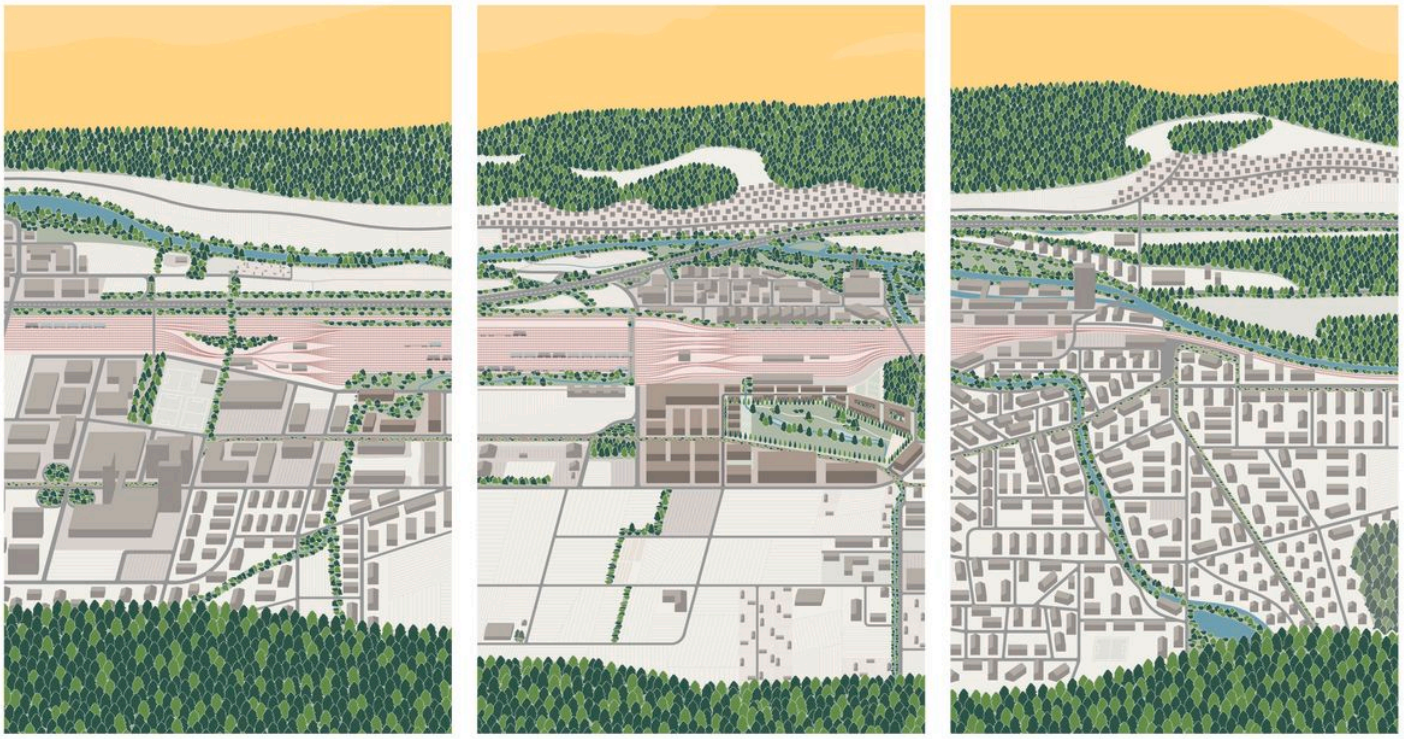
ETH Zurich Department of Architecture
ARCHITECTURE OF TERRITORY
Chair of Architecture
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Professor Milica Topalović

Nothing but Flowers
Fall 2021

Limattal

Ecologising Infrastructures: New Habitats for an Urban Landscape

Florian Hofmann, Markus Nyfeler, and Jonas Schmid

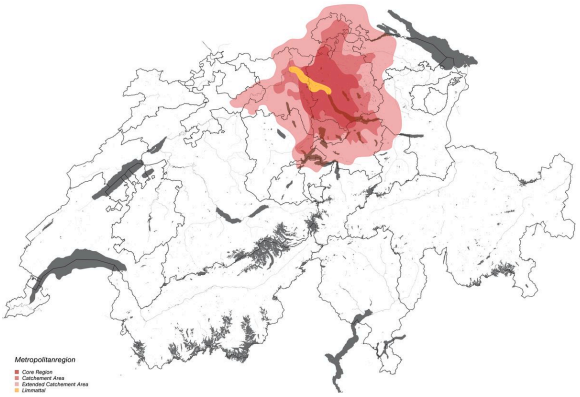


Infrastructures are artificial constructs. They are made to connect and bring humans and their goods from one place to another. But they also divide landscapes, fragmenting nature into small patches, which results in the loss of habitats for non-human species. These fragments often have a rich diversity of plants and animals, but due to its isolation they are vulnerable to environmental changes. The Limmat Valley is a prime example for this phenomenon. A highway, train tracks, and a marshalling yard have been built in the 1970s and 1980s and cut the landscape substantially. By expanding the linking quality of infrastructure upon ecology, a hybrid infrastructure with the ability to connect different fragmented biotopes can emerge. Resilience will be improved and with it biodiversity.

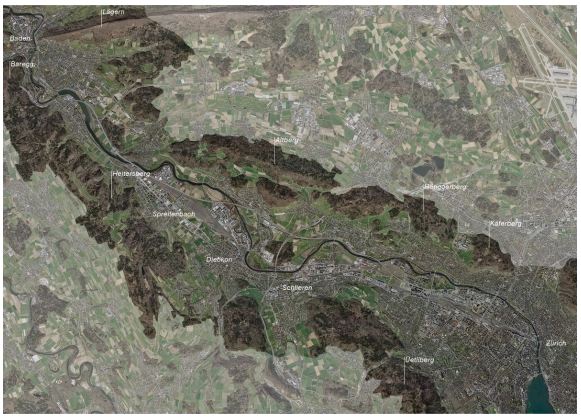
The Limmat Valley: Nature Between Steel and Concrete



The Limmat Valley is an anthropogenic construction of prominent infrastructures consisting of river, railroad, and highway. This led to an increasing settlement pressure and a multifaceted landscape.



Map with the metropolitan region of Zurich with the Limmat Valley marked yellow. Source: Florian Hofmann, 2021



Overview of the Limmat Valley from Zurich to Baden. Source: Florian Hofmann 2021

The Limmat Valley is located on the northern end of the lake Zürich and is flanked by the Heitersberg, Hönggerberg and the Ablis mountain chain. Out of the lake the Limmat rises and gets confluenced by two rivers, the Sihl at the Platzspitz and the Reppisch at the height of Dietikon. Several other smaller streams run down the hillside and flow into the Limmat at different location. The summits of the hills are forested and fade into an agricultural and urbanized valley floor.



Limmat with overgrown shoreline. Photograph: Florian Hofmann, 2021.



Southeastern end of the marshaling yard in Dietikon. Photograph: Markus Nyfeler, 2021.



Natural river course. Photograph: Florian Hofmann, 2021.



Canalized river course. Photograph: Florian Hofmann, 2021.



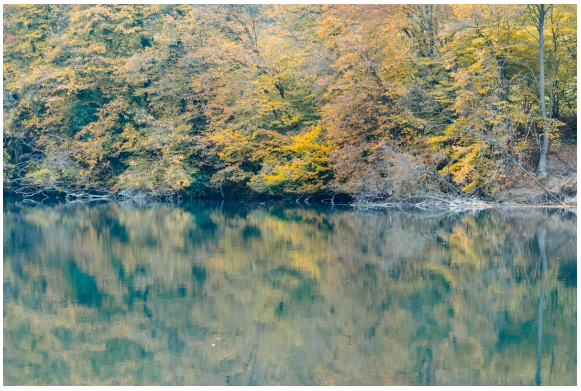
Industrial building in Dietikon.
Photograph: Markus Nyfeler, 2021.



Dam next to Dietikon. Photograph:
Florian Hofmann, 2021.



Rural village in Oetwil.
Photograph: Markus Nyfeler, 2021.



Limmat bank with dense vegetation.
Photograph: Florian Hofmann, 2021.



Highway in Dietikon. Photograph:
Markus Nyfeler, 2021.



Crossing of the highway bridge over the
Limmat. Photograph: Florian Hofmann, 2021.



Highway Exit of A1 between Dietikon and
Oetwil. Photograph: Markus Nyfeler, 2021.

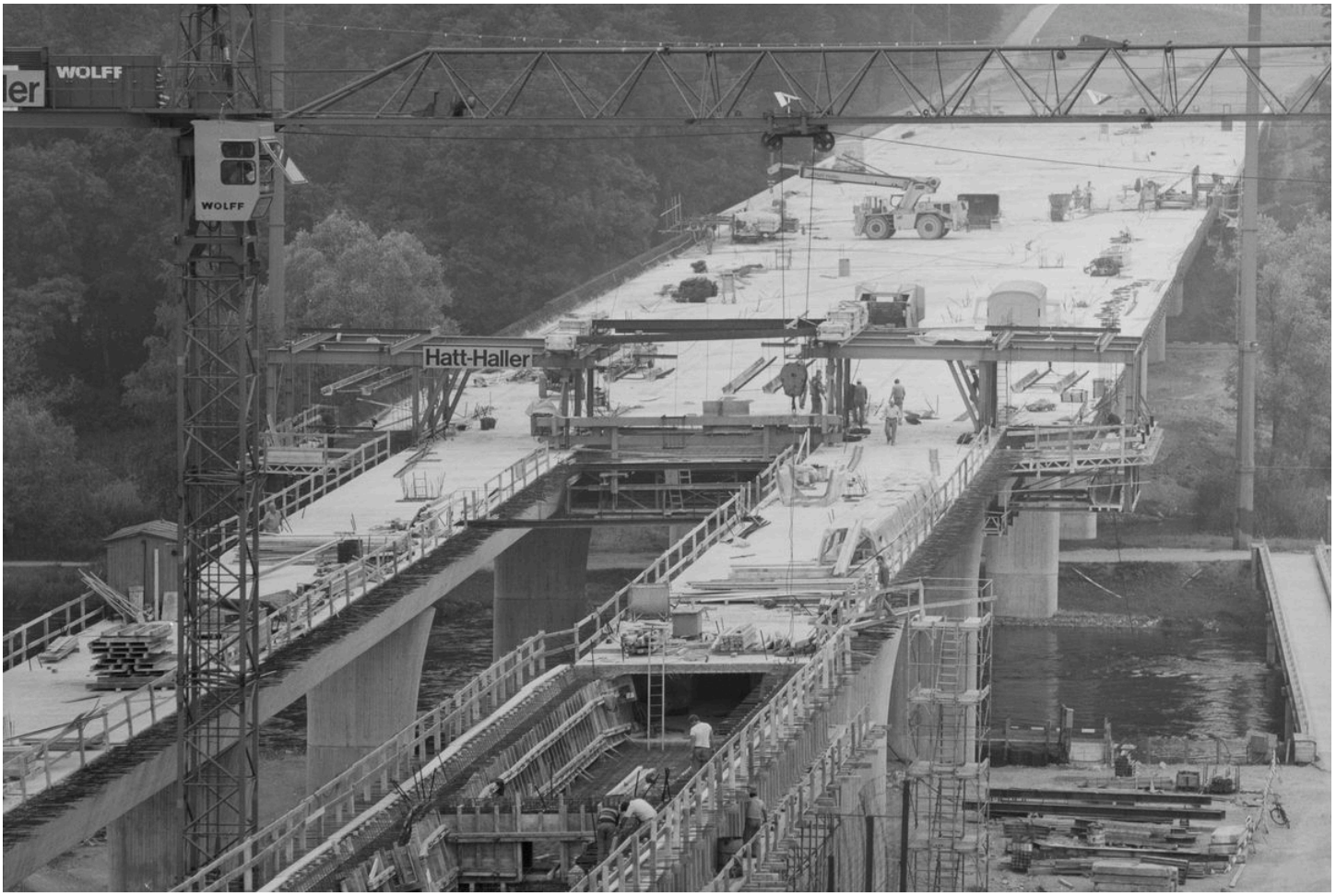


Marshalling Yard in Dietikon. Photograph:
Limmattaler Zeitung - Alex Spichale, 2021.

If you walk through the Limmat Valley, you will pass quite a lot of contrasting landscapes. Along the river, a nature can be found with an untouched appearance, historical meandering river courses and nature protection zones, but also corrected and straightened riverbanks.

Industries have settled in this Valley and affected its appearance in different ways. There are huge industrial areas like Silbern near Dietikon with almost no green space in between or hydropower plants which cut into the river and hinder fishes and amphibians from moving freely. Although these industries made huge intrusions in the landscape, the Limmat functions as a green belt, providing a life-sustaining environment, especially at parts where the shore is inaccessible for humans. Alongside the industries, there are two dividing infrastructures which influence the valley, namely the railway and the highway. Almost like the power plants, they cut into the landscape, producing hostile environments which are insurmountable for animals and producing a fragmentation of the landscape.

How Did the Valley Develop?



The geographical conditions explain the immense urban pressure that the city of Zurich creates in the Limmat Valley. Like an octopus, it spreads out its tentacles of urbanisation and infrastructural growth along the valley floors because the hill ranges and the lake limit its radial expansion. Why are the prominent infrastructures so relevant in this valley? On the one hand, they have made the enormous growth and economic upswing possible, on the other hand, they promote urban growth, the displacement of nature, and the fragmentation of the valley.



River course of the Limmat in 1759.
Illustration: Joe Rohrer bildebene.ch.



River course of the Limmat in 1910.
Illustration: Joe Rohrer bildebene.ch.

The Limmat and its valley floor have changed greatly over time. In the Middle Ages the course of the river was still untouched and was used for navigation and the transport of goods. In 1847 the first railway in Switzerland, the so called Spanisch-Brötlibahn was established in the Limmat Valley, which transported people and cargo between Zurich and Baden. This was the starting point of the industrialisation which had a huge influence on urbanisation, economy, and the river course.

The further development was influenced by three main interventions. The correction and industrial use of the river, the expansion of the railway with the marshalling yard, and the construction of the highway through the valley.

The Bending of the River Course



Factory Letten. Canvas: Johann Jakob Aschmann, 1785.



View on the flooded Limmat from Höngg.
Photograph: Limmattaler Zeitung, 1910.



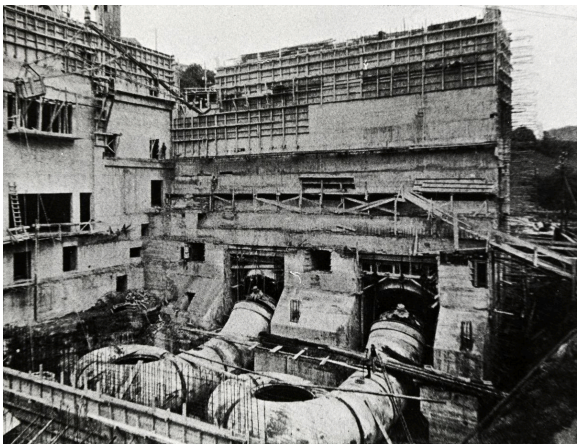
Construction work on the Limmat correction. Photograph: Ortsmuseum Dietikon, approx 1890.



The river cource at the Grien-Inseln after the correction. Photograph: Ortsmuseum Dietikon, 1895.



canalized Limmat in Dietikon. Photograph: Florian Hofmann, 2021.



Power house of the power station in Dietikon. Photographs: Kraftwerke an der Limmat von Zürich bis Untersiggenthal, René Schraner, 1895.



View on the reservoir of the power station in Wettingen. Photograph: Werner Friedli, 1939.

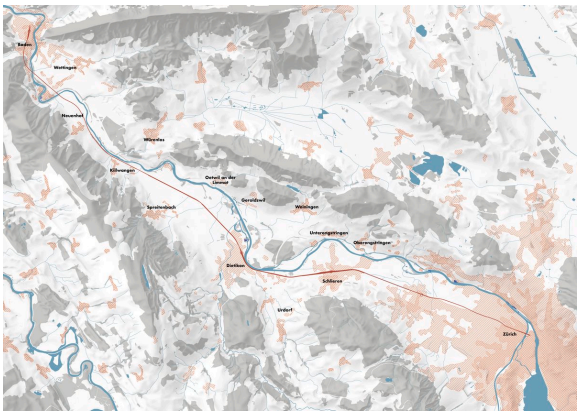


Stagnation of the Limmat in Wettingen. Photograph: Florian Hofmann, 2021.

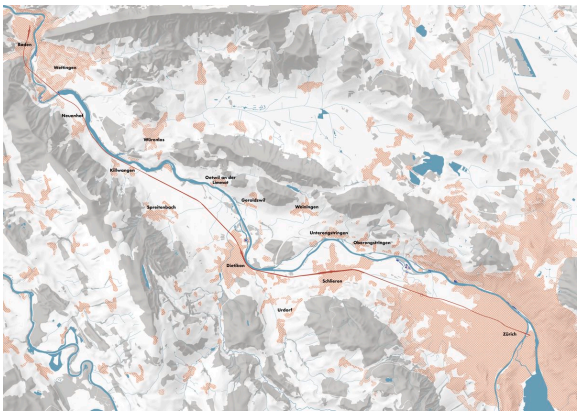
In the Limmat Valley the river meanders, and floodplain landscapes could be found in several places. But this idyllic landscape was also treacherous. During heavy rainfall flooding occurred and still continues to occur which is why in 1876 the decision was made to correct the Limmat, to straighten the course of the river and to drain the surrounding wetlands in a huge construction process. This made it possible to use the land more reliably for agriculture and promoted the growth of villages such as Dietikon.

The correction of the Limmat made industrialisation profitable along the river course, and five power stations were gradually built between Zurich and Baden. An important one was built in Dietikon in 1888 on the Grien-Insel. This location is important because here the correction of the Limmat greatly altered the natural course of the river. In order to operate the power station properly, an additional canal was built, which led to the creation of the Grien-Insel. In this area, the Limmat meandered strongly and even after straightening, the meanders were still visible and filled with water. This uniqueness and the resulting biodiversity prompted the canton to turn the area around the Grien-Insel into a nature reserve as early as 1930. Also, in other areas of the Limmat nature is once again being accorded greater importance which lets to more and more renaturation projects until the entire Limmat will have a more natural appearance again. Downstream, the flow rate decreases and the diameter of the Limmat increases due to the Wettingen weir. It was built in 1933 and dams the water far upstream resulting in almost stagnant water which creates a unique river landscape that can best be compared to a lake.

Of course, the industries have a bad influence on the aquatic fauna. But the Werdhölzli sewage treatment plant was built in 1961 to prevent the pollution of the Limmat, which unfortunately does not mean that no waste ends up in the river. The construction of these power plants made general navigation along the Limmat impossible, but the transport of people and goods was taken over by new and modern infrastructures.



The bending of the river course in 1930. Source: Markus Nyfeler, 2021



The bending of the river course in 1956. Source: Markus Nyfeler, 2021

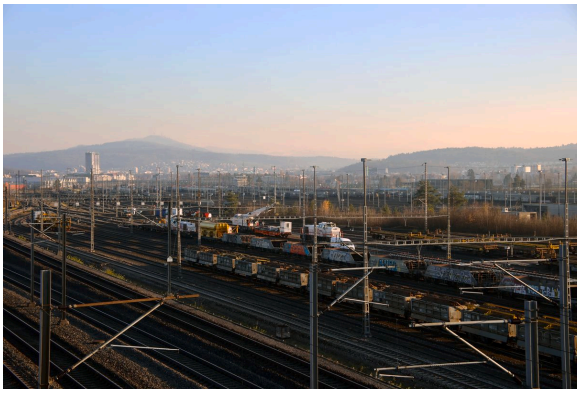
The Construction of the Marshalling Yard



View on the construction of the marshaling yard. Photograph: Comet Photo AG, 1974.



Marshalling yard. Photograph: Jonas Schmid, 2021.

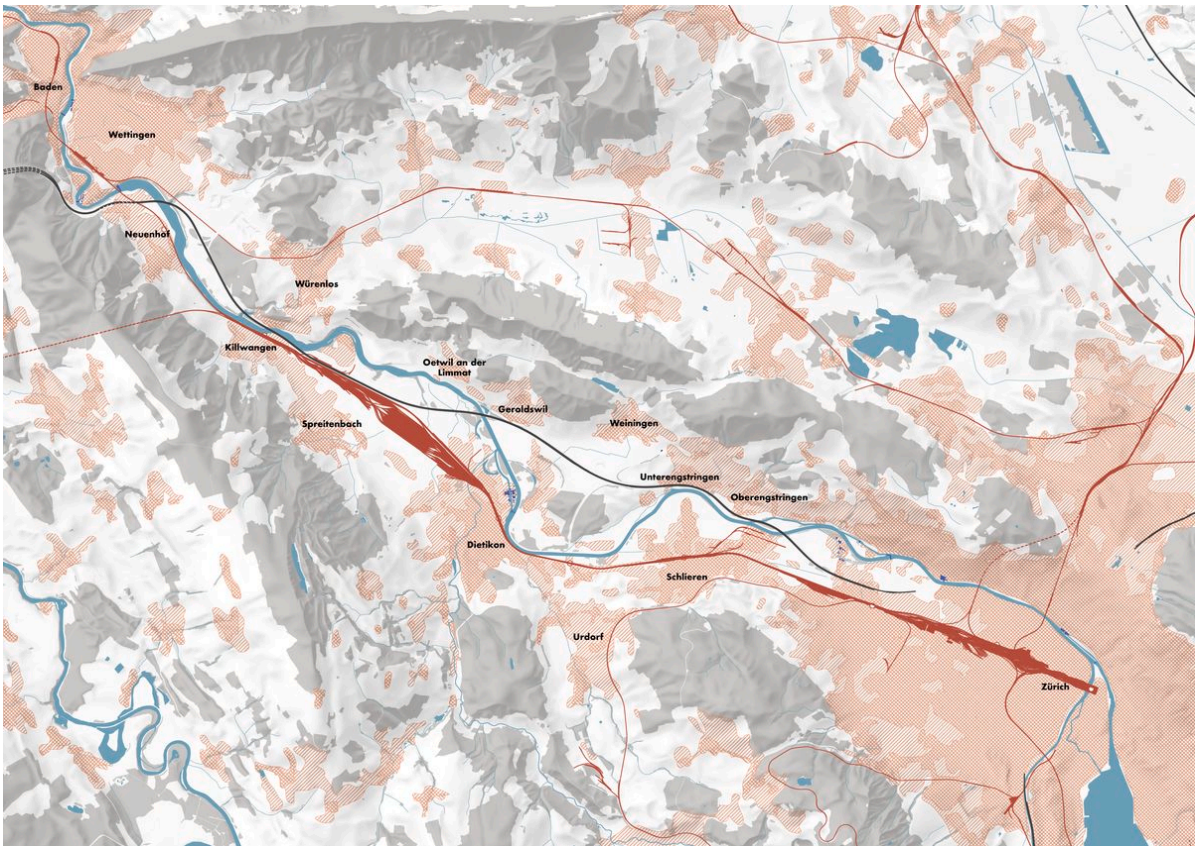


View over the mashalling yard. Photograph: Jonas Schmid, 2021.



View over the mashalling yard. Photograph: Jonas Schmid, 2021.

The main station in Zurich and its infrastructural properties expanded during the 20th century until a certain level. The SBB reached their boundaries and had to outsource some capacities to unravel the infrastructural hub. The division of the infrastructural planning had to find a place, where the SBB could build the marshalling yard in the outskirts of Zurich. With the completion of the Heitersberg-tunnel this question got solved and the marshalling yard in the Limmat Valley between Dietikon and Spreitenbach was finished in 1978. It is the biggest station in Switzerland next to Lausanne-Triage and has a national importance for single wagon load traffic. Interestingly, the marshalling yard does not work at its maximum capacity but rather at 50 %. That means it only operates during the night and can still counter future changes in cargo traffic. Also, the continuous reductions in the single wagon load traffic means, that the marshalling yard Limmat Valley does not have to be expanded in the near future.



The construction of the marshaling Yard in 1978. Source: Markus Nyfeler, 2021

The Car Culture and the Construction of the Highway



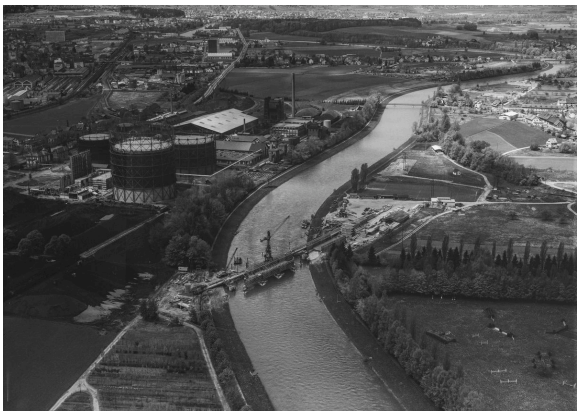
Highway bridge over the Limmat in Glanzenberg.
Photograph: Heinz Baumann, 1985.



Construction of new buildings
between Spreitenbach and Kilwangen.
Photograph: Comet Photo AG, 1964.



Shopping Tivoli in Spreitenbach with its hughe parking lot. Photograph: Hans Krebs, 1974.



Construction bridge of the highway A1 in Schlieren. Photograph: Comet Photo AG, 1965.



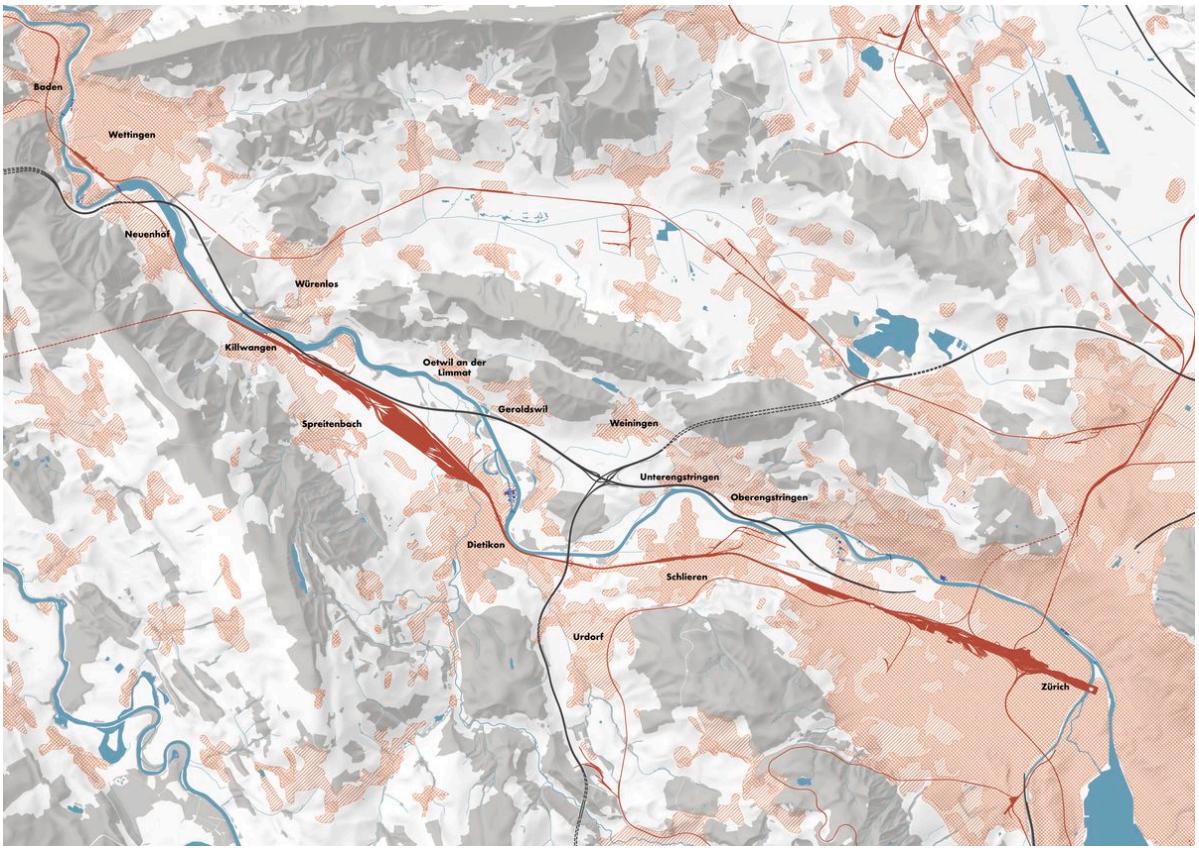
View on theconstruction of the highway A1 in Schlieren. Photograph: Comet Photo AG, 1969.



Construction of the highway bridge in Glanzenberg. Photograph: Patrick Lüthy, 1983.

The current urban structure found in the Limmat Valley, especially in Spreitenbach, developed in the late 50s and 60s and is influenced by a car based urban design. With the construction of the Shopping Tivoli, based on the US role model, in 1970, and the first Ikea outside of Scandinavia in 1973 with their huge parking lots, the car-based city established. The third massive intervention in the Limmat Valley, the highway A1 in 1978, had the same ideal in mind. The car as the ultimate transportation and the main focus on urban design. Shortly after in 1985 the northern ring enhanced the connection further to the eastern parts of Switzerland.

This improved connection to Zurich and the rest of Switzerland, and the big land reserves in form of agricultural fields, led to enormous urban growth on the southern side of the Limmat, especially in Dietikon and Spreitenbach. If you compare it to the other side of the river where the connection with the railway and the highway are not as strong, and the settlements are in a tighter territory, the urban growth was sustainably lower. Villages like Oetwil, Geroldswil, or Weiningen still have a rural appeal to this day. A huge contrast to Dietikon and Spreitenbach which were once small and rural villages and became industry dense cities.



The car culture and the construction of the highway in 1978. Source: Markus Nyfeler, 2021

Infrastructures Through the Lens of Ecology



The Limmat, the train tracks, and the highway are infrastructures that split the valley into fragmented landscapes. Nevertheless, through their presence, potentials for new biotopes have been created.

The Cantons of Zurich and Aargau recognize potentials throughout their territory regarding biodiversity, nature conservation and animal movement corridors. However, if one takes a closer look at the Limmat Valley, one sees that the two cantons recognise almost no potential for the promotion and conservation of nature in it. Apart from the nature reserve at the Limmat between Oetwil and Dietikon and a spawning area for amphibians in the south of Spreitenbach, no other potentials are recorded.



Potentials for ecologically valuable zones in the Limmat Valley. Source: Florian Hofmann, 2021.

For further analysis, we have chosen a smaller section between Spreitenbach and Dietikon, which contains the two identified potentials. This part of the Limmat valley is characterised by urbanisation, industrialisation and fragmenting infrastructures. But these infrastructures have not only brought negative changes. Their necessity has made room for a different kind of nature. The third landscape, which is unintentional and left over space, lies between urbanised areas and does not seem to be attractive to humans, which is why it remains largely untouched.



View on the Limmat Valley as it appears today. Source: Markus Nyfeler, 2021.



Railtrack Silbern area.
Photograph: Jonas Schmid, 2021.



Railtrack Kreuzäcker area.
Photograph: Jonas Schmid, 2021.



Railtrack Spreitenbach.
Photograph: Jonas Schmid, 2021.



Railtrack Spreitenbach.
Photograph: Jonas Schmid, 2021.



Highway exit of A1 between Dietikon and Oetwil. Photograph: Markus Nyfeler, 2021.



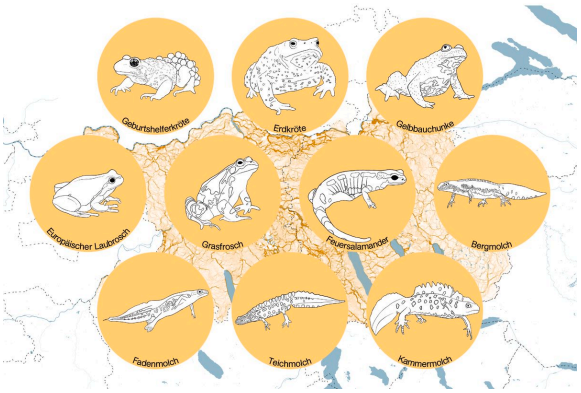
Glanzenberg highway bridge over Limmat. Photograph: Florian Hofmann, 2021.

Can this potential of infrastructures be further exploited? Is it possible to link natural spaces with infrastructures? These questions have shaped the concept of connectivity and how green spaces in the Limmat Valley can be improved by creating new and improving old connections.

But why do we need connections between green spaces? In a highly urbanized area like the Limmat Valley, more and more space is being taken away from nature. Many smaller and scattered fragments of nature are left over after urbanization wiped over them. These Fragments provide a home for a variety of animals and plants. But due to the lack of links with other habitats, no gene exchange takes place and thus resilience and biodiversity decline.

EAWAG's research on functional connectivity and blue-green infrastructure visualizes functioning connections between natural areas in a network that extends across Aargau and Zurich. Biodiversity was determined by measuring the occurrence and range of movement of ten amphibians. Since they move both in water and on land, they are suitable indicators of biodiversity.

Looking at the section between Spreitenbach and Dietikon, it becomes apparent that the Limmat and the forests along the hills function well as habitats, but that there are hardly any functioning connections between them.



Amphibians as indicator for biodiversity. Sketches: Florian Hofmann, Source: EAWAG, 2021.

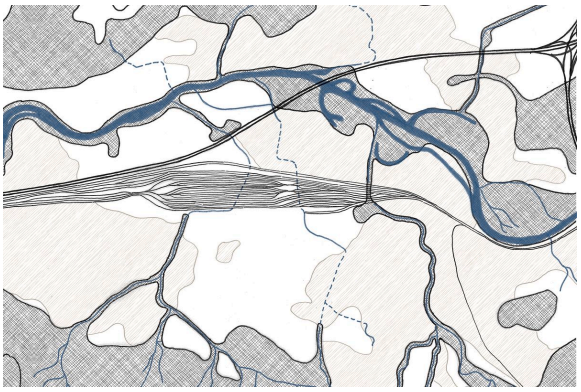


Amphibian movement in the region of Dietikon and Spreitenbach showing missing connections between fragmented patches of nature. Source: Florian Hofmann, 2021.

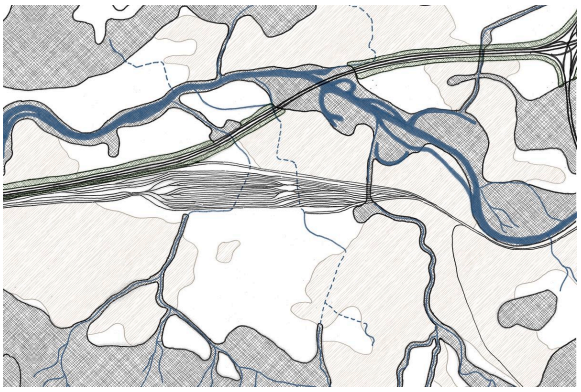
The Hybridization of Roads, Tracks, and Streams to Connect Existing Habitats



Infrastructure as a tool to connect different biotopes and establish a green network in an urbanized landscape. Through new links and extended axes, resilience gets improved and biodiversity enhanced.



Ecological connections as it is today. Sketch: Markus Nyfeler, 2021.



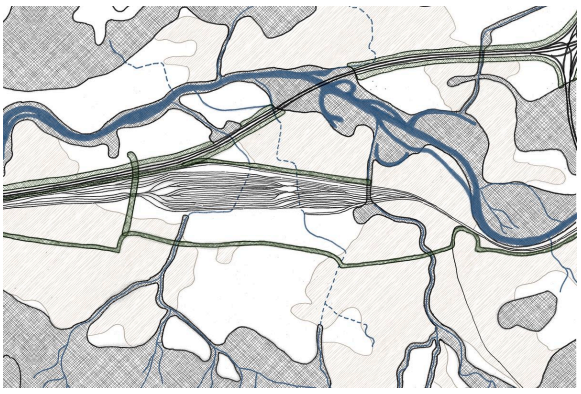
Ecological connections with the ecologising of the highway. Sketch: Markus Nyfeler, 2021.



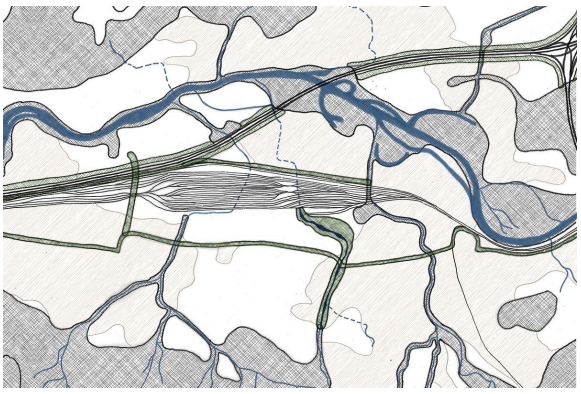
Ecological connections with the ecologising of the bicycle trail. Sketch: Markus Nyfeler, 2021.



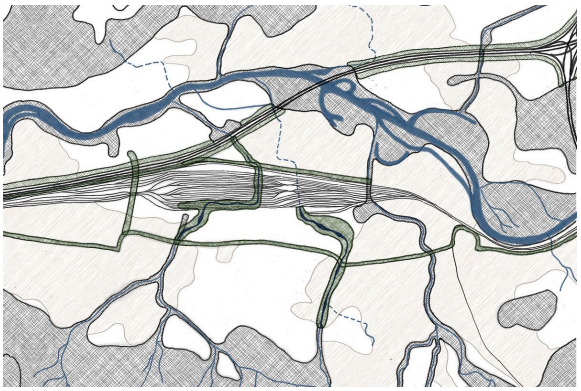
Ecological connections with the ecologising of the Ikea bridge. Sketch: Markus Nyfeler, 2021.



Ecological connections with the ecologising of the Limmattalbahn. Sketch: Markus Nyfeler, 2021.



Ecological connections with the renaturalising of the Teischlibach. Sketch: Markus Nyfeler, 2021.



Ecological connections with the renaturalising of the Dorfbach. Sketch: Markus Nyfeler, 2021.



Ecological connections after all interventions. Sketch: Markus Nyfeler, 2021.

By using existing structures and combining them with future projects a hybrid network of green axes can be created that provide connections for nature as well as people.

Ecologising the Highway



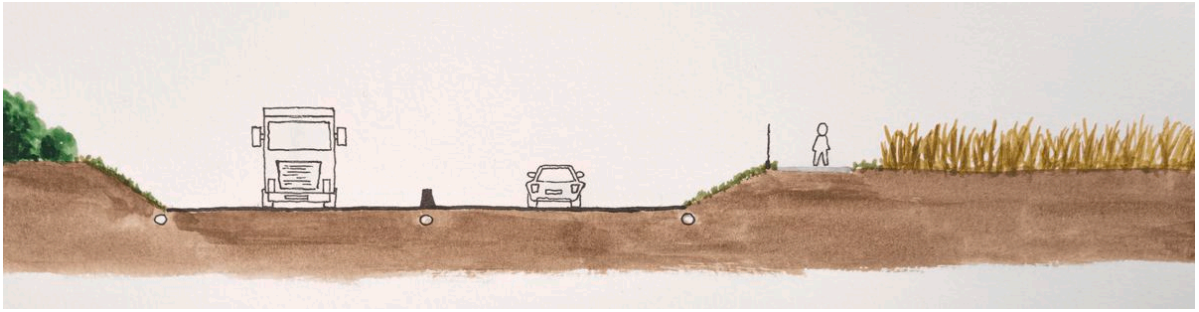
The Highway with extended green strip and SABA. Sketch: Florian Hofmann, 2021.



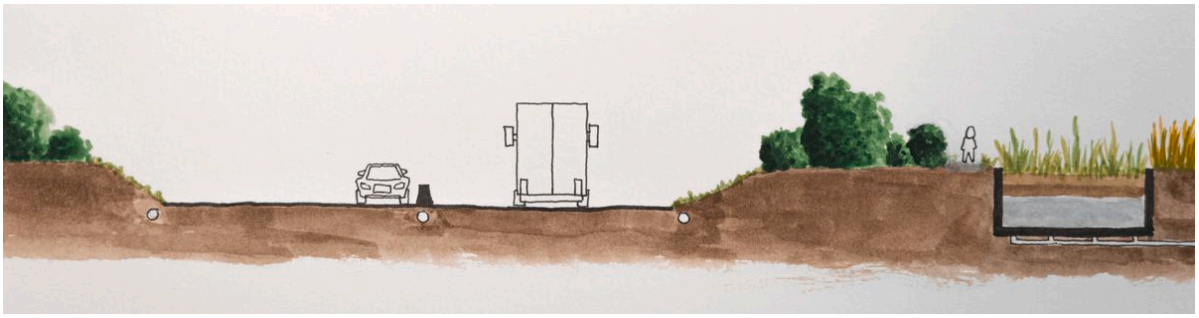
The third landscape between highway and railway. Photograph: Jonas Schmid, 2021.



Highway between Spreitenbach and Dietikon. Photograph: Jonas Schmid, 2021.



The highway at its current state. Sketch: Florian Hofmann, 2021.



The Highway with extended green Strip and SABA. Sketch: Florian Hofmann, 2021.

The first project is the highway, which is currently bordered by settlement areas and agriculture. There is only a narrow green strip separating the motorway from the bordering land, which has to be maintained intensively for safety reasons. As the motorway is close to the river and the nature reserve, irrigation is of great importance, which is why new drainage facilities are planned between Geroldswil and Weinigen. These so-called SABA (road wastewater treatment plants) clean the wastewater through different mechanical and natural filters and return it to the groundwater. The natural filter basin also functions as a habitat for different species. The planned intervention to improve wastewater treatment will be extended to Killwangen and in addition to the intensively maintained green strip, an extensive maintaining part will be added. In the area of agricultural land, the farmer gets compensated for the management and promotion of biodiversity of the strip.

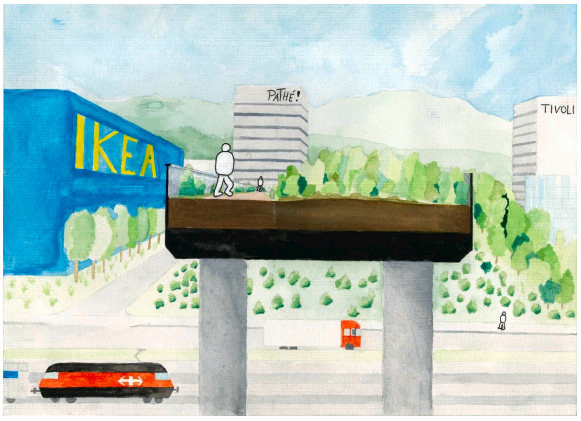
Ecologising the Bicycle Trail and the IKEA-Bridge



Bicycle fasttrack. Sketch: Florian Hofmann, 2021.



Bicycle fasttrack with ramp.
Sketch: Jonas Schmid, 2021.



IKEA-Bridge. Sketch: Jonas Schmid, 2021.



Unused railway between Silbern
and the marshalling yard.
Photograph: Jonas Schmid, 2021.



Path towards IKEA-Bridge.
Photograph: Jonas Schmid, 2021.



IKEA-Bridge. Photograph: Jonas Schmid, 2021.

The second project is the bicycle fast-track, which is planned between the city of Zurich and Dietikon. The route runs between the Silbern industrial area and the marshalling yard and will be realized on an old industrial track. In order to make optimal use of the route, it gets extended to Spreitenbach and the asphalt road is changed to a gravel path. Further the sides will be planted with small hatches and wildflowers to improve the overall atmosphere and the biodiversity.

In order to guarantee the connection to Spreitenbach, the route must cross the marshalling yard. The IKEA-bridge, which is hardly used, is suitable for this purpose. By adding a ramp, it links up with the bicycle route and by putting up soil on to the bridge, an idyllic meadow landscape is created. This green bridge also guarantees the natural connection over the marshalling yard.

Ecologising the Limmattalbahn and Renaturalising the Teischlibach



Integration of the Limmattalbahn and renaturation of the Teischlibach into the Planning of Nidfelden Area. Sketch: Jonas Schmid, 2021.



Depot Limmattalbahn.
Photograph: Jonas Schmid, 2021.



Limmattalbahn tracks.
Photograph: Jonas Schmid, 2021.



Limmattalbahn tracks towards Dietikon.
Photograph: Jonas Schmid, 2021.

Another project is the Limmattalbahn, which is intended to connect the villages and relieve traffic. On a large part of the route, the railway runs along existing asphalt roads. Instead of sealing the tracks with asphalt, they will be covered with meagre meadows which are used to break up the grey landscape and turn the tracks into a green axis.

Between Spreitenbach and Dietikon, the Limmattalbahn runs through the Niderfeld area, which is currently in the planning stage and provides for the renaturation of the Teischlibach. Parts of the planned park will be partly flooded to create a small wet land. On the north-western edge of Dietikon, the stream flows through land reserves which are used for future project. In this context, the culverted stream can be opened up and renaturalised.

Renaturalising the Dorfbach and Ecologising the Marshalling Yard



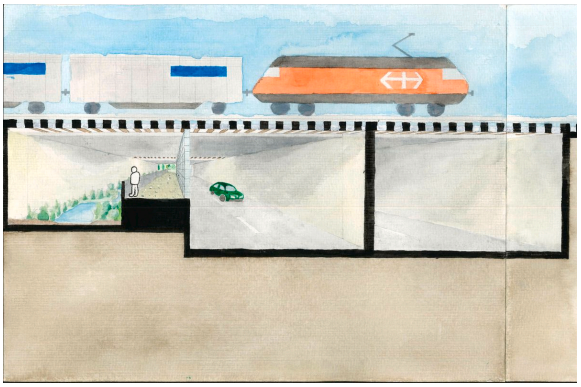
Integration of the Dorfbach into the planning of Kreuzäcker Area. Sketch: Florian Hofmann, 2021.



Removal of rails gives space to the stream. Sketch: Florian Hofmann, 2021.



Tunnel Mutschellenstrasse and canalization of the Dorfbach. Sketch: Jonas Schmid, 2021.



Tunnel Mutschellenstrasse and the new course of the Dorfbach. Sketch: Jonas Schmid, 2021.



Canalization of Dorfbach near Kreuzäcker. Photograph: Jonas Schmid, 2021.



Canalization of Dorfbach at marshalling yard. Photograph: Jonas Schmid, 2021.

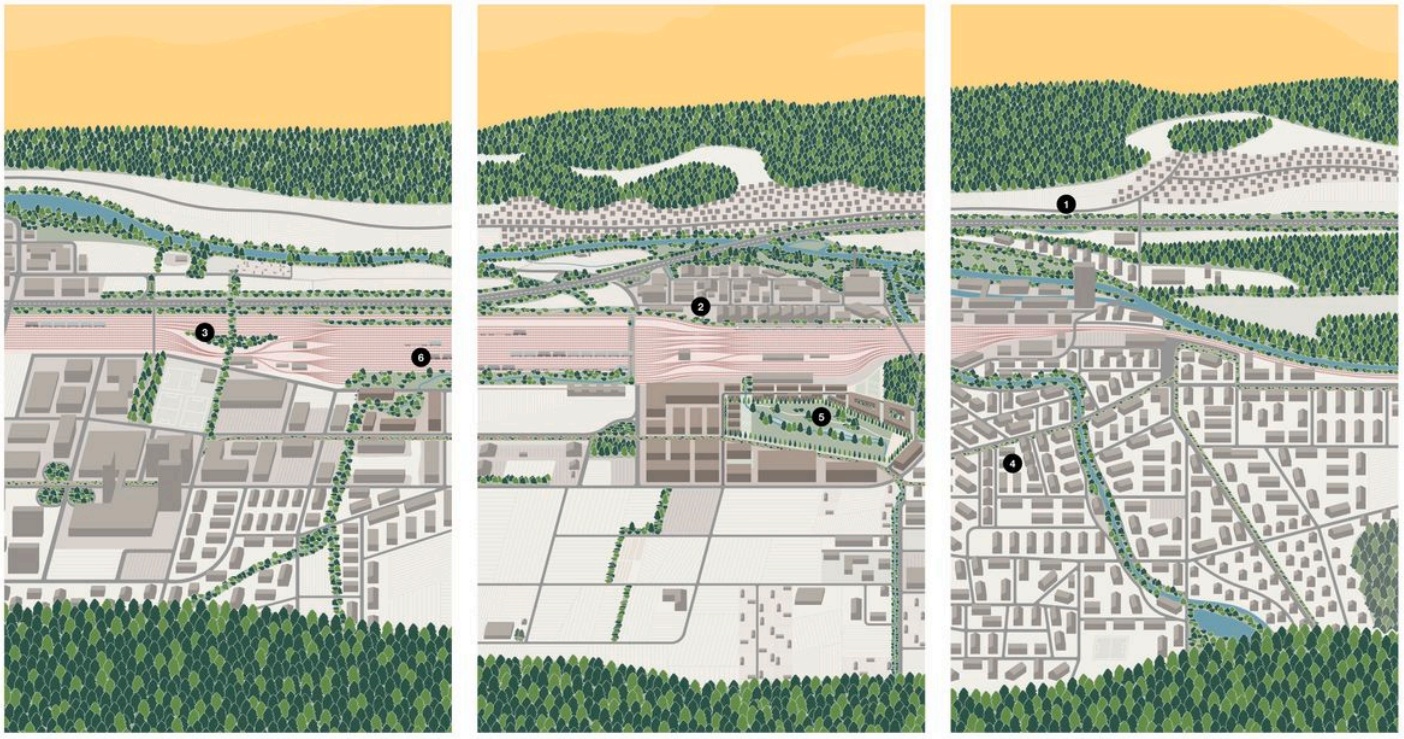


Canalization of Dorfbach under marshalling yard. Photograph: Jonas Schmid, 2021.

The last project revolves around the renaturation of the Dorfbach in Spreitenbach and the ecologising of the marshalling yard. A long section of the stream is culverted and passes under the marshalling yard. The aim is to give the stream more space and to enhance its surroundings. In front of the marshalling yard, the stream routes through the Kreuzäcker industrial estate, which is currently being planned. By integrating the Dorfbach into the planning process of the Kreuzäcker estate the course of the stream gets naturalized and a hybrid little park between the planned buildings develops.

In the area of the marshalling yard, four tracks are removed to give the river more space and create a new ruderal biotope. To open the culverted stream, it merges with the Mutschellenstrasse tunnel and is led northwards. By opening the tracks over the tunnel light can pass through, which enables plants to grow near the water. The new course of the stream offers a better atmosphere and a safer passage for pedestrians.

These different interventions show, that infrastructures can function as connections of existing biotopes. Further, it even improves the liveability of the cities.



1 Ecologising the Highway | 2 Ecologising the
Bicycle Trail | 3 Ecologising the IKEA Bridge
4 Ecologising the Limmattalbahn | 5 Renaturalising the Teischlibach
6 Renaturalising the Drofbach/Ecologising the Marshalling Yard

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