

The distinctive story of the Odra River

A River of Curiosities



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Its history began more than 10 million years ago, back in the Tertiary period. Its geographic position and structure already attracted settlers back in the middle Paleolithic. What is so special about the Odra (Oder), Poland's number-two river? How turbulent is its story?

The Odra flows out of the Odra Mountains, a range in the Opava Mountains of the Czech Republic. The source of the river is considered to lie at an altitude of around 630-680 meters above sea level, on the slopes of Mount Vysoká. In its upper course, after leaving the mountainous region, the river turns northward and flows through the Moravian Gate into the Sudeten Foothills. Near Koźle it turns to the northwest and maintains that bearing all the way to where it meets the Lusatian Nysa, after which it again heads north, directly to the Baltic Sea.

Running 854 km, it is the second-longest river in Poland (after the Vistula) and also the second-longest river flowing out of the Sudetes (after the Elbe). Interestingly, the catchment areas of the two Sudeten rivers are comparable (at 118,861 km² and 144,055 km², respectively). However, they differ greatly in terms of their source elevation - the source of the Elbe lies at about 1380 meters above sea level, as does that of the third-largest Sudeten river, the Morava (around 352 km, a tributary of the Danube, draining into the Black Sea). The Odra is also distinct in that its catchment basin includes nearly the entire area of the Sudetes,

and so it drains most of the precipitation in this region.

In the Lower Silesian segment, the Odra flows through a broad depression, sometimes more than 20 km across, known as the ancient Proglacial Odra Valley. Three times along this depression, it encounters uprisings that it cuts through, and each time it changes direction. At these locations, the valley is narrow and deep. When river waters swell, the local towns face the danger of flooding. The first such gorge is situated in the vicinity of Opole, where the Oder channel cuts through tectonically elevated calcareous rocks of the Triassic and Cretaceous age. The second cut, near Ścinawa, separates a strip of terminal moraine of the Odra Stadial into two ranges: the Trzebnica Hills to the east and the Dalkówskie Hills to the west (200-250 m above sea level). The third incision, east of Nowa Sola, separates the Zielona Góra Hills from the Leszno Lakeland, which are relicts of the terminal and ground moraines (respectively) of the Warta Stadial.

Cutting power

Geologists studying the paleogeography of the Sudetes agree that 10 million years ago (back in the middle Miocene) the region from today's Sudeten Foothills all the way to the Great Poland Lowlands already had rivers flowing across it from sources in the zone of today's southern Poland. The largest of those, the ancient Odra (or "pre-Odra"), flowed from the area where the Sudeten mountain range then started forming. We should point out here that the geological sense of the term "mountains" does not always coincide with the geographical sense. The rocks that the Sudetes are made out of are currently part of the geological structure of Europe and were created between 500 million and 60 million years ago. Most of them were formed during a time known as the Variscan orogeny and immediately thereafter, that is to say between 320 million and 180 million years ago. In the paleogeographic sense, on the other hand,



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the Sudetes are a set of mountain ranges, valleys, and basins of very diverse origins.

In the late Miocene, around 8 million to 5 million years ago, the area of the Sudetes and Sudeten Foothills formed a compact and moderate-sized massif, from which the first ancient rivers flowed in a radial pattern, in all directions. The largest at that time was undoubtedly the pre-Morava. The mighty scale of that river is illustrated, for instance, by the fact that it cut through the emerging massifs of the Carpathian orogeny, forming one of the largest gorges in this part of Europe (the Morava Valley). We can assume with great likelihood that it was then that the system of valleys of the largest Sudeten rivers, including the pre-Odra, began to form.

It was not until relatively recently, in the Pleistocene (around 2 million years ago), before the Scandinavian ice sheet advanced into the vicinity of the Sudetes (a time described as the pre-glacial period), that the landscape changed radically, as a result of a process known as "inversion." The area of today's Sudeten Foothills lowered, while the Sudeten range was uplifted.

This occurred along the line of one of the most important tectonic faults in Lower Silesia – the Sudetic Marginal Fault. Some of the new Sudeten rivers in the ancient Odra basin began to flow in the opposite direction, northward, most likely the utilizing still-existing valleys.

Somewhat later, the ice sheet advancing from the north reached the front of the uplifting Sudetes. The waters flowing out both from the melting ice and from the region of today's Sudetes, which then formed a broad elevation, deposited material over virtually the entire area of Lower Silesia and southern Great Poland. The successive halting of the Scandinavian ice-sheet created bands of moraines, forming a series of moraine hills after it retreated. During the Odra Stadial and immediately thereafter, the waters flowing from the ice-sheet and the pre-Odra combined into a great river flowing west towards the broad German lowlands and the North Sea. It carved out the broad ancient Proglacial Odra Valley, part of which is used by the recent channel of the Odra.

From the last glaciations to modern times, the Sudeten area has been uplifting, marking

For the residents of Wrocław, whose day-to-day lives involve crossing numerous waterways (the urban agglomeration alone having more than 300 bridges and footbridges!), the presence of water in the city is something completely normal, forming an integral part of Wrocław's urban fabric and landscape. But visitors from outside are frequently astounded, getting the impression that the city is "built on water..."

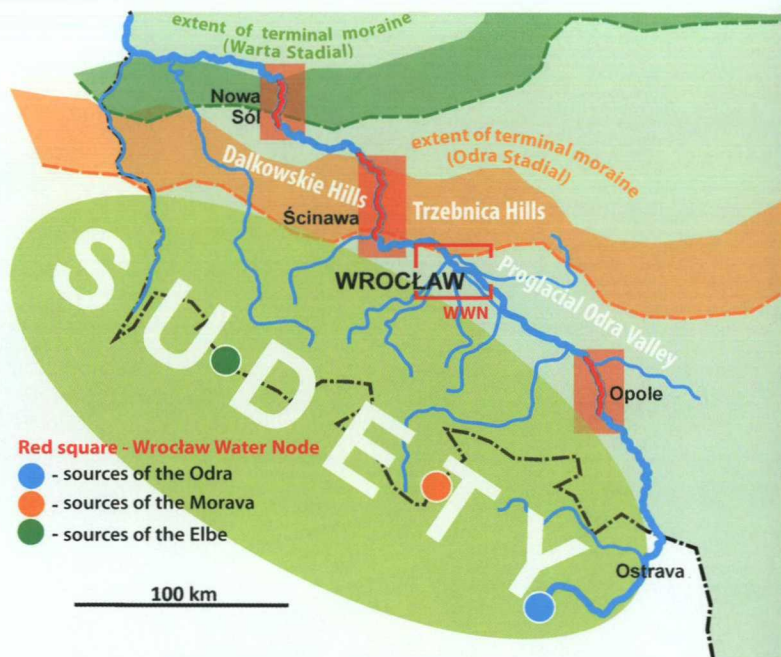
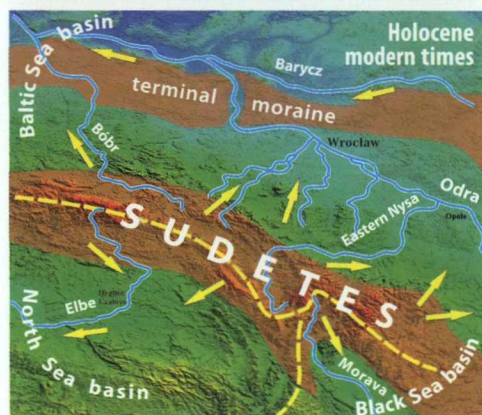
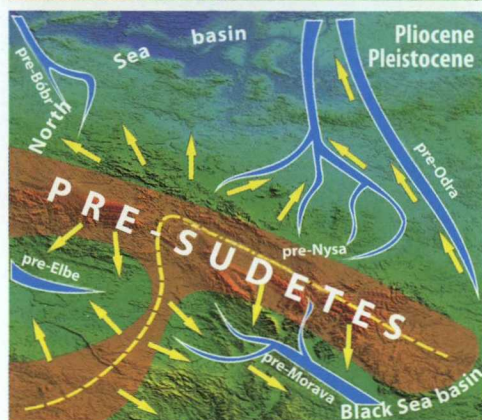
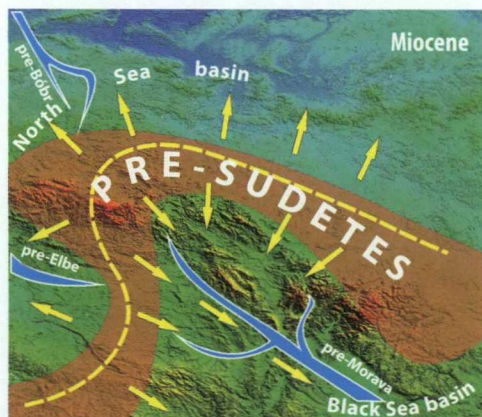
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out a clear watershed for rivers emerging from it. Some of them flow southwest to the Black Sea (the Morava and Danube basin), others are tributaries to the Elbe, which flows into the North Sea. But the largest and most important river system emerging from the Sudetes is the Odra and its tributaries (the Biała, Eastern Nysa, Bystrzyca, Strzegomka, Kaczawa, Bóbr, Kwisa, and Lusatian Nysa)

Age and structure

Reconstructing the natural, original shape of the valley and channels of the Odra in the segment between Oława and Brzeg Dolny is not

The outline of today's system of river valleys in Lower Silesia already began to emerge around 20 million years ago, when the Carpathians were folding and at the same time upheaving in the southeast of Europe. In the late Miocene, around 8-5 million years ago, rivers flowed from what is today's Scandinavia, some of them flowing into the "Pre-Carpathian sea" in the south of today's Poland. In the Pleistocene, the upheaving Sudetes set established a new watershed between the south-flowing rivers of the pre-Morava basin and north-flowing rivers that formed the new basin of the pre-Odra. The ancient Proglacial Odra Valley was formed back in the Odra Stadial and immediately thereafter, and it continues to be used by the modern channel of the Odra.



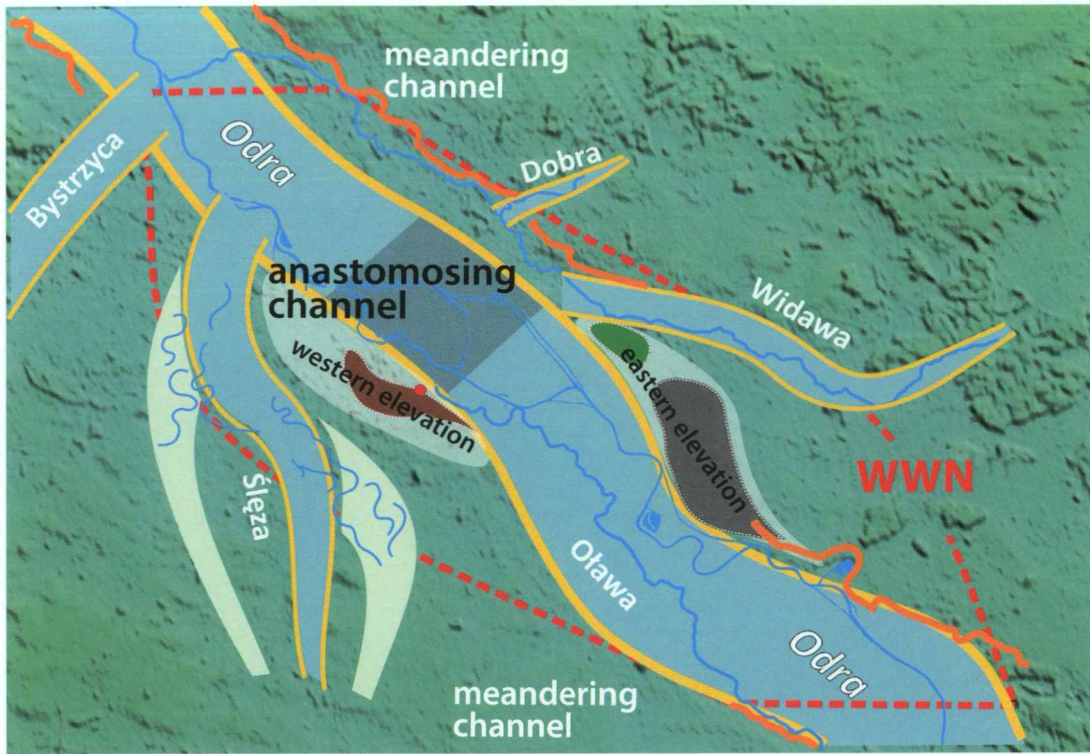
an easy task, mainly because of centuries of river regulation efforts for navigation purposes. The urban region of Wrocław is particularly problematic, as there are no longer any natural elements of the valley and most of the surface waters follow man-made channels. However, we have managed to approximately identify the range of the original river valley based on existing traces of the ancient Odra - mainly in the remains of preserved meander sandbars and former channels which today form oxbow lakes. Valuable material was supplied by construction work in connection with the renovation of Wrocław's floodway channels, which revealed the location of former river talwegs. Dating of deposited oak trunks which had previously grown in the floodplains of the ancient Odra (known as "black oaks") enabled the age of these paleochannels to be dated to from 1,500 to 6,000 BCE.

Along the segment under discussion, the Odra Valley takes the shape of a regular band with an average width of around 4.8 km, gradient of 0.4 m/km (1 m / 2.4 km) and approximate sinuosity of 1.06 to 1.7 km / 1 km. Near Wrocław, the gradient curve of the valley axis is nearly 1m lower than in other areas. The exception is the segment of the valley in the city center, more or less from the Czarna Odra to the mouth of the Widawa, where the river flows (and flowed) in multiple channels, forming numerous islets and islands. This pattern seems to show centuries-old stability, as evidenced by numerous sketches and cartographic depictions from the 13th century to the present.

Floating city

Without a doubt, such river behavior in this particular location was conducive to settlement,

Wrocław is the most important hydrographic node in southwestern Poland. Its main axis is of course marked the Odra, which has as many as 5 significant tributaries within the limits of the urban agglomeration: the Oława, Śleza, Bystrzyca, Widawa and Dobra



Our knowledge of the ancient Odra River is based mainly on the results of geological, geomorphological, and archeological research. It is only to a certain approximate extent that we can reconstruct the historical Odra and its related canals on the map of Wrocław

serving numerous communication, defense, and economic purposes. In its central-Wrocław segment, the Odra Valley is a typical multichannel anastomosing river, a type which under lowland conditions forms valleys and channels in areas with a consistent declining tendency. The fact that several smaller rivers and streams (together known as the "Wrocław Water Node") – including the Oława, Widawa and Śleza – flow into the Odra within Wrocław confirms that tendency. It also indicated by the clearly stable location of elevations of the geological substratum, preserving characteristics of the ancient landscape. One of these can be found in the southern portion of Wrocław along ul. Hallera, where traces of human activity from the middle Paleolithic are situated among sediments of the pre-Odra. The geological substratum in this location is a plateau, whose surface is situated some 10 m above the bottom of today's Odra valley. It formed through river erosion and is covered in channel deposits of the ancient Odra, from back when the river's appearance was similar to that of the large braided rivers of the Canada and Siberia. Deposits of the pre-Odra are also found at a similar, elevated position with respect to today's valley in near the village of Chrzastawa, where coarse residual channel deposits (some boulders reaching more than 3m in diameter) greatly hamper the local quartz sand mining efforts.

Today's braids of the Odra are in large part human-altered. The area of Wrocław's old town has a centuries-long history of settlement and rebuilding of the original

configuration of islands (islets) and Odra channels. Only some of them are reminiscent in shape and course to the river prior to settlement. Most of the existing water-bodies are relicts of transport canals, mill leats, and fragmentarily preserved defensive moats of the city. The older moat, dating from the 13th century, also known as the Czarna Oława, on account of the quick expansion of the city lost its defensive value before its construction was completed. It was still being used as an urban canal in the mid-19th century, after which it was filled in and turned into an internal city artery. The younger moat, whose construction was begun in the 15th century and ultimately completed in 1810, has remained in the Wrocław landscape even though it never performed a defensive function. We should mention that most of the arteries in today's city-center were built in place of filled-in medieval transport canals. A boatway and floodway system based on medieval principles therefore contributes to the normal functioning of today's Wrocław. Its construction was completed in 1905-1908, and modernization work is underway. ■

Further reading:

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