chusova.

The forest resources of the Urals, which in the past provided charcoal for the iron industry, are now utilized by the paper- and cellulose-mills at Krasnovishersk and the large paper-mills of Krasnokamsk, on the Kama river near Perm (completed in 1936). The rivers are used for the transport of timber.

Thus within the short space of twenty years the Urals region has become one of the foremost industrial areas of the world, comparable only with the largest industrial districts of Europe or America, supplying the U.S.S.R. with heavy industrial equipment, machinery, tractors, locomotives, iron and steel, non-ferrous metals, oil, and chemical fertilizers, and drawing a large proportion of its raw materials from Western Siberia and Kazakhstan. [p432]

Agriculture

Agriculture is developed to the greatest extent in the southern part of the region – in the wooded steppe and steppe zones. North of a line extending roughly from Perm to Tyumen, amid the forests, with their poor podsolized soils, agriculture is limited to the growth of flax, and the rearing of milk cattle upon the valley meadows, together with the small-scale cultivation of crops for local use. Less than 5% of the land is arable. Near the new towns and mining settlements, vegetables and milk are produced for urban consumption.

The chief areas of arable land lie to the south of this line, in the steppe zone, which produces a surplus of wheat in the south and rye and oats in the north. The greatest amount of wheat is raised in the Trans-Urals region. In the Bashkir Republic hemp and sunflower are important crops.

In the Orenburg district (Orenburg is now known as Chkalov) the climate becomes drier, with a very slight fall of snow to protect the ground from frosts in winter. Spring wheat is important. Large areas of the drier steppe country are devoted to the rearing of cattle, sheep, and horses. The profusion of flowering plants in the meadows and grassland provides the basis for bee-keeping. This region is one of the most important in the Soviet Union for the production of honey.

The chemical fertilizer industries of the Urals, together with the production of tractors and agricultural machinery, is of the greatest importance for the state and collective farms, the produce of which is sent by rail and river to all parts of the Soviet Union, as well as supplying the industrial regions of the Urals with food.

Industry and Agriculture in the Bashkir Autonomous Republic

On the western slopes of the Urals, between the steppe and forest zones of the Pre-Urals region, lies the Bashkir Autonomous Republic, before 1917 a part of Russia devoted to agriculture, but now a part of the great industrial complex, [p433] the core of which is situated around Cheliabinsk, Sverdlovsk, and Magnitogorsk.

The Beloretsk metallurgical and engineering centre has been mentioned above. Manganese and chrome are

found to the north and south, and iron near Zigazinsk, and are used in the production of steel of the highest quality. Copper and gold are mined near Baimak.

The oil industry of Bashkiria is rapidly assuming a position of first-rate importance for the entire Urals industrial region. Oil from Syzran on the Volga and from Ishimbayev is transmitted by pipeline to the cracking plant at Ufa. Containing 25 to 30% of volatile fractions, the former is particularly valuable for the production of aviation spirit.

There are oil-wells at Tuimaza, west of Ufa, and near Ishimbayev, where high-quality benzine is manufactured.

In addition to being a centre of the oil industry Ufa possesses wagon-building works, shipyards, and a modern plant for the manufacture of motor engines. Coal from Karaganda is used by these industries.

Cattle-rearing is the most important sector of agriculture in this republic. The Bashkirian dairy herds provide the urban population of the Urals with milk and butter. There is a large dried-milk factory at Meleuzogorsky.

The river Belaya divides the land into two sharply contrasted regions. The lands on the right bank are hilly and wooded. From the left bank open plains and wooded steppe lands, possessing fertile black soils, stretch away to the horizon. But drought makes the cultivation of the soil a difficult matter, and has to be combated by the adoption of extensive dry-farming methods. Such methods have had remarkable results, reflected in the great increase of arable land.

Industry and Agriculture in the Udmurt Autonomous Republic

This small republic lies to the north-west of the Bashkir Republic, in the forested country of the Pre-Urals.

[p434] With the growth of industry the population has increased rapidly since 1920. The output of steel has increased more than tenfold. Ishevsk is the main centre of the industry, and machines, lathes, precision instruments, and small arms and motor-cycles are produced. The timber resources are utilized by the wood-working industries at Mozhga. (Note that the products of the Izhevsk engineering industries are those requiring relatively small amounts of high-grade metal, since the iron ore has to be transported to the steel-mills from the mines of the Urals. The river Kama is used for most of the journey.)

Flax, grown mainly in the north, is the most important product of agriculture, and supplies a large number of linen factories, including a large modern factory at Glazov. Potatoes form the most important crop in the south, and the rearing of cattle on the meadowlands is also of importance. About 2½ million acres are now under crops.

Communications

Very few of the rivers are useful for navigation. The Kama, and to a less extent the Belaya and Chusovoya, are the most important, and they link the region with the Volga.

Three main railway-lines cross the region from west to east: from Leningrad and from Moscow through Sverdlovsk, and from Moscow through Cheliabinsk. The lines from Sverdlovsk and Cheliabinsk converge at Omsk, to form the main-line of the Trans-Siberian Railway. In addition to these trunk lines there is a relatively dense network of north-south communications. Railway-lines run from Cheliabinsk via Troitsk to Orsk and Orenburg, with a branch-line to Magnitogorsk and another to Kustanai. From Cheliabinsk the line continues north to Sverdlovsk and Nadezhdinsk. From Orenburg a main-line links the region with the republics of Central Asia. A new line is to branch off from this line at Akmolinsk and run to Karaganda, in order to provide a direct route along which the coal of Kazakhstan may be sent to the Urals. Reference to Fig. 44 will make it clear that all the industrial centres of the Urals are now served by [p435] railways, many of which are electrified and several of which have been constructed within the last ten years,

The Bashkir Republic was in the past particularly poorly served by railways. The Belaya river was the most important transport artery for this region. But the imperative need to provide Magnitogorsk with a good system of communications has led to the construction of a number of railway-lines, some of which pass through the republic. Among those lines which have been planned or have already been completed mention must be made of the railway from Ufa to Magnitogorsk, via Beloretsk, with a branch line to the Komarovo-Zigazin mining district, the lines from Ufa to Ishimbayev and Orenburg, and Ufa to Kazan. It is obvious that Ufa, the administrative centre of the Bashkir Republic, is destined to become a railway-junction of great significance, the more so since the town is situated on the navigable Belaya river, which is of considerable use as a waterway leading to the Volga.

Population And Towns

The first settlers in the Urals were the ancient Finnish and Turkic peoples. Today they form about 25% of the

total population. The Bashkirs, the remnants of the original Turkic group, number about one million. They form only a third of the total inhabitants of the Bashkir Republic. The rest are Russians (44.4%) and Tartars (17.3%), Ukrainians, Byelorussians, Chuvash, and Marii peoples. About 84% of the population is engaged in agriculture.

The Finnish group, known as the Permyakis, and related to their neighbours of the Komi Republic, live mostly near the north-western border of the Urals region.

The total population of the Urals region is about 11,500,000. The Bashkir A.S.S.R. supports over 3,000,000 people, the Udmurt A.S.S.R. and Chuvash A.S.S.R. a little more than 1,000,000 each, and the Marii A.S.S.R. 579,000.

The density of the population is greatest in the Pre-Urals and Trans-Urals, at least in the forested north and the dry south. In the autonomous republics mentioned above the majority of the population is rural. In the industrial areas there is a high urban concentration, which reaches 45% in the Sverdlovsk and 37% in the Cheliabinsk districts. Rapid industrial expansion has resulted in the quick growth of the towns. Sverdlovsk, with 425,544 inhabitants, is four times larger than it was in 1917. It is situated at the junction of seven railway-lines and is an important airport. Magnitogorsk was a village of some 2000 inhabitants not many years ago. Today it has a population of 146,000. Cheliabinsk, situated at the intersection of important railway routes, has a population of almost 300,000. Perm has 255,000 inhabitants.

Other towns which have shown remarkably rapid growth are Ufa (245,863), Izhevsk, in the Udmurt Republic (175,740), Zlatoust (99,272), Ishim (145,870), Berezniki (63,575), while there are a number of industrial centres with populations of 50,000 or more.

The growth of industry and population in the Urals is of the greatest strategic importance to the U.S.S.R., since it has provided an "industrial base" well away from the frontiers and hence not liable to attack in time of war.

CHAPTER XV THE POVOLZHYE (THE LANDS ALONG THE VOLGA)

THE lands along the Volga and its larger tributaries form an enormous region which extends for 900 miles from north to south, and although these lands include parts of the great coniferous forest zone, the wooded steppe zone, and the steppe and dry steppe zones, the Volga unites the entire area into a single economic unit.

In its upper course, near the confluence of the Oka, at Gorki, the Volga is from one-half to one and a quarter miles wide, and is navigable for river steamers. The width of the valley exceeds 12 miles. Below the confluence of the Kama the Volga is about 2 miles in width, and this increases during the spring floods to between 10 and 20 miles. In the middle and lower course there are numerous islands, shallows, and sandbanks, which impede navigation, especially at the end of the summer (see p. 62). The lower Volga passes through an arid region between low banks, and flows through an enormous delta before reaching the Caspian Sea. The southern edge of the delta consists of an amazing combination of islands, islets, lakes, gulfs, and innumerable streams. Enormous quantities of mud are deposited on the sea-bed around the delta itself, creating shallows which make navigation difficult. These shallows and the difficult conditions for navigation in the delta prevent ships of the Caspian mercantile fleet sailing up the Volga. Cargoes have to be transferred to river vessels at Astrakhan.

From ancient times this mighty river has served as a transport artery between Central Asia, the Caspian, and the Baltic. The early portages between the rivers flowing into the Baltic and the upper Volga were replaced later by canals.

For many centuries the Asiatic nomads came to the Volga to trade, and around the trading points strong feudal states [p438] established, such as the Khanate of Kazan. These were eventually suppressed by the expanding Moscow State.

The lands lying near to the Volga possess no great mineral resources, but since the time when the river came to be used regularly by the Russians wheat, salt, oil, coal, and timber have passed up and down, supplying the lands close to the river with commodities in which they are deficient. The Volga boatmen, renowned in song, were the men who spent their lives toiling on the large wooden ships and barges which carried these commodities and supplied the towns with raw materials for their industries, and which brought food – particularly bread and salt, the traditional Russian emblems of hospitality – to their populations.

Thus this great Russian transport artery became an axis around which economic regions have grown up. Along the river came raw materials, while manufactured goods and the products of agriculture were exported in the same way.

The construction of railways further increased the importance of the waterways. It enabled cargoes to be transhipped at various points for convenient carriage by rail to those parts of Russia not directly served by the Volga. Ten main-lines come down to the river from the west, and five of them cross it and continue to the east

or south-east. The chief towns are situated at the junctions between river and railways. But it must be remembered that they were in most cases well established before the building of the railways, which increased their importance as trading and commercial centres, but did not create them.

Five of the main-lines come to the lower Volga, and of these, three converge upon the city of Stalingrad.

In addition to these west-east lines there are others (Fig. 45) which run in a north-south direction. These are of particular importance in winter, when the Volga is frozen and navigation is brought to a standstill. During the summer, however, it is estimated that the Volga carries a load which could only be carried by five main railway-lines.

In addition to being a main route between north and south the Volga also formed a natural frontier to the early expansion [p440] of the Moscow State. Long after Russia had secured control over the territory lying to the east of the river these dry lands, which extend into the deserts of Kazakhstan and Central Asia, remained uncolonized, because they were unattractive and unproductive. Consequently they did not come to any large extent under the jurisdiction of feudal landowners, and many peasants sought refuge there from serfdom. At various periods in Russian history peasant bands have joined together in revolt against the feudal lords of the Volga, retreating in case of defeat to the 'free' lands on the east bank.

The marked differentiation between the wetter western lands and the more arid eastern lands remains to this day, and the lands on the left bank are still sparsely peopled.

Both the character of the river and the nature of the relief, climate, soils, and vegetation change from north to south, so that the Povolzhye fall naturally into three divisions: (1) the northern forest region; (2) the central wooded steppe region; (3) a southern region of steppe and dry steppe.

The Northern Forest Region

The northern forest zone is drained by the upper Volga and its tributaries, the Sura, Sviyaga, Kama, Vyatka, and Vetluga. The watershed between the two latter rivers and those draining into Arctic waters – the divide between the Volga and Arctic drainage basins – is formed by the low hills which also divide the Gorki and Kirov administrative regions from the Northern Region.

The remainder of the northern forest region consists of a slightly hilly plain, flattest in the west, and covered by glacial and fluvio-glacial deposits of sands and clays, with considerable marsh and peat-bog formations.

Winter lasts for five months as compared with three months in the lands around the lower Volga. Westerly and north-westerly winds prevail, and precipitation is relatively high. To the north of the Volga and the Kama poor podsol soils and coniferous forests predominate, changing to mixed [p441] deciduous and coniferous trees towards the south, where there are generally clay soils, with occasional patches of black earth.

The economy of this region is determined primarily by four main factors: (1) the extensive forests, the basis of the lumber industry, which supplies timber to many parts of the Soviet Union, much of it being shipped down the Volga to the treeless steppe land; (2) shortage of grain, due to the limitation of cultivation by the cool, damp climatic conditions and poor soils; (3) the prevalence of handicraft industries which were developed in the past as a source of income which could supplement the poor returns of agriculture; (4) the role of the Volga-Kama waterway and valley as a route connecting the Moscow and Urals industrial regions, followed by railway-lines from Europe to Siberia.

The numerous saw-mills of the region cater for the home rather than the foreign market, supplying the Moscow district, the steppe zone, the Don basin, and even Baku and Krasnovodsk, on the shores of the Caspian. A large proportion of the timber is sent down the river in a 'raw' state, only about half of the total production being used for paper manufacturing, the production of matches, and the chemical industry. The Balakhna paper-mills, near Gorki, are some of the largest in the world. There are large cellulose, paper, and wood-working plants at the mouth of the Vetluga river, in the Marii A.S.S.R., and at Shumalin, in the Chuvash A.S.S.R. The oak forests in the south-west of the latter republic provide raw material for the furniture, parquet, and veneer industry.

In agriculture the colder and damper northern part of the region specializes in the production of potatoes and flax and the rearing of dairy cattle, while in the south pig-breeding and poultry-farming are important occupations. Both the area and the yield per acre of flax and sown grass have been increased. Rye and oats occupy the greater part of the land [p442] sown to grain crops, although more wheat is now grown than formerly.

There are many industries which are dependent upon the products of agriculture – tanning and boot and shoe manufacturing at Bogorodsk, and the flax and hemp industry, which supplies the regions adjacent to the Volga with ropes and fishing-nets. As there are no large supplies of minerals, and in Tsarist times the region became

over-populated, the handicraft industries developed and have for long employed large numbers of people. Of these the most important are wood-work and metal-work artels (near Pavlovo) and the preparing and manufacturing of sheepskins and sheepskin coats, etc., at Kirov (formerly Vyatka). Within recent years much use has been made of local fuels such as peat and wood, together with oil brought from Baku and coal from the mines of the Don basin. This has brought about the expansion of industry on a much larger scale than was possible hitherto. Regional electric-power stations working on peat have been built at Gorki and Balakhna. Peat and phosphate deposits are being utilized in the chemical industry.

Heavy industry (metallurgy and the construction of machinery and vehicles for transport) has expanded to such an extent that the region around Gorki is now one of the U.S.S.R.'s leading industrial areas.

Ship-building and ship-repairing have been carried on near the Volga for nearly a hundred years. At Sormovo this industry has been developed to include the construction of engines, diesel motors, motor-cars and lorries, self-loading wagons, tram-cars, boilers, and boring machinery, while river steamers, tugs, and barges for the Volga and sea-going vessels for the Caspian are built here.

The Gorki automobile works – the largest in Europe – employs over 15,000 workers and produces cars and lorries. Lathes, diesel motors, aero-engines, and river vessels are also produced at Gorki. Near by, at Balakhna, paper is manufactured from timber floated down the Volga and its tributaries from the northern forests.

At Pavlovo large numbers of men have brought their [p443] traditional skill in fine handicraft work to the new tool-manufacturing, tractor, and automobile works.

For all these industries the greater part of the iron employed has to be brought from other parts of the Soviet Union. But an ever-increasing proportion of local ores is being used since the opening of mines near Murom, on the river Oka, and others to the north of Omutninsk.

The largest deposits of phosphates in the whole of the Soviet Union are situated on the Vyatka-Kama watershed. They supply the chemical works at Dzerzhinski, near Gorki.

The majority of the industrial undertakings of this region are in towns which are grouped together and form an industrial area with Gorki as the centre.

Communications

The position of Gorki at a point where the main line of communication from the Moscow State to Siberia crossed the great highway of the Volga was appreciated in the thirteenth century, when the original town of Nizhni-Novgorod was founded. The town was situated at the place where the large vessels which plied up and down the Volga were unloaded, and their cargoes transhipped to smaller boats which made the journey up the river Oka to Moscow, and later by the canals which gave access to Leningrad and Archangel.

Nizhni-Novgorod became a most important trading centre, the main junction between the Moscow State and the East – Persia, and Central Asia (via the Volga and the Caspian) – the Urals and Siberia. Tea was brought from China across Siberia and was but one item of commerce which made the Nizhni-Novgorod fair of world-wide importance.

With the advent of the railways, lines were laid down from Moscow and Leningrad through Vyatka and Gorki respectively to Siberia. From Vyatka a line was constructed to Kotlass, in the Northern Region. New lines which have recently been completed include those from Kotelnich to Gorki, from Yar to Phosphoritnaya, and from Cheboxari to the Moscow-Siberia line. The Yar-Phosphoritnaya line is [p444] of particular value since it renders possible the exploitation of the iron and phosphate deposits which are now mined near the latter town.

In the Chuvash Autonomous Republic, notorious in the past for its lack of communications, a modern network of motor highways has been constructed. Yoshkar-Ola, in the centre of the Marii A.S.S.R., is served by a branch line from the main Moscow-Kazan-Siberia trunk line.

Population

About one-half of the entire population of the northern forest region is concentrated in less than a quarter of its area, on the south bank of the Kama and Volga, where climatic and soil conditions are more favourable for agriculture, and where industry and commerce may be carried on close to the Volga waterway. In the north-east, in the basin of the upper Vetluga, the country still remains thinly peopled, and covered by virgin forest.

Of the population, 85% is Russian, 10% Chuvash, and 5% Marii. Cheboxari, on the Volga, is the administrative centre of Chuvash A.S.S.R., a region noted in Tsarist Russia as having the greatest number of beggars and the largest number of people suffering from trachoma. Conditions have changed rapidly in the last twenty years, however. Not only has the area of arable land and the number of cattle increased greatly, but such industrial

undertakings as the Shumerlinsk wood-working plant, the Kanashk wagon-repair works, and the exploitation of phosphate and shale deposits have resulted in a marked increase in the urban population. The Marii Autonomous Republic has undergone a similar transformation. The table given at p. 445 shows the position reached by 1939 in the various administrative divisions of the northern forest region of the Povolzhye.

These statistics demonstrate clearly that the population of the upper Volga is still predominantly rural and that the most important concentration of urban population is found in the newly developed industrial area of the Gorki region.

[p445] ...

The Wooded Steppe Region

South of the Volga, where it flows from west to east between Gorki and Kazan, the relief of the land changes, rising on the right bank of the river to the Pre-Volga heights. The relief is largely determined by pre-glacial tectonic factors. The surface has been considerably affected by faulting and fracturing, factors which have produced the Dzhiguli Mountains and the Samara Luki. The latter, a block of hard rocks raised up by faulting, compels the Volga to make a large detour.

The former, dissected by steep, narrow valleys, presents a landscape of steep-edged wooded heights overlooking the Volga. Everywhere, in fact, the Pre-Volga Heights fall steeply to the right bank of the river, and bring about a definite increase in the precipitation, while the greater variety of soils found upon the plateau surface presents favourable conditions for agriculture – in contrast to the low-lying flat or undulating, and rather arid country of the opposite bank, where only in the south is the monotony broken by the rolling upland country and broad, gently sloping valleys of the Obshchy Syrt hills. (The Pre-Volga Heights, by protecting the lands along the eastern bank from westerly winds, reduce the precipitation in these areas.)

South of the Volga-Kama junction, owing to the milder climate, the forests (now largely cleared for agriculture) include deciduous trees such as the oak. The diminution in precipitation towards the south and east brings about the transition to the wooded steppe type of vegetation, changing [p446] to open steppe land in the more arid regions of the left bank of the Volga in the latitude of Kuibishev.

The increased fertility of the soils which accompanies this change in the vegetation is responsible for the prevalent agricultural character of the economy of the middle Volga lands. But there is a marked differentiation between the agriculture of the east and west banks of the river, reflecting the differences in climate, relief, and soils described above. Wheat-cultivation, together with the breeding of sheep and cattle, forms the main occupation of the drier east. The problems of lack of labour, due to the low density of population, and the frequent occurrence of drought have been overcome and the acreage of grain increased by irrigation projects, and the employment of extensive and mechanized dry-farming technique. This has involved the organization of enormous state farms, the introduction of drought-resistant plants, such as maize and sunflower, in addition to drought-resistant types of wheat, the building of reservoirs, and the planting of wooded zones and belts of trees around the fields in order to conserve the snow during winter. The snow protects the ground from frost, and moistens the soil in spring.

The cattle and sheep farms specialize in meat- and wool- production. The rearing of pigs, fed on grain, is also important.

The former poverty of the peasants on the left bank of the Volga was regarded as being the result of drought, while the miserable state of the peasantry on the rich lands of the right bank was attributed to over-population. But the problem of over-population has been no more difficult to overcome than that of drought. The old three-field system of farming has been superseded by a scientific system of crop-rotation and intensive agriculture, with a great increase in the proportion of crops which possess a high value and require a large amount of labour. Such crops are flax, hemp, potatoes, and sugar-beet.

This intensive mixed type of farming also includes the breeding of pigs, poultry, and dairy cattle, vegetable-growing, and orchard-cultivation.

[p447]

Industry

In the past there were few industries of national importance. Handicraft industries were developed to a great extent, and from the lands on the right bank of the Volga, where the primitive system of agriculture could not employ a dense population, there was a regular flow of men to the mines of the Don basin, the lumber-camps of the north, and to the barges and river vessels of the Volga. Terrible famines decimated the population from time to time, as a result of periodic droughts, for the lands of the middle Volga, especially those on the left bank, lie

in the transitional zone between the agricultural and pastoral regions of the U.S.S.R.

Within recent years a number of new industries, engaged in working up agricultural products, have been established, and older ones have expanded. Wool, leather, and skins provide the raw materials for the manufacture of textiles, clothing, boots and shoes, starch (from potatoes) and vegetable oil (from sunflower-seed) are manufactured. Bones and wood are used in the chemical industry, while the forests of the north supply wood which is brought downstream to wood-working and match factories, and the paper and wood chemical works at Kondopobsk. Linen factories have been built, and the dressing and manufacturing of furs from the north is a very important occupation.

The food industry includes flour-milling, distilling, butter-manufacturing, meat-processing and packing. Syzran and Ulyanovsk are the chief centres of the leather, food, and saw-milling industries.

At Saransk, the capital of the Mordovian A.S.S.R., there a large preserved-milk combine.

In addition to the industries which depend directly upon agricultural products there are others which rely upon local mineral deposits and supplies brought to the industrial towns by river. The Tartar Republic possesses a powerful regional electric-power station at Kazan. Tin is manufactured from local deposits, and the production of cement at Volsk and Kuibishev is of national importance. Combustible slates [p448] found at Kashpir (south of Syzran) to the south-east of Kuibishev, and at Undori (north of Ulyanovsk), are used as fuel for the generation of electricity, and the waste products supply raw materials for the chemical industry. The Syzran combustible shale refining plant and the Kashpir electric-power station work in conjunction on this basis. The electric power is transmitted, together with that of the other stations on the Volga, through the regional grid transmission system to various industrial centres, such as the woollen and clothing factories of Penza and Ulyanovsk, and the metal-working industries of Kuibishev. The latter are supplied with nickel, copper, chrome, and iron from the Orenburg-Khalilov region, (see p. 427), and manufacture transport machinery, carburettors, etc. Combustible slates, however, are not the only source of fuel. The Saransk power station, for example, uses peat, while the Kazan and Kuibishev stations, and other industrial undertakings, utilize coal and oil brought along the Volga from the Don basin and Baku respectively. This accounts for the fact that most of the factory towns are situated close to the river or its larger tributaries. (Oil-wells were opened in Syzran in 1937. The two Kuibishev hydroelectric stations, when completed, will provide the most important source of power for the entire Povolzhye. They will form the largest hydro-electric enterprise in the world, with a total capacity of 3.4 million kw. The dam across the Volga will provide water for the irrigation of the arid eastern lands, and will assist the navigation of the upper Volga and the Kama.)

Phosphate deposits (*e.g.*, in the Dzhiguli Mountains) provide raw materials for the manufacture of fertilizers. At Kazan there are chemical, wagon-building, and engineering works, and one of the largest Soviet factories for the manufacture of typewriters. There is mass production of machines with Latin characters, used by the various national groups of Turkic origin. In Tsarist times these peoples were not generally permitted to use their native languages in schools, trade, commerce, law, etc. But with the development of education and the granting of full citizenship to national minorities, there has arisen a great demand for books and literature in languages which use the Latin alphabet.

[p449]

Transport and Communications

The significance of the Volga and its chief tributary, the Kama, cannot be over-stressed. It was around the junction of these two great rivers that the ancient kingdom of the Kama Bulgars was founded, and later, that of the Tartars with the capital at Kazan. The Tartars, in turn, were conquered by the Moscow State. The importance of Kazan, situated at the junction of the main east-west route with the Volga, running from north to south, was increased when it became also the junction between railway and waterway.

The early development and colonization of the remainder of the Volga lands was closely associated with the commencement of regular river navigation in the middle of the nineteenth century, and the construction of railway-lines from Europe to Siberia and Central Asia. It was the growth of the transport system which not only increased the trade and commerce of towns on the Volga but also brought about the conditions in which their industries could expand.

Population

It is not surprising that large cities such as Kazan and Kuibishev are situated at points where the main railway-lines cross the Volga. Kazan (401,655) is the administrative centre of the Tartar Republic. Kuibishev (Fig. 46), a town of more than 390,000 inhabitants, is the centre for the whole of the middle Volga region. The town lies on the great bend of the Volga, at the junction with the Kuibishev river. It is an important point for the

transshipment of grain from river to railway, and in consequence contains large grain-elevators and flour-mills. Northern timber, trans-Volga grain, Turkmenistan cotton, on their journeys by rail and river, meet here. Food products, transport machinery, and building materials (e.g., asphalt, cement, etc.) are manufactured in the town.

[p450] Ulyanovsk (102,106) lies on the right bank of the river, at the crossing of the Ryazan-Ufa railway-line. At SyrzaI (77,679) the railway crosses a bend of the Volga on its way from Penza, a town on the Sura river, to Kuibishev. Penza, is also at the junction of the lines from Gorki and Kazan to Saransk and the Don basin.

Everywhere in the Middle Volga Region there is a sharp differentiation between the density of population on the west and east banks. But on both sides of the river, in spite of the remarkable increase in the size of the towns, the population is still largely rural.

The total population of the Middle Volga Administrative Region was 2,767,562 in 1939, and of this number nearly two million people were living in villages or rural districts, and of the urban population more than 70% was concentrated in Kuibishev, Ulyanovsk, and Syrzan. The Tartar Republic is not, strictly speaking, included in the lands of the middle Volga. Geographically and economically, however it occupies a transitional position between the northern and central parts of the " Povolzhye," and it is convenient to include it in the central part, since the most populated area of the republic, situated close to the river Kama, comes within the wooded steppe and broad-leaved forest zone. The population in 1939 was slightly more than 2,900,000. The 400,000 inhabitants of Kazan constituted about two-thirds of the urban population of the republic.

In the middle Volga lands as a whole about one-quarter of the people belong to the Tartar, or Mordovian national groups, while there are small numbers of Chuvash, Marii and Bashkir peoples. The remainder are mainly Russians.

The Steppe Lands Of The Lower Volga

The north-western corner of this region is occupied by the Pre-Volga Heights, which extend as far south as Stalingrad and are then continued in the low Ergeni Hills. In the north-east there are the low foothills of the Obschchy Syrt.

South and east of these hills the Caspian Lowland, a [p451] monotonously level plain which formed the bed of an enlarged Caspian Sea in recent geological times, extends to the shores of the Caspian and into Kazakhstan.

Traces of the ancient sea are still to be found in the numerous salt lakes, the largest of which are Lakes Elton and Baskunchak. The latter is 12½ miles long and 4½ miles wide.

The landscape is one of reddish-brown or grey sands, in some places completely devoid of vegetation; in others partly covered with patches of tufty and frequent saline grasses. Near the shores of the Caspian it is possible to travel for long distances with nothing to meet the eye but sands, salt deposits, and salt lakes. Sand and soil are impregnated with salt. [p452] The wind raises clouds of salty dust and sand which foul the wells and make human life exceedingly difficult.

The climate is dry and continental in the extreme, Astrakhan is as cold as Pskov in winter. There is practically no snow cover to protect the soil. In summer hot, dry winds from the deserts of Central Asia cover the farms of the damper steppe lands west of the Volga with a fine dust, and often completely wither and destroy the crops.

The black soils of the north-western corner of the region, however, are exceedingly fertile, and the climate is moister and consequently more favourable for agriculture,

Between Saratov and Stalingrad the soils are mainly of the chestnut-brown type, fertile, but limited in their productive capacity by the small amount of precipitation, In the arid lands south-east of Stalingrad a narrow strip of green on either side of the Volga runs across the countryside, strongly reminiscent of the lands on either side of the Nile. The rich alluvial soils are of great value for agriculture. Close to the Volga there are dense thickets of reeds and rushes, four to six metres in height, with the red Indian lotus growing in their midst.

The marked differentiation between the north-west, central, and southern sections of the lower Volga region is reflected in the following table:

Area	Annual Precipitation in inches	Population (mainly in villages) per square mile
North-west	11.8 to 17.7	104.0
Central Steppe	5.9 to 11.8	36.0
Southern Dry Steppe and Semi-desert	Under 5.9	3.6

The Volga is the highway which unites these three sections and provides large areas near the river with water,

Below Stalingrad spring floods extend over a belt of land on either side of the river to a breadth of 28 miles, converting it into a huge 'oasis,' where orchards and melon gardens flourish.

[p453] After the sixteenth century the north-western part of the region, near Saratov – the area most suitable for agriculture – was colonized by the Russians fairly rapidly. The drier steppe lands to the south-east remained for a long period the domains of nomadic cattle-breeders, such as the Kalmucks. Only when the Siberian lands had been colonized, and when regular navigation of the Volga and the construction of railways enabled agricultural surpluses to be transported to markets in the more thickly populated areas of European Russia (especially in the north, where there was a deficiency of grain), did large numbers of farmers come to settle on the drier lands. Between 1897 and 1912 the population of the lower Volga region more than doubled, and the acreage under grain increased in proportion, so that by 1912 this part of Russia provided a large surplus of wheat.

The low technical level of agriculture – the lack of fertilizers, the cropping of the fields until the soil became exhausted, and the ever-present possibility of droughts such as that which produced the great famine of 1921 – eventually threatened the region with economic ruin.

By 1932, however, re-organization was well under way. Large mechanized state farms were created and the sown area was greatly increased. Crop-specialization has been introduced, so that today rye and oats, together with potatoes, sugar-beet, and vegetables, are the main crops in the extreme north-west. Further south, sunflower and wheat are cultivated, while near the cities, especially Saratov, market gardening, pig-breeding, and dairy farming are important occupations. The Volga flood-meadows provide excellent pasture for cattle.

In the central steppe zone more than 50% of the sown area is devoted to wheat. Tobacco, water melons, and mustard are the most important secondary crops. On the left bank of the river cattle and sheep are reared. Enormous tracts of land on the left bank have recently been brought under cultivation by means of the Volga Irrigation Scheme (see p. 462).

In the southern zone drought restricts the sown area, [p454] and the farmers specialize in the production of meat and wool.

These dry steppe lands, suffering from saline soils, summer heat and drought, and extreme winter cold, are inhabited by the Kalmucks, a nomadic group of people which migrated from Western China in search of new lands over three hundred years ago. They received a bitter reward for their endeavours in these desolate plains. Their cattle often died of starvation, and life was so hard that during the eighteenth century a large proportion of them decided to make the return journey to China.

Scientific methods of farming have considerably lightened the lot of these unfortunate people. In 1936, for example, the great Arshan-Zelmensk reservoirs were constructed, and although farming is still mainly of the pastoral type, the acreage under crops, especially maize, was increased three and a half times between 1917 and 1937. About a third of the sown area is on large state farms, and the greater part of the land under crops is on the right bank of the Volga where the drought is not so severe.

In contrast to the dry steppe region which surrounds it the land close to the Volga and its delta possesses exceptionally favourable climatic and soil conditions. The summers are hot, while the spring floods and irrigation works have made possible the intensive cultivation of melons, quince, tomatoes, grapes, vegetables, cotton, and sesame, as well as new industrial crops such as kenaf and kender.

This type of intensive cultivation has been extended to the lands above the delta, where the Volga branches into a large number of channels, the largest of which forms the river Akhtuba. Between the latter river and the main stream the country consists of a maze of rivers and islands fringed with reeds, rushes, and tall grasses, and inundated by floods each spring. Embankments and drainage works to control the floods, and irrigation channels to take water to the dry lands on either side of the rivers, have been constructed, so that today the lands on either side of the Volga, between Stalingrad [p455] and the Caspian Sea, form one of the most important areas of intensive agriculture in the whole of the U.S.S.R.

But the wealth of the lands near the Volga consists not only of the products of agriculture. About 40% of the fish caught in the waters of the U.S.S.R. are caught in the lower Volga, the delta, and the waters of the Caspian close to the delta. The slow-flowing Volga brings down enormous quantities, of organic matter, and the waters in and near the mouth are shallow and much less saline than elsewhere in the Caspian Sea. These shallow waters and the numerous gulfs and inlets around the delta form excellent breeding-grounds for fish of many kinds. The black caviare from the Volga is renowned throughout the world, the Soviet Union possessing a monopoly of this delicacy.

Special areas have been set apart as breeding-grounds for fish, and the fishing industry has been organized on modern lines, making use of steam trawlers, motor-boats, modern nets and equipment. Astrakhan is the

U.S.S.R.'s most important centre for the fishing industry. Fish are transferred at the port from sea-going ships to river vessels, or sent to the canning, preserving, and refrigerating plants which have been constructed there. Salt used in certain curing processes is obtained from the deposits at Lake Elton and Lake Baskunchak.

Fishing is also carried on higher up the river between the delta and Stalingrad. There is a canning and preserving plant at Lagan.

Industrial Occupations

We have already noted the general deficiency of mineral resources in the Volga lands. Iron ore is now mined near the Khopier river, cement clays are obtained from Volsk, natural hot gases near Derbachi, slates and shales in the outliers of the Obschey Syrt Hills, phosphate deposits in the Volga Heights between Saratov and Kamyshin, and salt from Lakes Elton and Baskunchak.

Apart from these local resources, raw materials may be brought along the river from other regions, while the products of agriculture provide the basis for a number of industries.

[p456] The canning of fish, fruit, meat, and vegetables is now of great importance.

Since ancient times trade was carried on at various points along the river, where the overland routes from the east crossed the water route from the Caspian. The Russians, after they had colonized the Volga lands, began to concentrate upon the working up of agricultural raw materials, manufacturing flour, vegetable oil (from sunflower-seed), tobacco, leather, and soap. At a later stage coal and iron were brought from the Ukraine and the Don basin, wood was floated down the river from the north, cotton was imported from Central Asia, and these materials formed the basis of metallurgical and timber industries at Stalingrad and textile manufactures at Saratov. After 1917 regional power stations were constructed at these towns, the former employing coal-dust and waste products from the mines of the Donetz coalfield, the latter using coal and oil and combustible shales. A further source of power will be the new hydro-electric station at Kamyshin (see p. 462).

Saratov, an important centre for trade and commerce since the seventeenth century, possesses the largest combine-harvester works in Europe, in addition to machine-building factories which specialize in the production of lathes, Diesel engines, and ball-bearings, oil refineries, flour and textile mills. At Engels, across the Volga from Saratov, there are important timber and meat-processing and packing works. Cement is manufactured, from local materials, at Volsk. (The construction of a bridge across the Volga at Saratov, and the completion of the Uralsk-Iletska railway, giving direct access to the Southern Urals and Kazakhstan, have done much to increase the industrial and commercial importance of Saratov within recent years.)

Stalingrad is today a large modern industrial city, with new factories and workers' settlements stretching along the Volga for several miles. High-quality steel and chemicals are manufactured. The foremost industry, however, is the mass-production of heavy caterpillar tractors for agriculture. There are also oil refineries, and saw-mills and woodworking plants, representing the modern development of the original [p457] industries, which commenced with the construction of the first saw-mill in 1880.

A new motor road runs from the city to Krasnoarmaisk, a river port which specializes in shipbuilding and the manufacture of internal-combustion engines and railway wagons.

The salt works at Lakes Elton and Baskunchak are of the greatest importance, since they supply about 25% of the salt used in the U.S.S.R.

The role of the Volga as an artery which supplies the industrial towns along its banks with coal, iron, oil, and wood, building materials, salt, raw cotton, and agricultural produce was strengthened by the construction of railways and the building of a small canal between the Don and the Volga at Stalingrad.. When the new ship canal replaces the older canal, and the whole of the Volga is deepened to allow large ships to proceed from Astrakhan to Moscow (see p. 462), the lands close to the river will assume even greater importance. Stalingrad, which even in the days before 1917 was described as the "solar plexus of the Russian grain belt," will then become a great industrial metropolis.

Population

Apart from the towns, the population decreases in density from north-west to south-east, reflecting the decrease in precipitation. The lands close to the river and around the delta are distinguished by an extremely dense population.

Russians form 75% of the population, Germans 8.5%, and Kalmucks over 8%. The remainder consists of small groups of Tartar, Chuvash, and Mordovian peoples. The German population before the German-Soviet war was concentrated in the German Volga Republic, with its centre at Engels. A large portion of the lower Volga lands west of the river and south of Stalingrad is included within the boundaries of the Kalmuck Autonomous

Republic.

The expansion of industry has resulted in a rapid increase in the urban population, the proportion of which is now a [p458] little above the average for the U.S.S.R. as a whole. The chief towns are situated on the banks of the Volga, at the junction between river and railway-lines, where the transshipment of goods from rail to river and *vice versa*, the storing and warehousing of goods, trade and commerce, are occupations second in importance only to industry.

Stalingrad (445,476) is the economic and industrial centre of the entire lower Volga region. It is the administrative centre for a large area, with a total population of 2,250,000. The importance of the industrial towns is reflected in the fact that approximately 893,000 of the inhabitants of the region were classed as urban in the 1939 census, and of these more than 700,000 lived in Stalingrad and Astrakhan. Thus the population statistics present a picture of a relatively thinly peopled agricultural area, with a small number of large industrial centres. The Kalmuck Republic has a population of only 220,723, in spite of its enormous area. About 20% of the population is urban.

Stalingrad owes its importance to its central position in relation to the rich southern grain lands of European Russia and the coalfields of the Don basin, and its situation at an important railway junction, at the point where the Don and Volga come close to each other (Fig. 47). It is a junction between north and south, Europe and Asia, a river port, connected by means of rail and river with Northern Russia, Moscow, the Urals, the Don basin, the North Caucasus, the Caspian, and Central Asia. The rapid growth of its industries is reflected in the increase of its population, from 20,000 in 1920 to almost half a million in 1939.

Saratov also occupies a central position, second in importance only to that of Stalingrad. It has a population of 375,860, and is the administrative centre for a region with a population of 1,798,800, 61% of which is rural. Saratov itself was superseded by Stalingrad as the administrative centre for the entire lower Volga region in 1931. In addition to being an industrial town it is an important rail-river junction, at which cargoes are transferred from boats to the railway-line which runs eastward to Moscow. Other [p459] lines run south-west to the Don basin, eastward to the Urals, south to Astrakhan, and south-east to Central Asia.

Across the river from Saratov is Engels, the centre of the German Volga Republic, the total population of which is 605,545. Nearly 75% of the population is rural, and more than a half of the urban population is concentrated in Engels (73,279).

Astrakhan (253,655), the centre of the fishing industry, is situated at the point where cargoes are transhipped from sea-going vessels to river boats, and *vice versa*. It is connected by rail with Moscow (via Saratov) and with the important salt works at Lake Elton and Lake Baskunchak. Elista, a new town, is the capital of the Kalmuck A.S.S.R.

[p460] The population of the entire Povolzhye area is about 23,000,000. About 25% of the people belong to native groups. The first settlers, in ancient times, were the Finnish groups, followed by the Turkic groups. The two groups of peoples have considerably intermingled. Lying astride the great overland route into Europe, which was followed by successive waves of nomadic invaders from Asia, the region today possesses the remnants of many former nationalities. Today each national group has its own territory, and forms an autonomous district or republic.

Of the various administrative areas of the Volga lands the Stalingrad region has the largest extent, and the Kuibishev region the largest number of inhabitants. In fact, in the south and east generally population is particularly scanty in the rural districts and particularly concentrated in industrial towns. In the north-west, however, there is a relatively dense agricultural population – a most positive reflection of the influence of soil and climate. In the Stalingrad region, for example, the average density of population is only 12 persons to the square kilometre. Twenty-nine% of the total population is urban. In the Tartar Republic and the Kuibishev region, in contrast, the average density is as high as 40 per square kilometre – but only 12 or 13% of the population is urban.

The Mordovians of the west, near the river Moksha, the Marii, settled mainly between the Vetluga and Vyatka rivers in the north, and the Udmurts of the north-east are all remnants of original Finnish stock. They represent a total population of about two and a half millions. About three and a half millions belong to the Turkic group – the Tartars, living chiefly in the lower Kama, but spread throughout the region, the Chuvash on the eastern side of the river Sura, and the Bashkirs in the south-east. The Kalmucks are of Mongol origin, while the Germans represent the descendants of families who fled from their own country during times of religious persecution (see p. 166). Of the entire population 75% is Russian, with some small admixture of Ukrainian. [p461]

Summary

The lands along the Volga are characterized by a general lack of large-scale mineral resources. Industry depends more upon raw materials brought to the towns by river and rail than upon those produced locally. Thus the lack of raw materials other than agricultural products is balanced by an excellent geographical position, and although practically every town along the banks of the Volga is engaged in some section of the food industry and the working up of agricultural produce, metallurgical, chemical, textile, and engineering industries are assuming an ever-increasing importance.

In agriculture the north specializes in dairy-farming, pig- and poultry-breeding, the production of flax, rye, and oats; the central region specializes in the cultivation of sunflower, hemp, mustard, wheat, etc., while the drier lands of the south and east are important for the production of meat and wool. The flood lands and irrigated areas near the river and its delta specialize in the cultivation of cotton, the vine, melons, fruit, and vegetables.

The importance of the Volga lands in the economy of the U.S.S.R. as a whole lies in their ability to produce surpluses of both agricultural and industrial products for use in other parts of the country.

The "Great Volga" Scheme

Although the Volga has for long been a great and important waterway, passing as it does through lands containing about a quarter of the entire population, and carrying some 35% of the river traffic of the Soviet Union (about 30,000,000 tons a year), it suffers from some serious defects. For example, it suffers from enormous floods during the spring, when great ice-floes are driven rapidly downstream by the fast-flowing current, while during the summer and autumn navigation is impeded by shallows. In the past large vessels could not proceed above Kazan.

Furthermore, much of the lands lying along the eastern bank of the lower Volga suffer from drought. The irrigation [p462] of such vast areas is possible if a large amount of power is available for pumping water, since the steppe lies at a height of 200 to 300 feet above the level of the river. Consequently, in order to make the fullest use of the Volga and the adjacent lands, three problems had to be solved – the creation of a deep navigable waterway, the provision of electric power, and the building of extensive irrigation works on the left bank of the river between Kuibishev and Kamyshin. In order to solve these problems the "Great Volga" Scheme was initiated, and a great deal of the constructional work has already been completed. Eventually, about 1,500,000 acres of land will be irrigated for wheat-production.

Large dams, five on the Volga and three on the Kama, in addition to several smaller ones, have been built.... [all post RCW]

CHAPTER XVI THE CAUCASUS AND THE CRIMEA

The Caucasus

THE Caucasus is a region which forms a broad isthmus between the Black Sea and the Caspian. It connects the south-eastern part of the U.S.S.R. with Asia, and separates it from Turkey and Iran. It is one of the most southerly, warmest, and richest regions of the Soviet Union, including within its boundaries the rich steppe lands of the Don-Kuban country, the thick forests and snow-capped mountains which overlook the deep-blue waters of the Black Sea, and valley lowlands, which experience an almost sub-tropical climate, and where a variety of sub-tropical plants grow freely.

The Caucasus may be divided into three major natural regions: the Pre-Caucasus, a land of plains and including the foothills of the Caucasian mountain ranges; the Great Caucasus, comprising the main mountain ranges; and the Transcaucasus. The greater part of the two latter regions are included within the three Soviet Republics of Georgia, Armenia, and Azerbaijan. The former comes within the boundaries of the North Caucasian, or Rostov, region.

The Pre-Caucasus

The lands of the Pre-Caucasus occupy one-half of the area of the entire Caucasian region. Low plains, in which the Don valley and the Manych-Kuma depression form the only significant features of relief, extend from the Black Sea to the Caspian. They are separated from the foothills of the Caucasian mountain ranges by the valleys of the Kuban and Terek rivers, which run towards the west and east from the elevation of the Stavropol Plateau (Fig. 49).

South of these valleys the relief of the land becomes more varied, the surface being dissected by deep valleys and ravines.

[p466] Near Pyatigorsk a group of cupola-shaped mountains rise in the midst of steppe plains. Their structure shows that they are of volcanic origin, having been produced as a result of molten volcanic matter pushing up from below bending the crust of sedimentary rocks. Weathering has exposed the volcanic rocks in some places, and these upswellings are today marked by the presence of hot and cold mineral springs, famous for their medicinal properties throughout the U.S.S.R. (see p. 487).

The Kuban and Terek rivers are fed by glaciers high up in the Caucasian Ranges, and hence contain most water when the glaciers melt in the summer when water is most needed for agriculture. The mountain torrents and rapids of their upper courses render them useless for navigation, although they are of immense value as possible sources of hydro-electric energy. When the rivers reach the lowlands they branch out into a multitude of shifting channels, forming a labyrinth of lakes and marshes. The channels rapidly become choked with alluvium, so that even the Kuban, a large river, is navigable only below Krasnodar. Apart from the Don, no other rivers are used for purposes of navigation in the Pre-Caucasus.

The Pre-Caucasian plains not only form a continuation of the East European Plain; they also offer no obstacle to the penetration of the climatic conditions of Eastern Europe far south, to the foot of the mountains. Of course the southern latitude brings about a reduction in the length of the winter. Nevertheless, extremely severe frosts are possible, especially in the east, where cold winds from the interior of Asia bring dry, frosty conditions in winter and a dry, hot climate in summer. This is in strong contrast to the west, which lies open to the influence of mild westerly winds from the Black Sea and the Mediterranean. Consequently the winters are mild and the precipitation is heavy, especially in the south-western corner, close to the mountains and the Black Sea (see p. 96). Thus the physical regions of the Terek and Kuban valleys are also climatic regions, and the Stavropol Plateau may be regarded as a climatic divide between them.

This contrast between east and west is further reflected in [p467] both the natural vegetation and agricultural practice. Almost the whole of the land lying to the north of the main Caucasian ranges supports a steppe vegetation, with woods and forests only near the rivers and along the slopes of the mountains and foothills, where the higher land enjoys an increased precipitation.

In the west, however, there are fertile black soils, while the climate is relatively damp, and the winters, in particular, are mild. Above the dark, green of the thickly forested mountain slopes, rise majestic snow-capped peaks. Below the forests vast golden fields of maize and wheat stretch across miles of flat and rolling country to the horizon. More than 15% of the total area under crops is found in huge state farms. The low-lying open nature of the country favours the development of large-scale mechanized farming (see p. 225).

The main crops are spring wheat in the north, near the [p468] river Don and its tributaries, and winter wheat in the south. The Pre-Caucasus produces about 10% of the wheat grown in the whole of the U.S.S.R. Since 1917 maize, the second important crop, has displaced wheat to a great extent. It is extensively grown in the Kuban valley, while in the foothills of the Caucasus it has displaced almost every other crop. The reason for this is that maize requires a higher summer temperature than wheat, so that it can be grown on a large scale only in the south, while wheat can be produced in many other parts of the U.S.S.R. Sunflower is the third important crop, occupying a large acreage in the Kuban lands. The seeds are used for the production of vegetable oil, and the waste from this industry is a valuable source of fodder for hogs, which are reared in large numbers. In the Kuban valley intensive cattle-breeding is carried on, on the basis of sown grass.

The warm, damp climate of the Kuban valley and Black Sea coast favours the growth of special crops such as cotton, jute, and tobacco. The wet forest belt of the western foothills, stretching from the Taman Peninsula to the Laba river, a tributary of the Kuban, supports extensive tobacco plantations. Cotton, a new crop, has been successfully introduced into the moist lowlands of the Taman Peninsula and the Kuban valley, while rice, which requires much moisture and irrigation, is grown on the flooded alluvial lands near the mouth of the river (see pp. 201 and 223).

Climatic and soil conditions are also suitable for viticulture and the cultivation of fruit and vegetables. Grapes, apricots, the mulberry, apples, and pears are grown both along the Black Sea coast and in the valleys of the Don and the Kura. There is an important market-gardening region around the city of Rostov.

In the drier eastern plains, and especially on the poor steppe lands close to the Caspian shores, pastoral occupations – mainly sheep-breeding – predominate. Agriculture is confined to the river valleys and the Caucasian foothills, where the precipitation is heavier. In the Kura valley the chief crops are cotton, fruit, and the vine. Large areas of the lower Terek valley have been drained and adapted for rice [p469] cultivation. The higher parts of the valley are devoted to orchards and viticulture.

Apart from cotton and rice, a number of new crops such as soya bean, Italian hemp, kenaf, kender, and rami are now successfully cultivated in the damper and warmer parts of the Pre-Caucasus.

Industry

As might be expected in such rich agricultural region, many of the industries are concerned with the working up of agricultural raw materials. Rostov, Krasnodar, and Armavir are the chief centres of such industries as flour-milling, vegetable oil production, distilling, tanning, the preserving and canning of fruit and vegetables, tobacco-manufacturing, and the production of starch and treacle from maize. Rostov is also a more important centre for the production of champagne and wines. The industries mentioned above are carried on in most of the larger towns of the Pre-Caucasus.

Heavy industry, however, now occupies a more important position than those occupations mentioned above. Oil production is the leading branch of industry, the output of crude oil, petroleum, etc., having increased to six times that of 1914. The largest oil-producing districts are situated close to the northern slopes of the Caucasus near Grozny and Maikop, and at Makhach-Kala, at the mouth of the Kura river. Oil is also found near Krasnodar and Neftegorsk. The Grozny region is the second largest producer of oil in the whole of the U.S.S.R., and the wells are of particular significance since they yield a greater proportion of benzine than the oil-wells of any other region in the Soviet Union. In 1934 new wells, which today yield an output approximating to 35% of the production of the Grozny district, were brought into operation at Malgobek.

Grozny is now a large industrial centre, engaged not only in the production of oil, but also in the construction of machinery for the oil industry and the manufacture of chemicals on the basis of by-products from the refineries.

Pipelines run to Makhach-Kala, on the Caspian coast, [p470] to the Black Sea port of Tuapse, and to Rostov-on-Don, and beyond, to Nikitova. The latter pipeline will eventually be continued as far as the Dnepropetrovsk industrial region.

Altogether, the wells of the North Caucasus yield about 5,000,000 tons of crude oil a year, or about 16% of the yield of the entire Caucasian oilfields. There are refineries connected by a pipeline at Grozny, Makhach-Kala, Armavir, Krasnodar, and Tuapse, with a total capacity of more than 10,000,000 tons a year. From Tuapse, petroleum and petroleum products are exported abroad, and from Armavir are sent to the Ukraine and the industrial regions of Central European Russia.

Coal-mining is carried on in the north-west of the Pre-Caucasus, at Shakhta, on the eastern end of the Donbas coalfield. There are some smaller deposits in the Caucasian foothills. At the port of Taganrog, on the Sea of Azov, iron-mining, metallurgy, and machine-building are important industries. Rostov possesses one of the largest agricultural engineering works in Europe, using metal from Taganrog, coal from the Donbas, and oil from the Caucasian wells. Locomotives are made at Novochoerkassk.

Hydro-electric power is rapidly rising to first place among the sources of energy available for industry. Powerful electric stations have been constructed on the Guzeldo, Ardon, and Baikson rivers, and the electrical power produced here feeds the high tension power-transmission system, which also receives electricity from a number of power stations which utilize coal-dust and mineral oil as fuel.

In addition to oil-production, other important industries are the manufacture of cement, near Novorossisk, and the mining of zinc, lead, silver, and copper in the Sadon mines, to the west of Ordzhonikidze. The ores are concentrated in the village of Alagir, and then transported by rail to a large, modern, highly mechanized and electrified refinery at Ordzhonikidze, where sulphuric acid is also manufactured.

Many other minerals, particularly ferro-chrome, molybdenum, [p471] and antimony, are mined in the Caucasian foothills. Finally, the need of artificial fertilizers for agriculture and the demand created by industry for a number of products have stimulated the growth of the chemical industry.

Economically, therefore, the Pre-Caucasus may be divided into the following regions: (1) the western plains, north of the Kuban; (2) the drier eastern plains, which support sheep and cattle; (3) the region of special cultures along the Black Sea coast between Novorossisk and Tuapse; (4) the regions of intensive agriculture and both agricultural and heavy industries in the eastern Don basin and the valleys of the Kuban, Kura, and Terek rivers and their tributaries.

The Main Caucasian Ranges:

The Great Caucasus

The main Caucasian mountain ranges, details of which are given in Chapter I, rise with relatively gentle slopes from the foothills of the north, but fall sharply towards the south. The mountains of the western end, composed mainly of limestone rocks, do not attain such great heights as are attained by the central ranges, in which crystalline and volcanic rocks predominate, and where the climate is more continental, the glaciers more extensive than in the Alps, and ten of the highest peaks exceed Mont Blanc in altitude.

Large areas of the lower slopes are clothed with thick forests, which have remained untouched for nearly two hundred years. They are now being intensively exploited, the timber being of great value for the aviation and motor-vehicle industries, the making of textile and agricultural machinery (beech and hornbeam), cart-wheels (ash), and parquet-flooring (oak).

In the south of this central region there is a series of almost parallel valleys and depressions, locked in on all sides by lofty mountains and ridges which link the main east-west chains. ("The connecting ridges often form wide upland glens, sometimes at a great elevation. A typical example is Upper Svanetia and the Tush and Khevsur glens in the Eastern Caucasus. Here communities have lived in almost complete isolation for many centuries." — W. E. D. Allen)

[p472] The eastern ranges, which continue into the mountainous country of Daghestan, are somewhat lower. The climate is very dry, and consequently the snowfall is lighter, the glaciers are smaller, and mountain slopes are bare and treeless.

Outstanding features of the highlands of Daghestan are the separate limestone tableland blocks and the black clayey shale formations, eroded into fantastic shapes. Between the mountains the numerous land-locked depressions and narrow, canyon-like valleys have exerted a very great influence upon the human geography, which in many respects is comparable with that of the North-west Frontier of India. In the past the peoples of Daghestan were isolated not only from the world outside but also from one another. Almost each valley or depression contains a separate national group. There are thirty-one such groups altogether, each possessing from one to five thousand people. Many of them had not seen a wheeled vehicle until recently.

Today the broader Caucasian valley lands, such as those of the Sulak and Terek rivers, yield rich crops of cotton, kenaf, kender, and soya bean, as well as supporting orchards and vineyards. A considerable proportion of the sown area is irrigated. Herds of cattle, pastured on the steppe plains during winter, are taken up to graze on the mountain meadows during the summer. Sheep-rearing for wool-production is an important occupation.

New industries have been established. The machinery and engineering works of Makhach-Kala are of national importance. In the Derbent district natural gases and quartzite sands are utilized by the glass industry, and glass is manufactured more cheaply than anywhere else in the U.S.S.R. At Izerbash oil-wells have been sunk in a newly discovered oil-bearing region.

The powerful rivers are being harnessed to provide electric power. The river Sulak, fed by four tributaries from mountain glaciers, has a fall of 1980 feet. One hydro-electric power station is already in operation at Gergebilsk, and another, which will be larger than the famous Dnieper power station, has been planned.

[p473] The amazing economic development of Daghestan would not have been possible without the construction of roads. The old inter-tribal feuds were largely due to the isolation of the various groups, and the frequent occurrence of droughts and lack of food. Conditions were in many respects similar to those of the Khyber Pass region in India. The fact that these former mountain tribes today live together in harmony bears eloquent testimony to the solution of the problems which beset the country. Cattle-rearing is the main occupation of the people, with horticulture and viticulture in some of the valleys. Some cotton and wheat is grown. Makhach-Kala is the administrative centre of the Daghestan Autonomous Republic.

Transcaucasia

Transcaucasia is a mountainous country. The lower parts (below 2000 feet) together occupy only one-third of the total area. From the main Caucasian ranges the Suram Mountains (5000-6000 feet) branch out in a, south-westerly direction, separating the Rion basin in the west from the larger Kura-Arax basin in the east, and linking the Great Caucasus with the Armenian highlands.

From the southern end of the Suram Range a vast system of mountains and plateaux extends towards the south-west and the south-east, forming the southern boundaries to the Rion and Kura basins. The south-eastern highlands—the Armenian plateau and peripheral highlands, 6000 to 7000 feet high—are traversed by the valley of the Arax, which cuts through the south-eastern end of the range known as the Maly, or Little Caucasus, to join the Kura valley. South of the lower Kura the Lenkoran, or Talish Lowland, extends between the Talish Mountains and the shores of the Caspian Sea.

The landscape of the Armenian Highlands is wonderfully varied. A large part of the surface is composed of erupted volcanic rocks, in places weathered into fantastically shaped columns and obelisks up to 25 feet in height, each bearing a boulder perched precariously on top. These boulders were shot out like shells from volcanoes of the Quaternary period, [p474] and the ground around them has since been removed by weathering. There are a number of mineral springs, and numerous lakes formed by the damming of streams by lava flows, and completely surrounded by high mountains and plateaux. The plateaux are frequently dissected by deep

ravines, the slopes of which are often covered with red-brown lava and volcanic ash.

Transcaucasia falls into four main physical regions: (1) the Black Sea coast and the Rion valley; (2) the eastern valley of the Kura and the Arax and some of their tributaries; (3) the Lenkoran Lowland; (4) the mountains and plateau of Armenia.

The Black Sea coast south of Tuapse (known as "Kholkhiz") and the Rion valley are favoured by mild, usually frostless winters and hot, damp summers. The soils are predominantly of the red laterite type, and precipitation is abundant. Hence the vegetation, sub-tropical in character, is both profuse and varied (see Chapter IV), and includes [p475] valuable timbers on the forested hill slopes. The rivers fall swiftly from the mountains and form large areas of marsh and alluvial deposits on the lowlands.

The Black Sea coastal lands and the lower hill slopes and plateaux which overlook them specialize in the cultivation of citrus fruits, tea, and tobacco. Maize and wheat are the chief grain crops. Viticulture, orchard cultivation, and the growing of grain are the most important agricultural occupations in the Rion valley (Fig. 51).

Before 1917 most of the best land was sown to maize, and as in modern Italy, this was the staple food of the people. Today tea is of far greater importance. Adjaria alone produces almost the entire tea-crop of the Soviet Union. Mature, well-planted plantations give a yield of about 5 cwt. of dried tea per acre. The large acreage now devoted to tea is shown by the output in 1938 of 6400 tons. (The output expected for 1941 was 12,500 tons. In Adjaria and the sub-tropical region of Azerbaijan there were, in 1939, about 135,000 acres of tea-plantations.)

[p476] Adjaria also produces about 220,000,000 citrus fruits a year – 70% of the citrus fruit crop of the U.S.S.R. Great care has to be taken to protect the trees against occasional light frosts during the winter (see p. 202).

Enormous oil-burners are placed among the trees; at the approach of frost they are lit, and spread a pall of dense black smoke over the plantation.

The Colchis, or Kolkhiz, marshes, well known in the days of ancient Greece, now form one of the most productive regions of the Caucasus. Large areas of marsh have been reclaimed, so that today these lands support flowering gardens, orchards, and plantations, amid the thick forests.

In Georgia, and especially in Adjaria, tobacco and the mulberry are cultivated on a large scale. About 18% of the silk produced in the U.S.S.R. is derived from Georgia, as well as large quantities of excellent tobacco.

In the mountain districts cattle-rearing is the chief occupation.

In contrast to the warm, damp climate of the Black Sea coast and the Rion valley, more continental conditions prevail in the eastern lands of Transcaucasia, shut off by the Suram Mountains from the influence of mild, damp air from the west. Owing to the southerly situation the winters are not severe, except in the mountains and plateaux. But in the valley lands there are more frequent frosts than in the west. The summers are exceptionally hot, and since the precipitation is very low, the vegetation of the plateaux and valleys is mainly of the steppe type, with considerable 'solonetz' formation (see p. 115). The summer is so dry that the green grass of spring withers and fades, only reviving again when the rains fall in the autumn. The steppe lands between the lower Kura and Arax are particularly arid.

Wheat and barley are grown for local consumption. Orchards and vineyards flourish in the lower lands, and large tracts of the dry steppe near the Kura river are used for the cultivation of cotton. The lower lands of Azerbaijan enjoy particularly favourable climate conditions for the growth of long-staple Egyptian cotton. The summer temperature is [p477] high and the frost-free period long. Where necessary the land is irrigated. Today Azerbaijan is one of the main cotton-producing regions of the U.S.S.R. Smaller areas of irrigated land are devoted to rice cultivation.

In the mountains and plateaux of Armenia and the upper valley of the Arax the winters are very severe, while the summers are very hot. Precipitation is light or moderate according to the height and orientation of the land. The mountain slopes generally enjoy sufficient precipitation to support forests, while the plateaux and the country on either side of the Arax river is mainly open steppe land, dissected by canyon-like ravines, and in many parts supporting enormous fields of golden grain. Here and there are pleasant red-tiled villages, and the houses, with their high red roofs, wide windows, balconies, and gardens, offer a strong contrast to the rather gloomy stone villages in the mountains of Southern Armenia.

For centuries cattle- and sheep-rearing have been the most important means of livelihood for the people in the drier parts. In the past fodder grasses were rarely grown. The herds were driven up to the high Alpine meadows during the summer and brought back to the lower lands for the winter. But the disproportionate distribution of winter and summer pasture often made it necessary to drive the cattle long distances. Cattle-rearing was,

therefore, a nomadic occupation.

Fodder grasses, especially lucerne, are now cultivated on irrigated lands near the rivers, and the old nomadic way of life has been superseded on large farms by intensive cattle-breeding for meat, milk, and cheese. Wheat and sugar-beet are grown on the Leninakan and Loriisk steppe.

The irrigated lands of the Arax valley and the arid Ararat region support vineyards, orchards, and tobacco- and cotton-plantations. In 1938 Azerbaijan possessed 343,900 acres of cotton-plantations, and the production of cotton was exceeded only by the republics of Soviet Central Asia.

The Talish Mountains rise to the east of the lower Arax, and between them and the Caspian Sea lies the Lenkoran Lowland. Here the climate is very similar to that of the [p478] Kholkiz Lowland, near the shores of the Black Sea. Atmospheric moisture is condensed by the mountains so that the precipitation is fairly heavy. The winters are mild and the summers hot.

The contrast between the forested eastern slopes of the Talish Range and the productive coastal plain on the one hand, and the dry, treeless western slopes, affords a clear illustration of the important part which these mountains play in the geography of this region. The forests contain valuable timbers such as ironwood, while citrus fruits, and tea, kenaf, rami, and other industrial crops are cultivated on the lowland, which constitutes the second most important region for the production of sub-tropical cultures in the U.S.S.R.

Industries

Although coal is mined at Tquarchelly and Tquibuli in Georgia, and the oil-wells of Baku are among the most important in the world, it is probably true to say that hydroelectric power is the key to the industrial development of Transcaucasia.

Electricity is needed not only for industrial production, but also for railway transport, in order to solve the problem of carrying heavy loads over the steep gradients of the high mountain passes, to pump water to higher levels in irrigation works, and to operate suspended rope-railways which transport valuable timber and minerals from the more remote mountainous areas.

Many of the dams built ...

Transcaucasia possesses immense sources of wealth other than water-power. The country is extraordinarily well endowed with minerals, of which oil is of paramount importance. The chief wells are in the Aspheron Peninsula, near Baku, where the first wells were sunk in 1871. The oilfield of this region yields about one-half of the total output of the U.S.S.R. and possesses about one-half of the total reserves of petroleum. There are other wells in the Shirak steppe, in Georgia.

Considerable quantities are shipped across the Caspian to Astrakhan, and thence up the Volga to the various refining centres. Two pipelines, one carrying kerosene, the other petroleum, run from Baku to Batum, the main centre for the foreign export trade. There are refineries both at Baku and Batum, and together they have a capacity of 18,500,000 tons a year. The Baku, Maikop, and Grozny oilfields together yield about 30,000,000 tons of crude oil each year, representing 85% of the total output of the U.S.S.R. Transcaucasia contributes about 75% of this amount.

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In addition to the industries which depend upon mineral resources there are many others concerned with the manufacture of agricultural products – fruit-preserving and -canning, meat-packing, and cold-storage, tobacco- and tea-manufacturing, the textile industry (cotton and silk), and the timber industry.

The chief cotton-mills are at Leninakan, Baku, and Kirovobad. The Leninakan spinning and weaving mills produced more than 100,000,000 yards of cotton fabric in 1937. Silk spinning and weaving is carried on at Kutaisi, Nukha, and Tbilisi. In the latter town woollen and knitted goods and other articles of clothing are also manufactured, as well as chemicals, films, vegetable oil from cotton-seed, and margarine. There are also important engineering works engaged in the Construction of machinery for the oil industry. At Erivan, in addition to the synthetic rubber works mentioned above, there are tanneries and clothing and tobacco factories.

The factories of Adjaria use the produce of the local plantations for the manufacture of tea and tung oil, and there are also engineering works where machinery for these industries is constructed.

Fruit and vegetables are preserved and canned at Erivan and Batum. In 1940 Armenian canneries produced 20,000,000 cans of fruit and vegetables. The Batum factories specialize largely in the preserving of citrus fruits. They deal with more than 40,000,000 fruits a year.

The importance of the timber industry lies in the great variety of deciduous trees which are available for use – oak, beech, maple, chestnut, ironwood, box, and others, in addition to coniferous trees. Paper-mills are situated at Ingur, on the river Ingur, in Abkhazia, and there are saw-mills, paper-mills, and furniture factories at Tbilisi. [p483]

Population and Communications

Since ancient times the central geographical position of the Caucasus, lying astride a historic trade route between Europe and the East, has profoundly influenced the character of its population. All the ancient empires strove to control the Caucasus. The soldiers of Rome, Byzantium, Mongolia, Persia, Arabia, and Turkey fought each other there, attempting to secure domination of the fertile Rion and Kura valleys and lowlands – the gateways to the pass across the Suram Mountains, and the key to the route between the shores of the Caspian and the Black Sea. Georgia had a flourishing culture and civilization of its own more than two thousand years ago. The Caucasus, and particularly the Colchis Lowlands known to Greek mythology in the stories which describe Jason's adventures in his search for the Golden Fleece, were renowned for their wealth. The Greeks established colonies on the shores of the Black Sea, and Alexander the Great occupied the Caucasus on his way to the borders of India. The mountains form a barrier between the steppe lands to the north and Persia in the south, and in order to secure their northern frontiers the Persians invaded Transcaucasia and founded the town of Tbilisi (Tiflis) during the fourth century. It was also during this century that Christianity was first introduced while some three centuries later the Arabs introduced the Moslem religion.

The Turks eventually displaced the Arabs as the dominant force in the Caucasus, and by taking advantage of their difficulties during the Crusades the Georgians achieved their independence and established a kingdom from the Black Sea to the Caspian.

From the sixth century onward nomadic tribes from the north had continually raided and plundered the rich valleys, and by the thirteenth century the Tartar conquest of Georgia finally destroyed the national unity of that kingdom.

During the sixteenth century the Caucasus was the scene of the struggle made by the Turks to establish their supremacy over the Persians.

[p484] Finally the Cossacks – originally peasants who had fled from the terrible conditions of serfdom in feudal Russia – came to the lands of the Terek and Kuban. They were used by the Tsar during the Russian conquest of the Caucasus during the nineteenth century, when Russian penetration, which had commenced in the time of Peter the Great, was carried forward ruthlessly. The Georgian military highway, linking the Pre-Caucasus with Transcaucasia, was built in 1804. By the end of the century the Caucasus belonged to the Tsars, and its colonization proceeded rapidly.

It is not surprising, therefore, that from these human tidal waves which swept across the region, a 'wash' consisting of more than forty different national groups should have been left behind.

In Transcaucasia the greater part of the population today consists of groups of Turkic, Mongol, and Indo-European origin. To the latter group probably belong the Georgians, as well as the Svani, Meritini, and other peoples, the Armenians and Iranians (Ossetians, Kurds, and Talish peoples), and the inhabitants of the mountainous districts – the Adygei, Abkhazi, Karbardino, Chechen, and Daghestan peoples. The Georgians and Armenians form two of the largest national groups – about 3,500,000 and 1,250,000 respectively. The former comprise 31% of the peoples of Transcaucasia and the latter 23%.

The Ossetians form an interesting national group. Their language is predominantly Aryan, and they have blue eyes and fair or light-brown hair. It is probable that they are an ancient Germanic people which migrated into Southern [p485] Russia and were subsequently driven by nomadic invaders into the hills where they now live. There are also about 10,000 Germans in the Caucasus, the descendants of members of religious sects which left Germany in the seventeenth century.

The Turkic and Mongol peoples came originally from the north-east, across the Caspian Sea. The inhabitants of Azerbaijan form the largest Turkic group (3,300,000), while the Mongols are represented by the Kalmucks, who dwell in the Pre-Caspian dry steppe country.

From the time when Caucasian unity was destroyed by the Tartar invasion until the establishment of the Soviet regime there was constant bloodshed and strife, brought about both by attempted domination from outside and by bitter fighting amongst the various national groups.

The Armenians in particular suffered terribly from the policy of "Anti-Armenianism" introduced during the period [p486] of Turkish rule, extended when Russia obtained control of Armenia at the end of the nineteenth century and carried to another high level of atrocity when the Turkish Government began the mass-deportation

of Armenians from Turkish Armenia during the Great War. Many thousands perished, and by 1918, as a result of massacres, deportation, revolution, and war, nearly half of the Armenians had been destroyed.

Friendly relations between Turkey and the U.S.S.R. have been maintained since 1921, and the system of Soviet republics, autonomous republics, autonomous provinces and national regions within the Caucasus, together with the granting of a large degree of economic autonomy, and complete cultural autonomy, to the various national groups, has at last brought peace, unity, and economic well-being to the peoples of this part of the Soviet Union – a magnificent achievement when one considers the problems involved in the development of the culture of only one community – the people of Daghestan. Here there are eighty-one different national groups, speaking 320 languages or dialects.

Today the Caucasus is the proud possessor of forty-one higher educational institutions, with 40,000 students. In Azerbaijan, to take a particular example, there are more than thirty-six schools, with over 700,000 pupils.

Since the majority of the people are Georgians, Armenians, and Azerbaijanians, the territory of Transcaucasia has been divided into three Soviet Republics – the Republics of Georgia, Armenia, and Azerbaijan. The smaller national groups possess their own territories within these republics (Fig. 53).

In the lowlands of the Pre-Caucasus 90% of the population is either Russian or Ukrainian. When the Russians conquered these lands the native Cherkess, Adygei, Kabardino-Balkari, etc., were driven into the foothills and the mountains, where today they possess their own autonomous districts and republics.

The population of Caucasia is most dense in the damper fertile valleys, particularly in the Rion and middle Kura valleys, and also along the coast of the Black Sea, where such a large proportion of agriculture and industry is concentrated.

[p487] The drier eastern lands and the mountainous districts are sparsely peopled. An exception is the Erivan Plateau, where there is a considerable concentration of Armenian population.

About 18,000,000 people live in the Caucasus, and of this number about one-third are town-dwellers. More than half of the entire population is found in the valleys of Transcaucasia, and here a high proportion of the people is engaged in agricultural occupations. In the Pre-Caucasus about one-fifth of the total population is concentrated in ten towns.

Apart from the larger industrial towns, the population of which is given below, there are several fairly large health and pleasure resorts, such as Kislovodsk and Sochi in the Caucasian foothills, or in the 'Soviet Riviera' on the Black Sea coast.

The mineral waters and spas of the Caucasus are well known throughout the U.S.S.R. There are hundreds of natural mineral springs – more than a hundred in the district around Pyatigorsk alone. The Narzan waters of Kislovodsk, renowned in fable and song many centuries ago, are today bottled and sold in street kiosks in almost every Soviet town!

The great increase in industrial activity which has occurred within the last ten or fifteen years is reflected in the increase in the population of the larger industrial towns. This is indicated in the table given at p.488.

The three largest towns, Rostov, Tbilisi, and Baku, each have a population greater than half a million. Baku, the centre of one of the most important oil-producing regions in the world, is the chief port on the Caspian Sea, a sea which carries more than 35% of all Soviet shipping tonnage. It is an ancient town of Persian origin, founded in the fifth century. (Baku is a Persian word, meaning "City of the Winds.") Today it is a large modern city, the fifth largest in the Soviet Union, with tall modern buildings, blocks of flats, factories, offices, boulevards, and gardens. Grey hills and plateaux rise behind the town, dotted with brown stone houses with flat grey roofs. It is connected by rail with the great grain port of Novorossisk.

[p489] Tbilisi, another town of ancient origin, and the capital of the Georgian Republic, stands astride the historic route from the Caspian to the Black Sea, across the Suram mountains, followed today by an electric railway. It is also the terminus of the military highway which crosses the Caucasian mountains from Ordzhonikidze.

Rostov-on-Don, the administrative centre for the North Caucasus, is placed at the gateway to the entire Caucasian region. It lies between the rich black earth lands of the Ukraine and the fertile grain lands of the Don-Kuban country. It is a focal point of communications between Moscow, the Ukraine, Stalingrad, and the Volga on the one hand, and the Caucasus on the other, besides being a port near the mouth of the Don, having access to the Black Sea. Its importance will be further increased by the completion of the Manych-Kuma and Don-Volga Canals (see p. 464). To the north is the industrial region of the Donetsk valley, and to the west lie the iron-mines of Taganrog. (Taganrog, a port on the Sea of Azov of a similar size to Southampton, was founded two hundred

years ago and became an important South Russian trading centre. In the middle of the nineteenth century the harbour became shallow and the port declined. Since 1917 it has revived as a metallurgical centre.)

The significance of Rostov's geographical position is reflected in its history. After the devastation of the ancient Greek colony of Tanais (situated near the modern town of Azov) by the Huns, the entire area between the lower Don and the Azov Sea remained uninhabited until Russian settlers made their way to this region during the eighteenth century.

The favourable position of the lower Don valley – lying close to the Volga, which gave access to the Urals and Central and Northern Russia, on the one hand, and close to the Caucasus and the Black Sea on the other – gave it considerable advantages as a centre for trade between Russia and the Mediterranean lands. Numerous commercial settlements sprang up close to the river Don.

In 1761 a fortress was built on the high left bank, named after St Dmitri of Rostov (the seat of the ancient principality [p490] near Moscow) and later named Rostov-on-Don in order to distinguish it from the older town. In 1779 Armenians were permitted to settle near Rostov-on-Don and founded Nakhichevan, which eventually merged with its neighbour into a single city.

Batum, the best port on the eastern Black Sea coast, lies at the southern end of the fertile Kholkiz region, in a countryside where the palms and luxuriant vegetation are reminiscent of Florida.

Before the unification of Georgia as a kingdom this region was the scene of many historic battles. The Romans warred with the Persians here, and during the Byzantine period a fort was built not far from Batum. The great Georgian queen, Tamara, built a fort in the twelfth century, while in 1564, when Turkish power held sway, a citadel was built near the town.

During the Russo-Turkish War (1877-78), when the Russians came to Batum, it was a village of some 3000 inhabitants, surrounded by marshes and forests. During the next eighty years, partly owing to the fact that Batum Bay was one of the best harbours on the Black Sea, the village grew into a town and became a great Russian port through which trade passed between Europe, Persia, Transcaucasia, and Central Asia. In 1883 a railway was constructed, connecting Batum with the main line from Tbilisi to the rest of Russia. In 1886 the first oil-transporting ships appeared in the harbour, and its future commercial prosperity was assured. Today Batum is an exceedingly pleasant city. There is practically no winter, while south-west winds bring relief from the heat of summer. It is a city where dust and fogs are unknown, where the atmosphere is so transparent that the majestic peaks of the Caucasus are often clearly visible. The marshes around the city have been drained and the town has been almost entirely rebuilt within the last twenty years. The open squares, white stone houses with large windows balconies, vines clinging to the walls, and gardens and trees surrounding them, give the town the appearance of a health resort.

[p491] The Caucasus region is traversed by two main routes, important since ancient times for trade from Iran and the East, across the Caspian Sea to Europe. One route follows the Caspian shore around the eastern edge of the mountains to Makhach-Kala, then turns north-westward across the Pre-Caucasus Lowlands. The other, 560 miles long, follows the Kura valley, crosses the Suram Mountains, and descends to the Rion valley and the Black Sea coast. Both these routes are followed by main railway-lines, which, together with branch lines, and another main line along the Arax valley to Erivan and then across the mountains to Leninakan and Tbilisi, give access to the most developed agricultural and industrial regions of the Caucasus. From the latter line two lines branch off to the south, to Turkey and Iran respectively. Large sections of the main lines have been electrified, an important factor if they are to be utilized to carry heavy loads of agricultural and industrial products over high passes, and the mountains of the Caucasus do not possess many easy routes (see frontispiece). Within recent years the building of a very important railway, which will be the only one to cross the main Caucasian Ranges, has been planned between Tbilisi and Ordzhonikidze, and construction may possibly have commenced. From Batum, a new coastal railway to Tuapse is partly completed, and will eventually continue to Novorossisk, already linked with Batum by an excellent highway. But in spite of the network of railways described above, large areas are still not served by this means of transport. This deficiency has been overcome by the construction of motor roads. Some of them, such as the military highway from Ordzhonikidze to Tbilisi, are of great strategic value.

Finally, communication with the other parts of the Soviet Union will be facilitated by the completion of the Don-Volga and Manych-Kuma Canals. The latter, which will eventually establish direct communication by water between the Black Sea and the Caspian, has already been partially constructed, and in 1938 it was possible for ships to sail for 200 miles up the Manych. When the Don is connected to the Volga the whole of the Caucasus will have access to the Black Sea, the [p429] Caspian Sea, and, by way of the Volga, to a large part of the lands of European Russia. ("It is worth emphasizing that a large proportion of Transcaucasian traffic is transmarine. It is estimated that 40% of Soviet internal trade passes across the Black Sea and the Caspian Sea

and over the internal waterways of Russia....The two marine basins ...have the same importance in the economy of the U.S.S.R. as the Great Lakes have in Canadian and American economy." – W. E. D. Allen.)

Oil and manganese are exported from the Caucasus abroad and to all parts of the U.S.S.R. The Novorossisk cement industry supplies many distant regions. The north Caucasian plains constitute one of the chief Soviet granaries. Across the Caspian various cargoes come from Central Asia. Hence we cannot underestimate the importance of a good transport system both within the Caucasus, and between that region, the Soviet Union, and the rest of the world.

The Crimea

The Crimean Peninsula lies between the Caucasus and the Ukraine, being separated from the former by the narrow Kerch Strait and Kerch Isthmus, and from the latter by the Perekop Isthmus. The steppe plains of the north, the Kerch Isthmus, the Crimean Mountains, and the narrow coastal plain in the south form four natural regions.

The extremely level and low-lying steppe plains occupy more than three-quarters of the total area of the Crimea, and form a continuation of the Ukrainian steppe. The climate is continental and extreme. In winter cold dry winds from the north sweep over the plains, removing the thin cover of snow from the frozen ground. The summer is dry, precipitation is very slight. Hence these steppe lands are particularly dry and waterless, and the farmers have to rely almost entirely upon artesian wells and the melting snows of spring to moisten the soil.

This is essentially a grain and tobacco region, wheat and barley being the main crops. Some of the best types of Russian tobacco are grown here, and recently the cultivation of cotton and fruit has been introduced.

[p493] The Kerch Peninsula consists of several low hills and ridges. Oil and natural gases are found, in addition to vast deposits of good-quality iron ore.

The Crimean Mountains are composed largely of limestones. They divide into three ranges in the west, and of these the central range has been considerably denuded and eroded by river action, so that the land is often dissected into separate plateau blocks. The hard grey limestones of the southern ridge have been less eroded, and consequently the elevation is higher and the mountains fall in a steep faulted edge to the coastal plain. The drier mountain and plateau pastures support flocks of sheep. The wetter mountain slopes, particularly those facing south, are forested. Horticulture, viticulture, and tobacco cultivation are carried on in the valleys.

The fourth region, the narrow coastal plain of the south, stands in contrast to the rest of the Crimea. Its width varies from just over a mile to more than six miles. In places it is broken by limestone bluffs, protruding towards the sea from [p494] the mountains, or by outcrops of volcanic rocks. The mountains screen the coast from the cold northerly winds of winter, and at the same time limit to the coastal plain the penetration of mild damp air from the south. The climate is of the Mediterranean type, with mild winters and clear, rainless, sunny summers. The natural vegetation is also Mediterranean in character, including such trees as the olive, cypress, laurel, cork, oak, etc. The dark green forested hill slopes, broken here and there by the white-stone buildings of sanatoria or holiday resorts, overlook fertile tobacco plantations, orchards, and vineyards (*e.g.*, the famous Massandra vineyards).

From these rich and fertile plains the land falls steeply to the sea.

Industry

The most useful minerals found in the Crimea are salt, near Perekop, phosphoric iron ore (the second largest deposits in the U.S.S.R.) at Kerch, where there are mines and iron- and steel-works, sulphur, and various salts from lakes. Although some coal is mined in the south, the Don basin coalfield supplies most of the fuel used in the metallurgical industry. Waste products from this industry are used in the manufacture of chemicals. (One of the most important products of the chemical industry is phosphatic fertilizer.) Salt is obtained from the shallow Sivash firth in the north, and building stone from the mountains in the south.

The second important group of industries is engaged in the preserving and canning of fruit and vegetables and the manufacture of tobacco.

Population

In ancient times Phoenicians, Greeks, and Romans came by sea and established trading colonies on the Southern Crimean coast. In the Middle Ages Genoese, and later Turks, founded colonies there. Finally the entire peninsula was taken by Russia at the end of the eighteenth century.

The present population (1,126,824) consists chiefly of [p495] Russians and Ukrainians. Tartars form 28% of the inhabitants, and in the towns there are Bulgarians, Germans, Jews, Greeks, and Armenians.

The greater part of the Crimea is included within the dry steppe plains of the north, where agriculture is of the extensive, mechanized type, and the density of population consequently not high. About 48% of the people of the Crimea live in towns, and are engaged in trade and commerce, in the industries described above, or working at the health and pleasure resorts in the south.

Feodosia, Kerch, and Eupatoria are small ports which export wheat, iron ore, and salt respectively, to European Russia. There are tobacco factories at Feodosia. Kerch, with a population of more than 100,000, is the centre of the mining and metallurgical industries.

Sevastopol (111,946) possesses an excellent system of docks and ship-repairing yards, as well as a fine harbour. It is an important naval base, guarding the entrance from the Black Sea into the Southern Ukraine and the Caucasian coast. Simferopol (146,678) is the administrative and transport centre of the Crimean Republic. Fruit- and vegetable-preserving works are situated here. Yalta is the largest health resort on the south coast, the 'Soviet Riviera.'

The Crimea is served by a good system of railways, and a number of excellent modern motor roads.

CHAPTER XVII THE UKRAINE AND THE WESTERN BORDER LANDS

The Ukraine

THE Ukraine occupies a large and important section of the East European Plain, which continues farther to the south and south-east in the Crimea and North Caucasus. It is one of the most densely populated regions of the Soviet Union, being favoured by a relatively mild climate, fertile black soils, and great mineral wealth. The climate of the Eastern Ukraine is markedly more continental than that of the west. The winter is colder, the summer hotter, and precipitation lighter. In the west the spring comes earlier and the autumn is longer and warmer. Rain falls chiefly in spring and early summer, a distribution which is favourable to agriculture, especially the ripening and harvesting of grain. In the drier eastern lands on the left bank of the Dnieper thunderstorms and heavy downpours of rain are common.

Precipitation decreases from north-west to south-east, and this is reflected in the change in the character of the natural vegetation from forest to wooded steppe and finally to true steppe. Everywhere, except in the extreme south, the sides of the valleys are wooded, and in depressions, where the ground water lies nearer the surface, as well as by the sides of streams, poplars, willows, alders, and osiers grow. Most of the steppe land is now under the plough.

The natural regions of the Ukraine, described below, are shown in Figs. 55 (a) and (b).

The northern forested, or "Polyessie", region includes a section of the great Polyessie Lowland of Byelorussia and the Western Region (see p. 516). It consists of very level plains in which bogs and marshes, sandy and podsolized soils, predominate. The climate is wet, and the natural vegetation is a mixture of coniferous and deciduous trees. Agriculture is mainly concerned with the breeding of dairy cattle on a [p498] basis of meadow, sown grass, and potatoes. Rye and buck wheat are grown to meet local needs. In the south, when the vegetation begins to change from forest to wooded steppe sugar-beet is the most important crop.

On the left bank of the Dnieper the land is slightly higher and rather hilly, and the climate less moist. There is clear evidence of glacial deposits-morainic material, and extensive tracts of fluvio-glacial sands. As in the western part of the Polyessie region, there are extensive forests. Hemp takes the place of potatoes, and the cultivation of this crop is second only to dairy farming as an agricultural occupation.

The countryside around the village of Novgorod Seversky between Chernigov and Bryansk in the Desna valley, is typical of the left-bank region. The village, an old settlement dating back to the eleventh century, is situated on the hillside above the Desna, and is composed largely of neat wooden houses, with pumpkins and melons growing in the gardens. The village is surrounded by mixed deciduous and coniferous woods, and broad meadows where thousands of geese feed and herds of cattle graze. Fish are plentiful in the rivers, fishing being the occupation of numbers of local people, who work together in artels. The left-bank tributaries of the Desna flow through wide, mature valleys, where numerous peat-bogs provide raw material for several turf briquette factories.

The wooded steppe zone enjoys much more favourable natural conditions – black soils, a warmer climate, and precipitation which is sufficient, but not too heavy, for the growth of a variety of crops (18 to 20 inches with autumn and winter maximum).

On the right bank of the Dnieper the land rises gently to the Volhynia-Podolsk Plateau. The climate is milder and damper than in the Dnieper Lowland on the left bank, where the winters are more severe, and towards the

east the annual rainfall is as low as 12 inches. The spring rains are deficient and often irregular, while the downpours which occur in summer may seriously interfere with work in the fields.

The cultivation of sugar-beet, together with winter wheat [p500] on the right bank, and pig-breeding and spring wheat on the left bank, are the most important agricultural occupations. Beet is grown as the main crop in a system of crop-rotation, since it prepares the soil for the following crop, which is usually wheat. Hence the higher the percentage of beet, the greater is the yield of grain, in spite of the acreage of the latter crop being smaller than in those regions of the Ukraine where grain-cultivation predominates. A greater proportion of the sown area is devoted to beet in the lands on the western side of the Dnieper than on the drier eastern side. Rye, barley, and oats are usually grown in addition to wheat. Finally, intensive cattle-rearing is assisted by the provision of fodder from the waste products of the beet sugar industry, which supplements the fodder crops—potatoes, sown grasses, etc.

In the Volhynia-Podolsk Uplands the ancient crystalline rocks of which they are composed come to the surface in some places. But generally they are hidden by a cover of sandstones, limestones, and clays, and in turn these are masked by loess deposits. As a result of the ease with which these deposits are eroded, the surface is dissected by steep-sided valleys, and ravines and gullies are common.

Apart from the main crops of sugar-beet and grain, bee-keeping and orchard cultivation are carried on everywhere in this region. The vine flourishes in the valleys, where the plants are protected from cold winter winds. In fact, the right-bank lands of the wooded steppe zone form one of the most beautiful as well as one of the most fertile regions of the Ukraine. The picturesque villages, with their thatched cottages surrounded by cherry-trees and orchards, are reminiscent of France. Woods and trees break the monotony of the ploughed fields, bringing variety to the landscape. The country has an abundance of dairy cattle, draught oxen sheep, and pigs.

The landscape of the southern steppe is quite different. Here, on the left bank, the broad Dnieper Lowland rises gradually north-eastward towards the southern end of the Central Russian Uplands, from which a number of rivers flow gently, through wide, smooth valleys, down to the [p502] Dnieper. The loess-covered surface of the uplands is dissected by ravines. The monotonous flat plains of the Dnieper Lowland are loess-covered, too, varied only by shallow saucer-shaped depressions, particularly valuable to the farmer since they hold the waters from the melting snows of spring. ("...A huge, slowly undulating plain, a world of parabolic distances which make one think of the open sea." – H. P. Vowles.) Throughout the lands of the left bank precipitation is slight. The dry, treeless landscape is in many respects similar to that of North Castile, and is composed largely of endless cornfields. The villages are practical rather than picturesque. The pretty thatched cottages across the river to the north-west are replaced by modern houses with tiled or corrugated iron roofs.

The southern end of the Central Russian Uplands is separated by the Donetsk valley from the Donetsk Heights, a hilly plateau covered with sandstones, clayey shales, and limestones, and representing the remains of old folded mountains which have been extensively fractured, worn down to the present level, and the surface deeply dissected by valleys. The north-eastern edge of the heights falls sharply to the Donetsk river with picturesque chalk and limestone crags and cliffs.

The right-bank lands of the southern steppe zone specialize in wheat, sugar-beet, and pig-breeding, while on the drier left-bank lands the percentage of beet is smaller and spring wheat, sunflower, and maize are the chief crops. Within recent years large areas have been planted with cotton. A small proportion is irrigated. In the lower Dnieper valley grapes and peaches are cultivated. Thus the steppe zone of the Ukraine is predominantly a grain-growing region. Rye and barley form subsidiary crops, while sown grasses, potatoes, and maize provide fodder for cattle-rearing. About five million acres are sown with potatoes, but owing to the dry climate yields tend to be rather low. Dry-farming methods and deep tractor ploughing are now universally adopted in order to combat the effects of low precipitation.

[p503] The valleys of the Donetsk Heights form a separate region where the farmers are concerned mainly with dairy farming and orchard cultivation. Another separate region is found within the great bend of the Dnieper, below Dnieperstroi. Here a new type of highly specialized intensive 'electrified' agriculture has been introduced. The low precipitation is countered by irrigation on a very large scale, electric power from the Dnieper hydro-electric station being used to pump water from the river and deliver it throughout an extensive area. Cotton, rice, kender, fruit, and vegetables are cultivated, and cattle are reared. As early as 1935, 865,000 acres of land was served by electric threshing-machines, and 7400 acres were electrically ploughed. Some 8600 acres of arid steppe were irrigated by electric power, and there was a large number of electrically heated hot-bed frames.

Near the large towns of Kiev, Kharkov, Odessa, and Dnepropetrovsk there has been a considerable development of market gardening and dairy farming for urban consumption.

In the extreme south of the Ukraine there is an extensive lowland area, which slopes gently down to the Black Sea and the Sea of Azov. The low plains of this region were formed in recent geological times, and owing to a subsequent subsidence of the coast the lower parts of the river valleys were flooded, forming estuaries often separated from the open sea by sandy spits. The plains are cut by numerous dry valleys, in all probability the courses of ancient rivers. Towards the south, as the climate becomes drier, the soils change from the black to the chestnut-brown type. Winters are fairly cold, but short, and the summers are hot. Sunflower, barley, melons, Makhorkha (coarse tobacco), cotton, and rice are grown. The area devoted to barley is particularly large.

Agriculture occupies a significant position in the economy of the Ukraine. Nearly 64,000,000 acres (60% of the land) are devoted to crops. Farm-work is highly mechanized, as is shown by the fact that in 1939 there were 90,000 tractors, more than 26,000 harvester combines, and 24,000 lorries at work on the farms, and even in dry years the farms give a [p504] much higher yield per acre than during the best years before 1917. In the U.S.S.R. as a whole almost 20% of the land under wheat, and about 30% of the land under barley, is found in the Ukraine, which also supplies the Soviet Union with large supplies of apples, cherries, pears, plums, melons, grapes, tomatoes, and hops. (In 1937 Ukrainian farms accounted for 72% of the sugar-beet, 24% of the maize, 32% of the barley, 22% of the wheat produced in the U.S.S.R., and about 20% of the total number of pigs.)

Agricultural products form the basis of several industries – sunflower, hemp, and linseed provide vegetable oil. Beet, which occupies some 5% of the total sown area, supplies the Soviet Union with almost all its sugar requirements, and the yield of sugar-beet is extremely high. The factories, generally lying close to the fields, are situated mainly on the right-bank lands of the Dnieper.

Cotton-weaving is carried on at Poltava, and jute is manufactured at Odessa. Cattle and hogs provide the raw material for the making of leather and bristles in several towns. Hops go to the numerous distilleries, while potatoes are utilized not only for animal fodder but also in the production of potato alcohol. Flour-milling is another industry which is widespread, and at the river port of Nikolayev are the largest grain-elevators in Europe.

Non-Agricultural Industries

The Ukraine possesses exceptionally large mineral deposits. The combination of excellent coking coal and limestone in the Don basin, on one side of the Dnieper valley, with high-quality iron ore at Krivoi Rog, on the other side, only 250 miles away, and other iron deposits in the Kerch Peninsula [p505] to the south, is especially valuable (see p. 238). (The Krivoi Rog deposits contain about 1000 million tons of iron ore (58 to 62% metallic content). In the Kerch Peninsula the reserves are estimated at 3000 million tons, and although the metallic content of the ore is only 33.4% and contains a considerable proportion of phosphorus, it occurs in thick beds (average thickness 22.5 feet) which lie much nearer the surface than the Krivoi Rog ores. Hence the Kerch deposits are cheaper to work. Donetsk coal is sent by sea to Kerch, from Mariupol, while Kerch iron supplies the ships with a return load.)

The iron and coal-producing centres are connected by rail. There are smelting and metallurgical works both in the Don basin, at Krivoi Rog, and at Mariupol and Taganrog, near the Kerch deposits, so that trains can make the return journey carrying a full load both ways – iron ore in one direction and coal in the other. This is obviously a most economical arrangement. Between the two industrial centres of the Don basin and Krivoi Rog, and connected with them by rail, lies the new industrial region around the Dnieper hydro-electric station.

The area of the Don basin coal measures, from which about 60% of Soviet coal is produced, is exceeded only by that of the Kuznetsk coalfield. In the former the seams are thinner and the quality of the coal lower. But in some ways the Don basin is in a more fortunate position for industrial development. It is, for example, in the centre of a densely populated area, and connected by the best railway network in the U.S.S.R. with other large centres of population such as Moscow and Leningrad.

In addition to the iron-ore deposits mentioned above, local deposits of limestones, dolomite, and fire clays are valuable for the iron-smelting processes, while manganese, used to harden steel, is obtained from the district around Nikopol. Mercury is found in the Don basin, at Nikopol, and bauxite near Dnepropetrovsk. There is some oil-production at Chernigov and near Roman. Salt, used in the chemical industries, is found at Artymovsk.

For several centuries the Ukraine was no more than an agricultural borderland of the Moscow State, and a constant source of discord between Russia, Poland, and Turkey. With the construction of railways, however, both its wheat supplies and its coal and iron deposits began to occupy an important place in Russian economy. Today, with an area and population similar to that of France, the Ukraine produces similar amounts of wheat, steel, and iron. Coal is sent to all parts of the U.S.S.R. Iron- and steel-producing towns have grown [p506] up in the Krivoi Rog and Don basin regions, and the metallurgical, mining, engineering, machine-building, and

chemical industries are of national importance.

The chemical industry obtains local supplies of practically every necessary raw material – salt from near Slavyansk and Artyemovsk, waste products of the coking and metallurgical industries, rock phosphates, and cheap and abundant supplies of electric power both from the Dnieper hydro-electric station and from the numerous power stations which make use of Donbas coal. Agriculture, requiring large quantities of fertilizers, makes heavy demands upon this industry. In addition to fertilizers, sulphuric, nitric, and hydrochloric acids, coke, benzol, etc., are produced, and since waste materials from the heavy industries play such a large part in this production the Donbas region constitutes a great coal-, metallurgical-, and chemical-producing region.

Between 1913 and 1938 the annual output of pig-iron increased from 2,882,000 to 8,900,000 tons, of steel from 2,410,000 to 8,467,000 tons, and of coal from 27,800,000 to more than 80,700,000 tons. More than one-half of the pig-iron production and one-third of the steel production of the U.S.S.R. was concentrated in the Ukraine in 1938.

A second industrial region has grown up around the Dnieper hydro-electric station,...

Thus there are three great industrial areas in the Ukraine. The Donbas includes the towns of Kirovgrad, Stalino, Voroshilovsk, Voroshilovgrad, Artemovsk, Slavyansk, etc. Voroshilovgrad and Stalino and Voroshilovsk specialize in locomotive-building. Kramatorskaya is the centre of a powerful industry which supplies furnace equipment and [p507] machinery for coal-mining and the metallurgical industry. Voroshilovgrad (formerly Lugansk) is the oldest iron and steel centre of Southern Russia. It was here that the first experiments made in Russia in the smelting of iron with coke took place in 1797. The success of the process led to the complete decline of the Urals, where charcoal was used, and efficient coal could not be found locally. During the last few years Voroshilovgrad has been known throughout the Soviet Union as the centre for the construction of the latest types of Soviet freight and passenger locomotives.

The chief centres of the chemical industry are Slavyansk, Lubichansk, Gorlovka (which also specializes in the construction of mining machinery), and Konstantinovka.

Within the Dnieper industrial region we find the iron and steel and engineering works of Zaporozhe, Dneprdzershinsk, and Dnepropetrovsk, well situated for receiving coal from the east and iron from the west, with unlimited supplies of electrical power close at hand, and producing high-quality steel, tractors, ball-bearings, machine-tools, agricultural machinery, etc. Steel alloys and aluminium, both requiring large amounts of electricity, are also manufactured, while the waste products from the undertakings mentioned above supply the chemical industry with its raw materials. At Dnepropetrovsk, and to the south at Nikolayev, there are railway-wagon works.

All these industries are intimately connected one with another in order to obtain the most economical utilization of raw materials, waste products, and transport. They have all been planned and organized jointly as parts of a major producing unit, known as the Dnieper Industrial Combine.

Across the Dnieper to the west, in the stony ridge of the Volhynia-Podolsk Upland, lie the iron-mining settlements, the chief of which is Krivoi Rog. Both in this town and at Kamenskoya there are large metallurgical undertakings. Apart from the high-grade haematite iron deposits of this region, however, the Oolitic ores of the Kerch Peninsula are also used in the Ukraine. The iron and steel works at Mariupol and Taganrog use these ores exclusively.

[p508] Outside these main industrial areas, but lying in a central position in relation to them, and depending upon them for supplies, the city of Kharkov is today the third most important engineering centre of the U.S.S.R. Its factories produce large numbers of tractors, mining and electrical equipment, turbines, and locomotives. At Kiev, chemical apparatus for the sugar-beet industry is manufactured.

A number of towns – Berdyansk, Odessa, Kiev, Kherson, and Melitopol – are engaged in the manufacture of various types of agricultural machinery for the farms of the Ukraine. At Kiev river craft are constructed, while at Nikolayev there is a shipbuilding industry, engaged in the construction of vessels for the Black Sea mercantile fleet.

It should now be clear that in the Ukraine there is a remarkable combination of agricultural and industrial wealth, both highly developed, together with a dense population. It is not surprising, therefore, that it occupies a very high place in Soviet economy, being one of the chief sources of grain and food, as well as the largest coal and metallurgical base for the whole of the U.S.S.R.

Communications

At the dawn of Russian history the Dnieper was being used as a trade route through what is now the Ukraine,

from the Black Sea to the north. When larger ships were introduced during the last century the river ceased to be of any considerable value as a navigable waterway, because it was obstructed by rapids at Zaporozhe, and was generally too shallow. It is only since the completion of the Dnieper hydro-electric power station that the rapids have disappeared and the level of the river has been raised, so that a certain revival of navigation has taken place.

The Dnieper and its tributaries, however, are of great value for local traffic between the towns and villages along the valleys. The Desna, for example (a left-bank tributary of the Dnieper), is an important local highway, passing from Kiev to the north-east through pleasant and fruitful countryside. [p509] Timber is floated downstream and convoys of barges carry heavy loads of pig-iron, lime, and agricultural produce.

Peter the Great used the river, as he used the river Don, to assist the southward expansion of the Russian State. He opened a wharf and shipbuilding yard at Bryansk, and built a river flotilla. The surrounding forests provided the timber.

Steamships have been plying between Chernigov and Kiev since 1846, and along this section of the Desna navigation is still moderately good. When the Great Dnieper Project is completed through navigation will be opened up from the Dnieper at Kiev to the Oka and the Volga.

The Black Sea ports, Odessa, the largest, Kherson, Nikolayev, etc., are of great value for foreign trade, and for communication with the Caucasus. But the most outstanding feature of the communications which serve the Ukraine is the excellent network of railways, particularly necessary for the full economic development of a region possessing such enormous agricultural and industrial resources. No other part of the Soviet Union is so well equipped in this respect. These railways carry coal, grain, salt, and sugar to other parts of the country, and bring into the Ukraine timber (via the Volga as far as Stalingrad and thence by rail) and oil, which is transported by pipeline or railway to the Black Sea coast, by sea and rail, to Rostov, and then by rail to the Ukrainian towns. (The density of the railway network is 32.2 kilometres per 1000 square kilometres. The Ukraine possesses about one-third of the total length of railways in the U.S.S.R. The new Moscow-Donbas trunk line is particularly important for the transport of coal.)

Population

Approximately 20% of the population of the U.S.S.R. is to be found in the Ukraine, although this republic occupies only 2% of the total area of the Union. (In 1939, before the addition of Western Ukraine.) The majority of the people – about 60% – are Ukrainians. In the north-east there are considerable numbers of Russians, and in the north-west Byelorussians.

In spite of the fact that there are large industrial areas, [p510] only 23% of the population is urban. This is due to the dense agricultural population of the farm-lands. The drier lands to the east of the Dnieper are not so densely peopled as those to the west, where agriculture is of a more intensive type.

The villages are generally situated near the rivers, where water is available, or in dry valleys where it is easy to sink wells. This 'control' of the site of the villages is most apparent in the lands on the left bank. In some of the more densely peopled districts the villages are strung out along the valleys in a long, often unbroken, line, each being connected to the next, thus forming a continuous ribbon of settlements.

The high proportion of people engaged in agriculture and the major industrial towns are shown in the table below.

The Population of the Ukraine (1939)

Urban	11,195,620
Rural	19,764,601
Kiev	846,293
Kharkov	833,432
Dnepropetrovsk	500,622
Stalino	462,395
Odessa	604,223
Krivoi Rog	197,621
Nikolayev	167,108
Mariupol	222,427
Zaporozhe	289,188
Kirovograd	100,331
Vinnitsa	92,868
Moghilev	99,440

Kherson	97,186
Kremenchug	89,554
Melitopol	75,735
Slavyansk	75,542
Artyemovsk	55,165
Voroshilovsk	54,794
Zhitomir	95,090
Cherkassy	51,693
Berdichev	66,306
Sumy	63,883

Kiev and Kharkov are the most important towns. Kiev is the third largest city of the U.S.S.R. One of the most ancient of Russian cities, the capital of the Slav principality of "Kiev Rus," and a trading centre on the Dnieper over a thousand years ago, it is situated at a junction between the Dnieper and the railways from Moscow to Odessa, and from Poland to Stalingrad. Three valleys join the Dnieper valley at Kiev, the valleys of the Desna, Pripet, and Sozh.

[p511] It is an important centre for the manufacture of beet-sugar. Its factories produce in addition ships, tramway rolling-stock, textiles (silk and knitted goods), leather, boots and shoes, chemicals, machines such as automatic lathes, etc.

Kharkov does not possess the same historical traditions as Kiev. Founded about three hundred years ago on the borders of the early Russian State, as a settlement of immigrant Crimean Tartars on the banks of the Kharkov river, it occupied a central position in the Ukraine, and between the Ukraine and Moscow, and by 1653 its importance had increased to such an extent that it was made the administrative centre of the area known as "Slobodskaya Ukraine", a part of Southern Russia where immigrants from surrounding lands (*e.g.*, Poland and Lithuania) were allowed to settle.

Kharkov soon became the gateway to the southern iron areas and the coal-mining region of the Donetz basin. It lay close to two natural highways to the Black Sea – the Dnieper and Donetz valleys – and was therefore a commercial centre.

These advantages of geographical position have continued to the present day. Kharkov was the capital of the Ukraine under the Soviet administration until 1934, as well as being one of its most outstanding industrial and cultural centres. In 1934 the capital went back to the more ancient historical town of Kiev. Kharkov, however, now surpasses the latter as an industrial town. It is one of the most important engineering centres of the Soviet Union, and is situated at the junction of main-line railways from Moscow, the Crimea, Kiev, Dnepropetrovsk, Kherson, Rostov, and Stalingrad, while the new express main-line for coal transport between the Don basin and Moscow passes through it.

To the south-west of the Ukraine is Moldavia, with its administrative centre at Tiraspol. This republic forms a continuation of the South-western Ukraine, and is engaged in similar forms of agriculture. Maize, wheat, and potatoes are the main crops, while there are also orchards, vineyards, and tobacco plantations, especially on the terraced slopes of the Dniester valley. [p512]

Western Ukraine and Western Byelorussia

The western regions of the Byelorussian and Ukrainian Soviet Republics were included within the territory of Poland after the Great War, and remained under Polish control until November 1939, when they became part of the U.S.S.R.

Geographically they form simple westward extensions of the two Soviet Republics of Byelorussia and the Ukraine, extending southward from the Lithuanian border across the Pripet Marshes into the former south-eastern corner of Poland, including Eastern Galicia and part of the ancient province of Volhynia.

They form a section of that western frontier of the U.S.S.R. which for centuries has been difficult to stabilize, since the Russian Plain passes from Eastern into Western Europe without any strong natural divide between the two. The only obstacle of any significance is the Pripet Marshes. This geographical fact is reflected in history. Poland forms a transitional region between east and west. To the west are the countries of Western Europe, which have had a cultural and economic evolution quite different from that of Eastern Europe. The Germans, for example, are largely Protestant, while the Russians traditionally adhered to the Greek Orthodox faith, and received their earliest elements of civilization from Constantinople. Between the two are the Poles – a Slavonic people – neither Protestant nor Greek Orthodox, but Roman Catholic. They received their early civilization from Italy.

Poland also lay between the conflicting economic interests of East and West. The nations of Western Europe, particularly Germany, tended to extend their frontiers eastward, while Russia attempted to expand towards the west. Although Poland, as a dual monarchy with Lithuania, maintained an empire from the fourteenth century onward, which extended in 1740 as far east as the Dnieper, and included Byelorussia and most of the Ukraine, the bordering states of Germany, Russia, and Austro-Hungary divided Poland between them during the latter half of the eighteenth century, and until 1919 the Polish State ceased to exist.

[p513] Poland, like the Russian Empire, of which a large portion of her territory formed a part before 1919, was a backward agricultural country with a poorly developed industry. Whereas Soviet economy made rapid progress after the Great War, both agriculture and industry expanding very quickly, Polish economy did not advance to the same extent.

Parallel with the development of Soviet economy went the recognition of the rights of national minorities, Byelorussia and the Ukraine were formed into separate republics. They used their own language, developed their national culture, and made rapid strides in the education of their peoples.

[p514] In the Ukrainian S.S.R. the administration of the republic is in the hands of Ukrainians, and the native language is used everywhere. There were, in 1937, 17,736 schools, catering for the needs of over 4,000,000 children. There were 278 scientific research institutes. There were 27,344 collective farms, covering 87,500,000 acres, and employing 84,000 tractors and 27,000 combine harvesters. The wheat harvest was greater than that of Germany, Poland, and Hungary together.

In Western Byelorussia and Western Ukraine, however the Byelorussians and Ukrainians, mostly peasants, suffered both from the backward state of Polish agriculture and from their treatment as a national minority. In 1920 the Poles had taken Kiev and attempted to hold the entire north-western part of the Ukraine. The Red Army drove the Polish Army from the Ukraine and swept on to the gates of Warsaw, but were then compelled to retreat. A new frontier was defined which left a large Byelorussian and Ukrainian population within the new Polish State. In the north between Lithuania and the Polish frontier of 1938, from 25% to 40% of the people are Poles. Farther south this percentage decreases to about 10%, rising to between 25% and 40% near Tarnopol, but falling again to 10% to the south of Stanislawov. In Western Ukraine there are five or six million Ukrainians forming 75% of the population in Galicia, east of the river San (see p. 526).

The Polish Government made many promises regarding the rights of the Ukrainian minority, but kept none of them. Thus in 1923 there were 3030 Ukrainian schools in Poland but by 1930 this number had fallen to 700. From 1920 to 1939 there was constant strife between Poles and Ukrainians reaching a high level in 1930, during Pilsudski's reign of terror.

As peasant farmers the Ukrainians suffered from lack of land. Between 1919 and 1925 there was some redistribution of land in Poland, but not on a sufficiently large scale. There [p515] was often discrimination in favour of Polish peasants. In any case, an increase in the number of small holdings merely served to intensify the agrarian problem. The small holding is uneconomic, and tends to prevent the use of agricultural machinery and modern scientific methods. Both in the Western Ukraine and Western Byelorussia, agriculture and industry remained in a backward condition and the peasantry in particular suffered under a regime of persecution, unceasing toil, taxes, and debts.

The Northern Moraine Zone

North of the Podolian plateau the landscape and soils have been determined largely by the effects of glaciation. The northern part of Western Byelorussia comes within the Baltic moraine zone. It is crossed by numerous forested morainic ridges, with flat, marshy lowlands and valleys between them. The soils are poor, the climate damp. Where the forests have been cleared rye and potatoes are grown and pigs are reared.

Farther south the landscape is one of vast level and monotonous plains, crossed by only slight valley depressions and occasional low morainic hills. Much of the land is desolate, covered by marsh and forest. Only a small proportion is devoted to agriculture – dairy farming and the cultivation of flax, potatoes, and rye. Remnants of serfdom and feudal economy have persisted until recent years; farm economy is particularly backward, and the density of population falls to below 35 per square mile.

Across the plains run the ancient east-west valleys which drained the Russian Plain at the end of the great Ice Age, when the outlet to the Baltic was still blocked by the ice-sheets. The valleys are natural route-ways from Russia to the West, and cutting across the present north-south river valleys, make possible the creation of an excellent system of river, canal, and railway communications.

Although some railway-lines follow these routes, little has been done to utilize to the full their potential value as through ways between Eastern and Western Europe. [p516]

The Polyessie

The southern portion of these plains, and the low marsh lands around the Pripet and its tributaries, which extend from the south of Western Byelorussia into the north-west Ukraine, are known as the "Polyessie". The lower plains present a landscape of endless bogs and chains of lakes. The land around the lakes rarely rises to a height of 15 feet above the surface of the water. The only break in the grey-green monotony of this inhospitable country is provided by occasional sand-dunes, or the pine-woods which cover the few patches of drier land. (In the whole of the Byelorussian or White Russian Republic there are about five million acres of bog and marsh. Many of the bog-soils, when drained, are exceedingly fertile, since they contain natural phosphate deposits. Thus they give higher yields than the poorer podsolized soils of the higher and better-drained land which needs heavy applications of fertilizers.)

Around the edge of the "polyessie" proper – the plains and marshes in the lower parts of the Pripet basin – there are higher plains, rising to between 30 and 120 feet above the level of the rivers (see Fig. 57), and formed from Cretaceous and Tertiary deposits. The surface is slightly undulating, and the ground drier, so that the majority of the population is found here, and the landscape is dotted with small villages, fields, and woods. In early geological times the site of these plains was occupied by a mountain range, running parallel to the Urals. They have been completely peneplained, and the ancient rocks were covered by sedimentary deposits laid down under Cretaceous and Tertiary seas.

During the retreat of the Quaternary ice-sheets the Polyessie lands formed a great gulf between the ice-sheets and the Podolian Uplands, flooded by the waters from the melting ice which laid down thick deposits of sand. After the ice had finally retreated the sand was blown into dunes along the valleys.

In some places there are large stretches of undulating sand broken by low ridges, while the dunes themselves may be [p517] three to four miles long and 60 feet high. The slopes are covered with thick pinewoods.

The light-coloured sands and dark pinewoods stand out in strong contrast to the sombre country around the dunes. Rising above the marshes, they form bridgeways across the bogs, and are generally followed by roads.

Brest-Litovsk (30,000) is a small agricultural centre and timber port on the river Bug. It lies on one of the glacial valley routes which pass from the east through the Pripet Marshes across the valley of the Bug to the Vistula. It also controls the entrance to the Bug valley.

Bialostock is a textile-manufacturing town on the river Narev (a tributary of the Bug). It is connected by canal to the Niemen, the canal following the floor of one of the valleys formed at the end of the Quaternary glaciation. Another former valley provides a route-way to Vilna and is followed by the railway from Bialostock. Yet another runs to the south-east of Grodno, from the upper Niemen to Pinsk and the Pripet. A canal joins the two river basins. A project has been considered for providing a through waterway from the Baltic, along the Niemen and Pripet, to the Dnieper and the Black Sea. In Pinsk there are textile, chemical, paper, and timber industries.

Volhynia, Podolia, and the Southern Lands of Western Ukraine

To the south of the Polyessie the land rises to the Volhynian hill country and the Podolian Plateau, in Western Ukraine. This is the western extension of the fertile black earth region of Southern Russia. In Volhynia the formation beneath the black earth and loess is chalk; in Podolia it is limestone. The increase in the fertility of the land from the Polyessie in the north to the black earth lands in the south is marked by an increase in the density of the population from below 35 to nearly 50 per square mile. The wide, treeless, level or rolling plains are cut by gullies and ravines, and wide, mature valleys. The summers are warmer than in Western Byelorussia. Wheat [p518] takes the place of rye as the chief grain crop, sugar-beet and hops are cultivated, and pigs and horses reared. Under Polish rule large estates and feudal remnants of serfdom were common. Artificial fertilizers were not used on the land, and the yield per acre was very low.

Along the southern edge of the Podolian Plateau lies the Galician depression. It follows the Dniester valley, as a continuation of the San-Vistula depression, between the Carpathians and the edge of the rigid block of the Russian platform in the Podolian Plateau. The depression forms an important route from Silesia through Bessarabia and Rumania to the Black Sea, although the Dniester itself is of little value as a waterway.

Along the southern edge of the depression the land rises gradually to the forested slopes of the Carpathians. Forestry and pastoral industries are the chief occupations. Rock salt and zinc are mined in the foothills, and there are considerable petroleum deposits.

In North-western Podolia, between Lvov and the Dniester valley, lies a high plateau region, known as the "Opolye". It rises to over 1200 feet above sea-level in the north, and is deeply dissected by the wide valleys of the tributaries of the Dniester. These wide valleys and the smoothly sloping hills offer a strong contrast to the

narrow cañon-like ravines which are so common elsewhere in Podolia. Many of them are connected with each other by the depressions of ancient valleys. The Dniester itself originally flowed along the Bug valley.

Along the hillsides are terraces, varying in height between about 135 and 360 feet, the highest belonging to the early Quaternary period, when the "Opolye" and the Podolian hill country formed a low plain, drained by the long, unstable meandering streams of the Dniester and its tributaries. The subsequent raising up of the land *en masse* caused the rivers to incise deeply into the plateau, leaving terraces to mark the former levels. The terraces sometimes carry boulders of Scandinavian origin, carried here by the waters of the melting ice-sheets. The valley soils are rich in humus and lime. In [p519] the whole "Opolye" region 50 to 75% of the land is cultivated, the remainder being covered largely by deciduous forests in which the oak is the most common tree. To the east of the "Opolye" the oak is rarely seen.

Wheat, rye, and flax are the most important crops, together with hops in the north and sugar-beet in the south. The main industrial occupations are concerned with timber, sugar-beet, and dairy products.

In the south-east of Western Ukraine is a region known as "Pakutnaya Podolia". It lies between the river Dniester and the Eastern Beskids, outliers of the Carpathians. To the south-east the forested slopes of the Eastern Beskids are cut by broad valleys. Above the slopes the mountain-tops, composed largely of sandstone, are weathered into fantastic columns and caverns. To the north and east the Eastern Beskids give way to ridges of picturesque hills along the edge of the Volhynia-Podolsk Plateau, occupying the watershed between the upper Prut and the tributaries of the Dniester.

At the end of the Tertiary period Pakutnaya Podolia was a wide plain sloping towards the Dniester. Then the level surface was warped, and in this process a number of high ridges and a series of north-west – south-east depressions were formed. The Prut, which formerly flowed slowly northward into the Dniester valley, changed its direction and began to flow to the south-east. The raising up of the land brought about the formation of the narrow valleys of the Podolian Plateau. Their steep sides are covered with oak- and beech-woods.

The Dniester valley is bounded by steep, precipitous slopes, crowned with enormous limestone crags. The bottom of the slopes is covered with a thick growth of hazel-bushes and wild pear, while the valley floor, along which the river meanders, is clothed with golden fields.

The plateau between the Prut and the Dniester forms fertile black earth steppe, now almost entirely cultivated. The mild climate favours the cultivation of maize, vines, and tobacco, as well as wheat and rye. In the gardens around the farm-houses apples, pears, plums, and cherries are grown.

The chief industrial resource's of the region are the oil [p520] deposits of the Borislav district. The oil-bearing zone of the northern slopes of the Carpathians commences near the Western Ukraine, extending from the Dunaitza and Byeloi valleys to the upper Prut, where it turns south-west into Rumania. The forested mountain slopes, with their grey rocky summits, rise to over 6000 feet – an eastern extension of the Alpine system of mountain folding.

Intense folding caused successive folds to be piled on top of one another. The young sedimentary rocks, mainly limestones, have undergone metamorphism in the more deep-seated layers, generally becoming crystalline, and in some places have been exposed by denudation. The sedimentary rocks were formed in seas of moderate depth, and as the folds rose from the sea, shallow water deposits were laid down – generally sandstones and clays known as "Flysch". Denudation rapidly reduced the height of the mountains, which were, however, rejuvenated by an upward movement *en masse* at the beginning of the Quaternary period.

Within the areas of "Flysch" are found oil deposits formed during the Cretaceous and Tertiary periods when the climate was wet and tropical and the low-lying seashore was covered by lagoons, lakes, and river deltas, surrounded by, and partly overgrown with, tropical vegetation. Oscillation of the level of the land caused the sea-floor itself to be alternately raised (and covered with forests and swamps) and submerged.

In mid-Cretaceous times intense folding caused remnants of the organic matter from the tropical vegetation to be 'trapped' between the folds, together with salt water. The chemical action of the salt water, under immense pressure, brought about the formation of oil in the lower folds. In the higher folds the organic deposits were not covered by a sufficiently deep layer of protective rocks, and were removed by denudation.

Unplanned exploitation of these oilfields in the past led to a fall in output from 2,000,000 tons in 1909 to 514,000 tons in 1935. Most of the oil was exported, and the high price in the home market made it impossible for the peasants of Western Ukraine to buy paraffin for domestic use. After the [p521] Western Ukraine became a part of the Ukrainian S.S.R. in 1939 the production of the oil-wells of the Droghobich-Stanislawov region was doubled.

Lvov is the largest town of the Western Ukraine. It has a population of about 240,000. Founded seven hundred

years ago by the Russian prince, Daniel of Galicia, it became a centre of Ukrainian culture, the capital of Russian Galicia, and an important commercial centre on the old route from Cracow to Kiev.

During the fourteenth century the town was seized by the Poles, who partitioned the Ukraine. For 450 years the Poles held Lvov. Then the Germans seized both Polish and Ukrainian lands and took both Cracow and Lvov, holding them for 150 years. The latter town was again taken by Poland after the Great War. Its main industries are concerned with metallurgy, mining and wood-working, and the manufacture of textiles, chemicals, and paper.

Bessarabia and Northern Bukhovina

In 1940 those parts of Northern Bukhovina and Bessarabia where the population is predominantly Ukrainian were incorporated in the Soviet Union, the former becoming part of the Ukrainian Republic and most of the latter part of the Moldavian Republic. Six districts around Kishinev, with a population about 70% Moldavian, went into the Moldavian Republic, the mainly Ukrainian areas joining the Ukrainian S.S.R.

These small frontier areas of the U.S.S.R. have been in the past the cause of strife and contention between various great powers. In early history the Greeks, Romans, Goths, Huns, and Bulgars all invaded these lands. In the thirteenth century the Mongols, sweeping across Europe, entered Bessarabia. During the same century Genoese traders established themselves on the Dniester river. During the fourteenth century Bessarabia was ruled by a prince of Moldavia, while [p522] in the sixteenth century it passed alternately between the Crimean Tartars and the Turks, remaining as a cause of dispute between the Russians and the Turks in the eighteenth century. It was annexed by Russia in 1812. Moldavia, west of the river Prut, was left to the Turks.

Bukhovina, at the junction of the Polish, Czech, and Rumanian frontiers, was a principality of Moldavia, occupied by the Russians in 1769, the Austrians in 1774, and then was ceded to Turkey in 1777. From 1849 to 1918, however, Bukhovina was included within the Austrian crown lands. After the Revolution part of it passed, together with Bessarabia, under Rumanian control, and part was taken by Poland.

The Treaty of Paris (1920), by which Bessarabia was recognized as a province of Rumania, was not signed by either the United States of America or the U.S.S.R., and the latter never admitted the legality of Rumania's possession, but regarded Bessarabia as being Soviet territory occupied by Rumania.

In 1940 both Northern Bukhovina and Bessarabia came into the Soviet Union (see note at p. 526).

Relief and Climate

The Russian platform extends under the Volhynia-Podolian Plateau in the Ukraine and its continuation in Bessarabia to the Carpathians. It is covered with Tertiary deposits, and these, overlaid with loess, form the basis of the fertile black earth region of the Volhynia-Podolian Plateau.

Central Bessarabia is deeply dissected by the tributaries of the Dniester and the Prut, so that from the valleys the landscape appears very hilly. This is especially noticeable in the centre of the anticline which passes through this region from west to east. The soils of the valleys are often poor, and the land marshy. Forests of beech and oak are common.

In the south the land merges into the Budjak steppes and the sandy and salt-marsh country around the lagoon-fringed Black Sea.

The climate is continental, January average temperatures [p523] falling several degrees below 32° F. and the July averages exceeding 70° F. The rainfall, mainly in summer, is light, the annual precipitation being about 25 inches. Hence Bessarabia and Northern Bukhovina form the continuation of the Ukrainian steppe lands (now almost entirely cultivated) with the exception of the forested hilly country in the centre.

Agriculture

Climatic conditions and the fertile soils are excellent for the cultivation of grain. Wheat and maize are the chief crops. tobacco is also grown, and fruits and the vine are widely cultivated.

Sugar-beet is an important crop in North-west Bessarabia and Northern Bukhovina. In the mountains of Bukhovina pastoral occupations prevail, and considerable numbers of sheep, cattle, and horses are reared in the Bessarabian steppe.

Agriculture, however, remained in a very backward state under Rumanian rule. Farming methods were often primitive; subsistence farming, with the employment of only the simplest machinery, was common everywhere, and relics of serfdom and ancient customs were still to be found.

The dry loess plateau land is not suitable for subsistence farming. Modern large-scale methods of agriculture

and the employment of machinery would increase the productivity of the land enormously, and the introduction of these will be one of the results of the incorporation of Bessarabia in the Ukrainian Republic.

Population

Bessarabia bore the brunt of several Turkish invasions of Europe, and the countryside was largely depopulated during the Turkish wars. During the early nineteenth century large numbers of Ukrainians and Russians came to settle here, and today they form a good proportion of the total population of about three million.

The Rumanians live chiefly on the broad hilly spurs of the Carpathians, between the Dniester and the Prut. The low [p524] lying land along the valleys is occupied by peoples of Cossack and Tartar origin. It was along these valleys that the Huns, Slavs, Bulgars, Magyars, and Tartars migrated into Europe in early historical times.

According to Bowman in *The New World: Problems in Political Geography* (Harrap), the Rumanians enjoy an absolute majority to the north of Kishinev, where they exceed in numbers all other national groups together. There are, however, large Jewish and Ukrainian minorities (10 to 20% of the total). Close to Kishinev itself there is a very large Russian minority.

To the south of Kishinev the Rumanian population is not as large as the Russians, Ukrainians, and Jews combined, while in the extreme south the Ukrainians form a national group larger than either of the two most important minorities – the Bulgarians and Rumanians.

The population of the whole of Bukhovina is about 800,000, composed almost equally of Rumanians, Germans, and Ukrainians (Ruthenians). The Rumanians spread into Bukhovina across the plains from the south, while the Ukrainians came into the country from Galicia, and form the majority of the population in the north. It is this northern portion that is now a part of the Ukrainian S.S.R. In Bessarabia and Bukhovina together there are about 800,000 Ukrainians.

It is clear, therefore, that physically and ethnographically Bessarabia and Northern Bukhovina form the natural borderlands of the Russian Plain. Economically they are even more strongly bound to Russia.

Communications

Under Tsarist rule the railways were designed to converge upon Odessa. The one exception has its terminus at the port of Akerman, which, however, was in turn connected by sea with Odessa.

These railways and the river Dniester were the natural outlets for the agricultural produce of the country – grain, wool, fruit, and wine, while the vast Russian lands provided [p525] the market. Under Rumanian rule the railways not connected directly with Rumanian ports were of no value for trade, and the Russian market was closed. The Dniester was no longer available for the shipment of agricultural products, and apart from this, both the Dniester and the Prut are slow-flowing, meandering rivers, difficult for navigation. Rumania, herself an agricultural country, with no great industrial centres, could not take the surplus from the Bessarabian towns. The peasants were in a particularly unfortunate position owing to the small size of their holdings and the fact that much of the land was in large estates, the property of wealthy landowners. (In Bukhovina the majority of the holdings were below 20 acres and some as small as 2 acres. In Bessarabia they were up to 25 acres.)

During the twenty-three years of Rumanian occupation there were many peasant revolts. The area of land sown to crops fell to less than one-third of that of 1913, while the number of cattle was more than halved.

The redivision of the land which took place after the entry of Bessarabia into the U.S.S.R. in 1940 proved to be a very popular measure, the peasantry receiving altogether about 440,000 acres of new land.

Industry

The main industrial resources of the new territory of the Ukrainian and Moldavian Soviet Republics consist of brown coal deposits in the south, near the Prut valley, and oil and salt between the Upper Dniester and the Upper Prut (see Fig. 57). Lumbering is carried on in Northern Bukhovina. Elsewhere industry – mainly on a small scale – is concerned with flour-milling, sugar-refining, and leather and tobacco manufacturing. In the limans, or lagoons, on the shores of the Black Sea fishing is an important occupation.

The chief towns are Kishinev (117,000), Akkerman (a second-rate port on the Black Sea), Ismail (a river port on the Dniester), and Reni and Kagul (river ports on the Prut).

The Western Region

THE Western Region embraces the Byelorussian S.S.R. and the former Western (Administrative) Region, and is situated on that part of the European Plain which lies between Poland and Latvia to the west and the Central Region of European Russia to the east. The territory of the Western Region has always occupied a position of strategic significance as a borderland between the states lying close to the Baltic and the important industrial region of Russia, with its centre in Moscow.

The general uniformity of climate and the predominance of glacial forms of relief unite the whole area into a single natural region. But local variation in relief, and particularly in the character of the river-net, make possible the following subdivisions: (1) the north, with a morainic landscape; (2) the Central Russian Uplands in the east; (3) the Polyessie lands of the west.

In the north, along the edge of the great Pre-Baltic Lowland – extensive plains which are occupied by bogs and marshes – there are several rows of broken morainic hills. Between two of the highest rows, known as the Valdai Heights, lies a depression which contains a series of lakes and the sources of the streams which flow in one direction towards the north Dvina and to the Volga in the other. It was in this depression that the early portages between the two rivers were made. During the spring floods, when the land is inundated, it is impossible to determine the position of the actual water-parting, the waters flowing now to the west, now to the east.

The Central Russian Uplands in the east constitute a gently rolling upland plain, broken only by gently sloping hills of insignificant elevation and broad marshy valleys. The eastern part of the upland is higher, and the surface more dissected.

[p528] In the north there are limestone outcrops, where pothole underground caverns, and disappearing streams are common features.

The south-western section of the Western Region consist of a broad lowland depression, drained by the river Pripet. Slightly elevated patches of sandy deposits, clothed with coniferous forests, occur amid enormous tracts of swamps and bogs which cover hundreds of square miles. These marsh lands, known in Russia as the Polyessie, are covered with an intricate network of interconnected streams and rivers. During the spring floods the Polyessie have the appearance of a vast lake, in which the elevated sandy areas stand out like islands. Large stretches of these marshes have been drained and are now used as meadows or arable land.

Climate and Vegetation

The climate is distinctly humid, so that agriculture is not hindered by droughts. In the east the temperature conditions are similar to those prevailing around Moscow. But toward the west the increased effect of oceanic influences is apparent, so that the winters are not so cold, the summers are not so hot, and the precipitation is relatively heavy. In the south west winter lasts for only three months. Thaws often occur in January and February. This change of climate from north-east to south-west finds its reflection in the natural vegetation. In the forests of the north and east coniferous trees and the birch and aspen predominate, while in the south-west the oak, lime, maple, and hornbeam are the chief trees. About two-thirds of the forested land has been cleared for agriculture. The bog vegetation varies, and, according to local conditions reeds, rushes, sedge, or coarse grasses are found. In the northern Polyessie lands the marshes and patches of coniferous forest are strongly reminiscent of the cold northern parts of the Soviet Union, while the landscape of the deciduous forest lands is more akin to that of the right-bank lands of the Ukraine in the south.

Agriculture

The poor clay or sandy podsolized soils, and the damp cool [p529] climate, limit the growth of grain. On the drained peat-bogs, however, the yield of winter rye, grown for local use, and of oats is higher, acre for acre, than in Denmark. Everywhere modern agricultural methods are compelling the soil to increase its yield. Local phosphatic deposits are used for the production of fertilizers, and the farms are highly mechanized.

[p530] In 1939, 4712 tractors and 695 combines (used for the flax harvest, which otherwise entails a great deal of arduous human labour) were in use in the Smolensk Region alone. The total sown area in White Russia alone increased from 6.2 million acres in 1913 to 10 million acres in 1937.

Flax, a crop more suited to the soils and climate, is grown on the damp morainic lands of the north. The best soils for both flax and vegetable cultivation are in the north-east, between Orsha and Moghilev, and near Minsk.

Hemp is an important crop in the south, in the marshy Polyessie lands, while the very large areas of poor sandy soils between these lands and the Bryansk district are devoted to potatoes, which supply fodder for hogs.

In the north-west (on the borders of the Kalinen Region) and near Bryansk hay crops and meadows provide fodder for large herds of dairy cattle. Grasses are sown in rotation with flax, since the latter makes heavy demands upon the soil. The rearing of cattle for meat and hides is an occupation which is widespread throughout the south. Large numbers of pigs are reared, fed on potatoes and waste products from the butter factories and distilleries.

In Byelorussia sown grass, potatoes, hemp, and flax occupy 40% of the total arable acreage. Oats and barley, grown as fodder crops, occupy about 60%. The Western Region supplies the linen industry of the Soviet Union with nearly 30% of its raw materials. A new crop, recently introduced with remarkable success, is the rubber-bearing kok-sagyz.

Forestry is of great importance. Although the area of forests is small in comparison with the great forest lands of the north, the species of timber are more valuable and the position in relation to markets is much more advantageous. Timber is exported to Poland along the West Dvina and the Niemen and carried down the Dnieper and Pripet rivers to the treeless steppe lands of the Ukraine. [p531]

Industry

In Tsarist Russia Byelorussia was one of the most backward agricultural regions, with practically no industry. In 1939 the factories of the Byelorussian S.S.R. produced twenty times the volume of commodities manufactured in 1913.

The Western Region as a whole is not well endowed with minerals. There are, however, phosphate deposits and large amounts of peat, while near Sukhinichi the south-western corner of the Moscow coal basin, yielding brown coal and containing iron of rather poor quality, extends into the Western Region.

Peat is used as fuel at the Bryansk, Osinovsk, Minsk, and Gomel regional power stations. Bryansk is the centre of an important metallurgical industry, which originally utilized ores mined near Sukhinichi, but eventually began to use supplies of cheaper metal brought by rail from the mines of the Ukraine. The largest locomotive and wagon-building works of the Soviet Union are situated in this town, as well as cement and glass works and saw-mills. At Gomel machinery for the cultivation, retting, and primary working up of flax is constructed. At Minsk and Vitebsk articles which require relatively small quantities of metal – lathes and needles, for example – are manufactured.

Throughout the remainder of the Western Region, industry is mainly concerned with the working up of agricultural products. The linen factories of Rzhev and Orsha are among the most important in the U.S.S.R. At Moghilev artificial silk is manufactured. Saw-milling and woodworking, including the making of veneers (at Bobruisk and Borisov), the making of matches (at Borisov and Rechitse), and the manufacture of paper, are all industries of national importance. Some of the largest Soviet paper and cellulose mills are situated at Bobruisk.

Of the remaining industries, the production of alcohol, starch, treacle, and acetone from potatoes, the manufacture of hemp (in the south), bristles, boots and shoes, butter, cheese, and bacon are the largest.

[p532] Vitebsk is the centre for a number of light industries such as textiles (linen) and knitted goods. It contains one of the largest knitwear factories in Europe. The tanneries of Vyazma can deal with one million pig-skins a year. Cotton-mills are situated at Yartsevo, near Smolensk, while at Klinty woollen cloth is produced.

Population and Communications

Smolensk grew up, early in Russian history, as an intermediary in trade and commerce between Kiev and Novgorod on the route from the Varangians to the Greeks (see p. 142) When the Moscow State expanded nomadic invasions cut off most of the lands now in the Western Region from its domains, and later a large part of this territory was absorbed into the Polish-Lithuanian State.

These western borderlands became a battlefield between Moscow and Poland, a factor which retarded economic development. When eventually Russia obtained supremacy and control of the Baltic ports, and began to trade through them, a number of railway-lines were laid down, crossing the Western Region on their way to the Baltic from Moscow and the Ukraine. Thus today Smolensk and the few other large towns are situated at railway junctions (Fig. 59). The rivers and canals have in the past been important means of transport, and with the reconstruction of the old system of waterways their importance is likely to revive.

The dam which is to be constructed at Orsha will raise the level of the Dnieper and enable large river-steamers to sail into Smolensk, which is already important as the centre for the flax and dairy cattle region, and contains one of the largest flax-working mills in the U.S.S.R.

The most densely peopled areas are in Byelorussia. Although the main occupations are agricultural, the population is not small, since for long the farmers have had sure markets for food, and flax, hemp, etc., in the surrounding regions (*e.g.*, the Moscow industrial region). In the north there is a marked concentration of population in the higher and better-drained land of the Central Russian Uplands and on the [p533] morainic heights. Of the 9,000,000 inhabitants of the Western Region Byelorussians are in the majority in the west, Russians in the north and east, and Ukrainians to the south of the river Pripet. People of Polish origin are found throughout the region. After the unification of the Byelorussian Republic by the addition of Western Byelorussia (see p. 512) the population of the Western Region was increased by about four and a quarter millions. Minsk, the capital of Byelorussia, lies at the junction between important railway-lines from Moscow and the Ukraine to Warsaw and Königsberg. It contains machine-building and wood-working factories. Gomel is situated at the point where the railway from Minsk to the Ukraine crosses the river Sozh, a tributary of the Dnieper. It contains metal and wood-working factories and glass works.

[p534] The Population of the Western Region (1939)

Byelorussian S.S.R.

Urban	1,372,522
Rural	4,195,454

Smolensk Region

Urban.	447,996
Rural	2,242,783

Orel Region

Urban	693,066
Rural	2,789,322

(The western half only of the Orel Region is included within the Western Region. The former is an administrative, the latter a geographical division.)

Minsk	238,772
Vitebsk	167,424
Gomel	144,169
Smolensk	156,677
Moghilev	99,440
Bobruisk	84,107
Bryansk	87,743
Rzhev	54,081

The Central Region

The Central Region, although relatively small in area, has a population of about 28,000,000, and is the second most densely peopled part of the Soviet Union, the density of population being exceeded only in the Ukraine. This is mainly due to its central geographical position. The climate is less severe than in the north, but not so warm as in the south. It is wetter than in the lands lying further east, but not so wet as in those to the west. The region also occupies a transitional position between the zone of podsolized soils to the north of the Oka and the zone of black earths in the south.

North of the Oka

The marshes and forests which originally covered the lands gave protection to the Moscow State during the early stages [p536] of its growth, while the fact that the upper courses of the main rivers of European Russia flow through the region gave it enormous advantages in the control of trade and communications (see p. 146).

The northern part of the region is in the main a forested and marshy lowland, lying around the upper Volga and its tributaries, with a landscape of level or rolling plains, covered with sandy and clayey glacial and fluvio-glacial deposits. The river banks are smooth and flat, and as a result of the low relief the drainage system is poorly developed, so that vast areas are flooded in spring.

Settlements in the plain are confined to narrow sandy ridges on the banks of rivers and lakes. The remaining low-lying marshy country is very sparsely populated. To the north of Moscow are the chains of morainic heights, such as the Nevel and Valdai Hills, which extend from Smolensk beyond Moscow in a north-easterly direction. The Klima-Dmitrov ridge is the most notable elevation, rising to a height of 975 feet.

On top of the morainic heights the surface consists of an undulating plateau, deeply dissected.

In the north-west lies the Kalinin Region, where the Volga rises amid swamps and marshes, not far from Lake

Seliger. This is the largest of a number of deep lakes which extend in a north-west to south-east direction – the direction of the advance of the Quaternary ice-sheets.

The West Dvina also rises at no great distance from Lake Seliger, while to the south is the source of the Dnieper, and to the north Lake Ilmen, and the river Lovat – leading to Lake Ladoga, the river Neva, and the Gulf of Finland. This was an important area of inter-river portages in the early days of Russian history, when Kalinin (then named Tver) was the centre of the important principality of Tver.

An interesting geological formation occurs along the upper Tver river, where a ridge of low hills rises 120 to 180 feet above the marshy plains, extending southward from Vishne-Volochok. Not far below the surface are red, grey, and blue clays (used in the manufacture of pottery and toys), together [p537] with quartzite sands (used in the glass factories of Vishne-Volochok). But the most surprising feature is the presence of coal measures belonging to the Carboniferous period.

Deep boring made in 1927 proved that the Carboniferous strata do not constitute a broad, deep mass, but lie in the form of a huge tongue upon morainic clays and sand, and were probably transported hither by the waters from the melting ice-sheets at the end of the Great Ice Age.

The climate is similar to that of the Northern (coniferous forest) Region. The summer, however, is definitely warmer and longer. Precipitation is abundant, although not extremely heavy (see pp. 87-88). Since large areas of the country are forested, the winter snow cover tends to be preserved more than in the open southern steppe lands, where the winds sweep it from the ground. The retention of snow is of great value to agriculture since it protects the ground from severe frosts.

The soils are of the podsol type, with a clay and sand basis. The sandy soils provide favourable conditions for potato-cultivation. There are also considerable tracts of alluvial soils near the rivers. These support meadows which provide excellent pasture for dairy cattle. The natural vegetation changes from coniferous trees in the north to mixed forests in the south. Near Vladimir, in the north-west, there is a wide expanse of treeless country known as the 'Opolye'. Here the soils are dark and similar to the black earths of the steppe.

Unfavourable natural conditions for cereal growth, the thick forests, poor soils, and rains which often fall in late summer, retarded the early agricultural development of the Central Region, especially in its northern part.

From early times refugees from the adjacent lands flocked into this region when their lands were invaded, and as the soil could not support a large population, especially with the backward agricultural technique of those days, people were compelled to supplement their income by handicraft occupations. The central position of the region facilitated the exchange of handicraft products for raw materials and grain. Later, when the Moscow State became the centre of the [p538] Russian Empire, raw materials such as flax, cotton, wool, and metal were brought in, the local supplies of timber were used as fuel, and the skilled craftsmen had greater scope for their work, many of them eventually becoming industrial workers.

Thus agriculture developed, not to secure a surplus for export or trade, but in order to meet the local requirements by providing milk, meat, and vegetables, and to supply industry with raw materials such as flax and potatoes. Grain had to be imported from the Ukraine. Today technical advances in farming methods have almost removed this necessity, much of the food consumed by the population (even grain) being produced locally.

The most important agricultural regions are indicated in the succeeding paragraphs.

The Northern Flax and Dairy Cattle Region.

Flax, a suitable crop for the poor soils and cool damp climate, is combined with grasses, sown in rotation, in order to restore the fertility of the soil, upon which flax makes heavy demands, and to provide fodder for dairy cattle reared for milk production near the towns, and for butter in the north, where there is no market for milk (*e.g.*, in the Ivanovo Region). Flax and grasses occupy about one-half of the sown area. (The Kalinin Region alone produces more flax than the whole of Western Europe, this crop occupying 16% and potatoes 10% of the sown area of the region.) Vegetables and potatoes are widely grown, the latter on the sandy soils. In the extreme north-east, however, owing to the extreme climatic conditions, there is only a small amount of agriculture.

The Milk, Potato, and Vegetable Region.

This includes the lands around the central industrial region, and extends eastward towards Yaroslavl, Ivanovo, and Gorki. In the Rostov-Yaroslavl district potatoes occupy up to 40% of the sown area. Elsewhere large quantities are grown on sandy soils. In the Moscow Region a greater proportion of arable land is under potatoes than in any other part of the U.S.S.R. Fodder crops (for dairy cattle) occupy about 16% of the sown area, while a similar proportion is devoted to market-garden crops. [p539]

The Suburban Market-gardening Region.

This zone, which includes the country close to Moscow, specializes in the production of milk and vegetables for the urban population. Pigs and rabbits are reared, a considerable proportion of the fodder being obtained from the waste food from restaurants and factory kitchens in the towns.

The Southern Cereal and Potato Region.

Here the climate is milder than in the north and the soils are rather more fertile. In the regions described above winter rye and oats are grown to meet local requirements. Within this zone, however, not only is there a larger area under grain, but winter rye and oats are replaced by winter wheat. Potato-cultivation is important, too, as a basis for pig-breeding, and as a raw material for starch and treacle factories, distilleries, and the manufacture of synthetic rubber. Poultry farming is also carried on.

The Black Earth Lands of the South

South of the Oka the relief changes. To the west the land rises in the Central Russian Uplands. In the east lies the Tambov Plain, the southern section of the Oka-Don Lowland, covered with a meandering and complex river-net, cut deeply into the valleys. The right banks are steep, while on the left banks there are broad meadows.

The watersheds between the rivers are dissected by ravines and gullies, which are a prominent feature of this region. Their extension and growth are assisted by the ease with which the loess surface is washed away, especially where man's activity has resulted in the clearing of the protective cover of forests, or in the ploughing up of the land on the hillsides. In the past a great deal of arable land was lost to the farmers in this way, and it is only within recent years that serious steps have been taken to combat this menace to agriculture by the planting of trees along the edges of the ravines.

The winters are severe, but as a result of the southerly latitude of this part of the Central Region, the summers are warm and long. The spring, too, comes earlier, and is milder [p540] than in the north. During some years, however, dry south-easterly winds bring about rapid evaporation after the thaw, so that the moisture from the melting snow has not time to soak the soil. This causes serious difficulties for agriculture. Precipitation is generally sufficient and decreases in a south-easterly direction. Heavy rains often fall during early summer. During the latter half of this season, however, the weather is dry and conditions are good for harvesting.

The original deciduous forest vegetation which formerly covered the northern section of these lands has been largely cleared so that today it remains chiefly along the sides of the valleys. On the drier sandstone and limestone formations, especially on the banks of the Oka, there are areas of steppe. Towards the south-east, deciduous forest changes to wooded steppe and finally to true steppe.

The soils are black and fertile, and combine with the climate to produce favourable conditions for agriculture. More of the land is devoted to crops than in the north of the Central Region, and in place of dark and sombre masses of forest which obstruct the view, open fields, green with young spring crops, or a golden sea of waving corn in summer, extend to the horizon, broken only by islands of trees. The sky is less cloudy, and seems higher and a deeper blue. In fact, the landscape becomes strongly reminiscent of the neighbouring Ukrainian steppe lands. It must be remembered, however, that some of the country now under the plough, although having the appearance of original steppe country, was formerly wooded, especially towards the north, as is evident from the soils, the so-called "degraded black earth," which contain less than 6% of humus, while the true steppe can be recognized by the presence of soils containing up to 10% of humus.

Until the end of the sixteenth century this southern section of the Central Region lay on the route of the nomads, when they invaded the Moscow State. When the invaders were eventually driven back the land was divided into large estates and given to military people. With the land went the peasant serfs. After the abolition of serfdom and the enclosure of [p541] much of the land by landlords and nobles there was a large landless peasantry which provided a reservoir of cheap labour. Hence there was no incentive to introduce machinery, and agricultural technique remained in a backward condition.

When the Ukrainian lands of the south were connected to Moscow by railway they provided cheap and abundant supplies of grain, since the virgin soil, untouched for centuries, yielded rich harvests without the employment of fertilizers. This brought about the final economic collapse of the southern lands of the Central Region, and wholesale emigration of the peasants took place. Many went to seek work in the Urals, or to settle in the empty lands across the Volga.

After 1917 modern methods of farming, the establishment of large mechanized farms, the application of fertilizers, and an increase in the area under cultivation brought about a great improvement. The number of industrial crops such as beet, sunflower, tobacco, hemp, and potatoes, as well as the area sown to fodder crops (the basis of dairy cattle and pig- and poultry-rearing), rapidly increased. The value of this procedure lay in the

presence of an industrial market close at hand (in the Moscow district).

Today it is possible to distinguish four agricultural regions.

(1) In the south-west (the Kursk Region) the precipitation is relatively high, and the climate relatively warm. Sugar-beet is the main crop, and this region is now the second most important source of sugar in the Soviet Union. Market-garden crops are grown and pigs and poultry reared.

(2) In the drier lands of the south-east the farms specialize in winter wheat, millet, rye, oats, and sunflower. About 15% of the sown area is under wheat in the Voronezh Region as compared with 10% in the Kursk Region. Pigs are reared, and in the south of the Voronezh Region, sheep.

(3) In the damper and cooler north-west (Orel Region) the cultivation of hemp and the rearing of dairy cattle are highly developed.

(4) The remainder of the north, in which conditions of soil and climate approximate to those obtaining north of the river Oka (and described below), is devoted to the growing of fodder and potatoes and to pig-breeding, with [p542] some grain and sugar-beet in the southern part of the Tula, Ryazan, and Tambov regions.

Considerable areas are devoted to potatoes in the Kursk and Voronezh regions. Cattle and pigs are reared in each of the four areas, rye and oats, sown grass, and the waste products of agriculture, such as sugar-beet waste, and stubble being used for fodder. Around all the large towns vegetable- and milk-production form the chief agricultural occupations.

Industry

An explanation of the early development of the handicraft industries, and the subsequent establishment of industries engaged in the working up of agricultural produce, such as flax, cotton, wool, and metal, has already been given (see p. 537). Industry developed not because of an abundance of local raw materials, but because of the central geographical position in the midst of one of the most densely peopled parts of the Soviet Union and hence close to the great consuming centres. The Kalinin Region, for example, was in a particularly favourable entrepot position, between Moscow, Leningrad, and Southern Russia, and it was rendered more favourable when, during the time of Peter the Great, the rivers were connected by canals.

The lack of local supplies of high-quality coal and iron, and hydro-electric resources, tended to retard the development of the heavier industries. But within the last twenty-five years the brown coal of the Moscow basin has been utilized, in addition to coal from the Donbas and oil from the Caucasus. The output of the Moscow basin had risen to 7,400,000 tons a year by 1938. After the coal has been burned the ashes, together with sulphur and other substances found in brown coal, are utilized by the chemical industry.

Peat, too, is extensively employed as a fuel. There are large regional peat-electric-power stations at Yaroslavl, Orekhovo, Ivanovo, and Shatura, while those at Kashira, Bobriki, and Stalinogorsk use brown coal.

In the Kalinin Region there are now 125 electric-power [p543] stations, while the Moscow district alone possesses greater supplies of electrical energy than any other industrial region in Europe. About two-thirds of the fuel used in power stations and industry is produced locally.

Iron has been mined in Tula since the time of Peter the Great, and is today used in the engineering works and iron-ware factories near the town. The iron deposits of Kursk and Lipetsk are now being utilized (*e.g.*, at the Lipetsk metallurgical works). Other deposits of iron occur along a line extending approximately from Kaluga to Murom. But up to the present the local supplies of iron ore in the Central Region have not been great, and the machinery and engineering industries which have been developed are in the main those which require relatively small amounts of metal and large quantities of skilled labour – as the Russians say, "metal for a kopeck, and labour for a rouble". Scrap-iron and imported ores from the Ukraine are used for the production of high-quality steel at Moscow and Noginsk. Thus we may say that the iron and steel region of the Moscow district was founded in order to supply the engineering industry, in contrast to the Urals Region, where iron- and steel-production were established first, and on the basis of this the engineering industries came into operation at a later stage.

The majority of the engineering works, mainly engaged in the production of machine-tools, instruments, lathes, ball-bearings, motor vehicles, printing, textile, agricultural, transport and electrical machinery, are situated either in Moscow or in the neighbouring towns. The manufacture of machine-tools, and a large proportion of the motor vehicle industry, is [p544] concentrated in Moscow itself. At Kolomna locomotives are constructed, at Mytishi railway-wagons and coaches, tram-cars, and agricultural machinery.

Farther away from Moscow, at Kalinin, railway-coaches and wagons are built. At the Kalinin railway works 28% of the passenger coaches and 16% of the wagons used on Soviet railways are built. The growth of heavy

industry in the Kalinin Region as a whole is reflected in the relative decline of the older light industries, the output of which has been reduced since 1917 from 70% to 45% of the total industrial production.

The factories of Yaroslavl specialize in synthetic rubber, motor vehicles, and agricultural machinery. The latter is also manufactured at Torzhka. Heavy as well as light industry has also been extended to the Ivanovo district. Ships and printing machinery are made at Rybinsk, machines for the peat-extracting industry at Ivanovo, precision instruments at Vladimir, and non-ferrous metals are refined and smelted at Kolchugino. In the south, agricultural and textile machinery is made at Voronezh.

The textile industry, however, is the most important. In and around Moscow, and to the east, in the Orekhovo-Zuevo district, cotton fabrics, woollen, silk, linen, and a variety of knitted goods are manufactured. Kalinin and Vishne-Volochok are smaller cotton textile centres. The Kalinin Region as a whole, however, is an important linen-manufacturing area, accounting for a considerable proportion of the entire production of the U.S.S.R. The chief centres of manufacture are Rzhev and Bezhetska. The textile industries of the Moscow district are now tending to specialize in the manufacture of fabrics of high quality, as well as in special fabrics required for the machine-building and chemical industries. This is because new mills have been constructed in Central Asia, Transcaucasia, and Western Siberia, as part of the plan for a more rational distribution of industry, placing the factories nearer the sources of raw materials.

Ivanovo, however, is still the "Manchester of Russia," and not only are there important cotton-mills in the town itself, [p545] but it is also the centre of a group of cotton-manufacturing towns, which in turn are surrounded by a second ring of linen-manufacturing towns (Fig. 62). Other industrial enterprises-chemical works, producing acids and dyes, engineering works, starch factories, etc. provide the textile industry with essential requirements. To the north-west of Ivanovo, in the Yaroslavl Region, there are linen factories at Yaroslavl and Kostroma.

Handicraft industries are still maintained in artels-linen-weaving near Vyazniki, cotton-weaving near Alexandrov, and the making of sheepskin coats at Shuga.

The Ivanovo district has no local supplies of coal, and peat and wood constitute a large proportion of the fuel used in the industrial undertakings and power stations. Electric power is also transmitted from the Moscow and Gorki districts.

Within recent years the chemical industry has undergone enormous development, especially in the Moscow district, where dyes are manufactured for the textile mills. The chemical works of Voskressensk, Stalinogorsk, and Dzerzhinsk [p546] produce nitrogenous and phosphatic fertilizers. Local deposits of phosphates and brown coal are used.

An entirely new industry is engaged in the production of synthetic rubber from potatoes (see p. 246) at Yaroslavl, Efrimov, Kursk, Voronezh, and Tambov. Rubber is manufactured at Yaroslavl, where the tyre-works has a capacity of 8,000,000 motor-tyres per year, and a variety of rubber goods is produced in Moscow.

The forests of the Moscow district have been cleared to such an extent that the Government has introduced legislation forbidding the cutting of trees in certain protected zones. Hence the surrounding areas, such as the Ivanovo district, produce most of the timber for local requirements, as well as exporting it to other parts of European Russia. The wood-working industry is carried on at Kalinin, Vishne-Volochok, Ryazan, Sasovo, and along the Volga and its tributaries in the Ivanovo and Yaroslavl Regions.

The majority of the minor industries are engaged in the working up of agricultural material – the leather, boot, and shoe industry (in the Kinry-Taldom district), and boot-fulling (near Kalagin). Potatoes provide the basis for the production of starch, treacle, and alcohol.

It will be noted that practically all the industries described above are situated in the northern part of the Central Region. In the south farming is the dominant occupation, and most of the industries (beet-sugar, butter, starch, treacle, and tobacco production, flour-mills, and distilleries) depend upon agriculture for raw materials. (The Kursk and Voronezh Regions produce about 15% of the granulated sugar manufactured in the U.S.S.R.)

The significance of the Central Region, and especially the Moscow district, in the economy of the Soviet Union as a whole cannot be over-estimated. More machines are produced in the Central Region than in Italy, Japan, and Poland together. The Moscow district is the most highly developed industrial region of the Soviet Union, as the figures at p. 547 show.

The Ivanovo Region is the fourth most productive industrial [p547] region of the U.S.S.R. (In 1937 nearly 40% of the production of cotton fabrics was concentrated in this region.) It holds first place in the manufacture of linen, and is second only to Moscow in the production of cotton cloth.

Transport and Communications

Reference has already been made to the central geographical position of the Moscow district around the upper courses of several important rivers. Today the Volga is Russia's chief waterway, and its value to the Moscow district has been greatly increased by the construction of the Moscow-Volga Canal, and the establishment of deep waterway navigation along the entire length of the river. Its value will be enhanced still further when the "Great Volga" scheme has been finally completed. The reconstruction of the Vishne-Volochok canal system (Fig. 63), originally built between 1703 and 1708 and of great commercial importance up to the nineteenth century, will open the Volga-Leningrad route to larger vessels, which will then be able to proceed from the Caspian Sea up the Volga, along the Moscow-Volga Canal to Moscow, and thence to Leningrad.

Another shorter waterway which is being reconstructed is from Yaroslavl along the river Sheksna and the Mariinsk system to the Baltic-White Sea Canal or Leningrad.

The new Moscow-Volga Canal (80 miles in length) has been in operation since 1937. It commences at Kimri on the Volga, and after traversing a marshy lowland cuts through the Dmitrov-Klim morainic ridge (by means of a series of locks) to the Moscow river. At Kimri a huge reservoir has been constructed, from which part of the water is directed [p548] into the Volga, raising its level some 58 feet, while part goes to the Moscow river by way of the canal. The reservoir also supplies the city of Moscow with water for domestic and industrial purposes.

Big river-steamers can now sail right into Moscow. During the first month of navigation after its opening in 1937 185,000 passengers and 12 1,000 tons of cargo passed along the canal. Moscow, however, is not only the focal point for the river and canal system. It is also the largest railway junction in the U.S.S.R. Main lines converge upon the city from all directions (Fig. 64). A new trunk line has been constructed [p549] for the express haulage of coal from the Don basin. Recently a number of modern motor-roads have been constructed, radiating from Moscow to Minsk, Kiev, and other large towns. The Moscow Region as a whole is better served by railways and modern roads than any other part of the Soviet Union.

Thus the Moscow Region is excellently served by transport [p550] arteries along which coal, metal, oil, timber, wheat, sugar, cotton, and silk are carried to the large urban and industrial centres.

The Volga plays a major role in the economy of the Ivanovo Region, which it bisects, separating the lightly populated north, where soils are poor, the climate severe, and agriculture difficult, from the more populous south. Cotton from Central Asia, metal from the Urals, and coal from the Donbas are carried along the river to the factories of the Ivanovo and Moscow districts. A large number of industries depend directly upon the Volga for supplies of raw materials from other parts of the Union and as a means of dispatching finished goods. Prominent examples are the shipbuilding industry, flour-milling at Rybinsk, and oil-refineries at Yaroslavl and Konstantinovka, to which oil is brought in tankers from Baku. Grain is shipped up the Volga from the steppe lands of the south. Finally, timber from the northern forests is carried downstream to the south, where there is a deficiency of wood.

Population and Cities

Approximately 12% of the population of the Soviet Union – nearly 9,000,000 people – is concentrated in the relatively small area of the Central Region. Some 95% of the population is Russian. There are, however, several 'islands' of Tartar and Mordovian peoples.

There are ten administrative regions. Four (Moscow, Kalinin, Ivanovo, and Yaroslavl) are in the north, and two (Kursk and Voronezh) in the southern black soil lands.

In the Moscow district the density of population is higher than in any other district of the Soviet Union. The Voronezh and Kursk districts are also exceptionally densely peopled. In contrast, the lands in the districts of the north, possessing [p551] neither a good geographical situation for the development of industry nor favourable conditions for agriculture are very scantily peopled. (The dense agricultural population of the black earth lands is reflected in the average area per peasant household on the collective farms – 25 to 27 acres (in 1938) in the Orel, Kursk, Tambov, and Voronezh Regions, as compared with 82 in the German Volga Republic, and 99 in the Cheliabinsk Region.)

The contrast between the predominantly industrial occupations of the Moscow, Ivanovo, and Yaroslavl Regions in the north, where conditions do not assist agriculture, and the southern black soil lands is clearly reflected in the percentage of the population classed as urban in the 1939 census – 50% in the Moscow district, over 30% in the Ivanovo and Yaroslavl districts, but only 11.5% and 8.5% respectively in the Voronezh, Orel, and Kursk districts. In the latter there are only two large towns, Kursk and Orel, and each of these contains less than 200,000 inhabitants.

In the south the greater part of the population is concentrated in villages near sources of water – strung out for miles along river-banks and dry valleys, as in the Ukrainian steppe.

Practically all the cities of the Central Region are of ancient origin, especially in the north. This is a clear illustration of the important position of these lands in the historical development of the Moscow State (see p. 144). Some of the towns, such as Rostov and Suzdal, were important in the Middle Ages, but have deteriorated since that period to the status of villages.

Moscow, the capital city of one-sixth of the world, and the largest industrial and cultural centre of the Soviet Union, has a population of 4,500,000. It thus ranks as one of the chief metropolitan cities of the world. Founded eight hundred years ago, Moscow occupied a well-protected position on the high bank of the Moscow river, protected by that river and a smaller tributary, as well as by the surrounding forests and marshes.

The ancient fort, the Kremlin, contains massive stone buildings – palaces and churches – around which strong walls were built during the fourteenth century. Outside these walls a village of wooden buildings grew up, and these in turn were protected by a new wall, the "Chinese Wall" of the sixteenth century. The power of the Moscow State grew, and its territories increased in size, for there was no obstruction [p552] between the town and the great waterways of the Volga, Oka, Don, and Dnieper. All main routes converged on "Mother Moscow", just as today the railways converge upon it. The population of Moscow, the centre of trade and commerce, rapidly increased. The original city became too small, and new settlers had to build their dwellings and carry on their business outside the Chinese Wall. Eventually a third wall – the "White Wall" – was built to enclose these new settlements.

At the end of the sixteenth century Moscow was attacked by Tartar invaders, and in order that any further attacks might be repelled, another rampart was constructed from wood and earth.

Although Peter the Great, when he decided that Russia must be brought into commercial contact with the rest of the world, transferred his capital to the port of St Petersburg, Moscow continued to grow. During the eighteenth century the first industrial undertakings – textile factories engaged in producing linen and woollen fabrics for the army and navy – were established, and Moscow became not only a city of merchants but also an industrial centre. Later, when railways were constructed, it became the centre of the entire Russian railway system – a factor which greatly stimulated industrial expansion.

More textile factories were built, mainly along the banks of small streams, and later the metallurgical industries were introduced. In spite of all this industrial growth, however, Moscow retained the appearance of a great Asiatic village even up to 1917. Three-quarters of the buildings were of wooden construction, roads were in a primitive condition, and sanitation, lighting, and other such civic amenities were almost entirely absent.

In 1917 the population was 1,618,000. After 1917 the capital of the new Soviet Union was transferred to Moscow, and the city became the nerve-centre for the large-scale industrial and economic planning of the vast territories of the U.S.S.R. As the agriculture and the industries of the country began to expand, the industries of Moscow also [p553] increased in size. Many new factories were built, together with large blocks of offices and administrative buildings, and housing estates for the accommodation of the workers who flocked to the capital in thousands. The population had increased to over 2,000,000 by 1926, to more than 3,500,000 by 1933, while in 1939 it exceeded 4,000,000.

In 1933 a "Ten-year Plan" was initiated for the complete replanning and reconstruction of the city. A large proportion of this plan had been executed when the Soviet Union was attacked by the German Army in 1941. According to the plan, which included industrial development as well as reconstruction, the population would have increased to 5,000,000 by 1945. Already, in 1939, Moscow had been [p554] transformed into a beautiful city, with modern buildings, theatres, green belts, parks, and other cultural amenities.

The Kremlin still stands, surrounded by the old stone walls, and overlooking the Moscow river, now a deep, navigable waterway, with granite embankments and spanned by several splendid modern bridges. The old walls which surrounded the city have been taken down, and broad circular boulevards laid out, intersected by wide roads which radiate from the centre like the spokes of a wheel. Modern Moscow is served by an excellent system of trams, buses, and trolley-buses, and a new underground railway which technically and artistically has set an example to the capitals of the world.

The industrial settlements are grouped in zones around the periphery of the city, separated from it and from one [p555] by green belts. In addition to the chemical, textile, and engineering works there are factories engaged in the manufacture of clothing, knitted goods, and footwear, while the Moscow meat combine is the largest factory of its kind in the world, and is only one of a number of considerable undertakings engaged in the food industry.

Moscow is, therefore, well supplied with transport facilities, food, and an abundance of pure drinking water

(from the Kimri reservoir). This city is regarded by the people of the Soviet Union as a monument to their creative activities in the past twenty-five years, and a symbol, indicating the great possibilities which the future holds for them, of that concept of planned geography and economy which has been extended to the entire territory of the U.S.S.R.

Population Statistics

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The Baltic Republics

Before the Russian Revolution the three present Baltic republics of the Soviet union – Estonia, Latvia, and Lithuania – were within the Russian Empire. The Estonian people are of Finnish stock, and their language is closely related to that spoken in Finland. In Latvia and Lithuania, both Alpine and Nordic racial types are intermingled – broad-headed, dark-haired elements, and long-headed fair types, the latter being found mainly in Latvia. The exact racial origin of these peoples is not, however, at all clear, and their language is neither Finnish nor Slavonic. It belongs to the Indo-European group, and contains many archaic peculiarities. Close to the Russian frontier which existed up to 1939 the population is predominantly Slavonic.

In the social structure of these three countries German landowners – the " Baltic Barons " – have played an important role since the thirteenth century, especially in Latvia and Estonia, which had never been completely independent states prior to the end of the Great War.

These Baltic Barons settled as owners and overlords, exploiting the peasantry until, after the Russian Revolution, their estates were confiscated. In Lithuania the landowners were [p556] mainly Poles. Before the union with Poland in the fourteenth century Lithuania controlled territory extending almost to the Black Sea. After becoming united with the old Polish Empire it suffered extinction as a state, together with Poland, when all Polish-controlled lands were partitioned among the neighbouring Powers during the eighteenth century. When the Polish State was recreated after the Great War memories of the early union between the two countries still prevailed in Polish Government circles, and in 1921 Poland annexed the historic Vilna district.

Throughout the long period during which the present Baltic republics were parts of the Russian Empire their economy developed naturally in close harmony with that of the rest of Russia, to which they were, and are, bound for strong strategic, economic, and geographical reasons.

The Baltic region provided an important seaboard for what was originally a land-locked state, and its loss after the Great War shut off the greater part of the Soviet Union from the Baltic, and limited her naval power.

Early in the history of Russia her rulers attempted to establish ice-free ports, without which easy access to Western Europe was impossible. The harbours of the Baltic are almost ice-free, while Leningrad is icebound for about three months of the year. After the war with the Swedes Peter the Great obtained Estonia (with Reval and Narva) and Livonia, or Northern Latvia (with Riga). Southern Latvia and Lithuania were annexed after the defeat of the Poles (1794-95), during the reign of Catherine, thus finally establishing Russia on the Eastern Baltic. Swedish troops were next driven from Finland, and a treaty concluded in 1809 by which Russia obtained Finland and the adjacent islands. In this way control of the Northern Baltic was secured.

The importance of these Baltic States for the defence of the great industrial centre of Leningrad has been demonstrated not only during the present war. During the Great War, and the Wars of Intervention against the Soviet Union which followed, the German invasion of the Baltic States was designed as the prelude to a blow aimed at the city from the [p557] south, while German forces in Finland opened the way for an attack from the north.

Although after Germany's defeat in 1918 she evacuated her troops from the Baltic States, the Soviet States set up in Estonia and Latvia were suppressed by the forces of intervention and together with Lithuania became independent states. Thus in a very short time Russia lost her chief means of access to the Baltic and her barriers against any future attack on Leningrad.

At the conclusion of the Russo-Finish War (February 1940) [p558] a small portion of Finnish territory was transferred to the Soviet Union, most of it being included in the new Finno-Karelian Republic (see p. 563). Before the German invasion of the U.S.S.R. in 1941 the U.S.S.R. had obtained the right to establish garrisons in the Baltic States, which eventually elected to become incorporated in the Soviet Union as Soviet Republics, retaining their own governments. The Vilna district was restored to Lithuania.

The strategical considerations outlined above, which bind the Baltic republics to the U.S.S.R., are the direct outcome of the fact that the Baltic countries consist of an extension of the Russian Plain, not separated from the main mass by any natural defences or physical barriers. This factor has had important economic consequences,

which have created even greater ties, outlined below, between Russia and the Baltic lands.

The Plain here forms part of the great Baltic moraine zone (see p. 32), with a landscape of morainic hills with glacial lake basins and boulder clay and sandy lowlands between them, and occasional plateaux of Palaeozoic rocks, only partially or not at all covered with glacial material. The low plateau of Estonia, and the islands off the coast which form remnants of it, were denuded of soil by the advancing ice during the Great Ice Age. It is separated by a depression, filled with glacial sands and gravels, from the Livonian Plateau to the south. Along the eastern frontier of Estonia is Lake Peipus, drained by the river Narva. Where the river falls some twenty feet at Narva, near its mouth, a hydroelectric station has been built. Lake Peipus itself is in a large glacial lake basin, with a floor of sands and clays. It extends along the eastern edge of the plateau towards the West Dvina river. Glacial lake deposits also occur around the Gulf of Riga, itself once a lake-bed, and along the western border of the Livonian Plateau. The soils of the lake-beds and depressions are relatively fertile, while those of the plateaux are poor. The eastern part of Latvia contains considerable portions of end-moraine country, with numerous lakes, marshes, and poor, forest-covered soils. Lithuania is largely occupied by the basin of the important river Niemen.

[p559] Southern and Eastern Lithuania is traversed by lines of morainic hills, which continue north-east towards the North Dvina river. The centre of the country is occupied by a plateau, covered in part by a zone of end-moraine deposits. Along the coast is a region of ground moraine.

The glacial deposits have produced soils not exceptionally favourable for agriculture. Peat and bogs cover 15 to 20% of the land. Being nearer to the Atlantic than the interior of the Russian Plain, the climate is milder but damper than that of European Russia – a climate which, combined with the poor glacial soils, favours forest growth, dairy farming, and the cultivation of rye, oats, barley, potatoes, and flax. Agriculture has for long been in a backward state in all the Baltic republics. Dairy farming for bacon, eggs, and butter export has made the greatest advances.

Industrially too the Baltic States were backward. For a market for both agricultural and industrial products they have always depended largely upon Russia, and the fact that the low plateau and glacial topography creates no barrier to economic intercourse led in the past to the importance of these countries as controllers of the transit trade in Russian exports through the ice-free ports. When they became separated from Russia both the Russian market and the transit trade were lost. At the same time the rather poorly developed industries could not compete on other markets with the more technically advanced countries of the world. Hence industrial development suffered. Although the absence of useful minerals (apart from clays and combustible oil shales, round near Lake Peipus) restricts industrial growth, there are considerable possibilities for the manufacture of paper, plywood, and timber products. These branches of industry have, in fact, been developed since 1918.

Estonia

Estonia has made the most progress since the Great War. Of the land, 23% is arable, 41% meadow and pasture, 20% forest land, and 16% waste land, [p560] bogs, and lakes. The acreage under the main grain crop, rye, has decreased with the development of dairy farming for export.

Oil shale quarried on the plateau in Northern Estonia is used as a fuel in factories, for central heating, on the railways, in the cement-works at Port Kunda and Azeri, and for the production of fuel oil at Kohtla. Coal, however, must be imported to supplement the shale and oil fuel.

Industries declined when the Russian market was lost, but began to revive rapidly when Estonia became a Soviet Republic. Leather, paper, and linen were manufactured in several towns before the present war.

Tallinn (Reval), with a population of 134,000, owed its development to the fact that it was one of Russia's Baltic ports, with a large transit trade. The port can be kept open by ice-breakers through the greater part of the winter. It has iron- and steel-works, cotton-mills, and grain-elevators.

Baltiski was developed as a port because it is obstructed by ice for a shorter period than Tallinn. Pernau (22,000), on the Gulf of Riga, is the chief centre of the woollen industry, and exports timber and flax. Narva, with its cotton-mills, using hydro-electric power from the Narva Falls, exports timber. The lumber industry is important throughout the Baltic States.

In the upland districts of Estonia the Primary rocks produce poor soils. Where they are covered by morainic material wooded ridges stretch across the country. The rivers, where they flow from the plateau into the lakes in the east, possess considerable reserves of water-power. The only town of importance in Central Estonia is Tartu, or Dorpat (67,000), the chief market-town of the area. It is also a centre for the timber and pulp industry. (For population see p. 563.)

Latvia

The coastal lowland of Latvia forms a broad, fertile region developed on glacial soils around the Gulf of Riga (see p. 558). The chief crops are oats, barley, rye, and potatoes. Dairy farming is an important occupation. Before Latvia's separation from Russia the Latvian dairy produce was added [p561] to the butter, eggs, flax, hides, and cereals from Russia to form a great volume of export trade. Riga (378,000) was the main port, and was the chief market for timber from White Russia and Volhynia (Western Ukraine). It has timber, textile, metal, and rubber industries, and exports flax, butter, and eggs. Navigation can be maintained by ice-breakers until December, when the shallow gulf freezes over.

Liepaja (Libau) and Ventspils (Windau) are practically ice-free, and were out ports for Riga's transit trade from Russia.

In the forested morainic heights of Courland lumbering is the main occupation, while the valley lands of the Lielupe (Aa) and West Dvina (Daujava) support arable land devoted to wheat and flax and considerable areas of pastureland.

The Palaeozoic uplands of Eastern Latvia contain considerable areas of Primary limestone surface rocks. About 10% of the land is devoted to flax. Barley is an important crop, and cattle are reared for meat-production.

Latvia, like Estonia, has developed dairy farming to a considerable degree, exports of butter after the Great War rising to ten times the pre-war figure. On the other hand, the export of timber from Russia suffered when Latvia became an independent state. The loss of the Russian market brought about the extinction of the large industries, which were replaced by small establishments working for the home market. Industrial production declined by 82% between 1913 and 1939. Since some 60% of industry was situated in Riga the re-establishment of contact with the natural hinterland of Russia is certainly of great economic value to the port.

Before Latvia's entry into the U.S.S.R. the chief industries were the timber, pulp, match, cotton, linen, and leather industries.

Although Latvia possesses no coal, the rapids at Koknese (on the limestone escarpment) could be utilized to supply a large amount of hydro-electrical power.

When Latvia became a Soviet Republic plans for rapidly increasing the industrial output of the country were immediately drawn up. Between 1940 and 1941 the production of [p562] agricultural implements and machinery was nearly trebled. The production of building materials rose to between two and three times the pre-1940 level, while the manufacture of consumers' goods increased by 30 to 40%.

Latvia began to manufacture many articles which had been imported previously. The output of the spinning mills at Riga was greatly increased. Within a short period it was clearly demonstrated that the economy of Latvia was about to enter upon a period of most rapid expansion.

Lithuania

Lithuania, part of Poland until its annexation by Russia in 1795, is the most backward – both industrially and agriculturally – of the three Baltic republics, and, like Estonia and Latvia, suffered from the loss of the Russian hinterland after the Great War. Reincorporation with the U.S.S.R. and the restoration of the Vilna region, with the Niemen valley, which is a natural route between Lithuania and the Soviet Union, should do much to assist the expansion of its economy.

The Baltic coastlands produce rye, oats, wheat, potatoes, and sugar-beet. Behind the coastal lowlands are the morainic Baltic Uplands, containing forests, numerous lakes and streams. The inner plains support cattle and dairy farms, while the rivers are used for the transport of timber. Nearly 20% of Lithuania is forested. Flax, timber, meat, and eggs formed Lithuania's chief exports before 1939. Before the Great War large quantities of timber were floated down the rivers from Byelorussia. The chief industries were small-scale milling, leather-manufacturing, and wood-pulping.

Lithuania contains three towns of moderate size. Kaunas (113,000), the administrative centre before the restoration of the historic capital of Vilna in 1939, is situated at the point where the Königsberg-Vilna railway crosses the river Niemen. It is the main market for cattle and grain. Memel (36,000) is an ice-free port. It possesses saw-mills and celluloid works. Although it is Lithuania's only port, it has no direct communications with the hinterland.

[p563] Vilna (201,000) is a junction for railways from Leningrad, Moscow, Warsaw, and Libau. It was an important market (before being annexed by Poland) for Lithuanian timber, cattle, flax and wool. (For total population, see below.)

As a Soviet Republic Lithuania began the construction of six brick-works, a sugar factory, a number of textile mills, and factories connected with various branches of light industry and the food industry. Plans were made to increase the production of the meat industry by 158%, the sugar industry by 187%, and textiles by 260%.

As in Latvia, large numbers of new schools, hospitals, and clinics were established, and in the State budget provision was made for a vast new programme of social services.

Among the peasantry one of the most popular acts of the government of the new Soviet Republic was the land reform, which gave new land to large numbers of poor peasants, while on several of the large estates state farms were established. In Lithuania the majority of the population lives on the land; yet before 1939 45% of the farms were under 25 acres, and these farms shared between them only 16.9% of the land available for farming. Landlords possessed one-third of all the arable land, 47% of all the cattle, and 70% of the agricultural machinery. Large numbers of peasant families possessed neither a cow nor a horse. Many of them had received new land between 1920 and 1922, but lost it again, having to sell it in order to pay the heavy taxes. Soviet Lithuania established about 30,000 new peasant farms, and gave additional land to some 40,000 others. New settlers were given liberal financial assistance, and were absolved of redemption and land taxes.

Area and Population of the Baltic Republics

	Area (Sq. miles)	Population (Aug. 1940)
Lithuania	23,100	2,925,000
Latvia	25,400	1,951,000
Estonia	18,300	1,122,000

(The area ceded by Finland – 13,600 square miles – had a population of 450,000, which was mainly evacuated.)