ETH Zurich Department of Architecture
ARCHITECTURE OF TERRITORY
Chair of Architecture
and Territorial Planning
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Wind

On the Beauty of a Wind Turbine

Melanie Meyer and Nils Tamm

Wind turbines are not an energy source that you see in Switzerland very often. Trying to make the shift towards renewable energy is tricky. As architects, it is our challenge to find a way to welcome these infrastructures into our landscape happily and pleasantly.

Gone with the Wind: Looking Back at Wind Energy's History



The concept of wind turbines is not a recent development. As early as the 7th century, wind power was utilized to crush grains in Iran. By the 17th century, wind was harnessed for various types of water pumping. Two centuries later, wind power found a new application: energy production. Since then, wind turbines have been continually optimized for efficiency, with blades designed to move effortlessly, and the machines themselves growing progressively larger. In Switzerland, wind turbines typically stand at 150 meters tall, while the tallest turbine globally, located in China, reaches up to 280 meters. In Switzerland, wind turbines often carry a negative connotation, primarily due to their appearance and size in the landscape.



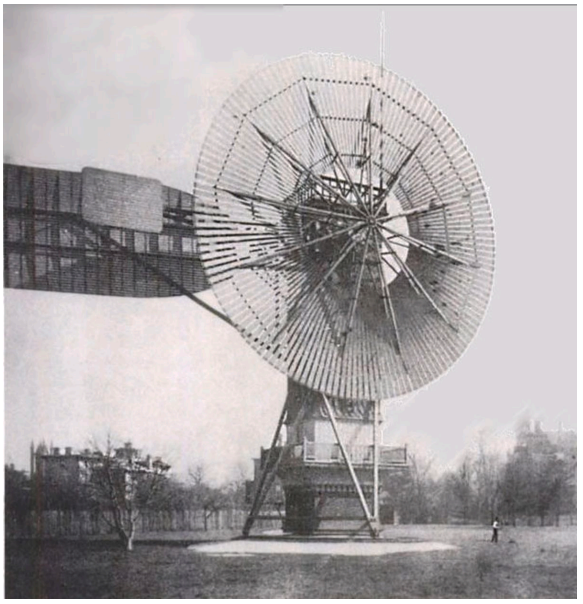
WINDMILLS FOR GRAIN CRUSHING in Nashtifan, Iran. 7th century. A. Hassanzadeh



A PAINTING OF A WIND MILL FOR WATER PUMPING. De Eschmolen, Delden. unknown photographer van Ruisdael, Jacob. Windamill of Wijk bij Duurstede, 1670.



SMALL WATER PUMPING WIND MILLS. Hopper, Edward. Rich's House, 1930



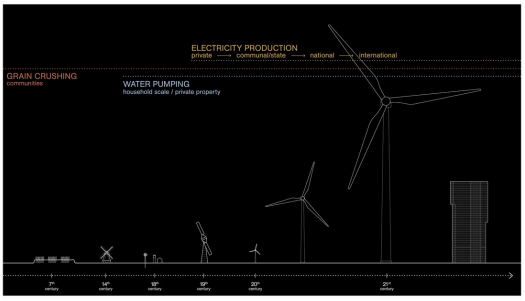
FIRST WIND TURBINE TO PRODUCE ELECTRICITY. Wind Turbine of Brush, OH, USA. 1888



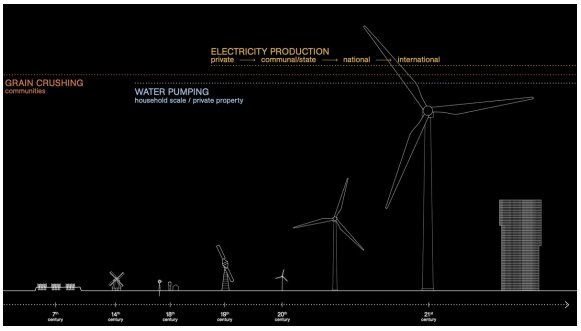
WIND TURBINES WITH TWO BLADES.
NASA Wind Turbines, WA, USA. 1981



TODAY'S COMMON WIND
TURBINES. Thorntonbank Wind
Farm, North Sea, Belgium, 2009-13

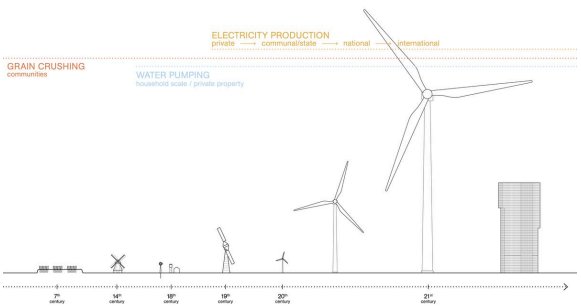


TIMELINE OF WIND ENERGY
DEVELOPEMENT. Graphic by Nils Tamm, 2024.

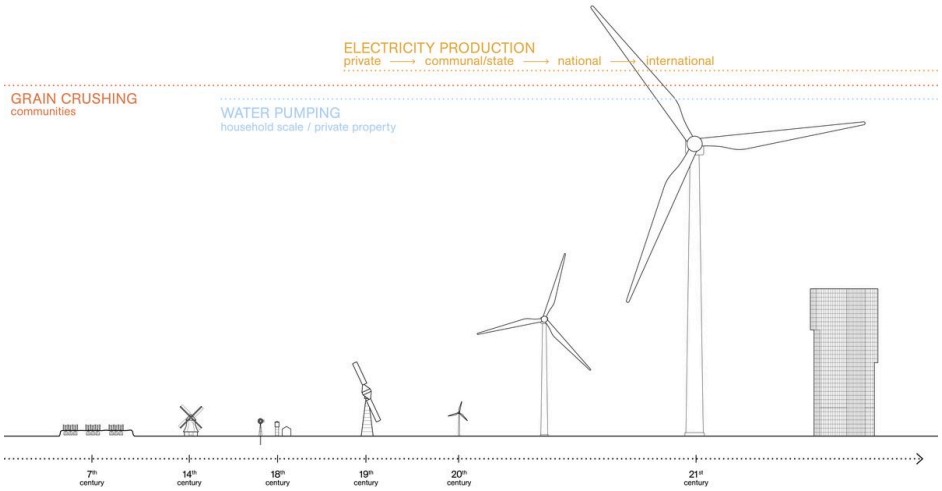


TIMELINE OF WIND ENERGY
DEVELOPEMENT. Graphic by Nils Tamm, 2024.

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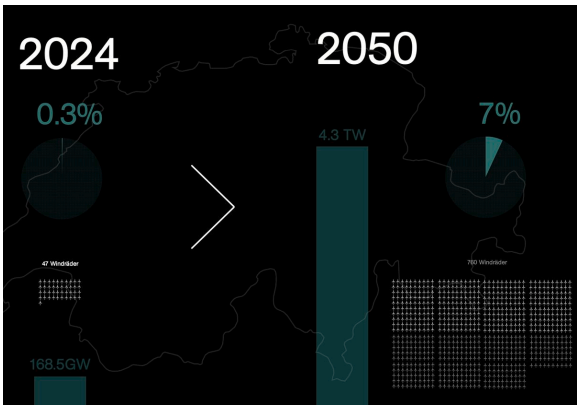


TIMELINE OF WIND ENERGY. Nils Tamm, 2024.

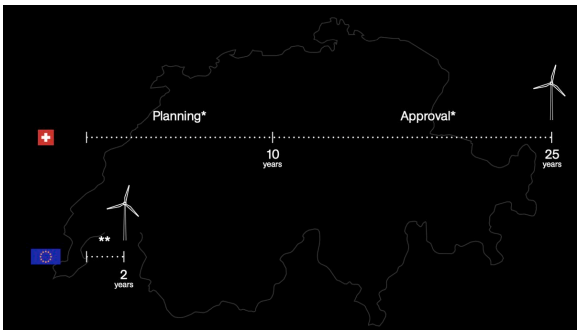
Is Switzerland Too Beautiful for Wind Turbines?



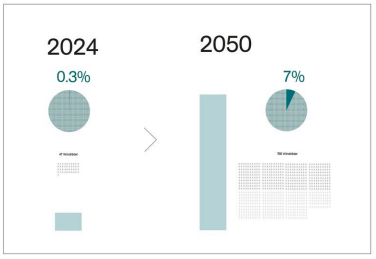
Compared to its neighboring countries, Switzerland lags significantly in wind-produced electricity. Due to extremely long building processes and an overall unfavorable opinion, wind energy only accounts for 0,3% of the Swiss energy mix. How will Switzerland face its own goal for 2050, being a 7% part of wind energy ?



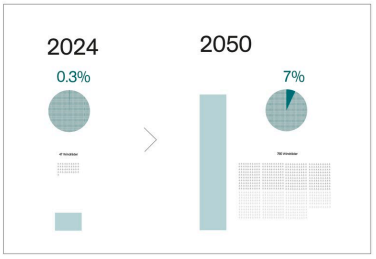
GOAL FOR 2050. Graphic made by Melanie Meyer, 2024.



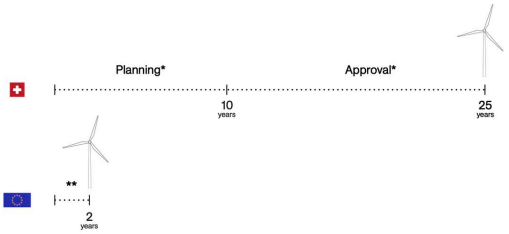
APPROVAL PROCESS IN SWITZERLAND IN COMPARISON WITH EUROPEAN COUNTRIES. Graphic made by Nils Tamm, 2024.



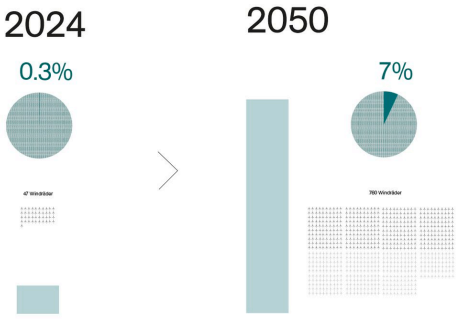
GOAL FOR 2050. Melanie Meyer, 2024.



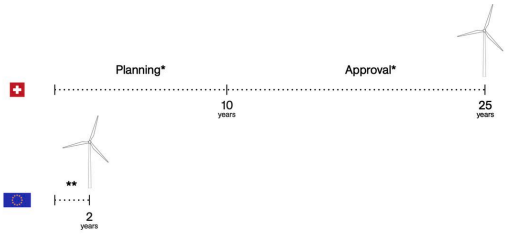
GOAL FOR 2050. Melanie Meyer, 2024.



APPROVAL PROCESS : SWITZERLAND & EUROPEAN UNION. Nils Tamm, 2024.



WIND ENERGY IN SWITZERLAND : GOAL FOR 2050. Melanie Meyer, 2024.



APPROVAL PROCESS : SWITZERLAND & EUROPEAN UNION. Nils Tamm, 2024.

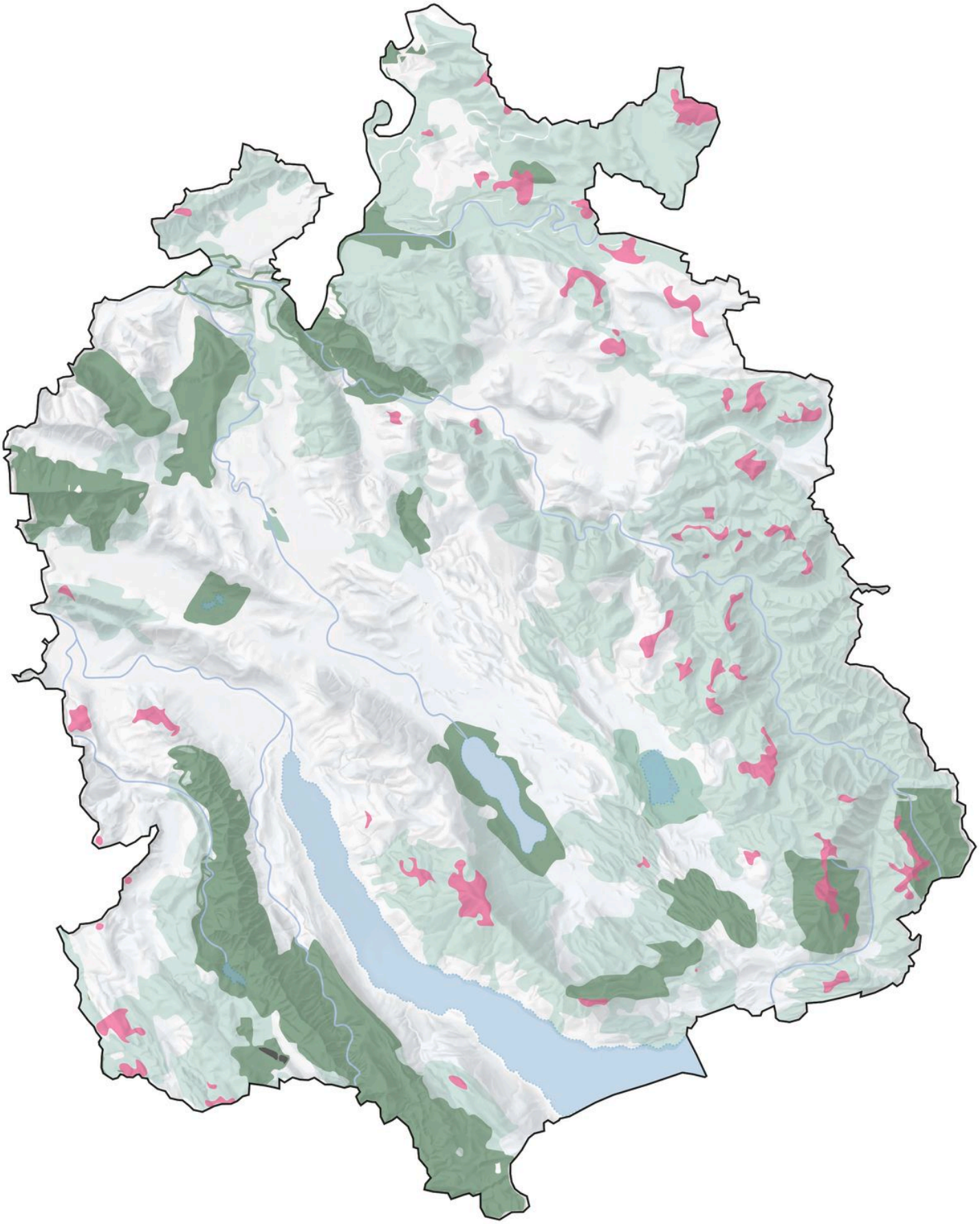
Wilhelm Tell vs The Wind Turbine



Can Switzerland overcome its own preconceived ideas about its identity ?

ZÜRICH’S FAILED WIND PROJECT

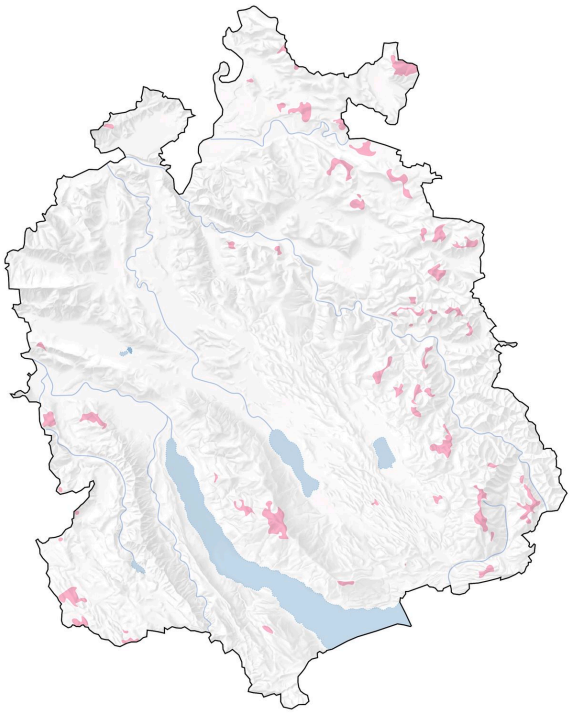
In the Canton of Zurich, a wind turbines project was submitted but never saw the light of day. The Greens Party, specifically Mr Martin Neukom, Head of the Construction Department of the Canton of Zürich, advocated for renewable energy, leading them to identify 46 potential areas for wind farms within the canton. However, their proposal was met with significant public opposition, both near the city, where to many people would have been affected, and in the countryside where landscapes and natural areas would have be deteriorated. Due to that insensitive approach to promoting wind energy, which already had a negative image, the general opinion even worsened.



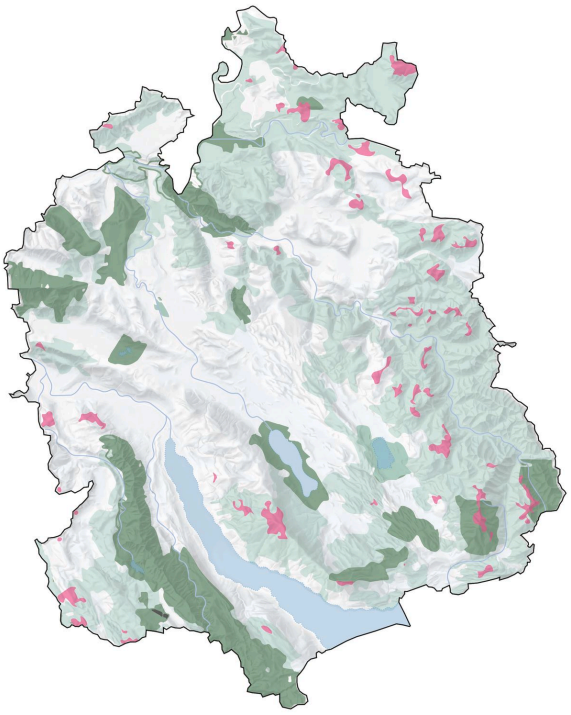
CANTON OF ZÜRICH.
Melanie Meyer, 2024.

Wind Turbine Potential Area

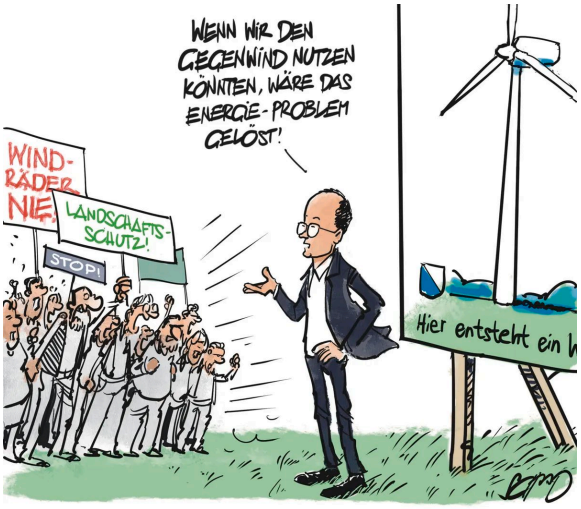
Area of Natural and/or Landscape Importance



POTENTIAL AREAS FOR WIND TURBINES
- GREENS PROJECT. Melanie Meyer, 2024.



POTENTIAL AREAS FOR WIND TURBINES
- GREENS PROJECT. Melanie Meyer, 2024.



CARICATURE OF MARTIN
NEUKOM. Tagesanzeiger, 2023.



RENDERING OF THE ALBISKETTE.
Freie Landschaft Zürich, 2023

Winning Formula: A Wind Park as a Tourist Attraction



R. Rodewald, a representative of the Landscape Protection Foundation and an influential figure in the design of Switzerland's largest wind farm at Mont Crosin in the Jura region, emphasizes the importance of public perception for the acceptance and efficiency of wind energy in Switzerland. Mont Crosin serves as a model, as it was carefully planned to blend with the landscape and marketed as a tourist attraction, enhancing the area's natural beauty. This approach demonstrates how wind energy projects can be successfully integrated into the landscape and positively received by the public.

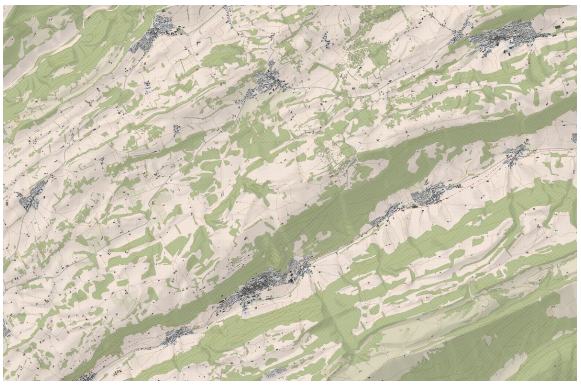




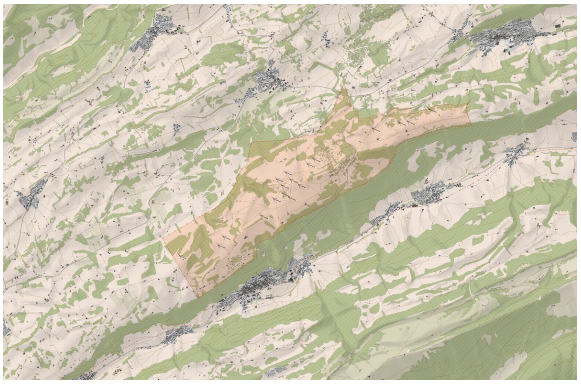
JUVENT PARC OVERVIEW,
Made by Nils Tamm, 2024.



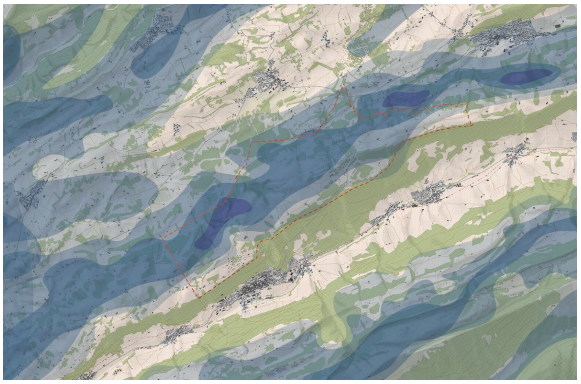
JUVENT WIND PARC, MONT-
CROSIN. Keystone Gaetan Bally, 2020.



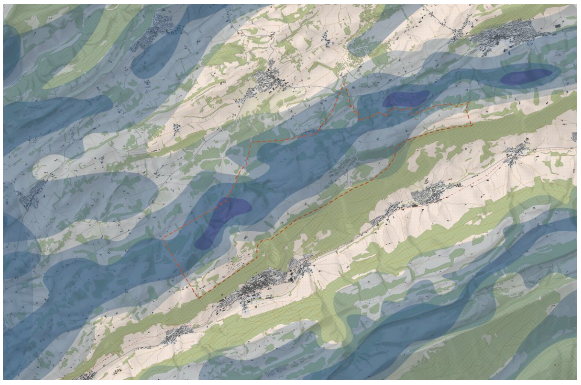
JUVENT PARC OVERVIEW,
Made by Nils Tamm, 2024. 02



JUVENT WIND PARK. Nils Tamm, 2024.



WIND SPEED ON THE JUVENT
WIND PARC. Nils Tamm, 2024.



WIND SPEED ON THE JUVENT
WIND PARK. Nils Tamm, 2024.

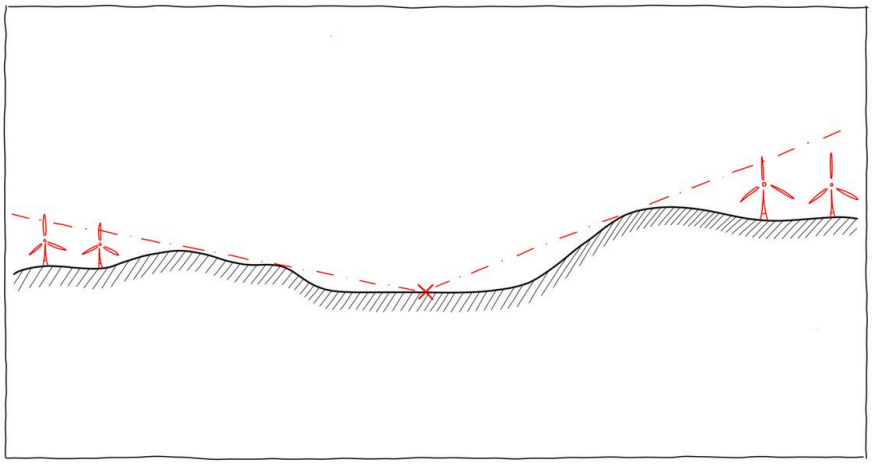
Design Rules For a Wind Park



R. Rodewald introduced several design methods for wind farms to ensure they are aesthetically and environmentally considerate:

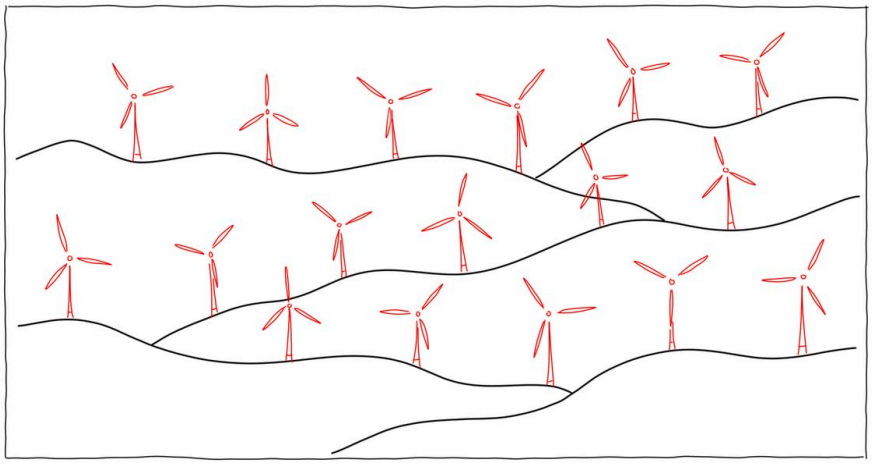
TANGENTAL ALIGNMENT

In landscapes with hills, place wind turbines behind the hills to extend the natural viewing axis. This approach integrates the turbines into the landscape, making them visually less intrusive.



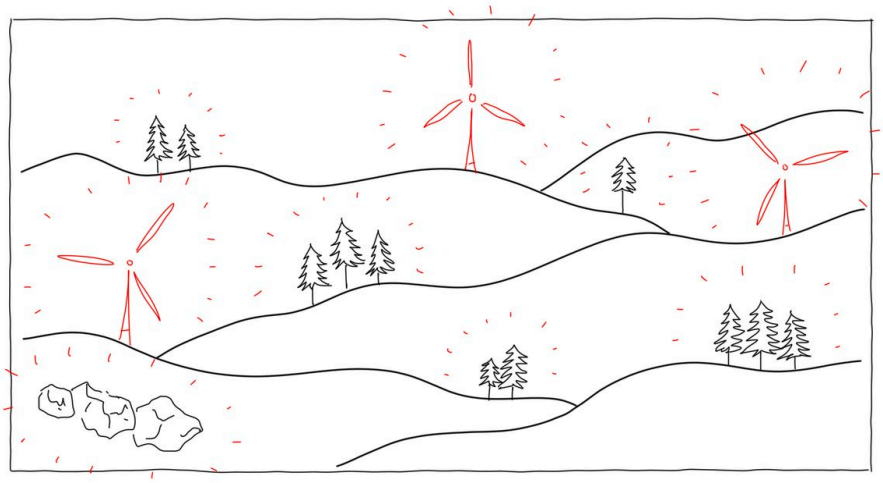
NON-GEOMETRIFICATION OF A HORIZON LINE

Avoid placing wind turbines in straight lines or clusters that create a “wall” effect. This makes them less visually appealing and also prevents disruption to bird flight paths. Instead, turbines should be positioned in a more organic, scattered arrangement.



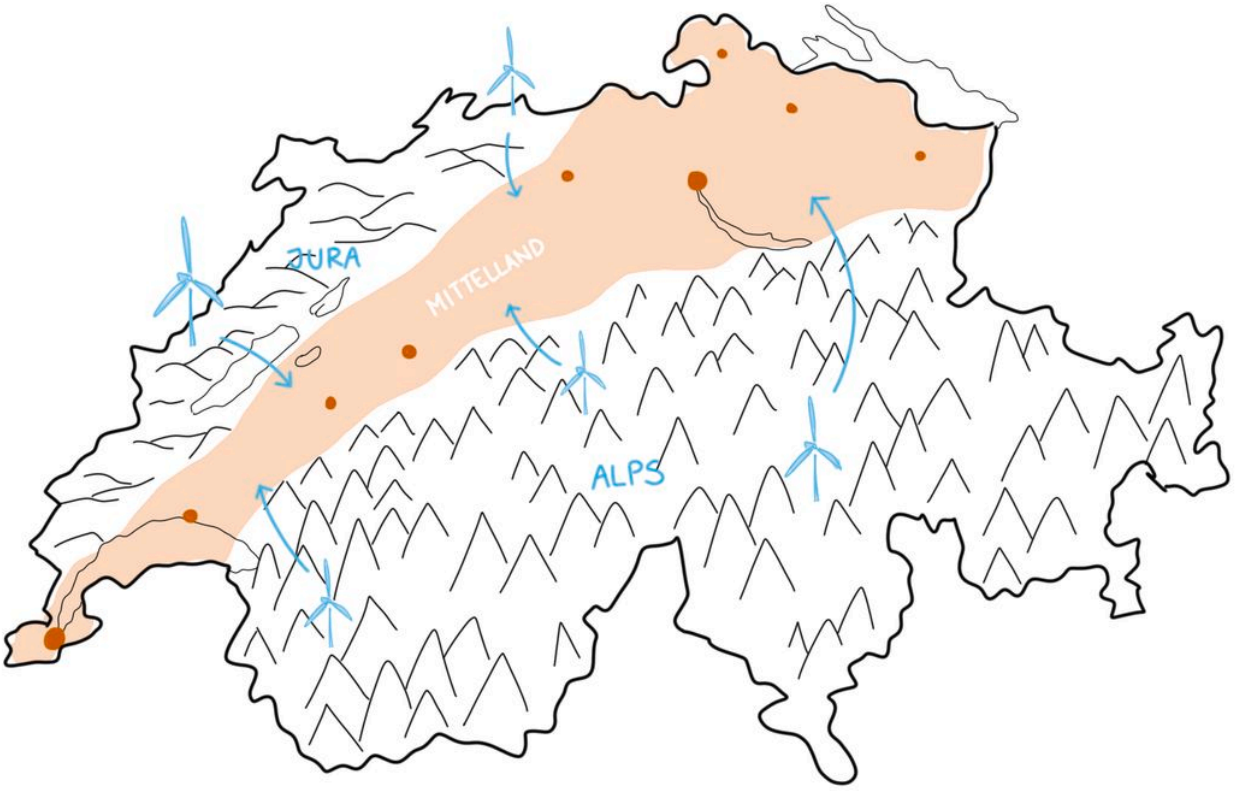
CO-VISIBILITY

Be mindful of the visual context of wind turbines. For example, a wind turbine visible from a window should not be aligned with a church or other significant landmarks, as this can create unpleasant visual associations.

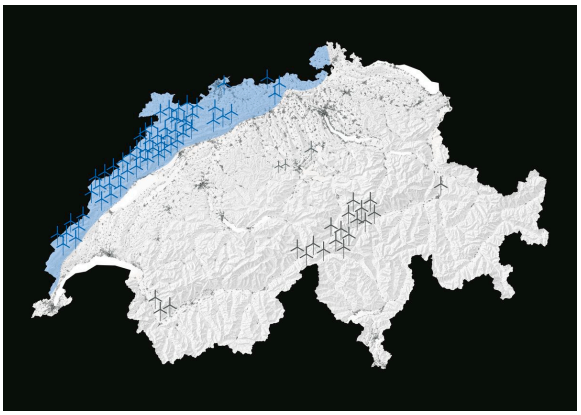


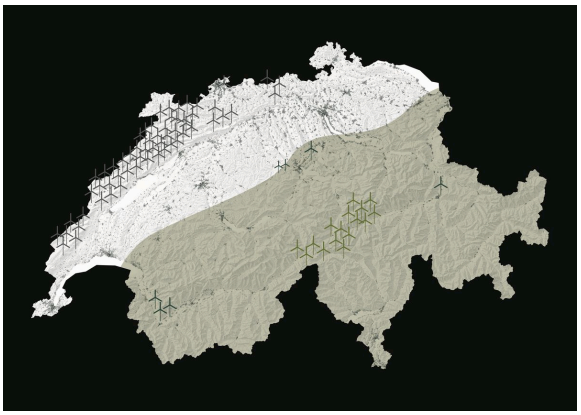
By following this method, wind farms can be more effectively integrated into their surroundings, minimizing visual impact and supporting ecological balance.

Territorial Inequity

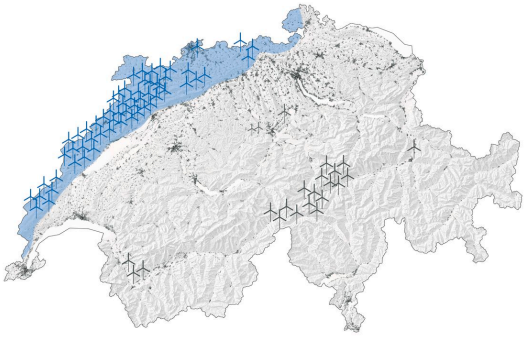


Existing wind farms in Switzerland are predominantly located in specific landscape typologies, such as the Jura mountaintops, valley floors, and alpine passes. There is a general tendency to situate energy production facilities away from metropolitan areas, which can lead to perceived inequities in sparsely populated regions. This practice raises the question of whether Switzerland can overcome this internal disparity and consider integrating wind energy facilities within urban areas to distribute the benefits and impacts equitably.

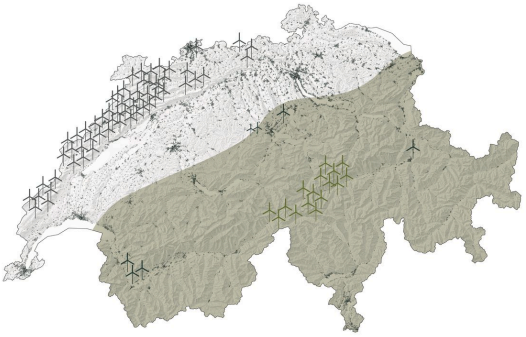




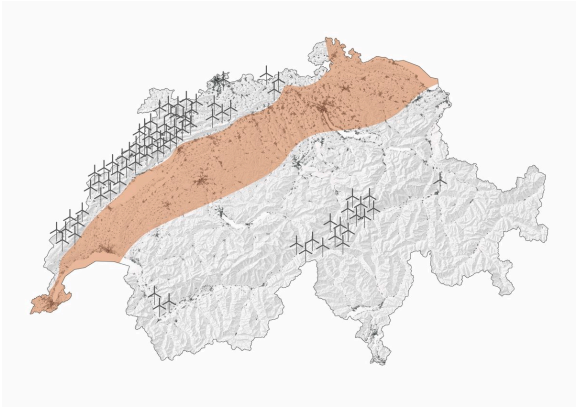
WIND TURBINES IN JURA REGIONS.
Graphic by Melanie Meyer, Nils Tamm, 2024.



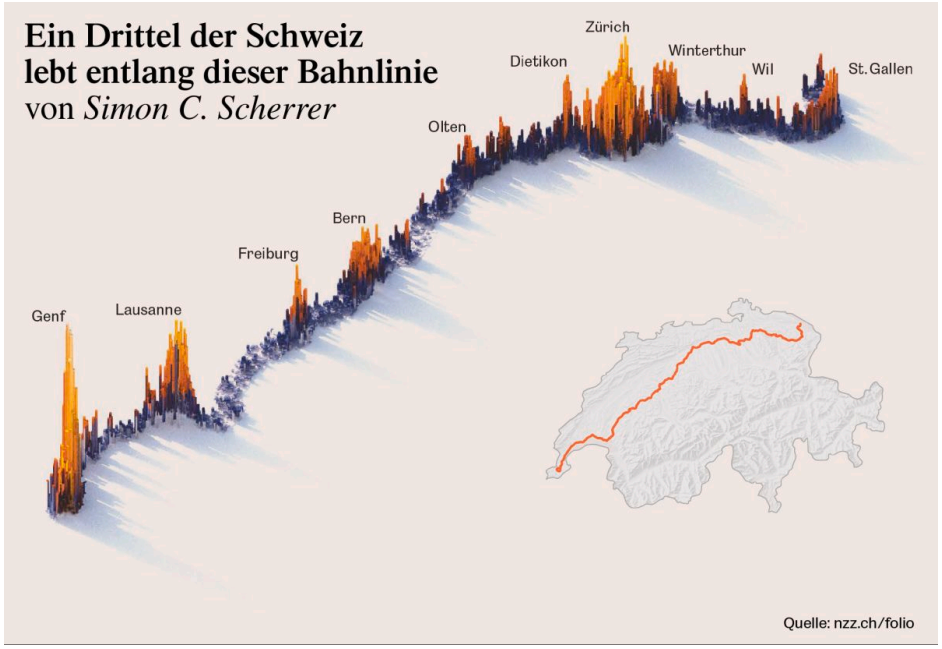
WIND TURBINES IN THE JURA MOUNTAINS.
Melanie Meyer, Nils Tamm, 2024.



WIND TURBINES IN THE ALPS.
Melanie Meyer, Nils Tamm, 2024.



WIND TURBINES IN THE PLATEAU
REGION. Melanie Meyer, Nils Tamm, 2024.

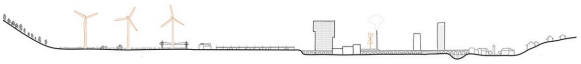


POPULATION DISTRIBUTION IN SWITZERLAND. NZZ, 2024.

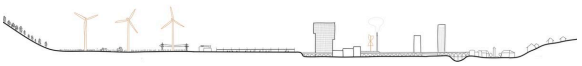
Moving Towards Metropolitan Areas

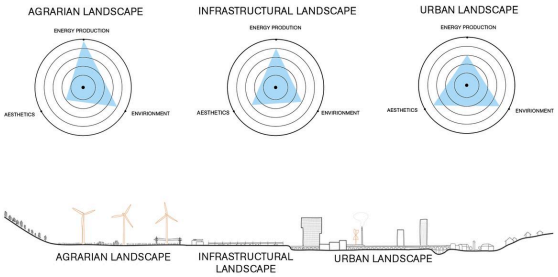


The idea of placing wind turbines in metropolitan areas and reinforcing the image of energy production where energy is primarily consumed inspires us to propose a shift in energy production strategies, aiming to offer a greater variety of energy sources. The rules suggested by R. Rodewald are applicable to the countryside. Therefore, we propose a complementary set of guidelines for the densely populated Swiss Plateau. Our project focuses on three sites in the Canton of Zürich where wind energy can be implemented. The three sites are chosen regarding their individual characteristics : agricultural, infrastructural, and urban landscape.



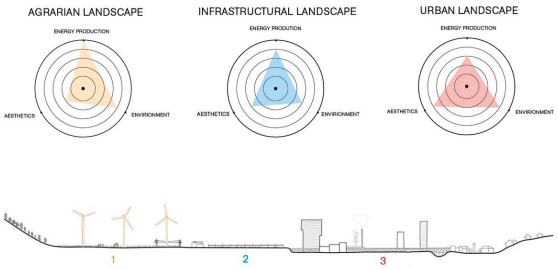
SECTION OF 3 SITES. Drawing
by Melanie Meyer, 2024.







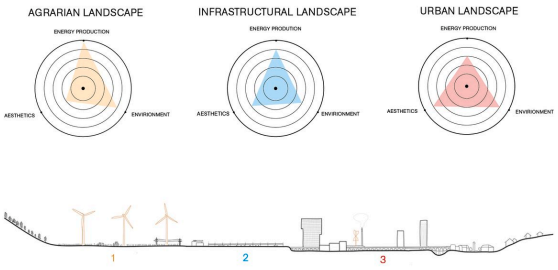
SECTION OF 3 SITES. Drawing
by Melanie Meyer, 2024.



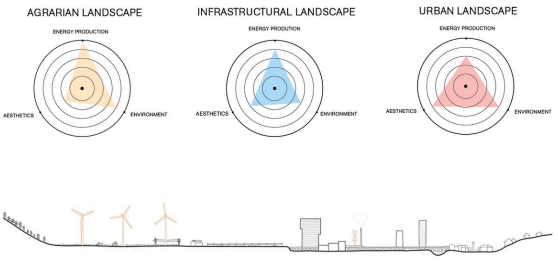
SECTION OF 3 SITES + BALANCING
PRIORITIES. Drawing by Melanie Meyer, 2024.



SECTION OF THE 3 SITES. Melanie Meyer, 2024.



SECTION OF 3 SITES + BALANCING
PRIORITIES. Drawing by Melanie Meyer, 2024.



SECTION OF THE 3 SITES + BALANCING
PRIORITIES. Melanie Meyer, 2024.

CASE STUDY ZÜRICH : 3 ALTERNATIVE SITES

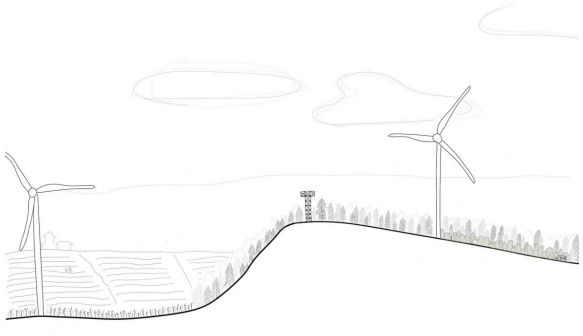
For our proposed sites in agricultural, infrastructural, and urban landscapes, we have assigned three distinct focuses: Energy Production, Aesthetics and Environment. Each site prioritizes these aspects differently, with varying weights assigned to each priority.

Energy Production is defined by the effectiveness of wind turbines in terms of their energy capacity, which correlates with their size and scale.
Aesthetics refers to the level of consideration required to integrate turbines into visually pleasing contexts.
Environment relates to the social, economical and ecological context. It encompasses the various synergies that can appear, beyond mere energy production.

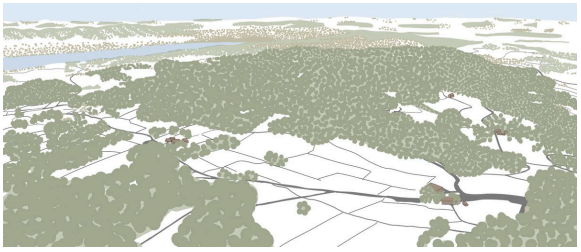
By prioritizing these aspects according to the specific characteristics and needs of each landscape type, we aim to develop a comprehensive approach to wind energy. The goal is to develop various benefits and increase the overall acceptance of wind turbines in Switzerland.

Agricultural Landscape: Pfannenstiel

A proposed site for a wind park by the Director of Construction of the Canton of Zürich, Martin Neukom, is Pfannenstiel. This area is characterized by forested areas and extensive agricultural land. Our proposal for this site diverges from Neukom's suggestion to place wind turbines within the forest. In order to mitigate deforestation, we advocate for locating the turbines in the agricultural land. By doing so, we utilize existing pathways for tractors and agricultural activities, thereby minimizing disruption to the forest ecosystem. Additionally, this approach presents an opportunity to enhance biodiversity by repurposing these pathways as ecological corridors with spaces conducive to supporting and promoting wildlife habitats.



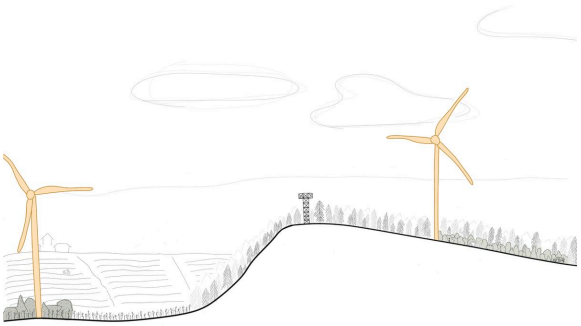
SECTION PFANNENSTIEL. Drawing made by Melanie Meyer, 2024.



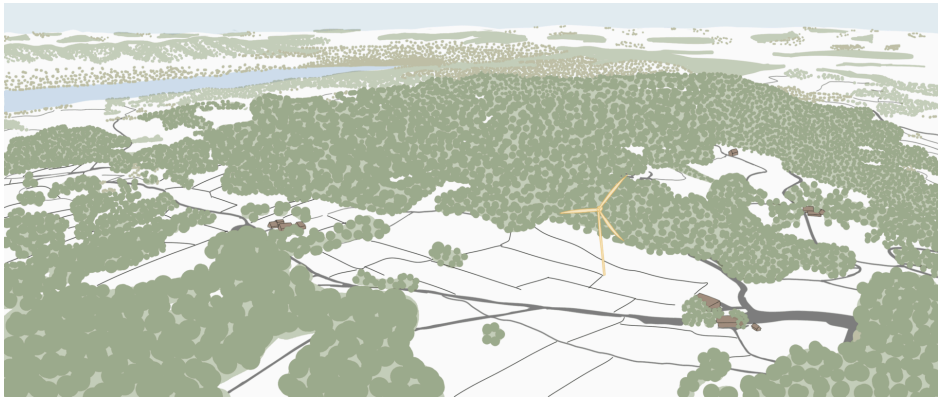
DRAWING PFANNENSTIEL. Drawing made by Melanie Meyer, 2024.



'SYNERGIES AROUND A WIND TURBINE'. Nils Tamm, 2024.



PFANNENSTIEL. Melanie Meyer, 2024.

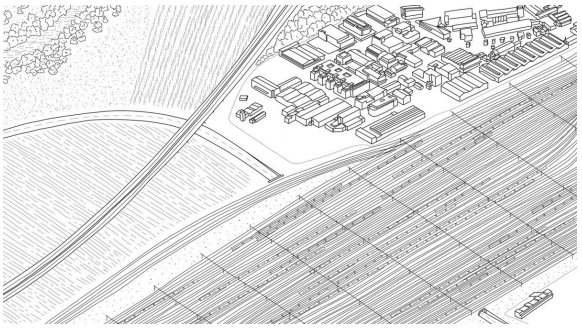


ALTERNANCE OF WIND TURBINES PLACEMENT. Melanie Meyer, 2024.

Infrastructural Landscapes: Spreitenbach

A relevant site for wind energy production could be Spreitenbach, which has significant existing infrastructure. This includes the largest train depot along the A1 highway and other railway lines, as well as prominent shopping centers like IKEA. Traditionally, a common approach in Switzerland has been to centralize infrastructure in one location, but this can potentially diminish the site's potential and result in negative perceptions.

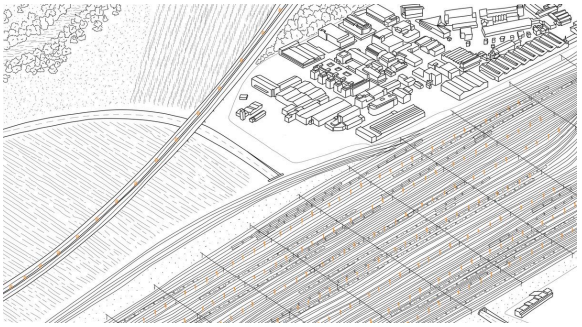
Our approach diverges from this convention by focusing on leveraging the inherent beauty of wind turbines to enhance the visual landscape. Instead of exacerbating any existing unsightliness, we aim to capitalize on the aesthetics of wind turbines to create a more pleasant view. Specifically, our proposal involves strategically placing small wind turbines along the highway and train tracks, enhancing the visual experience for travelers. These turbines would harness the speed of passing trains and cars to generate energy, simultaneously blending functionality with visual appeal.



AXO PERSPECTIVE SPREITENBACH.
Drawing made by Nils Tamm, 2024.



'VIEW FROM THE TRAIN'. Nils Tamm, 2024.

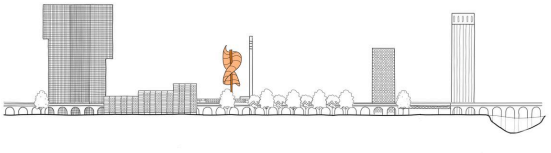


SPREITENBACH. Nils Tamm, 2024.

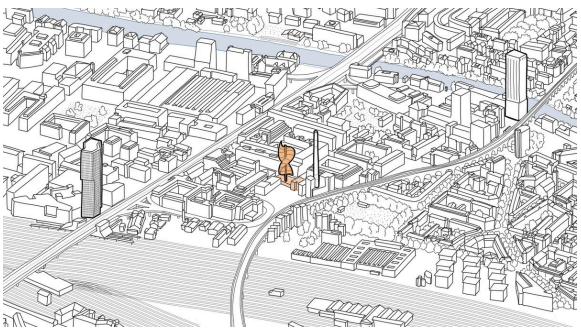
Urban Landscapes:
Zürich Industriequartier

The third site is located near Zürich Hardbrücke. We have chosen this site due to its proximity to existing scale of tall landmarks such as the Prime Tower, District Heating Chimney and the Kornhaus. This area, situated in Kreis 5, has a rich history of industrial buildings, making it a suitable context for incorporating a wind turbine.

We believe that a wind installation would complement the character of the industrial environment of this district. Our aspiration is that the presence of the wind turbine will be positively perceived alongside the other iconic landmarks of the city, contributing to a harmonious blend of architectural diversity and sustainable energy infrastructure.



SECTION HARDBRÜCKE. Melanie Meyer and Nils Tamm, 2024.



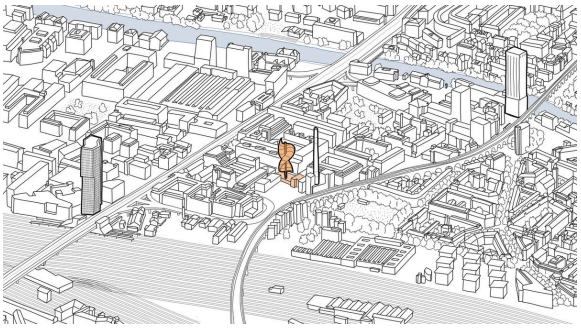
AXOMETRIC DRAWING
HARDBRÜCKE. Nils Tamm, 2024.



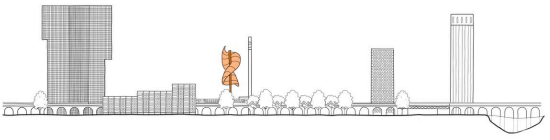
RENDER JOSEFWIESE. Nils Tamm, 2024.



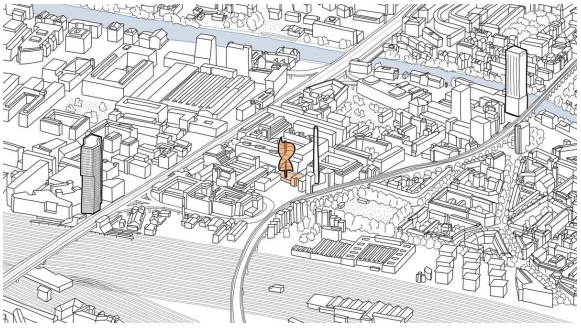
'JOSEFWIESE'. Nils Tamm, 2024.



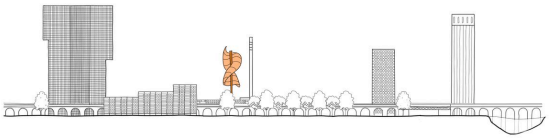
INDUSTRIEQUARTIER, Zürich. Nils Tamm, 2024.



SECTION INDUSTRIEQUARTIER.
Melanie Meyer and Nils Tamm, 2024.

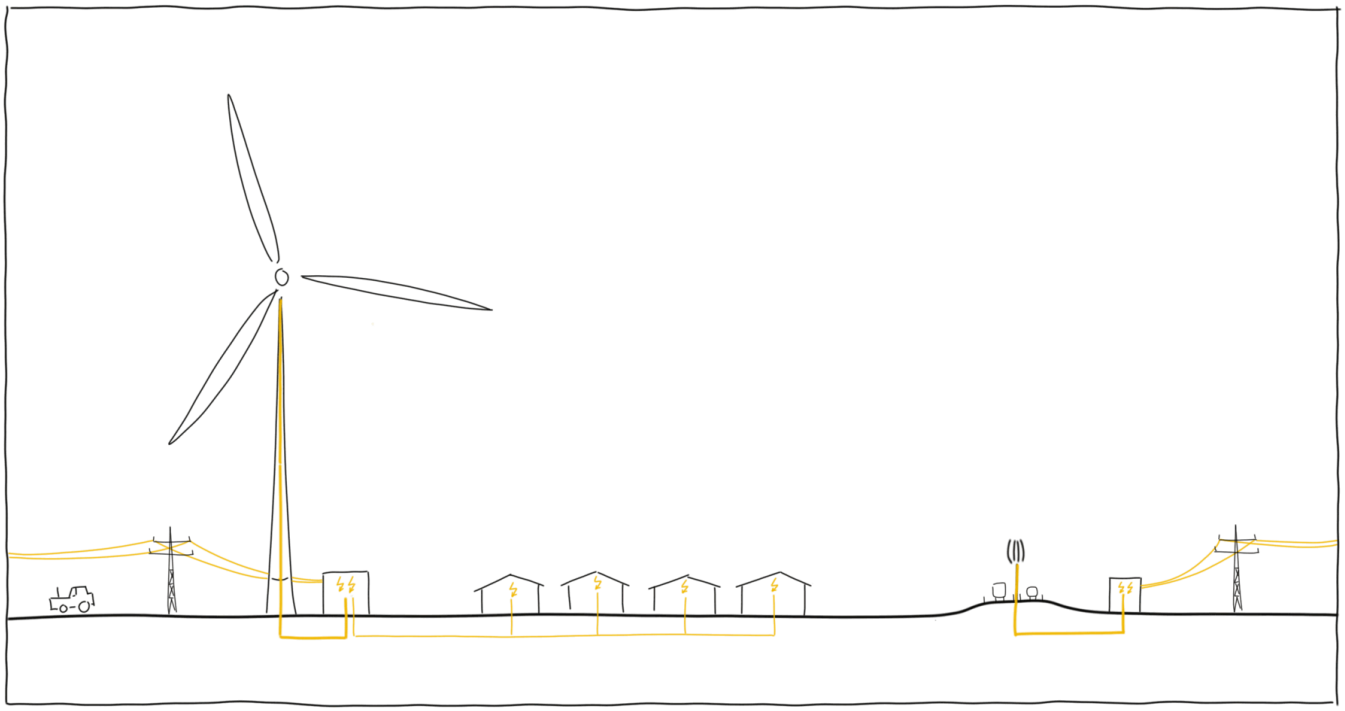


INDUSTRIEQUARTIER. Nils Tamm, 2024.

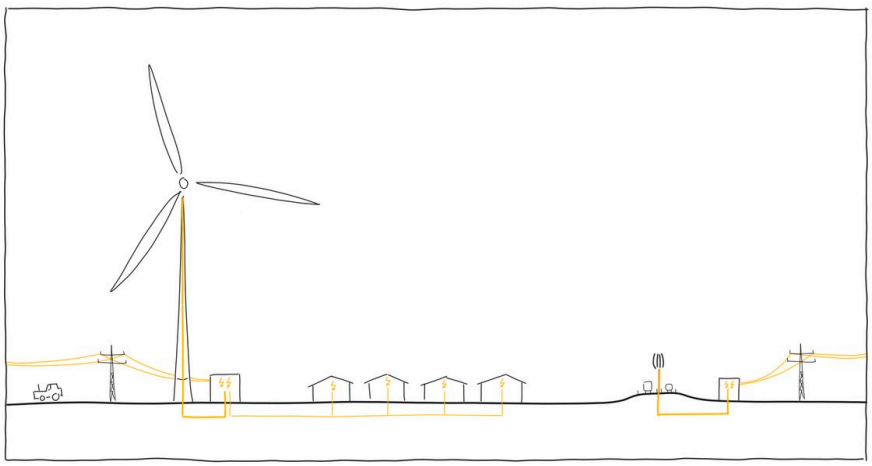


SECTION INDUSTRIEQUARTIER.
Melanie Meyer and Nils Tamm, 2024.

Guidebook

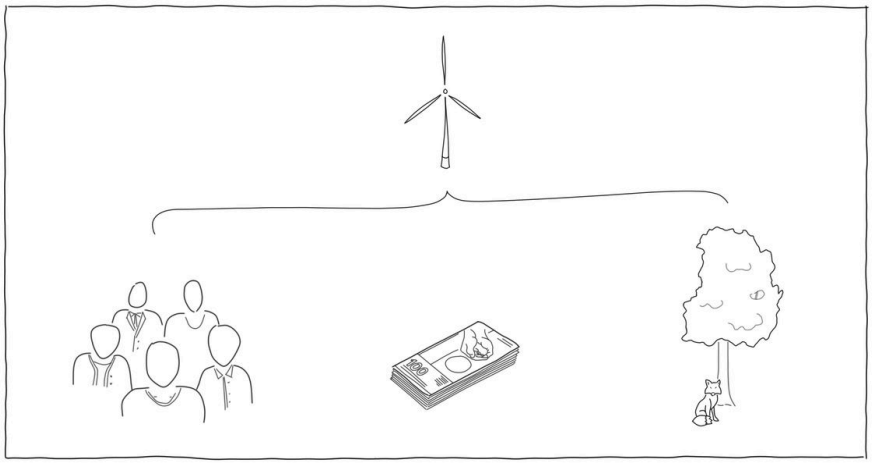


Our idea is to move towards metropolitan areas beyond our initial site proposals. That’s why we chose to create guidelines with three main priorities (Energy Production, Environment, Aesthetics). Since these sites vary significantly from one another, the importance of each criteria will differ across the sites.



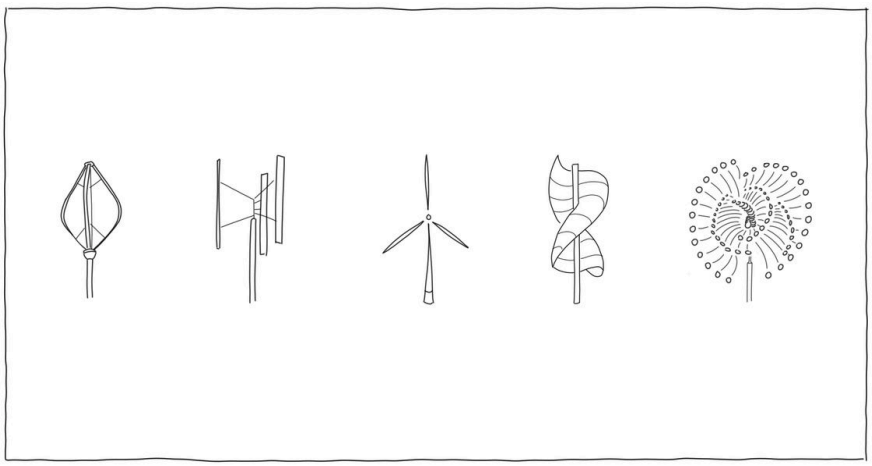
ENERGY PRODUCTION

The primary motivation for installing wind turbines is to generate energy. While we aim to install efficient machinery, we strive to minimize the impact on the landscape by avoiding the placement of excessively large machines in an environment where it does not fit from its context. Therefore, we suggest taking into consideration the existing heights of both built and natural structures in a sensitive manner.



ENVIRONMENT

The integration of a wind turbine should ideally provide *ecological, social, and economic* benefits in addition to energy production. In an agricultural landscape, wind turbines can create biodiverse hubs along the corridors, preserving these pathways as untouched nature for the next 25 years. In a city center like in Zürich, it can serve as a landmark.
Another crucial aspect for any project is involving local residents in the process. Gaining their approval and fostering their identification with the wind turbine are key elements for achieving successful synergies.



AESTHETICS

It is crucial not only to prioritize the most efficient and largest wind turbines, as they may disrupt the landscape and evoke negative perceptions of the region. It is imperative to think innovatively and explore alternative types of wind turbines, experimenting with various scales before proposing a final solution. As previously mentioned, involving local residents is important to obtain their approval, ensuring that the machine is aesthetically pleasing to those who encounter it in their everyday lives.

This work by Melanie Meyer and Nils Tamm was created as part of the design studio Kraftwerk Schweiz at ETH Zurich in Spring 2024. The PDF is intended for educational purposes only. Its commercial distribution is strictly forbidden.

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