

Rhine

The Rhine (Romansh: Rein, German: Rhein, French: le Rhin, Dutch: Rijn) is a European river that begins in the Swiss canton of Graubünden in the southeastern Swiss Alps, forms part of the Swiss-Austrian, Swiss-Liechtenstein border, Swiss-German and then the Franco-German border, then flows through the Rhineland and eventually empties into the North Sea in the Netherlands. The biggest city on the river Rhine is Cologne, Germany with a population of more than 1,050,000 people. It is the second-longest river in Central and Western Europe (after the Danube), at about 1,230 km (760 mi),^[note 2]^[note 1] with an average discharge of about 2,900 m³/s (100,000 cu ft/s).

The variant forms of the name of the Rhine in modern languages are all derived from the Gaulish name *Rēnos*, which was adapted in Roman-era geography (1st century BC) as Greek *Ῥῆνος* (*Rhēnos*), Latin *Rhenus*.^[note 3] The spelling with Rh- in English Rhine as well as in German Rhein and French Rhin is due to the influence of Greek orthography, while the vocalisation -i- is due to the Proto-Germanic adoption of the Gaulish name as **Rīnaz*, via Old Frankish giving Old English *Rīn*, Old High German *Rīn*, Dutch *Rijn* (formerly also spelled *Rhijn*). The diphthong in modern German Rhein (also adopted in Romansh *Rein*, *Rain*) is a Central German development of the early modern period, the Alemannic name *Rī(n)* retaining the older vocalism,^[note 4] as does Riparian Rhing, while Palatine has diphthongized *Rhei*, *Rhoi*. Spanish is with French in adopting the Germanic vocalism *Rin-*, while Italian, Occitan and Portuguese retain the Latin *Ren-*.

The length of the Rhine is conventionally measured in "Rhine-kilometers" (*Rheinkilometer*), a scale introduced in 1939 which runs from the Old Rhine Bridge at Constance (0 km) to Hoek van Holland (1036.20 km). The river length is significantly shortened from the river's natural course due to number of canalisation projects completed in the 19th and 20th century.^[note 7] The "total length of the Rhine", to the inclusion of Lake Constance and the Alpine Rhine is more difficult to measure objectively; it was cited as 1,232 kilometres (766 miles) by the Dutch Rijkswaterstaat in 2010.^[note 1]

Near Tamins-Reichenau the Anterior Rhine and the Posterior Rhine join and form the Rhine. The river makes a distinctive turn to the north near Chur. This section is nearly 86 km long, and descends from a height of 599 m to 396 m. It flows through a wide glacial alpine valley known as the Rhine Valley (German: *Rheintal*). Near Sargans a natural dam, only a few metres high, prevents it from flowing into the open Seeztal valley and then through Lake Walen and Lake Zurich into the river Aare. The Alpine Rhine begins in the most western part of the Swiss canton of Graubünden, and later forms the border between Switzerland to the West and Liechtenstein and later Austria to the East.

The mouth of the Rhine into Lake Constance forms an inland delta. The delta is delimited in the West by the Alter Rhein ("Old Rhine") and in the East by a modern canalized section. Most of the delta is a nature reserve and bird sanctuary. It includes the Austrian towns of Gaißau, Höchst and Fußach. The natural Rhine originally branched into at least two arms and formed small islands by precipitating sediments. In the local Alemannic dialect, the singular is pronounced "Isel" and this is also the local pronunciation of Esel ("Donkey"). Many local fields have an official name containing this element.

A regulation of the Rhine was called for, with an upper canal near Diepoldsau and a lower canal at Fußach, in order to counteract the constant flooding and strong sedimentation in the western Rhine Delta. The Dornbirner Ach had to be diverted, too, and it now flows parallel to the canalized Rhine into the lake. Its water has a darker color than the Rhine; the latter's lighter suspended load comes from higher up the mountains. It is expected that the continuous input of sediment into the lake will silt up the lake. This has already happened to the former Lake Tuggenersee.

Lake Constance consists of three bodies of water: the Obersee ("upper lake"), the Untersee ("lower lake"), and a connecting stretch of the Rhine, called the Seerhein ("Lake Rhine"). The lake is situated in Germany, Switzerland and Austria near the Alps. Specifically, its shorelines lie in the German states of Bavaria and Baden-Württemberg, the Austrian state of Vorarlberg, and the Swiss cantons of Thurgau and

St. Gallen. The Rhine flows into it from the south following the Swiss-Austrian border. It is located at approximately 47°39'N 9°19'E / 47.650°N 9.317°E / 47.650; 9.317.

The flow of cold, gray mountain water continues for some distance into the lake. The cold water flows near the surface and at first doesn't mix with the warmer, green waters of Upper Lake. But then, at the so-called Rheinbrech, the Rhine water abruptly falls into the depths because of the greater density of cold water. The flow reappears on the surface at the northern (German) shore of the lake, off the island of Lindau. The water then follows the northern shore until Hagnau am Bodensee. A small fraction of the flow is diverted off the island of Mainau into Lake Überlingen. Most of the water flows via the Constance hopper into the Rheinrinne ("Rhine Gutter") and Seerhein. Depending on the water level, this flow of the Rhine water is clearly visible along the entire length of the lake.

The Rhine emerges from Lake Constance, flows generally westward, as the Hochrhein, passes the Rhine Falls, and is joined by its major tributary, the river Aare. The Aare more than doubles the Rhine's water discharge, to an average of nearly 1,000 m³/s (35,000 cu ft/s), and provides more than a fifth of the discharge at the Dutch border. The Aare also contains the waters from the 4,274 m (14,022 ft) summit of Finsteraarhorn, the highest point of the Rhine basin. The Rhine roughly forms the German-Swiss border from Lake Constance with the exceptions of the canton of Schaffhausen and parts of the cantons of Zürich and Basel-Stadt, until it turns north at the so-called Rhine knee at Basel, leaving Switzerland.

In the centre of Basel, the first major city in the course of the stream, is located the "Rhine knee"; this is a major bend, where the overall direction of the Rhine changes from West to North. Here the High Rhine ends. Legally, the Central Bridge is the boundary between High and Upper Rhine. The river now flows North as Upper Rhine through the Upper Rhine Plain, which is about 300 km long and up to 40 km wide. The most important tributaries in this area are the Ill below of Strasbourg, the Neckar in Mannheim and the Main across from Mainz. In Mainz, the Rhine leaves the Upper Rhine Valley and flows through the Mainz Basin.

The Upper Rhine region was changed significantly by a Rhine straightening program in the 19th Century. The rate of flow was increased and the ground water level fell significantly. Dead branches dried up and the amount of forests on the flood plains decreased sharply. On the French side, the Grand Canal d'Alsace was dug, which carries a significant part of the river water, and all of the traffic. In some places, there are large compensation pools, for example the huge Bassin de compensation de Plobsheim in Alsace.

The Rhine is the longest river in Germany. It is here that the Rhine encounters some more of its main tributaries, such as the Neckar, the Main and, later, the Moselle, which contributes an average discharge of more than 300 m³/s (11,000 cu ft/s). Northeastern France drains to the Rhine via the Moselle; smaller rivers drain the Vosges and Jura Mountains uplands. Most of Luxembourg and a very small part of Belgium also drain to the Rhine via the Moselle. As it approaches the Dutch border, the Rhine has an annual mean discharge of 2,290 m³/s (81,000 cu ft/s) and an average width of 400 m (1,300 ft).

Between Bingen and Bonn, the Middle Rhine flows through the Rhine Gorge, a formation which was created by erosion. The rate of erosion equaled the uplift in the region, such that the river was left at about its original level while the surrounding lands raised. The gorge is quite deep and is the stretch of the river which is known for its many castles and vineyards. It is a UNESCO World Heritage Site (2002) and known as "the Romantic Rhine", with more than 40 castles and fortresses from the Middle Ages and many quaint and lovely country villages.

Until the early 1980s, industry was a major source of water pollution. Although many plants and factories can be found along the Rhine up into Switzerland, it is along the Lower Rhine that the bulk of them are concentrated, as the river passes the major cities of Cologne, Düsseldorf and Duisburg. Duisburg is the home of Europe's largest inland port and functions as a hub to the sea ports of Rotterdam, Antwerp and Amsterdam. The Ruhr, which joins the Rhine in Duisburg, is nowadays a clean river, thanks to a combination of stricter environmental controls, a transition from heavy industry to light industry and cleanup measures, such as the reforestation of Slag and brownfields. The Ruhr currently provides the region with drinking water. It contributes 70 m³/s (2,500 cu ft/s) to the Rhine. Other rivers in the Ruhr

Area, above all, the Emscher, still carry a considerable degree of pollution.

The dominant economic sectors in the Middle Rhine area are viniculture and tourism. The Rhine Gorge between Rüdesheim am Rhein and Koblenz is listed as a UNESCO World Heritage Site. Near Sankt Goarshausen, the Rhine flows around the famous rock Lorelei. With its outstanding architectural monuments, the slopes full of vines, settlements crowded on the narrow river banks and scores of castles lined up along the top of the steep slopes, the Middle Rhine Valley can be considered the epitome of the Rhine romanticism.

The Lower Rhine flows through North Rhine-Westphalia. Its banks are usually heavily populated and industrialized, in particular the agglomerations Cologne, Düsseldorf and Ruhr area. Here the Rhine flows through the largest conurbation in Germany, the Rhine-Ruhr region. One of the most important cities in this region is Duisburg with the largest river port in Europe (Duisport). The region downstream of Duisburg is more agricultural. In Wesel, 30 km downstream of Duisburg, is located the western end of the second east-west shipping route, the Wesel-Datteln Canal, which runs parallel to the Lippe. Between Emmerich and Cleves the Emmerich Rhine Bridge, the longest suspension bridge in Germany, crosses the 400 m wide river. Near Krefeld, the river crosses the Uerdingen line, the line which separates the areas where Low German and High German are spoken.

From here, the situation becomes more complicated, as the Dutch name Rijn no longer coincides with the main flow of water. Two thirds of the water flow volume of the Rhine flows farther west, through the Waal and then, via the Merwede and Nieuwe Merwede (De Biesbosch), merging with the Meuse, through the Hollands Diep and Haringvliet estuaries, into the North Sea. The Beneden Merwede branches off, near Hardinxveld-Giessendam and continues as the Noord, to join the Lek, near the village of Kinderdijk, to form the Nieuwe Maas; then flows past Rotterdam and continues via Het Scheur and the Nieuwe Waterweg, to the North Sea. The Oude Maas branches off, near Dordrecht, farther down rejoining the Nieuwe Maas to form Het Scheur.

The other third of the water flows through the Pannerdens Kanaal and redistributes in the IJssel and Nederrijn. The IJssel branch carries one ninth of the water flow of the Rhine north into the IJsselmeer (a former bay), while the Nederrijn carries approximately two ninths of the flow west along a route parallel to the Waal. However, at Wijk bij Duurstede, the Nederrijn changes its name and becomes the Lek. It flows farther west, to rejoin the Noord River into the Nieuwe Maas and to the North Sea.

The name Rijn, from here on, is used only for smaller streams farther to the north, which together formed the main river Rhine in Roman times. Though they retained the name, these streams no longer carry water from the Rhine, but are used for draining the surrounding land and polders. From Wijk bij Duurstede, the old north branch of the Rhine is called Kromme Rijn ("Bent Rhine") past Utrecht, first Leidse Rijn ("Rhine of Leiden") and then, Oude Rijn ("Old Rhine"). The latter flows west into a sluice at Katwijk, where its waters can be discharged into the North Sea. This branch once formed the line along which the Limes Germanicus were built. During periods of lower sea levels within the various ice ages, the Rhine took a left turn, creating the Channel River, the course of which now lies below the English Channel.

The Rhine-Meuse Delta, the most important natural region of the Netherlands begins near Millingen aan de Rijn, close to the Dutch-German border with the division of the Rhine into Waal and Nederrijn. Since the Rhine contributes most of the water, the shorter term Rhine Delta is commonly used. However, this name is also used for the river delta where the Rhine flows into Lake Constance, so it is clearer to call the larger one Rhine-Meuse delta, or even Rhine-Meuse-Scheldt delta, as the Scheldt ends in the same delta.

The shape of the Rhine delta is determined by two bifurcations: first, at Millingen aan de Rijn, the Rhine splits into Waal and Pannerdens Kanaal, which changes its name to Nederrijn at Angeren, and second near Arnhem, the IJssel branches off from the Nederrijn. This creates three main flows, two of which change names rather often. The largest and southern main branch begins as Waal and continues as Boven Merwede ("Upper Merwede"), Beneden Merwede ("Lower Merwede"), Noord River ("North River"), Nieuwe Maas ("New Meuse"), Het Scheur ("the Rip") and Nieuwe Waterweg ("New Waterway"). The middle flow begins as Nederrijn, then changes into Lek, then joins the Noord, thereby forming Nieuwe

Maas. The northern flow keeps the name IJssel until it flows into Lake IJsselmeer. Three more flows carry significant amounts of water: the Nieuwe Merwede ("New Merwede"), which branches off from the southern branch where it changes from Boven to Beneden Merwede; the Oude Maas ("Old Meuse"), which branches off from the southern branch where it changes from Beneden Merwede into Noord, and Dordtse Kil, which branches off from Oude Maas.

Before the St. Elizabeth's flood (1421), the Meuse flowed just south of today's line Merwede-Oude Maas to the North Sea and formed an archipelago-like estuary with Waal and Lek. This system of numerous bays, estuary-like extended rivers, many islands and constant changes of the coastline, is hard to imagine today. From 1421 to 1904, the Meuse and Waal merged further upstream at Gorinchem to form Merwede. For flood protection reasons, the Meuse was separated from the Waal through a lock and diverted into a new outlet called "Bergse Maas", then Amer and then flows into the former bay Hollands Diep.

The hydrography of the current delta is characterized by the delta's main arms, disconnected arms (Hollandse IJssel, Linge, Vecht, etc.) and smaller rivers and streams. Many rivers have been closed ("dammed") and now serve as drainage channels for the numerous polders. The construction of Delta Works changed the Delta in the second half of the 20th Century fundamentally. Currently Rhine water runs into the sea, or into former marine bays now separated from the sea, in five places, namely at the mouths of the Nieuwe Merwede, Nieuwe Waterway (Nieuwe Maas), Dordtse Kil, Spui and IJssel.

The Rhine-Meuse Delta is a tidal delta, shaped not only by the sedimentation of the rivers, but also by tidal currents. This meant that high tide formed a serious risk because strong tidal currents could tear huge areas of land into the sea. Before the construction of the Delta Works, tidal influence was palpable up to Nijmegen, and even today, after the regulatory action of the Delta Works, the tide acts far inland. At the Waal, for example, the most landward tidal influence can be detected between Brakel and Zaltbommel.

In southern Europe, the stage was set in the Triassic Period of the Mesozoic Era, with the opening of the Tethys Ocean, between the Eurasian and African tectonic plates, between about 240 MBP and 220 MBP (million years before present). The present Mediterranean Sea descends from this somewhat larger Tethys sea. At about 180 MBP, in the Jurassic Period, the two plates reversed direction and began to compress the Tethys floor, causing it to be subducted under Eurasia and pushing up the edge of the latter plate in the Alpine Orogeny of the Oligocene and Miocene Periods. Several microplates were caught in the squeeze and rotated or were pushed laterally, generating the individual features of Mediterranean geography: Iberia pushed up the Pyrenees; Italy, the Alps, and Anatolia, moving west, the mountains of Greece and the islands. The compression and orogeny continue today, as shown by the ongoing raising of the mountains a small amount each year and the active volcanoes.

From the Eocene onwards, the ongoing Alpine orogeny caused a N–S rift system to develop in this zone. The main elements of this rift are the Upper Rhine Graben, in southwest Germany and eastern France and the Lower Rhine Embayment, in northwest Germany and the southeastern Netherlands. By the time of the Miocene, a river system had developed in the Upper Rhine Graben, that continued northward and is considered the first Rhine river. At that time, it did not yet carry discharge from the Alps; instead, the watersheds of the Rhone and Danube drained the northern flanks of the Alps.

Through stream capture, the Rhine extended its watershed southward. By the Pliocene period, the Rhine had captured streams down to the Vosges Mountains, including the Mosel, the Main and the Neckar. The northern Alps were then drained by the Rhone. By the early Pleistocene period, the Rhine had captured most of its current Alpine watershed from the Rhône, including the Aar. Since that time, the Rhine has added the watershed above Lake Constance (Vorderrhein, Hinterrhein, Alpenrhein; captured from the Rhône), the upper reaches of the Main, beyond Schweinfurt and the Vosges Mountains, captured from the Meuse, to its watershed.

Around 2.5 million years ago (ending 11,600 years ago) was the geological period of the Ice Ages. Since approximately 600,000 years ago, six major Ice Ages have occurred, in which sea level dropped 120 m (390 ft) and much of the continental margins became exposed. In the Early Pleistocene, the Rhine followed a course to the northwest, through the present North Sea. During the so-called Anglian glaciation

(~450,000 yr BP, marine oxygen isotope stage 12), the northern part of the present North Sea was blocked by the ice and a large lake developed, that overflowed through the English Channel. This caused the Rhine's course to be diverted through the English Channel. Since then, during glacial times, the river mouth was located offshore of Brest, France and rivers, like the Thames and the Seine, became tributaries to the Rhine. During interglacials, when sea level rose to approximately the present level, the Rhine built deltas, in what is now the Netherlands.

The last glacial ran from ~74,000 (BP = Before Present), until the end of the Pleistocene (~11,600 BP). In northwest Europe, it saw two very cold phases, peaking around 70,000 BP and around 29,000–24,000 BP. The last phase slightly predates the global last ice age maximum (Last Glacial Maximum). During this time, the lower Rhine flowed roughly west through the Netherlands and extended to the southwest, through the English Channel and finally, to the Atlantic Ocean. The English Channel, the Irish Channel and most of the North Sea were dry land, mainly because sea level was approximately 120 m (390 ft) lower than today.

Most of the Rhine's current course was not under the ice during the last Ice Age; although, its source must still have been a glacier. A tundra, with Ice Age flora and fauna, stretched across middle Europe, from Asia to the Atlantic Ocean. Such was the case during the Last Glacial Maximum, ca. 22,000–14,000 yr BP, when ice-sheets covered Scandinavia, the Baltics, Scotland and the Alps, but left the space between as open tundra. The loess or wind-blown dust over that tundra, settled in and around the Rhine Valley, contributing to its current agricultural usefulness.

As northwest Europe slowly began to warm up from 22,000 years ago onward, frozen subsoil and expanded alpine glaciers began to thaw and fall-winter snow covers melted in spring. Much of the discharge was routed to the Rhine and its downstream extension. Rapid warming and changes of vegetation, to open forest, began about 13,000 BP. By 9000 BP, Europe was fully forested. With globally shrinking ice-cover, ocean water levels rose and the English Channel and North Sea re-inundated. Meltwater, adding to the ocean and land subsidence, drowned the former coasts of Europe transgressionally.

Since 7500 yr ago, a situation with tides and currents, very similar to present has existed. Rates of sea-level rise had dropped so far, that natural sedimentation by the Rhine and coastal processes together, could compensate the transgression by the sea; in the last 7000 years, the coast line was roughly at the same location. In the southern North Sea, due to ongoing tectonic subsidence, the sea level is still rising, at the rate of about 1–3 cm (0.39–1.18 in) per century (1 metre or 39 inches in last 3000 years).

At the begin of the Holocene (~11,700 years ago), the Rhine occupied its Late-Glacial valley. As a meandering river, it reworked its ice-age braidplain. As sea-level continued to rise in the Netherlands, the formation of the Holocene Rhine-Meuse delta began (~8,000 years ago). Coeval absolute sea-level rise and tectonic subsidence have strongly influenced delta evolution. Other factors of importance to the shape of the delta are the local tectonic activities of the Peel Boundary Fault, the substrate and geomorphology, as inherited from the Last Glacial and the coastal-marine dynamics, such as barrier and tidal inlet formations.

Since ~3000 yr BP (= years Before Present), human impact is seen in the delta. As a result of increasing land clearance (Bronze Age agriculture), in the upland areas (central Germany), the sediment load of the Rhine has strongly increased and delta growth has sped up. This caused increased flooding and sedimentation, ending peat formation in the delta. The shifting of river channels to new locations, on the floodplain (termed avulsion), was the main process distributing sediment across the subrecent delta. Over the past 6000 years, approximately 80 avulsions have occurred. Direct human impact in the delta started with peat mining, for salt and fuel, from Roman times onward. This was followed by embankment, of the major distributaries and damming of minor distributaries, which took place in the 11–13th century AD. Thereafter, canals were dug, bends were short cut and groynes were built, to prevent the river's channels from migrating or silting up.

At present, the branches Waal and Nederrijn-Lek discharge to the North Sea, through the former Meuse

estuary, near Rotterdam. The river IJssel branch flows to the north and enters the IJsselmeer, formerly the Zuider Zee brackish lagoon; however, since 1932, a freshwater lake. The discharge of the Rhine is divided among three branches: the River Waal (6/9 of total discharge), the River Nederrijn – Lek (2/9 of total discharge) and the River IJssel (1/9 of total discharge). This discharge distribution has been maintained since 1709, by river engineering works, including the digging of the Pannerdens canal and since the 20th century, with the help of weirs in the Nederrijn river.

The Rhine was not known to Herodotus and first enters the historical period in the 1st century BC in Roman-era geography. At that time, it formed the boundary between Gaul and Germania. The Upper Rhine had been part of the areal of the late Hallstatt culture since the 6th century BC, and by the 1st century BC, the areal of the La Tène culture covered almost its entire length, forming a contact zone with the Jastorf culture, i.e. the locus of early Celtic-Germanic cultural contact. In Roman geography, the Rhine formed the boundary between Gallia and Germania by definition; e.g. Maurus Servius Honoratus, *Commentary on the Aeneid of Vergil* (8.727) (Rhenus) fluvius Galliae, qui Germanos a Gallia dividit "(The Rhine is a) river of Gaul, which divides the Germanic people from Gaul."

From the death of Augustus in AD 14 until after AD 70, Rome accepted as her Germanic frontier the water-boundary of the Rhine and upper Danube. Beyond these rivers she held only the fertile plain of Frankfurt, opposite the Roman border fortress of Moguntiacum (Mainz), the southernmost slopes of the Black Forest and a few scattered bridge-heads. The northern section of this frontier, where the Rhine is deep and broad, remained the Roman boundary until the empire fell. The southern part was different. The upper Rhine and upper Danube are easily crossed. The frontier which they form is inconveniently long, enclosing an acute-angled wedge of foreign territory between the modern Baden and Württemberg. The Germanic populations of these lands seem in Roman times to have been scanty, and Roman subjects from the modern Alsace-Lorraine had drifted across the river eastwards.

The Romans kept eight legions in five bases along the Rhine. The actual number of legions present at any base or in all, depended on whether a state or threat of war existed. Between about AD 14 and 180, the assignment of legions was as follows: for the army of Germania Inferior, two legions at Vetera (Xanten), I Germanica and XX Valeria (Pannonian troops); two legions at oppidum Ubiorum ("town of the Ubii"), which was renamed to Colonia Agrippina, descending to Cologne, V Alaudae, a Celtic legion recruited from Gallia Narbonensis and XXI, possibly a Galatian legion from the other side of the empire.

Germanic tribes crossed the Rhine in the Migration period, by the 5th century establishing the kingdoms of Francia on the Lower Rhine, Burgundy on the Upper Rhine and Alemannia on the High Rhine. This "Germanic Heroic Age" is reflected in medieval legend, such as the Nibelungenlied which tells of the hero Siegfried killing a dragon on the Drachenfels (Siebengebirge) ("dragons rock"), near Bonn at the Rhine and of the Burgundians and their court at Worms, at the Rhine and Kriemhild's golden treasure, which was thrown into the Rhine by Hagen.

By the 6th century, the Rhine was within the borders of Francia. In the 9th, it formed part of the border between Middle and Western Francia, but in the 10th century, it was fully within the Holy Roman Empire, flowing through Swabia, Franconia and Lower Lorraine. The mouths of the Rhine, in the county of Holland, fell to the Burgundian Netherlands in the 15th century; Holland remained contentious territory throughout the European wars of religion and the eventual collapse of the Holy Roman Empire, when the length of the Rhine fell to the First French Empire and its client states. The Alsace on the left banks of the Upper Rhine was sold to Burgundy by Archduke Sigismund of Austria in 1469 and eventually fell to France in the Thirty Years' War. The numerous historic castles in Rhineland-Palatinate attest to the importance of the river as a commercial route.

Since the Peace of Westphalia, the Upper Rhine formed a contentious border between France and Germany. Establishing "natural borders" on the Rhine was a long-term goal of French foreign policy, since the Middle Ages, though the language border was – and is – far more to the west. French leaders, such as Louis XIV and Napoleon Bonaparte, tried with varying degrees of success to annex lands west of the Rhine. The Confederation of the Rhine was established by Napoleon, as a French client state, in 1806

and lasted until 1814, during which time it served as a significant source of resources and military manpower for the First French Empire. In 1840, the Rhine crisis, prompted by French prime minister Adolphe Thiers's desire to reinstate the Rhine as a natural border, led to a diplomatic crisis and a wave of nationalism in Germany.

At the end of World War I, the Rhineland was subject to the Treaty of Versailles. This decreed that it would be occupied by the allies, until 1935 and after that, it would be a demilitarised zone, with the German army forbidden to enter. The Treaty of Versailles and this particular provision, in general, caused much resentment in Germany and is often cited as helping Adolf Hitler's rise to power. The allies left the Rhineland, in 1930 and the German army re-occupied it in 1936, which was enormously popular in Germany. Although the allies could probably have prevented the re-occupation, Britain and France were not inclined to do so, a feature of their policy of appeasement to Hitler.

In World War II, it was recognised that the Rhine would present a formidable natural obstacle to the invasion of Germany, by the Western Allies. The Rhine bridge at Arnhem, immortalized in the book, *A Bridge Too Far* and the film, was a central focus of the battle for Arnhem, during the failed Operation Market Garden of September 1944. The bridges at Nijmegen, over the Waal distributary of the Rhine, were also an objective of Operation Market Garden. In a separate operation, the Ludendorff Bridge, crossing the Rhine at Remagen, became famous, when U.S. forces were able to capture it intact – much to their own surprise – after the Germans failed to demolish it. This also became the subject of a film, *The Bridge at Remagen*. *Seven Days to the River Rhine* was a Warsaw Pact war plan for an invasion of Western Europe during the Cold War.

Until 1932 the generally accepted length of the Rhine was 1,230 kilometres (764 miles). In 1932 the German encyclopedia *Knaurs Lexikon* stated the length as 1,320 kilometres (820 miles), presumably a typographical error. After this number was placed into the authoritative *Brockhaus Enzyklopädie*, it became generally accepted and found its way into numerous textbooks and official publications. The error was discovered in 2010, and the Dutch Rijkswaterstaat confirms the length at 1,232 kilometres (766 miles).[note 1]

Where does the Rhine empty

North Sea

What is the largest city the Rhine runs through

Cologne, Germany

What river is larger than the Rhine

Danube

How long is the Rhine

1,230 km (760 mi)

Where is the Rhine

Europe

What country does the Rhine empty

Netherlands

How long is the Rhine

1,230 km

Where does the name Rhine derive from

Gaulish name Rēnos

What is the French name for the Rhine

Rhin

What is the Proto-Germanic adaptation of the name of the Rhine

Rīnaz

What century did the name of the Rhine come from

1st century BC

What does the name The Rhine come from

Gaulish name Rēnos

What is the Rhine called in French

Rhin

What is the Proto-Germanic adoption of the Gaulish name of the Rhine

Rīnaz

What is the Rhine called in Dutch

Rijn

How was the Dutch name for the Rhine originally spelled

Rhijn

What is the conventional method to measure the Rhine

Rhine-kilometers

When was the scale to measure the Rhine introduced

1939

Where does the Rhine river's measurement begin

Old Rhine Bridge at Constance

Where does the Rhine river's measurement end

Hoek van Holland

What has shortened the Rhine river

canalisation projects

What is the conventional measurement of the Rhine

Rhine-kilometers"

When was the measurement of the Rhine introduced

1939

Where does the Rhine begin

Old Rhine Bridge at Constance

Where does the Rhine end

Hoek van Holland

Why has the Rhine been shortened

canalisation projects

Near Chur, which direction does the Rhine turn

north

How long is the section of the Rhine near Chur

86 km long,

What is the alpine valley that the Rhine flows through

Rhine Valley

What is the natural dam that the Rhine flows through

Sargans

What is the other country the Rhine separates Switzerland to

Austria

Where does the Rhine make a distinctive turn to the north

Chur

How long is the section that turns north

86 km

What is the height of the section that turns north

599 m

What is the glacial alpine valley known as

Rhine Valley

The Rhine forms the border between Austria and what other country

Switzerland

The Rhine forms an inland delta into which lake

Lake Constance

What is the delta in the Rhine delimited in the west by

Alter Rhein

What is the delta in the Rhine delimited in the east by

modern canalized section

In local Alemannic dialect, what is the the singular form of the names of the islands formed by the Rhine

Isel

What is the animal that the Rhine's islands are named after

Donkey

The inland delta at the mouth of the Rhine is with what Lake

Lake Constance

What delimits the delta of the Rhine in the East

modern canalized section

What delimits the delta of the Rhine in the west

Alter Rhein

What did the Rhine branch off to form in Austria

small islands

What is the Almannic dialect to describe the islands outside in Austria

Isel

Where is the upper canal regulation of the Rhine

Diepoldsau

What is the lower canal regulation of the Rhine

Fußach

Besides constant flooding, why else was there regulation of the Rhine

strong sedimentation

After the Dornbirner Ach was diverted, where does the Rhine flow now

parallel to the canalized Rhine

What is expected with the continuous input of sediment into the Dornbirner Ach

silt

Where was the Rhine regulated with a lower canal

Fußach

Where was the Rhine regulated with an upper canal

Diepoldsau

Why was the Rhine regulated

constant flooding

What was diverted and now flows parallel to the Rhine

Dornbirner Ach

What will cause the lake near the Rhine to silt up

continuous input of sediment

How many bodies of water makes up Lake Constance

three

What lake connects the Rhine to Lake Constance

Lake Rhine

What does Obersee mean

upper lake

What does Untersee mean

lower lake

Which border does the Rhine flow from the south

Swiss-Austrian border

How many bodies of water makes up Lake Constance

three

Besides Germany and Switzerland, where else is Lake Constance

Austria

What mountainous region is Lake Constance by

Alps

Where is the border of Swiss and Austria

47°39'N 9°19'E / 47.650°N 9.317°E / 47.650; 9.317.

Lake Constance separates the German state Bavaria from what other one

Baden-Württemberg

Why does the Rhine water fall into depths at the Rheinbrech

greater density of cold water

Where does the cold and warm water meet the warm water

Rheinbrech

What is the Island off of the German shore of the Rhine that this warm and cold water meet

Lindau

What Lake in a German island Mainau receives a fraction of the Rhine's flow

Lake Überlingen

How much of the lake connecting with the Rhine can you see from the German islands

entire length

Where does the cold water mix with Lake Constance

Rheinbrech

What island does the cold water flow of the Rhine and Lake Constance flow to

Lindau

A small fraction of the cold water flow from Lake Constance goes to what other lake

Lake Überlingen

What does the word Rheinrinne translate to

Rhine Gutter

What does the flow of the Rhine being visible depend on

water level

After the Rhine emerges from Lake Constance, what direction does it flow

westward

What is the major tributary of the Rhine

river Aare

How much water does the Aare give to the Rhine

1,000 m³/s (35,000 cu ft/s)

Where is the highest point of the Rhine basin

Finsteraarhorn

Where is the so-called Rhine Knee

Basel

When the Rhine emerges from Lake Constance which way does it flow

westward

What is the major tributary for the Rhine

Aare

The Rhine gets how much water from the Aare

1,000 m³/s (35,000 cu ft/s),

What is the highest point of the Rhine basin called

Finsteraarhorn

There's a rough border between Switzerland and what other country formed by the Rhine

German

What is the first major city in the stream of the Rhine

Basel

What is the bend of Rhine in Basel called

Rhine knee

What is the boundary between the High and Upper Rhine

Central Bridge

How long is the Upper Rhine Plain

300 km long

How wide is the Upper Rhine Plain

40 km wide

What is the first major city in the course of the Rhine

Basel

What is the first major bend in the Rhine called

Rhine knee

The bend on the Rhine goes from the West to what direction

North

What ends at this bend in the Rhine

High Rhine

What is the legal boundary behind the High and Upper Rhine

Central Bridge

Which century was there a program to straighten the Rhine

19th Century

What happened to the rate of flow in the Rhine during the Rhine straightening program

increased

What happened to the ground water in the Rhine during the Rhine straightening program

fell significantly

Which canal was dug in France to carry Rhine's water

Grand Canal d'Alsace

What is the Bassin de compensation de Plobsheim in Alsace

large compensation pools

What region of the Rhine was changed by the Rhine Straightening program

Upper Rhine

When did the Rhine Straightening program begin

19th Century

What happened with the rate of flow in the Rhine with the straightening program

increased

What happened with the ground water level with the Rhine straightening program

fell significantly

What carries a significant amount of the Rhine flow through France

Grand Canal d'Alsace

What is the longest river in Germany

Rhine

Where does the Rhine encounter it's tributary the Neckar

Germany

What is the average discharge of the Moselle to the Rhine

300 m³/s (11,000 cu ft/s)

What is a main tributary to the Rhine that goes through Northeastern France and part of Belgium

Moselle

What is the average width of the Rhine

400 m (1,300 ft).

The Rhine is the longest river in what country

Germany

Which country does the Rhine encounter it's main tributaries

Germany

Which of the tributaries in Germany contributes most

Moselle

What country does the Moselle take the Rhine to

France

How much does the Rhine discharge at the Dutch border

2,290 m³/s (81,000 cu ft/s)

What flows between the Bingen and Bonn

Middle Rhine

What gorge is between the Bingen and Bonn

Rhine Gorge

How was the Rhine Gorge formed

erosion

What is the area called near the Rhine Gorge with castles from the middle ages

the Romantic Rhine

What flows between Bingen and Bonn

Middle Rhine

Where does the Middle Rhine flow between Bingen and Bonn

Rhine Gorge

What is the Rhine Gorge known for

castles

What is the section of the Rhine Gorge recognized by UNESCO called

Romantic Rhine

What contributed to water pollution in the Rhine

plants and factories

Where are a bulk of factories concentrated along the Rhine

Switzerland

What is Europe's largest inland port

Duisburg

What river joins the Rhine in Duisburg

Ruhr

What does the Ruhr provide to its community

drinking water

What did industry do to the Rhine until the 1980s

pollution

Which section of the Rhine is most factories found

Lower Rhine

What country has the most factories that pollute the Rhine

Switzerland

What city has the largest inland port in Europe

Duisburg

Which river joins the Rhine in Duisburg

Ruhr

Besides viniculture, what's a dominant economic sector of the Middle Rhine

tourism

There's a UNESCO World Heritage site in the Rhine Gorge between the Koblenz and what

Rüdesheim am Rhein

What is the famous rock near Sanke Goarshausen

Lorelei

What is considered the epitome of the Rhine romanticism

Middle Rhine Valley

Besides viniculture, what is the other dominate economic sector in the middle rhine

tourism

What is the Rhine Gorge listed as

UNESCO World Heritage Site.

The Rhine Gorge is between Koblenz and what other city

Rüdesheim am Rhein

What is the famous rock called that the Rhine flows around

Lorelei

Where is the famous rock the Rhine flows around

Sankt Goarshausen

What city has the biggest port in Germany

Duisburg

What is the Canal in Wesel

Wesel-Datteln Canal

What does the Wessel-Datteln canal run parallel to

Lippe

What is the largest suspension bridge in Germany

Emmerich Rhine Bridge

How wide is the Rhine in Germany between Emmrich and Cleves

400 m

What part of the Rhine flows through North Rhine-Westphalia

Lower Rhine

What is the region called that is the largest conurbation of the Rhine

Rhine-Ruhr

What is the largest port in Europe called

Duisport

What is the name of the longest bridge in Germany

Emmerich Rhine Bridge

How wide is the Rhine in Germany

400 m wide

What is the Dutch name for the Rhine

Rijn

What does the water flow of the Rhine merge with after flowing through Merwede

Meuse

How much of the water flow does the Waal get from the Rhine

Two thirds

Which direction does two thirds of the Rhine flow outside of Germany

west

Where does two thirds of the Rhine flow outside of Germany

Waal

What does the Rhine merge with outside of Germany

Meuse

What's the name of where the Rhine branches off near Dordrecht

The Oude Maas

If two thirds of the Rhine flows through the Maas, where does the other one third flow through

Pannerdens Kanaal

The Rhine redistributes into the Ijssel and what other body

Nederriijn

What does the Nederrikn's name change into

Lek

Where does the Lek join

Noord River

If two thirds of the Rhine flows through Waal, where does the other third flow through

Pannerdens Kanaal

Other than the Ijssel, where does the water from the Pannerdens Kanaal redsitrubute

Nederriijn

How much of the Rhine flow does Ijssel carry

one ninth

What does the Nederriijn change it's name to

Lek

Where does the Nederriijn change it's name

Wijk bij Duurstede

What is the name for the smaller streams along the region northern Germany

Rijn

The smaller streams are used for what

draining the surrounding land

What is the name of the old north branch of the Rhine

Kromme Rijn

What is the translation of the old north branch of the Rhine

Bent Rhine

What part of the Rhine flows west at Katwijk

Old Rhine

What is the name of the Delta in the Netherlands

Rhine-Meuse

Where does the Delta in the Netherlands begin

Millingen aan de Rijn,

What is the nickname for the Delta in the Netherlands

Rhine Delta

At Millingen aan de Rijn where the Rhine splits, what does it change its name to

Nederrijn at Angeren

How many main flows are branched off from the Nederrijn

three

What is the largest main branch of the Rhine

Waal

What is the English translation of Het Scheur

the Rip

What is the translation of Oude Maas

Old Meuse

What flood impacted the Meuse

St. Elizabeth's

What year did the flood that impacted the Meuse take place

1421

Where did the Meuse flow before the flood

Merwede-Oude Maas

What did the Merwede-Oude Maas form with Waal and Lek

archipelago-like estuary

When did the Meuse and Waal merge

1421 to 1904

What is the term for closing off rivers that are no longer connected

dammed

What do closed rivers serve as after they close

drainage channels

What changed the Rhine's Delta

construction of Delta Works

When was the construction that changed the Rhine's Delta

20th Century

What type of Delta is the Rhine-Meuse

tidal delta

Besides rivers, what shapes the sedimentation of the rivers

tidal currents

What does a high tide risk near lands

tear huge areas of land into the sea.

Between Brakel and what other city can the most landward tidal influence be detected

Zaltbommel

The present Mediterranean Sea descends from what sea

Tethys sea

What period opened the Tethys Ocean

Mesozoic Era

What period did plates reverse directions to compress the Tethys floor

Jurassic Period

Microplates squeezing and rotating created the features of what

Mediterranean geography

What pushed up the Pyrenees

Iberia

What rift system developed in the Alpine orogeny

N-S

What elements from the rift system in the Alpine orogeny in Southwest Germany

Upper Rhine Graben

What time did a river system develop in the Upper Rhine Graben

Miocene

The Rhine and what other river drained the northern flanks of the alps

Danube

How did the Rhine extend watershed southward

stream capture

What period did the Rhine capture streams

Pliocene period

Where are the streams the Rhine captured

Vosges Mountains

What period was 2.5 million years ago

Ice Ages

How many major ice ages have occurred

six

How far did the sea level drop in the ice ages

120 m

In early Pleistocene, what direction did the Rhine

flow

northwest

During glacial times, where was the mouth of the Rhine located

Brest

When did the last glacial start

74,000 (BP

When did the last glacial end

11,600 BP

Which direction did the Rhine flow during the last cold phase

west

How much lower was the North Sea in the last cold phase than it is today

120 m

Besides the North Sea and the Irish Channel, what else was lowered in the last cold phase

English Channel

What was the source of the Rhine in the last Ice Age

glacier

What stretched across middle Europe in the last ice age

tundra

When was the Last Glacial Maximum

22,000–14,000 yr BP

What covered Scandinavia, the Baltics, Scotland, and the Alps in the last Ice Age

ice-sheets

What is the term for wind-blown dust in a tundra

loess

When did Europe slowly begin to warm up from the last Ice Age

22,000 years ago

What did frozen subsoil and expanded alpine glaciers begin to do

thaw

Where did the discharge from glaciers go in Europe in the last Ice Age

Rhine

When did rapid warming begin and help vegetation

13,000 BP

When was Europe fully forested and recovered from the last Ice Age

9000 BP

When did tides and currents similar to our current system begin

7500 yr ago

Why did natural sedimentation by the Rhine compensate the transgression bby the sea

Rates of sea-level rise

How long has the Rhine coastline been in the same location

last 7000 years

Why is the current sea level rising

tectonic subsidence

How quickly is the sea level rising

1–3 cm (0.39–1.18 in) per century

When was the Holocene

11,700 years ago

Where did the Rhine occupy during the Holocene

Late-Glacial valley

What country did the Rhine continue to rise during the holocene

Netherlands

When did the formation of the Holocene Rhine-Meuse delta begin

8,000 years ago

When have humans started impacting the delta

3000 yr BP

What increased in the Rhine because of the land clearance in the upland areas

sediment load

What has increased sediment and delta growth also produced in the Rhine

increased flooding and sedimentation

How many avulsions have occurred in the past 6000 years

80

When did embankment of the major Rhine distributaries take place

11–13th century

Where do the branches Waal and Nederrijn-Lek discharge to

North Sea

What do the Waal and the Nederrijn-Lek discharge through

Meuse estuary

Where does the IJssel branch flow

IJsselmeer

What did the Zuider Zee brackish lagoon change into

freshwater lake

How many branches does the Rhine branch into

three

When was the Rhine first discovered

1st century BC

The Rhine first formed a boundary between Gaul and what else

Germania

Since when was the Rhine part of the area of

Hallstatt culture

6th century BC

Who first wrote about the Rhine's discovery and border

Maurus Servius Honoratus

When did Augustus die

AD 14

The Rhine and what other river were accepted as the Germanic frontier

Danube

When did the Rhine stop being the Roman boundary

the empire fell

Where are the upper Rhine and upper Danube crossed

southern

Which direction did Romans use to drift through the Rhine

eastwards

How many legions in five bases were along the Rhine by the Romans

eight

What did the number of legions in Roman times depend on

threat of war

Vetra and I Germanica and XX Valeria were the two legions for what

army of Germania Inferior

What was the Colonia Agrippina's original name

Ubiorum

What does Colonia Agrippina's original name translate into

town of the Ubii

When did Germanic tribes cross the Rhine to migrate

5th century

What did Germanic tribes establish with help from the Rhine

kingdoms

What is the translation of Siebengebirge

dragons rock

Who is the hero who killed a dragon on the Drachenfels

Siegfried

Who threw gold into the Rhine, according to legend

Hagen

When did the Rhine become borders with Francia

6th century

When was the Rhine fully within the Holy Roman Empire

10th century

The Rhine flowed through Swabia, Franconia and what other location in the 10th Century

Lower Lorraine

Who sold the Upper Rhine to Burgundy

Archduke Sigismund

When was the Upper Rhine sold to Burgundy

1469

What was the name of the time the Upper Rhine form a border between France and Germany

Peace of Westphalia

What was a long term goal of French foreign policy along the Rhine

Establishing "natural borders"

Who established the Confederation of the Rhine

Napoleon

When was the confederation of the Rhine

1806

When was the Rhine crisis

1840

When was Rhineland subject to the Treaty of Versailles

end of World War I

When would the occupation of allies leave

Rhineland

1935

After 1935, who would be forbidden to enter Rhineland

German army

What do some believe the Treaty of Versailles assisted in

Adolf Hitler's rise to power

When did the German army reoccupy Rhineland

1936

Where is the Rhine Bridge

Arnhem

What was the Rhine considered to invaders in WWII

formidable natural obstacle

When was Operation Market Garden

September 1944

What bridge did the Germans fail to demolish

Ludendorff Bridge

What was the Warsaw Pact war plan

Seven Days to the River Rhine

What was the accepted length of the Rhine prior to 1932

1,230 kilometres (764 miles)

Who stated a change of the length of the Rhine

Knaurs Lexikon

in 1932 what was the Rhine measurement changed to

1,320 kilometres (820 miles)

Why was the Rhine measurement changed

typographical error

When was the Rhine measurement corrected back to the original

2010