



SWEET Call 1-2020: EDGE

Wind energy-policy and authorization procedures in Switzerland: Competences, duration and effectiveness

Complementary report on Milestone 8.3

Jonas Schmid and Isabelle Stadelmann-Steffen, University of Bern

October 2023

Table of contents

| | |
|---|---|
| Summary | 2 |
| Zusammenfassung | 3 |
| Résumé | 4 |
| Acknowledgement | 5 |
| 1 Introduction | 6 |
| 2 Policies targeting wind energy in Switzerland | 9 |
| 2.1 Policies on the federal level | 11 |
| 2.2 Policy instruments on the cantonal level | 16 |
| 2.3 Policy instruments on the municipal level | 19 |
| 3 Duration and effectiveness of authorization procedures | 21 |
| 3.1 Stages and duration of Swiss wind energy authorization procedures | Fehler! Textmarke nicht definiert. |
| 3.2 Policy-effects on effectiveness and duration of wind energy authorization procedures in Switzerland | Fehler! Textmarke nicht definiert. |
| 4 Conclusion | 27 |
| 5 Bibliography | 30 |



Summary

The starting point of this report is that the average duration of a wind project in Switzerland is predicted to be 15 years (Schmid 2023), while in Europe the average duration is only 3.5 years (Ceña et al. 2010). This empirical observation led to the guiding assumption tested in this report that procedural features and policies play a central role in the efficient and successful implementation of wind energy projects in Switzerland.

With the aim of empirically testing this assumption, the report starts with providing an overview of the federal distribution of competences in the field of wind energy and the policy landscape at the different levels of government (as of 2023), with a focus on incentive-based instruments and the regulation of wind projects. Concerning incentive-based instruments, the report shows that financial incentives for the promotion of wind energy in Switzerland are relatively small and largely limited to the national level. The cantons are even more reluctant to create financial incentives than is the case, for example, for electricity production from photovoltaics. This also means that smaller wind projects receive virtually no financial support. With regard to the regulation of wind projects, the conditions can be described as fragmented to the maximum. On the one hand, this fragmentation results from the legally required comprehensive balancing of interests between environmental, spatial planning and infrastructure interests, and on the other hand from the interaction of project characteristics with national, cantonal and partly even municipality competences and regulations. The consequence is that learning and synergy effects from previous procedures (i.e. from other cantons and municipalities) can hardly be created and used.

Thereafter, the report addresses the question of the effects of procedural design and policy on the effectiveness and efficiency of wind project procedures. Four factors are identified that are statistically associated with long low efficiency and low effectiveness: Efficiency (duration) is negatively influenced by the question of whether developers feel blocked by the development of the cantonal structure plan (CRP) and also by the extent of legal complaints by associations. The perceived effectiveness of the actors involved also correlates negatively with the extent of associational complaints, but also with the extent of coordination and assessment efforts of the federal government. It is also relevant that a concentrated procedure (e.g. parallel instead of sequential processing of the local land-use and construction phase) is not associated with a shorter duration or greater effectiveness.

Overall, the report supports and differentiates the demand for a simplification of the process for wind energy projects in Switzerland. The findings imply that such a simplification should also be accompanied by a certain standardization in order to trigger learning and synergy effects. In the area of financial support, the report shows that wind energy projects - compared to photovoltaics, for example - are less comprehensively supported. Particularly in the area of smaller wind turbines, this offers the potential to promote the energy transition even more broadly by including such turbines.



Zusammenfassung

Ausgangspunkt dieses Berichts ist, dass für ein Windprojekt in der Schweiz eine durchschnittliche Dauer von 15 Jahren prognostiziert wird (Schmid 2023), während in Europa die durchschnittliche Dauer nur 3,5 Jahre beträgt (Ceña et al. 2010). Diese empirische Beobachtung führte zu der in diesem Bericht getesteten Leitannahme, dass Verfahrensmerkmale und Policies eine zentrale Rolle für eine effiziente und erfolgreiche Umsetzung von Windenergieprojekten in der Schweiz spielen.

Mit dem Ziel, diese Annahme empirisch zu testen, gibt der Bericht zunächst einen Überblick über die föderalistische Kompetenzverteilung im Bereich der Windenergie und die Policy-Landschaft auf den verschiedenen Regierungsebenen (Stand 2023), wobei das Augenmerk auf anreizbasierten Instrumenten sowie der Regulierung von Windprojekten gelegt wird. In Bezug auf *anreizbasierte Instrumente* zeigen die Darstellungen in diesem Bericht, dass Anreizinstrumente zur Förderung der Windenergie in der Schweiz relativ gering und dabei weitestgehend auf die nationale Ebene beschränkt sind. Die Kantone sind noch bedeutend zurückhaltender in der Schaffung finanzieller Anreize als dies etwa in Bezug auf die Stromproduktion aus Photovoltaik der Fall ist. Dies bedeutet auch, dass kleinere Windprojekte praktisch keine finanzielle Förderung erhalten. Hinsichtlich der Regulierung von Windprojekten können die Bedingungen als maximal fragmentiert bezeichnet werden. Diese Fragmentierung ergibt sich einerseits durch die gesetzlich festgelegte umfassende Interessenabwägung zwischen Umwelt-, Raumplanungs- und Infrastrukturinteressen, andererseits durch das Zusammenwirken von Projektmerkmalen mit der Verteilung von nationalen, kantonalen und Gemeinde-Kompetenzen und Regulierungen. Die Folge ist, dass Lern- und Synergieeffekte aus bisherigen Verfahren (von anderen Kantonen und Gemeinden) nur schwerlich entstehen und genutzt werden können.

Daraufhin widmet sich der Bericht der Frage nach den Auswirkungen der Verfahrensgestaltung und -politik auf die Wirksamkeit und Effizienz von Genehmigungsverfahren. Dabei werden vier Faktoren identifiziert, die statistisch mit langer Dauer (geringer Effizienz) und geringer Effektivität (Wirksamkeit) einhergehen: Die Effizienz (Dauer) wird negativ beeinflusst durch die Frage, ob sich Projektentwickler durch die Erarbeitung des kantonalen Richtplans (KRP) blockiert fühlen, sowie ebenso durch das Ausmass von Verbandsbeschwerden. Die wahrgenommene Effektivität der beteiligten Akteure korreliert ebenfalls negativ mit dem Ausmass an Verbandsbeschwerden, aber auch mit dem Koordinations- und Beurteilungsaufwand des Bundes. Ebenso relevant ist, dass ein konzentriertes Verfahren (bspw. die parallele statt sequentielle Durchführung der Nutzungsplanungs- und Baubewilligungsphase) nicht mit einer kürzeren Dauer oder höherer Effektivität einhergeht. Insgesamt unterstützt und differenziert der Bericht damit die Forderung nach einer Prozess-Vereinfachung von Planungs- und Bewilligungsverfahren für Windenergieprojekte in der Schweiz. Die Befunde implizieren zudem, dass eine solche Vereinfachung auch mit einer gewissen Vereinheitlichung einhergehen sollte, um Lern- und Synergieeffekte anzustossen. Im Bereich der finanziellen Förderung zeigt der Bericht auf, dass Windenergieprojekte – etwa im Vergleich zu Photovoltaik – weniger umfassend gefördert werden. Gerade im Bereich kleinerer Wind-Anlagen ergibt sich daraus das Potential, mit dem Einbezug auch solcher Anlagen die Energietransition noch breiter voranzutreiben.



Résumé

Le point de départ de ce rapport est que l'on prévoit une durée moyenne de 15 ans pour un projet éolien en Suisse (Schmid 2023), alors que la durée moyenne en Europe n'est que de 3,5 ans (Ceña et al. 2010). Cette observation empirique a conduit à l'hypothèse testée dans ce rapport, selon laquelle les caractéristiques procédurales et les politiques publiques jouent un rôle central dans la mise en œuvre efficace et réussie des projets éoliens en Suisse.

Dans le but de tester empiriquement cette hypothèse, le rapport donne tout d'abord un aperçu de la répartition fédéraliste des compétences dans le domaine de l'énergie éolienne et de l'aménagement du territoire (situation en 2023), en mettant l'accent sur les *instruments basés sur des incitations* ainsi que sur la *réglementation* des projets éoliens. En ce qui concerne les instruments incitatifs, les présentations de ce rapport montrent que les instruments de promotion de l'énergie éolienne en Suisse sont relativement faibles et largement limités au niveau national. Les cantons sont encore plus réticents à créer des incitations financières que, par exemple, pour la production d'électricité photovoltaïque. Cela signifie également que les petits projets éoliens ne bénéficient pratiquement d'aucune aide financière. En ce qui concerne la réglementation des projets éoliens, les conditions pourront être qualifiées de fragmentées au maximum. Cette fragmentation résulte d'une part de la pesée des intérêts (fixée par la loi) entre les intérêts de l'environnement, de l'aménagement du territoire et des infrastructures, et d'autre part de l'interaction entre les caractéristiques des projets et les compétences et réglementations nationales, cantonales et parfois même municipales. Il en résulte que les effets d'apprentissage et de synergie des procédures antérieures (d'autres cantons et communes) ne peuvent que difficilement être créés et exploités.

Par la suite, le rapport se penche sur la question de l'impact de la conception et de la politique des procédures sur l'efficacité (durée) et l'efficacité des procédures d'autorisation. Quatre facteurs statistiquement associés à une longue durée et à une faible efficacité sont ainsi identifiés : L'efficacité (durée) est influencée négativement par la question de savoir si les développeurs se sentent bloqués par l'élaboration du plan directeur cantonal (PDC) ainsi que par l'ampleur des recours juridiques des associations. L'efficacité perçue des stakeholders est également en corrélation négative avec l'ampleur des recours des associations, mais aussi avec l'ampleur des efforts de coordination et d'évaluation de la Confédération. Il est tout aussi important de noter qu'une procédure concentrée (le déroulement parallèle plutôt que séquentiel des phases du plan d'aménagement local et la phase de permis de construire) ne va pas de pair avec une durée plus courte ou une efficacité accrue.

Dans l'ensemble, le rapport soutient et nuance l'exigence d'une simplification des procédures de planification et d'autorisation pour les projets éoliens en Suisse. Les résultats impliquent qu'une telle simplification devrait également s'accompagner d'une certaine uniformisation, afin de déclencher des effets d'apprentissage et de synergie. En ce qui concerne le soutien financier, le rapport montre que les projets éoliens sont moins bien soutenus que les projets photovoltaïques. Dans le domaine des petites installations éoliennes, il est donc possible de faire progresser la transition énergétique à une plus grande échelle en intégrant également ce type d'installations.



Acknowledgements

The research published in this report was carried out with the support of the Swiss Federal Office of Energy (SFOE) as part of the SWEET EDGE project. The authors bear sole responsibility for the conclusions and the results.

We thank Valentin Schneuwly, who has collected data on cantonal differences in planning policy. Furthermore, this report strongly draws from and relies on data from Schmid's (2023) dissertation. Especially the regulatory side is described in much greater detail in his dissertation. We also thank Gracia Brückmann who has provided valuable feedback on an earlier version of the report.



1 Introduction

In view of the climate change mitigation imperative of advancing the decarbonization of energy production, the Swiss Energy Strategy 2050 has foreseen the production of 4.3 TWh of electricity generated from wind turbines by 2050 (Prognos et al. 2011).¹ Compared to the production from wind turbines of 149.7 GWh in 2022 (provisional),² the factor of growth needed to achieve this goal is an astounding 28.7 – with 28 years to go. With regard to the technically realizable potential of 29.5 TWh (Meteotest 2022), the aim of the Energy Perspectives 2050+ targets only 1/7 of the potential. However, especially compared to PV, the deployment of wind turbines in Switzerland has been fraught with exceptionally complicated and long-enduring authorization procedures (Schmid 2023; Stadelmann-Steffen et al. 2018; Guy-Ecabert and Meyer 2016; Aemisegger and Marti 2021). Moreover, lacking community acceptance has been frequently documented and has triggered conflictual public debates (Vuichard, Stauch, and Wüstenhagen 2021; Vuichard, Stauch, and Dällenbach 2019; Stadelmann-Steffen and Dermont 2021; Walter 2014; Ebers and Wüstenhagen 2017).

It has been widely acknowledged that the institutional and policy context shapes deployment and acceptance. The Swiss wind energy context is “double-fragmented”: The first is that rules for wind energy-governance stem from multiple policy-fields (energy, spatial planning, environment), with each having a different competence distribution between the three levels of Swiss government. The second point of fragmentation is that cantons are generally in charge of implementing federal laws (Art. 46 Cst.), which means that those that implement are in most cases different from those that legislate. In principle, congruence between adoption and implementation competences exists for the cantonal legislation competences, unless these implementation tasks are delegated to private actors and/or a canton’s municipalities.³

Investigating the policy-context more deeply, it has been common to distinguish “incentive-based” policy-instruments from “regulative” policy-instruments. In the Swiss case, the Federation has legislated a wide-ranging program of renewable electricity promotion that includes, among others, feed-in-tariffs (FIT’s) and financial investment grants to wind turbines. Yet cantons and municipalities would in principle be free to define complementary or additional programs of support for electricity matters, as the competence of supporting renewable energies is shared (Schaffhauser and Uhlmann 2014; Müller and Vogel 2012). FIT’s and investment grants have served to make the production of electricity from wind turbines economically profitable. In absence of subsidies, following Broughel and Wüstenhagen (2022), electricity production from wind turbines could hardly be economic. Federal financial support has been paid through pay-per-kWh grid taxes and has therefore been paid by the electricity consumer, not the taxpayer. For the municipal programs, various financing models exist.

Plans and projects must comply with regulatory policy-rules from different fields (energy, spatial planning, environment) to operate a turbine and obtain an authorization. Economically, the operation of wind turbines is subject to the standard market regulations of electricity production (mainly StromVG, EnG and ordinances). In contrast to relatively simple economic operation regulation, the authorization procedure has been very complicated as a result of the fragmented competence distribution introduced above. Permitting takes multiple years (15 on average), requires strong coordination across and within levels of government, involves specialized agencies of cantons and of the Federation, but also puts high demands on the municipality, on whose territory the project is sited. Moreover, in the standard case, many mandatee offices, as well as many interest organizations are involved. Access vectors for organized interests to participate, but also to file legal complaints are manifold. The exact number of opportunities depends on the details of the authorization procedure, which is defined by the cantons. Schmid (2023) has identified a minimal number of one and a maximal number of seven opportunities

¹ The targets in the revised Energy Strategy, the Energy Perspectives 2050+, remain unchanged in this regard.

² <https://wind-data.ch/wka/list.php?lng=de>

³ Municipalities might also have such congruence in the domains where they can act autonomously, as defined by their cantons.

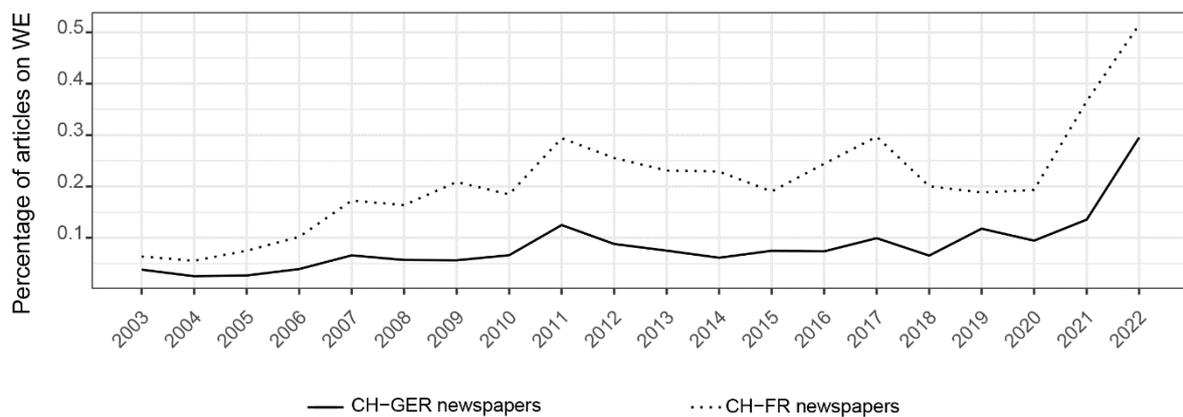


for legal cascades of complaints for a standard large-sized wind energy-project, depending on canton, project and time (legislation evolves).

In principle, projects that add renewable electricity-capacity, or even larger infrastructure projects more generally, are subject to the same legislation as wind energy-projects. Alpine PV-farms, for example, must undergo various stages in spatial planning (are also planned outside of dedicated construction zones), require grid access, have environmental impacts, are eligible for subsidies and are also governed by the Swiss laws setting up the electricity markets. Wind energy-projects differ from the average larger infrastructure with regard to two points mainly: There are many different environmental concerns to be addressed (flora, fauna, noise, light flickering, landscape, cultural heritage, etc.) that are not as prominent if the installations do not range 100-200m into the sky and have no moveable parts. The second difference is the disproportionately large and well-organized opposition to such projects.

The pressure to accelerate authorization procedures for wind energy-projects has been visible in the Federal parliament, where more than 35 parliamentary items of business on the topic have been entered since the popular adoption of the Energy Strategy 2050 in May 2017 and until the 1st of December 2022 (see Schmid 2023). On the cantonal level, there are similar levels of activity. The topic of wind energy has equally gained in public saliency: **Fehler! Verweisquelle konnte nicht gefunden werden.** below, using 11 German-speaking and 4 French-speaking Swiss newspapers, shows the percentage of articles about wind energy in comparison to all articles of the newspaper in each year from 2003-2022. Based on this graph, one can see that the saliency is larger in the Romandie (the French speaking part of Switzerland) than in the German-speaking part of Switzerland. The three peaks of 2011, 2017 and 2022 coincide with energy-related events: In 2011, the nuclear accident of Fukushima happened, in 2017 the Energy Strategy 2017 was voted upon and in 2022, the Russian War in Ukraine triggered an “energy crisis” based on fears of shortages of natural gas and very high energy prices.⁴ One reason for the difference in salience across the two largest language regions is likely due to the Romandie hosting many more projects than the German-speaking part. In the Romandie, about every 10th municipality is a host to a wind energy project, in the German-speaking part, it is about every 20th (Schmid 2023).

Figure 1: The saliency of the topic of wind energy in Switzerland based on data from 15 Swiss newspapers, 2003-2022, scraped from the Swissdox.ch-database.



Source: Schmid 2023.

Policies, together with physical prerequisites of wind speeds and territorial suitability, play a key role in shaping the deployment of wind turbines in Switzerland. Given the high public saliency of the topic, the political activity on accelerating the authorization procedure, as well as in view of ambitious growth towards the targets of the Energy Strategy 2050, a detailed mapping and analysis of wind energy policies is crucial. This report aims at fulfilling this by first giving an overview over the duration of wind

⁴ The smaller peak in 2019 in German-speaking newspapers only is likely to be due to the turnoff of the nuclear power plant in Mühleberg in December 2019 and because there were prominent debates about wind energy projects in Central and Eastern Switzerland.



energy-projects in Switzerland (chapter 2). Thereafter, the fragmentation of policies, competences across levels of government and between legislators and implementors is described by an overview over policies that target wind energy-authorization procedures in Switzerland (chapter 3). In the last chapter before conclusion, an evaluation of policy-effects on deployment efficiency (duration) and effectiveness is presented (chapter 4). Chapter 5 discusses implications and concludes.

2 Stages and duration of Swiss wind energy authorization procedures

Before one may investigate the policy-obstacles towards greater effectiveness of wind energy-authorization procedures, an overview over the procedure itself is required. **Fehler! Verweisquelle konnte nicht gefunden werden.** (below) summarizes the duration of Swiss wind energy authorization procedures graphically. It is based on Schmid's (2023) survey of all (n=85) authorization procedures for larger "regular"⁵ wind energy-projects in Switzerland (starting dates of projects included between 1998-2018, observation range: 1998-2022). Its purpose is to give an overview over the various planning stages and their duration. From bottom to top, the graph lists the different stages of large-scale wind energy-projects in Switzerland. As a benchmark for the start of the project, Schmid resorted to the dates of met mast authorizations and fixed this as a point of origin. He then counted the duration of each stage that follows thereafter compared to the mean duration of the previous stage in months. A positive number indicates that the decision of the subsequent phase happened after the decision of the procedurally earlier phase. A negative number indicates that the decision of the procedurally later stage happened before the (mean) decision of the procedurally earlier phase. If one takes the mean duration of all stages, a mean project including all stages would take 180 months or 15 years to get authorized. The estimate is imprecise due to multiple means-taking, but is the most reliable estimate of mean duration that exists in the Swiss literature that has otherwise relied on anecdotal evidence at best (Schmid 2023). In comparison to the mean authorization procedure of European countries of 3.5 years (Ceña et al. 2010), this is more than 4 times as long.

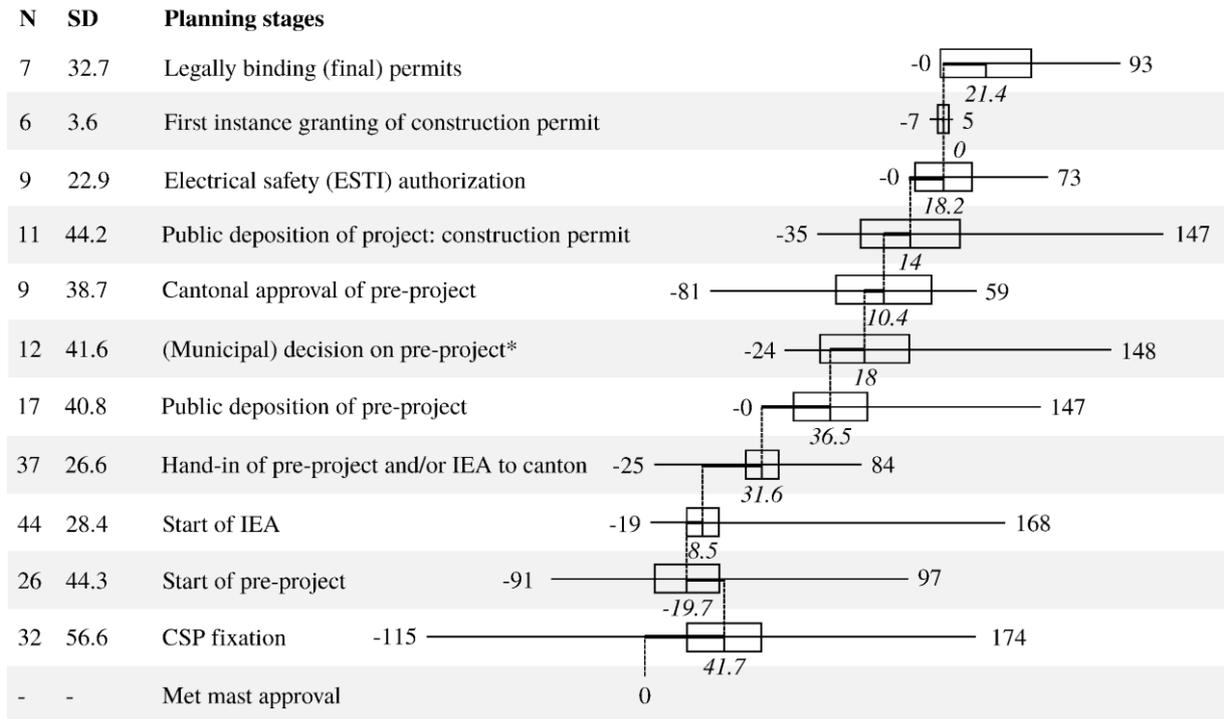
What is conspicuous when looking at the graph is that every stage can be short or long, with enormous extreme ranges on both sides. This is also the main point of the graph: An authorization procedure may take a long time at *any* stage in the procedure. This is support for the hypothesis that implementing wind energy-authorization procedures seem unique to the actors involved, especially to the cantons that are in the lead. The large differences in duration also point towards the issue of non-standardization of such procedures. Arguably, some intercantonal standardization with regard to the design and conduct of the procedure could arguably reduce some of the extreme points.

The generally long to very long duration of the procedure, also in international comparison, leads to the question of whether the fragmentation of policies, levels of government, as well as legislators and implementors contribute to these large differences in duration of each stage, and to the generally very long overall duration. The next chapter presents the policies and the policy-entanglement that target wind energy-authorization procedures in Switzerland and sheds some light on this question.

⁵ Household-sized turbines, as well as smaller turbines that apply for an exceptional permit (does not require cantonal structure plan fixation and no local land-use plan change) under Art. 24 RPG, are excluded.



Figure 2: Mean duration, confidence intervals and ranges of planning stages in Swiss wind energy-authorization procedures (in months).



Source: Schmid (2023). Stages are listed following the sequence of stages of the canton of BE. To the left of the name of the planning stage, the number under the heading of “N” shows on how many projects the graphical summary of the stage is based. SD presents the standard deviation in months. On the right side of the name of the stage, the lines and boxes indicate the following: To the left (negative number) the minimal extreme time point in months, compared to the mean duration of the previous stage, is shown. On the right end of the line, the maximum of the range is given. The numbers in italics (and the thick lines) indicate the mean duration of a stage. The boxes show the 95%-confidence intervals. For a detailed account, the reader is referred to Schmid (2023). *Mostly containing municipal assembly votes, but the cantonal land-use plan (CLUP) vote comprising multiple projects in the canton of NE is included as well.

3 Policies targeting wind energy in Switzerland

The aim of this section is to provide an overview of the policies governing wind energy-authorization procedures in Switzerland. In view of the energy turbulence resulting from the Russian War in Ukraine, the recently accepted revision of the Federal CO₂-Act, and a novel Federal Act targeting the acceleration of the authorization procedure (the so-called “Windenergieoffensive”) make for a very dynamically evolving policy-field. In consequence, changes to this policy overview are likely to happen rather sooner than later, even though this overview does not go beyond explaining the principles. These principles, especially the “fundamentals” in spatial planning regulation are not likely to be put out of force. What is much likelier is that other existing planning instruments, such as federal concepts (“Raumplanungskonzepte”) or sectoral plans (“Sachpläne”), are applied to selected priority projects.

Figure 3 follows the levels of government and the separation into promotional (incentive-based) fiscal and regulatory instruments. This categorization into promotional instruments and those that “regulate” the operation and construction of an energy technology has been usefully applied for other technologies (see e.g. Kirchgässner and Schneider 2003; Stadelmann-Steffen and Dermont 2018; Deroubaix and Lévêque 2006; Stadelmann-Steffen 2011; Vedung 2017). The distinction has also been used in the SWEET-EDGE White Paper on PV-policies in Switzerland (see e.g. Schmidt et al., 2022) and shall therefore be applied to the present case of Swiss wind energy as well. Whereas regulatory policies capture either the functioning of the market of electricity and rules the authorization procedure to build



and operate a wind turbine, the promotional policies denote only those schemes and programs that seek to incentivize the construction and operation by means of fiscal measures (premiums, tax reductions, etc.).

Regarding **fiscal incentives** to construct and operate wind turbines in Switzerland, several instruments of financial support and promotion have been available: Today, there are FIT's paid per kWh fed into the grid for older projects, and for new projects, lump-sum investment grants are available. For older and newer projects alike, tax breaks on different levels of government have existed, even though their scope and magnitude has changed over time. The main electricity-support program in support of wind energy is clearly situated at the federal level and provides FIT's and more recently, investment grants.

Concerning the **regulatory aspects**, with which compliance is necessary to obtain an authorization to build and operate a turbine, the market integration and operation of wind turbines have to be differentiated from policies that govern the siting and permitting of the turbines. Because market integration and operation are to a very large extent not wind-energy specific, but stem from the legislation regulating the production and trade of electricity and the use of the grid (as regulated chiefly in the EnG, StromVG and their ordinances), these policies are discarded from further description and explanation for the purpose of the present wind energy report.

Figure 3: Overview of policies governing the deployment of wind energy-projects in Switzerland.

| | Regulatory | Promotional |
|------------------------|--|--|
| Federal level | Spatial planning: Framework competence within DCZ* Exclusive competence outside of DCZ* Environment (narrow): Exclusive competence | Subsidies: Since 2009**: KEV/EVS Since 2018**: Direct marketing Since 2023: Investment grants Tax breaks |
| Cantonal level | <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> Implementation of federal (and own) laws: Special importance of the IEA </div> Spatial planning: Construction, design of authorization procedures Environment (broad): Forests, Hunting, etc. | Complementary or different subsidies possible Tax breaks possible |
| Municipal level | <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> Implementation and policy formulation role depending on canton </div> Spatial planning: Local land-use plan and/or construction permit, municipal building regulations Environment: - | Complementary or different subsidies possible, depending on canton and municipality Tax breaks possible, depending on canton and municipality |

Notes: The red boxes refer to governmental levels, the black vertical line separates regulatory policies (on the left) from promotional policies (on the right). **"DCZ" is short for "dedicated construction zones": These construction zones refer to delimited perimeters of land, on which construction is allowed and regular cantonal construction laws apply. **These federal subsidies continue to run depending on the contractual timespan of support. New projects cannot apply for these subsidy instruments.

In what follows, this chapter follows the structure of figure 3 and sequentially describes and explains the relevant policies on the federal level, followed by policies on the cantonal level and on the municipal



level. It further divides the discussion on policies of each level of government into the distinction of promotional and regulatory policy-instruments. Moreover, the chapter further accounts for the distribution of policy-competences between differences in implementation versus legislative competences.⁶

3.1 Policies on the federal level

Promotional policy

There are two instruments on the federal level that incentivize the adding of wind energy capacity: The first is a **subsidy scheme** and the second is a tax break. Regarding the former, there has been some evolution of instrument design over time. Starting in 2009 – rather late in comparison to Germany that started an expansion scheme in 2000 (Haelg et al. 2022) – developers of wind energy-projects of any size could apply to get fixed-price⁷ feed-in-tariffs (see EnV). This scheme was called “Kostendeckende Einspeisevergütung – KEV” and initially provided FIT’s for a duration of 20 years after the start of operations. With the novel “Energy subsidy ordinance” of the 01.01.2018 (EnFV), it was however reduced to 15 years for subsidy contracts that had been signed 2018-2022. More encompassing, however, were changes in the Federal Act on Energy (EnG) that came into force at the same time and changed the “system” of the subsidy-regime. New applicants for wind energy projects above 100 kW in installed capacity (that is, every modern, industrial-sized wind turbine) began to be obliged to sell their electricity directly on the market (“direct marketing”) and instead of receiving a fixed FIT, operators received the difference between quarterly set reference market prices and the contractually guaranteed FIT-amounts. Turbines smaller than 100 kWh of installed capacity were still eligible to apply for feed-in-tariffs without needing to switch to direct marketing. The system changed again in 2021, when it was decided that wind energy-projects seeking subsidies starting from 2023 and until 2030, could receive up to 60% of eligible investment costs, while the KEV was abolished. Thus, there was a pivot of subsidies to investment grants instead of supporting each produced kWh. To be eligible to receive them, however, a turbine must have an installed capacity of at least 2 MW (see EnG and EnFV). Novel wind energy turbines below this installed capacity will not be subsidized anymore, as the KEV-system providing FIT’s stopped taking applications officially in 2022. In reality, however, given limited funds, the KEV-system had to halt accepting wind turbine applications already in 2020 due to backlogs and waiting lists.

Concerning the amounts of subsidies allocated to wind energy-projects, a bird’s eye view on the relative importance of wind energy-projects with regard to subsidies for all other technologies of RE-capacity is necessary: Figure 4 below does this. It compares subsidies for the technologies of biomass, photovoltaics (PV), hydroelectric plants and wind turbines for the years 2011-2022, i.e., including the different subsidy schemes describe before. It shows that wind turbines have been subsidized with only a small fraction of overall public (federally collected) funds directed at incentivizing renewable energy production. This is not surprising, given that there are so few turbines that are operational (41 large-scale turbines at the end of 2022⁸) and until 2022, payments have only been made to operational projects. The graph shows that PV subsidies have represented the largest share in funding across the years. In the peak year of 2020, public spending on renewable energy subsidies amounted to CHF 982 Mio. Federal subsidies for wind energy over the years have fluctuated between CHF -9.1 Mio (2022)⁹ and CHF 21.6 Mio (2019). The mean annual federal subsidies to wind turbines amount to CHF 11.2 Mio (SD 7.4 Mio). In total, CHF 134 Mio of public subsidies have been directed at wind turbine operators, which represents 2% of the total subsidies of CHF 6’851 Mio (2011-2022). The number of turbines that are publicly supported by the federal scheme between 2011-2022 ranges between 16 (2012) and 43

⁶ The latter accords the competence to formulate and adopt changes in pieces of legislation that do not result from administrative discretion of implementation.

⁷ A difference between small turbines (<10 kW installed capacity) and larger turbines (>10 kW installed capacity) was made. For the smaller turbines, the feed-in-tariff remained fixed across the duration of the subsidies-contract. For the larger ones, the tariffs were revised and adapted to market conditions every five years (see EnV-old).

⁸ <https://wind-data.ch/wka/list.php>

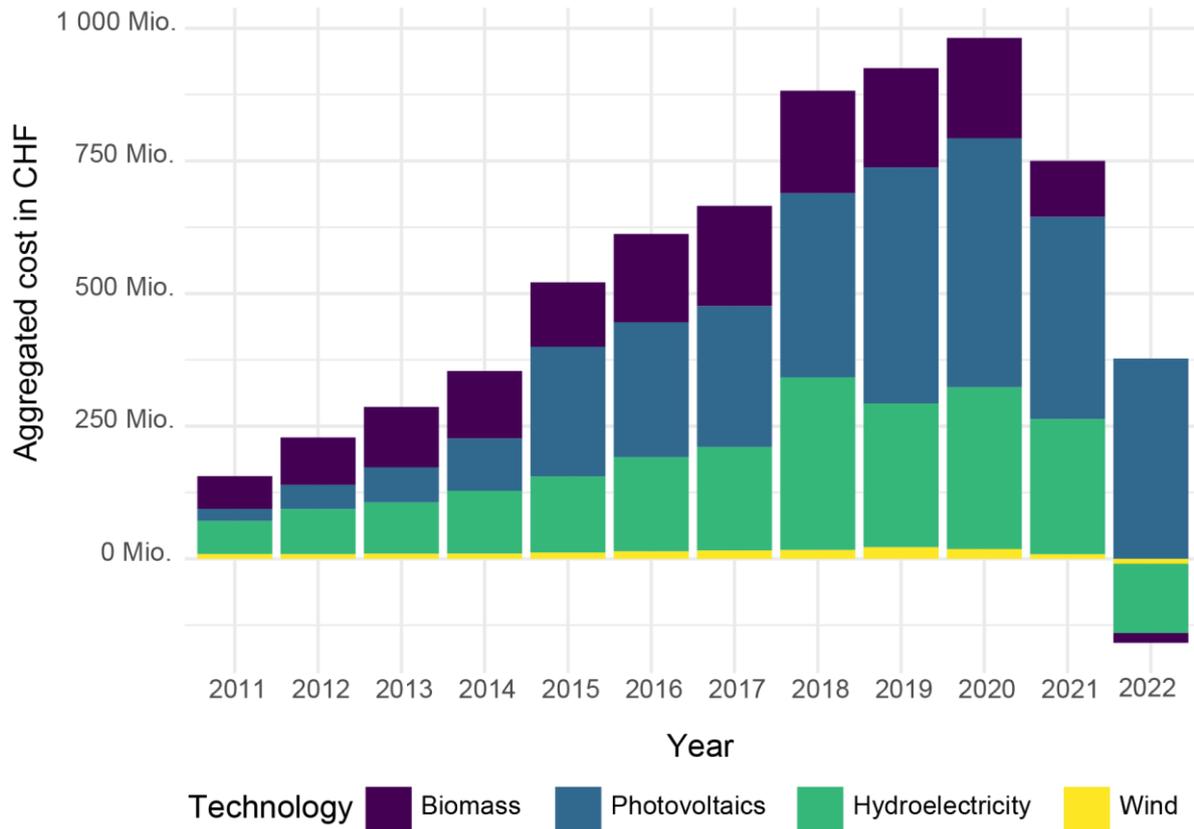
⁹ Total net amount of the year 2022. If the market reference price is higher than the guaranteed FIT-amount, operators/owners in the KEV/EVS-scheme must pay back the difference to the Fund (see paragraph below).



(2021). Between 2011-2022, there have been 4-9 turbines per year with an installed capacity of smaller than 100 kW that have received FIT's, all others had a larger installed capacity. This means that with the legislative change from 2018, requiring larger projects to direct-market their electricity, most projects fell under this rule and had to change to the direct-marketing model in 2018. Because of their smaller size, 34.5% of turbine-years of financial support would not have been paid if the current mix of turbines had applied under the current eligibility criteria for investment grants.

The year 2022 shows a particularity: All technology subsidies except for PV (lump-sum payments) have received negative net totals of subsidies. This overall negative effect is driven by the KEV-system subsidy contracts that entered into force between 2009-2022.¹⁰ These negative "contributions" resulted from the fact that electricity prices in 2022 have been very high due to the Russian War in Ukraine. By law, if the reference market price is higher than the feed-in-tariff, the difference is invoiced by the organization in charge of managing subsidies fund (Pronovo). It is for this reason that in 2022, the operators of wind turbines that are enlisted in the public support scheme, have paid "back" to the fund CHF 9.13 Mio, which is more than they received in three out of the twelve years measured (2011-2022).

Figure 4: Federally administered subsidies 2011-2022, including fixed feed-in-tariffs (KEV/EVS 2009-), single subsidy payments (EIV 2014- for PV, GROWA 2018-) and market-adjusted FIT's (2018-) for renewable energy production plants.



Source: BFE 2023a; 2023b; 2023c.

Importantly, these federal subsidies are not paid as a regular Federal budget item. Rather, following Art. 37 EnG, a special fund has been created that used to be managed by the transmission grid operator and owner Swissgrid (formerly part of the Federal Department of the Environment, Transport, Energy and Communications DETEC) and was handed over to a 100%-Swissgrid subsidiary called Pronovo starting in 2018. The fund created a special grid usage surcharge ("Netzzuschlag") that is paid by

¹⁰ In this period of time, lump-sum payments were only available for PV. Operational wind energy-projects may only receive lump-sum payments starting in 2023, and for the time being, until 2030.



electricity consumers, not producers, per kWh consumed. Hence, it is not the taxpayer that finances this fund, it is the electricity consumer. The surcharge amounts to maximally 2.3 cents per kWh consumed. The maximal amount of 2.3 cents per kWh has been charged since 01.01.2018.¹¹

In addition to incentivizing the deployment of wind turbines via grid-tax based subsidies, the Federation also allows the **deduction of private investments into renewable energy production systems (heat and electricity) from the Federal income tax**, but only for natural citizens, individual companies (“Einzelunternehmen”), collective business partnerships (“Kollektivgesellschaft”) and limited collective business partnerships (“Kommanditgesellschaft”). These legal entities, most relevant of which are the natural citizen-houseowner, might invest in small installations such as roof-attached or “garden-sized” wind turbines. Such investments for these types of entities count as a “measure towards the rationale energy consumption of technical house facilities” (Art. 1 lit. b para. 4 fn. 3 Verordnung über die Massnahmen zur rationellen Energieverwendung und zur Nutzung erneuerbarer Energien) and are therefore tax-deductible. However, only those costs that are not being subsidized may be deducted (Art. 1 para 2 Liegenschaftskostenverordnung). Such investments are equalized to measures of maintenance (value preservation of the property) even though these investments increase the value of the property (Art. 32 para 2 DBG) and would therefore generally not be deductible if it were not for the exception for renewable electricity/heating installations. These investments are deductible only in the year, in which they are invoiced. Owning and operating larger wind turbines is subject to the taxation on economic profits of judicial persons, i.e., limited liability companies (“GmbH”) and stock corporations pay a tax of 8.5% on their profits per year (Art. 49ff. DBG). Because profit taxes are based on an annual earnings statement (“Erfolgsrechnung”), the question of investment deductibility becomes one of where investments enter either earnings or expenses: Parts of investments might enter the expenses as part of depreciated assets in subsequent years of operation, another part might enter the earnings if the investment pays interests in the tax-year. The deduction of renewable energy investments in company’s profit taxes on the federal level is therefore not generally possible as it is for federal income taxes.

Regulatory policy

In Switzerland, the marked specificity of wind energy regulation lies in the difficulty of constructing and operating wind turbines.¹² The authorization procedure¹³ of wind turbines checks the legal compliance of an encompassing set of physical, territorial, environmental, and technical aspects of a wind energy-project. Because each location requires the checking of a different set of aspects to reach compliance, and each canton foresees a different succession of formal planning steps, this results in an almost “unique” authorization procedure for each project. There are still larger commonalities, however, because wind turbines require the building of a large tower with a stable foundation, on which – put simply – a three-blade rotor with a moveable generator-encasing is mounted. For this reason, it can generally be maintained that the construction and operation of wind turbines is subjected to a conglomerate of land-use, environmental, infrastructure assessments and procedural coordination. These shall now be elaborated in turn.

Spatial planning - phases

Regarding spatial planning, the Swiss constitution accords the Federal level the framework legislative competence (Art. 75 BV). This means that the Federation defines the principles and leaves all the specifics – and therefore much space to legislate to the cantons. However, this distribution of competences is only valid for planning instruments and construction *within* dedicated construction zones. Outside of these regular construction zones, however, legal scholars have universally

¹¹ www.strompreis.elcom.admin.ch

¹² I argue that general principles and rules governing the functioning of the electricity market and the grid (EnG and its ordinances, StromVG and its ordinances) are not relevant to wind energy deployment and shall therefore be excluded for the purpose of the present report. These general conditions also apply to all producers of electricity, including those that harvest any other primary energy source. Hence, they are not specific to wind energy and shall also be excluded from present considerations for this reason.

¹³ The construction permit also serves as an operation permit.



acknowledged that the Federation retains an exclusive legislative competence, with only few exceptions (Griffel 2017, 14). Given that larger wind turbines are located most often outside of regular construction zones (Aemisegger and Marti 2021), the Federation has predominantly set the rules, even though it leaves ample implementation room for procedural design to the cantons. A second spatial criterion that determines the basic setup of wind energy-authorization procedures is whether a wind turbine may be considered as compliant with the zoning requirements or not. Turbines that are larger than “garden-sized” or roof-attached will in most cases not conform with the zoning requirements.

For these (very) small turbines, essentially a special option exists that simplifies the procedure: A special permit may be granted (“Ausnahmebewilligung”) following Art. 24 RPG if the project pertains to a specific site (“standortgebunden”) and if there is overwhelming public interest to construct it at this site (Abegg and Dörig 2019, 39). This procedure fully replaces the authorization procedure in regular construction zones. As federally defined, the actual conduct of the special permit procedure is handled by the cantons, with some cantons outsourcing it to (larger) municipalities. As a rule of thumb, it can be said that projects that require an integrated environmental assessment (IEA) and prior anchoring in a Cantonal Structure Plan (CSP, “Richtplan”) are not eligible for such a special permit. An IEA is necessary if a project’s turbine(s)¹⁴ reach more than 5 MW of installed capacity (Annex 21.8 UVPV). Prior anchoring in a CSP is necessary if the turbine has a total height greater than 30m (ARE 2020). Industrial-sized wind turbines that tend to be higher than 120m in total height, will reach this threshold easily.

Industrial-sized projects will thus meet all thresholds that prohibit the application of the special permit procedure, requiring the conduct of a “regular” procedure instead. For these larger turbines, a three-phase planning becomes necessary: First, an anchoring in the CSP is required. Second, a project-specific (local) land-use plan (LLUP) (“Spezialbauzone”) follows, which may either run in parallel or take place before a third phase, the construction procedure.

Spatial planning – interest balancing

Having reviewed the sequences of planning stages, it is now time to turn the attention to the function of spatial planning, which is, the balancing of diverse sets of interests that meet a construction project. These interests are defined in many different pieces of legislation, which are adopted and implemented by all three levels of Swiss government. In principle, the regular planning sequence (CSP → LLUP → construction procedure) foresees a “funnel of concretization” of interest-balancing (“stufengerecht”): Whereas on the CSP-level, principles and territorial strategic interests are balanced with each other, the LLUP goes more in detail, and the construction procedure plans the final and conclusive details. The aim of this funnel is that more fundamental issues are addressed prior to addressing details. Still, for wind energy – and this is a problem – this does not mean that all controversial issues are finalized in the CSP already. The exact territorial location, for example, is fixed only in the LLUP, as is the turbine type, exact height, rotor blade lengths, etc. Furthermore, what makes it more complicated is that the balancing of interests is generally not done/received by the same authorities for each phase, and each is based on different pieces of legislation. What is more, frequent judicial litigation leads to additional interest balancing in courts, in up to three judicial instances per window for complaints.

Federal interests to be balanced

The Federal interests with regard to wind energy interest balancing are mainly “environmental” and “infrastructural”. To give the reader an overview of what they are, a list based on ARE (2020) and Schmid (2023) shall be provided, along with some explanations on the major points. Conforming to the idea of a “funnel of concretization”, these should be mainly (“schwergewichtig”) balanced on the level of the

¹⁴ The federal concept of wind energy foresees a principle of concentration of at least three turbines that should be constructed together for reasons of proportionality of environmental impact and energy benefit (ARE 2020). Not all cantons have translated this into their CSPs, leaving the concentration procedure non-implemented for the moment.



CSP. Federal environmental interests that need to be balanced with the interest of society and the developer for a wind turbine, are mainly the following:

1. Noise emission on the nearest inhabitants (Art. 7 and annex 6 LSV)
2. The “character” of the local landscape (Art. 3 NHG)
3. Forests (Art. 5ff. WaG)
4. Local fauna, mostly birds and bats (Art. 1, 7 and 11 JSG, Art. 14 and 20 NHV)
5. Federal protection inventories regarding landscape and natural monuments (Art. 5ff. NHG, VBLN)
6. Built heritage sites and historic transport routes (Art. 5ff. NHG, VISOS, VIVS)
7. UNESCO World Heritage sites
8. Protected territories such as water, peatlands, natural parks, biotopes, wildlife corridors, among others (Ramsar-convention, GschG, NHG, JSG, KGSG, WRG, Päv)

There are two permits that are accorded by the canton (based on federal legislation) that stand out among these many environmental considerations. A forest clearance permit (Art. 5ff. WaG) has shown to be necessary in almost two-thirds of projects (Schmid 2023). The Federal Office of the Environment (FOEV) must be heard if the clearance projected exceeds 5'000m². In case the project seeks to site a turbine in a water protection zone, a permit would be needed (Art. 19 para 2 GschG, Abegg and Dörig 2019, 42). Schmid (2023) reported that almost half of all projects in Switzerland needed such a permit, but also argues that this is likely strong overreporting.¹⁵

In addition, many Federal infrastructure interests also need to be accounted for. These are mainly the following (ARE 2020; Schmid 2023):

1. The proximity to federal planning corridors (e.g. SÜL, FFF)
2. Civil air traffic obstacles and/or radar impact (Art. 41 para. 1 LFG)
3. Military aviation and military equipment (MG, Art. 9 Anlagenschutzverordnung, Art. 66 VIL)
4. Meteorological instruments (WMO-GL, Art. 1 MetG)
5. Radio relay corridors (FMG)
6. Installation safety (EleG, VPeA)

When making a siting decision, these six infrastructure criteria need to be considered, each of which is governed by separate rules. The closeness of the location for turbines and their impacts on federal planning corridors concerns mainly the grid (needs access) in the federal planning corridor for transmission lines (SÜL), but also for arable agricultural lands (FFF). Additionally, because of their height and the rotation of the rotors, wind turbines may present obstacles to airplanes and helicopters and disrupt location tracking (radar) and guidance of airplanes (instrument landing systems). An aerial obstacle permit by the Federal Office of Civil Aviation (FOCA) is necessary if the turbine has a total height of greater than 60m. If the turbine cuts through an aerial safety zone, additional planning measures are necessary. The FOCA consults Skyguide, the Swiss aerial traffic control, and the Swiss military before it hands out such an aerial obstacle permit and they decide in concertation. If it penetrates a safety zone, additional planning requires the inclusion of the municipality and potentially a LLUP-change of the safety zone. Radio relay corridors and the communication of meteorological instruments in Federal possession present further location selection issues. Generally, all electrical installations that reach an apparent power of larger than 1'000V AC (Art. 3 para. 8 SwSv and Art. 3 para. 13 StSv ordinance) further require a Federal planning permit that certify their safety (Sec. III lit. b EleG and VPeA). While this permit is a comparably small procedural effort on behalf of the developer, it also opens a formal window for legal complaints if it is left uncoordinated with the construction permit.

Coordination aims

¹⁵ The overreporting might stem from the fact that assessments on impacts on waterways are often mandatory within IEA-assessments, and developers might confuse a permit that is required for construction in protected zones, with IEA-waterway assessments.



Following Art. 25 RPG, the necessary permits for a project (water, forest, safety, etc.) need to be coordinated with the construction permit and they cannot contain material contradictions. This coordination clause also maintains that the permits should be handed out simultaneously, if possible. In practice, however, the simultaneous coordination is not always feasible. The primary aim of this coordination is to allow a purposeful construction: For example, being allowed to install a transmission line in the ground without being able to excavate first does not make sense from a construction point of view.

A second aim of the coordination clause is that the legal procedure in case of objections and later complaints can be coordinated. If there is a lack of coordination, then a substantial delay in the authorization procedure is to be expected. In the field of Swiss wind energy, policy indeed is often set by judicial decrees, for two reasons: First, the difficulty of balancing interests inherent to larger infrastructure projects is a likely cause of legal complaints. The second is that the authorization procedure is still “experimental” to many cantons, municipalities and the Federation, given that some cantons have not yet led a single authorization procedure and many of those that have, had one or two (except VD, BE, VS, see Schmid 2023). As Switzerland is not a common, but civil law country, the question of whether court decisions are policy (“rechtsetzend”) would formally need to be negated. However, previous judicial decisions still serve as an inspiration to decide when a similar question appears the next time in a litigation.

3.2 Policy instruments on the cantonal level

Incentive-based policy

While cantonal legal competences in the domain of energy are primarily centered around buildings (Art. 89 para 4 BV), the Federal level is accorded the framework competence (Art. 89 para 2 BV). The competence of promoting new energy technologies (Art. 89 para 3 sentence 2 BV) is shared (Schaffhauser and Uhlmann 2014; Müller and Vogel 2012).

Regarding subsidies, cantons would be free to define additional measures of financial support. But only the canton of TI explicitly subsidizes the production of wind energy.¹⁶ The instrument is targeted to be complementary to the federal subsidies. As the federal investment grants are unavailable for new wind energy-projects below an installed capacity of 2 MW and small turbines cannot receive a federal subsidy anymore (as of 2023, except currently waiting or running KEV/EVS-contracts), the TI-subsidy is eligible to household/garden-size or slightly-larger-than-household, but not industrial-sized turbines. The amount of the lump-sum payment refers to 20% of the total subsidy that could have been received under the Federal KEV/EVS-system, or maximally CHF 500'000 (Art. 25a para 1 RFER-TI).

The canton of GE has put together two different “residual” programs of fiscal support that do not mention a specific technology, but could potentially also incentivize the construction of wind energy-projects. The first is a category containing “other technical installations”, where up to 50% of the investment cost can be covered depending on reduced CO₂ or saved kWh of electricity. A second residual category is designed to support “strategic projects that allow for the reduction of CO₂”. These could also potentially be open presumably for larger wind parks on the GE-territory, but maybe also for individual installations on the household-level (see GEnergie 2023).

Notably, the other 24 cantons do not foresee cantonal subsidies to wind energy projects in addition to the existing Federal ones. This is likely the case because the cantons concentrate on their core tasks in energy matters, namely buildings. In such a reading, they leave incentives to renewable energy-projects, other than those that are integrated in buildings (e.g. PV), to the Federal level. In more critical terms, one could argue that cantons view the existence of Federal subsidies as an excuse “to not do anything”

¹⁶ See the database of www.energiefranken.ch



(see Schmidt et al., 2022). In other words, the existence of Federal subsidies also presents a negative incentive for cantons to actively design their own subsidy-programs.

In contrast to the very scarce cantonal subsidy programs, all 26 cantons allow and foresee deductions to the cantonal income tax in cases of wind energy investments by those legal entities that are taxed on income (mainly natural persons). Some cantons apply the same rules as for the federal income tax (AI, GR, JU, SG, SH, SO). The cantons of AG, AR, BE, BL, BS, FR, GE, GL, NE, NW, OW, UR, VD) grant a deduction for household-sized wind turbines if they provide the electricity used for heating. To what extent there must be a direct, physical connection between a heating system and a wind turbine is not clear (not least because this deduction case being largely hypothetical as of today). Still other cantons have not defined in their dedicated documentation, whether they would grant a deduction for a private (garden- or household-sized) wind turbine. In these cantons (LU, SZ, TG, TI, VS, ZG, ZH), the technologies are not mentioned, leaving the question of tax deductions on household-based wind energy development open.

Concerning the deductible amount, there are differences across cantons in what year which proportion of amounts are deductible (years of invoices received or paid, start date of operations, finishing of construction works). Yet in all cantons, 100% of investments into renewable electricity generation, if tied to a heating system, are deductible.¹⁷

Regulatory policy

The authorization procedure – assessing and producing the permits necessary for the construction and operation of a wind turbine – is predominantly a cantonal matter. As mentioned, they are charged with implementing most federal legislation, in addition to formulating and implementing their own. Following Schmid (2023), cantonal differences regarding the authorization procedure of a turbine in a location that requires the maximally possible number of (standard) permits can be summarized into decisions on 18 criteria. These are implementation decisions of Federal and cantonal legislation. The differences, primarily to be found in spatial planning, are the following:

1. Who adopts the CSP? Either the cantonal executives, the legislative or both (in sequential procedure) adopt it. This matters for wind energy, because it is assumed that legislative CSP-proposals are “more political”.
2. Cantons differ with regard to whether a wind energy perimeter must be inscribed in a regional (between municipal and cantonal) structure plan. If required, this adds another spatial planning instrument to the wind energy authorization procedure. Known for their involvement in wind energy-sitings are the regional planning entities in the cantons of AG, BE, GL, GR, LU, NE, SG, SZ, TG, and ZH. This does not, however, exclude that other cantons also know planning regions for other purposes.
3. Cantons either conduct “negative” or “positive” planning in their CSPs: Negative planning refers to defining territorial perimeters, in which no wind turbines may be sited. “Positive planning” denotes the fixing of territorial perimeters that are suitable for larger-scale wind energy projects. It can be argued that a negative planning, especially if only few zones are excluded, implies higher flexibility for siting decisions (Stadelmann-Steffen et al. 2020).
4. Cantons may decide on the necessary “form” of the LLUP. The possibilities are the following: A framework land-use plan (“Rahmennutzungsplan”), a special land-use plan (“Überbauungsordnung”, etc.), or both in sequence.

¹⁷ There is some insecurity regarding the deductible amount statement, as one cannot be certain of the applicability of the 100%-deduction in those cantons that do not mention wind turbines explicitly.



5. Cantons also differ regarding who adopts the LLUP. Either the executive adopts them (FR and SO), or the legislative does (parliaments/legislative assemblies in all other cantons).
6. The level at which LLUPs are adopted also differs across cantons: The canton or the municipality can adopt a LLUP. Prominently, the canton of NE has adopted a Cantonal land-use plan (CLUP) for its wind energy planning. Most (AG, AI, AR, BE, BL, BS, FR, GE, GR, JU, LU, NE, OW, SO, SG, SH, SZ, TG, TI, UR, VD, VS, ZG, ZH) know the instrument of a CLUP, but have not (yet) applied it to wind energy, using it for varying reasons and conditions. The cantons of GL and NW do not know this instrument.
7. Different branches may validate a LLUP: If validation is required, in all cantons except GE, it is the executive (cantonal or municipal departments or executive) that validates a LLUP, in GE it is the legislative.
8. The level of government that validates a LLUP is different, it is either municipal (BL, GR, NW, SZ, VD) or cantonal (AI, AR, BE, BS, FR, GE, GL, NE, SG, SH, SO, TG, TI, UR, VS, ZG, ZH) or on both levels, depending on exact project-attributes (AG, JU, LU, OW).
9. The cantons further decide themselves which phase should serve as the lead procedure for the IEA. The cantons of BE, BS, FR, GE, GL, GR, TG, UR, VS and ZG use the construction permit procedure as a lead procedure of formal IEA-attachment. The cantons of LU, SG and ZH use the framework- or special land-use plan as IEA-attachment. The remaining cantons of AG, AI, AR, BL, JU, NE, OW, SH, SZ and VD have not formally defined the IEA's lead procedure.
10. Following the federal regulation on the procedure of the IEA, cantons may decide themselves, whether they pursue a two-stage or one-stage IEA of larger wind energy projects (see UVPV).
11. Cantons may also decide on whether they seek a “concentrated procedure”,¹⁸ meaning a combination of land-use planning and construction permit procedure. In such a concentrated procedure, the two run in parallel and the ensuing decree is either condensed into a single one, or two separate decrees are handed out in a coordinated fashion (following Art. 25 RPG).
12. Cantons define whether cantonal or municipal inhabitants may vote on the LLUP or a CLUP on wind energy projects. In larger municipalities, voting may also happen through elected representatives instead of in popular assemblies or in mail-in ballots. In NE, the cantonal population has voted on a CLUP.
13. The granting of the construction permit further differs by level of government, but as of today, do not differ by power (executive vs. legislative), as all are granted by executives. The level depends on whether the wind turbine is to be built outside of a dedicated construction zone or not. In the cantons of AG, BE, JU, NE, NW, SG, SO, TG, TI, VS, ZG and ZH, assuming a project outside of such a regular construction zone, it is the municipalities that hand out the construction permit. In the cantons of AR, BL, BS, FR, GE, GL, LU, SH, SZ and UR, it is the cantonal authorities that hand out such a construction permit. In the cantons of GR, OW and VD, both municipalities and the canton decide in sequence of each other. In AI, either the region (“Bezirk”) or the canton decides, depending on the location of the project.
14. Cantons further foresee whether (a part of) its population may vote on the granting of the construction permit. Even though in all cantons, it's an executive that grants the construction permit, if there is a coordinated procedure (combination of land-use instrument and construction permit), then the population of those cantons may be said to “vote on the construction permit”

¹⁸ This is not to be confused with the “combined procedure” that denotes the running in parallel of an expropriation and a land-use/construction permit-procedure.



as well. But there is no known case, in which (a part of) the population would vote on the construction permit, but not on the LLUP.

15. Cantons differ with regard to organizational aspects of the procedure: The existence and use of assessment deadlines (“Ordnungsfristen”) and whether consultation happens in parallel or sequentially, is for the cantons to decide internally.
16. The legal system of each canton foresees different eligibility criteria to file objections (“Beschwerdelegitimation”) and later lodge legal complaints (see Art. 33 para. 3 RPG, in connection with Art. 89 BGG). Minimally, the actors legitimized under federal law must be granted cantonal objection/complaints legitimacy (Abegg and Dörig 2019, 31). Local organizations must demonstrate the affectedness of their members for eligibility (Klaber 2014, 214). The associational right of appeal (“Verbandsbeschwerderecht”) is open to nationally active and long-established organizations (see Annex VBO for a list).
17. The cascade of instances competent in administrative matters, such as construction permits, is a cantonal domain of legislation (Abegg and Dörig 2019). At least one cantonal instance must treat it, before a federal court can admit a case, but most cantons foresee two cantonal instances (Art. 33 para. 2 RPG, see Klaber 2014, 207). In many cases, this is the executive council of the government that “lifts” the oppositions, followed by the Cantonal Appellate Court.
18. The number of possible instances depends on the design of the authorization procedure, the simultaneity of opening (“handing out”) the decrees, the number of necessary permits of the wind energy-project, as well as the possibility of coordination of courts to combine complaints by different (groups of) plaintiffs that may or may not target different levels of government in first instance. Schmid (2023) has estimated a range of 3-7 possible cascades of instances for a larger wind parc project.¹⁹

The combination possibilities for these eighteen criteria exhaust by far the 26 cantons and authorization systems. This also means that cantonal authorization procedures are near to unique, with strong procedural divergences. It can get even more complicated, however, as some wind energy-projects are bicantonal, meaning that they have a territorial basis in two cantons.²⁰ Importantly, the sixteen differences listed above do not yet consider the procedural richness of such bicantonal projects. Normally, these cantons and the developers meet in the beginning of a procedure and coordinate them to avoid doubling or material contradictions (Schmid 2023).

3.3 Policy instruments on the municipal level

Municipalities, as entities of cantonal law, may act within the competences that they are granted by their cantons. Within these cantonal, but also the federal limits, municipalities are free to decide upon subsidy programs. As environmental policies are mostly federal but complemented by cantonal rules, municipal legislation may define their own rules for local land-use plans if the cantons do not legislate them exhaustively. This means that with regard to regulatory policies, the role of municipalities within the same canton differs only minimally in the *content* of the local land-use legislation.²¹ Regulatory differences between municipalities of the same canton will therefore not be further elaborated upon.

¹⁹ Under the following conditions: An air safety zone is not “cut” by wind turbines, the location is a single canton (bi-cantonal projects possible if coordinated), and courts can fully combine complaints by different plaintiffs into a unified decision.

²⁰ Other procedures apply if a Swiss project has a (visual, noise) impact on another country.

²¹ There are cantons that attribute construction permit competences according to the number of their inhabitants (e.g. BL, BE). In most cases (exception: special city rights for historic reasons, minority protection reasons), the same rules apply, but they are logically not applicable across all municipalities: In one municipality, for example, protected hunting grounds might be located, and not on another. In other words, even though cantonal rules affect municipalities differently, this does not make these rules amendable by municipalities.



Some cantons further know a planning region²² (of AG, AR, BE, GL, GR, LU, NE, SG, SZ, TG, ZH) that takes a role in authorization procedures for wind energy installations.²³ If the host municipalities are to be found in two different cantons, the regulatory environment, as well as the degree of freedom to decide on subsidy programs, will be different. In such a case, the authorization will depend on procedural coordination between cantons.

In his census on large-scale (industrial) wind energy projects in Switzerland, Schmid (2023) counted a total of 121 municipalities involved in hosting 85 wind energy projects. Minimally, a single municipality is host to a single project. Maximally, five municipalities are hosts to a single project. Only very few municipalities are involved in multiple wind energy projects. Slightly over 50% of host municipalities are French-speaking, which is strongly disproportionate. Regarding the municipal type, as classified by the Federal Office of Statistics (2012), ranging from an “urban municipality with a large agglomeration” to a “rural and peripheral municipality”, the typical municipal type that is host to a wind energy-projects is a “periurban municipality of low population density”.

Incentive-based policy

In terms of additional incentives on the municipal level, of the 2'136 municipalities (as of 1.1.2023, BFS 2023), only four municipalities explicitly offer financial subsidies to wind energy-projects on the municipal territory.²⁴ Subsidy programs exist in Melchnau (BE), Meilen (ZH), Küsnacht (ZH) and Villeneuve (VD). The municipal programs do not provide support for investment-heavy projects of industrial size. To keep matters in perspective, a single industrial-sized turbine costs around CHF 5 Mio (Broughel and Wüstenhagen 2022) and these municipal programs target roof- and garden-installations. To what extent these programs exist only on paper cannot be determined. Whether larger installations could also receive these small sums of money is an open question. It is also unclear whether municipalities would count multiple turbines at the same location as a single project or each turbine individually, the latter of which would allow greater sums of subsidies. Table 1 summarizes the municipal-level incentive schemes.

Importantly, there are differences in terms of eligibility: Whereas the city of Villeneuve may act in complementarity to cantonal subsidies, Küsnacht only subsidizes those that do not receive cantonal subsidies (there are no cantonal subsidies for wind energy in the canton ZH as of 01.01.2023). All four municipalities target both natural and judicial persons as potential receivers of subsidies. The municipal programs are also funded differently: Whereas Küsnacht subsidizes using funds taken from its regular budget, the three other municipalities levy an additional tax on per-kWh grid-use. A further difference is between those that collect and invoice (the electricity company in the case of Melchnau, Meilen and Villeneuve, the municipality in the case of Küsnacht) and those that decide upon the funding allocation (the respective political municipality, or its departments). Also, importantly, all four municipalities carry the label of “Energierstadt”. This label might thus stand in positive correlation with the existence of voluntary municipal subsidy schemes.

Table 1: Overview over wind energy subsidy programs in Swiss municipalities.

| | Melchnau (BE) | Meilen (ZH) | Küsnacht (ZH) | Villeneuve (VD) |
|------------------------|---|--|--|---------------------------------------|
| <i>Subsidy manager</i> | Versorgungswerke Melchnau | iNFRA | Municipality itself | Romande Energie / Municipality itself |
| <i>Amount (CHF)</i> | 10% of construction costs, max. 4'500 per turbine | <20 kW: 2'000, 20-500 kW: 2'000 + 60/kW above 20 | “Small” wind energy only, CHF 30 per produced MWh and year | 50%, maximally CHF 6'000 per |

²² A planning region refers to an intermediary administrative level between cantons and municipalities.

²³ If such a planning region is relevant and differs between two host municipalities, then there are procedural differences to be expected for authorization procedures.

²⁴ Based on the database from www.energiefranken.ch.



| | | kW, maximally 20'000 | over lifespan, max. 40'000 per project | project (per turbine?) ²⁵ |
|--------------------|--|---|---|--|
| <i>Paid by</i> | Municipal tax on grid-use and per kWh of 1.08 ct/kWh, max. 5'000 per year and consumer | Municipal tax on grid-use and per kWh of 0.3 ct/kWh | Fund based on regular municipal budget | Municipal tax on grid-use and per kWh of 0.4 ct per kWh |
| <i>Eligibility</i> | Private and judicial persons | Private and judicial persons | Private and judicial persons, non-cumulative with possible cantonal subsidies | Private and judicial persons, matching of cantonal subsidies |
| <i>Source(s)</i> | Versorgungswerke Melchnau (2020), Melchnau (2019) | iNFRA (2022), Meilen (2022) | Küsnacht (2021; 2022) | Villeneuve (2015) |

Source: Own depiction, based on data from energiefranken.ch and municipal regulations, as cited.

4 Duration and effectiveness of authorization procedures

Experts concur that the dominant problem in Swiss wind energy is the authorization procedure (e.g. Stadelmann-Steffen et al. 2018; Aemisegger and Marti 2021; Guy-Ecabert and Meyer 2016). Therefore, analyzing their efficiency (duration in months) and effectiveness promises a contribution towards problem-solving. Schmid (2023) investigated the issue in detail, testing the impact of factors of procedural design and policies on efficiency and effectiveness. Effectiveness is measured based on stakeholder ratings of the perceived fairness, transparency, competence of those involved, efficiency and overall satisfaction with a project's authorization procedure.²⁶

The main assumptions on which these models are based, is that the differences in procedural design (as a result of competence fragmentation across levels of government) and policies have an impact on the efficiency and effectiveness of wind energy authorization procedures. In this section, we present results based on Schmid (2023) who evaluated the role of 22 procedural design- and policy-factors.²⁷ To model the probability of receiving an authorization for each point in time of the authorization procedure, survival models were estimated. Multiple linear regressions were used to assess the role of the policy factors on effectiveness. The reporting thresholds, estimating procedures and robustness tests are explained in detail in Schmid (2023).

The chapter proceeds as follows: A first section is dedicated to modeling efficiency, understood as negative duration (the longer the authorization procedure takes, the less efficient it is). A second section then presents the findings of factors that relate to effectiveness, as rated by all stakeholders involved in 30 wind energy projects.

²⁵ In principle, the municipality matches cantonal subsidies with the same amount and under the condition of existence of a cantonal subsidy for wind energy, which, however, could not be found online.

²⁶ Duration data is based on a census-survey that Schmid labelled "Project Characteristics Survey" whose population referred to 85 wind energy-projects. For effectiveness ratings, in what Schmid labelled the "Network Characteristics Survey", a sample of 30 projects from these 85 was taken.

²⁷ These were the following: whether cantonal parliaments or executives pass the CSP; whether developers are blocked by the elaboration of the CSP; whether the project is subject to a concentrated planning procedure; whether a project needs planning in a regional structure plan; whether developers halted the planning intermittently; the extent of natural person complaints; the extent of associational complaints; the extent of municipal participation as rated by municipalities and developers; the extent of municipal assessment effort; the number of cantonal conditional stipulations for LLUP validation by topic; the number of cantonal conditional stipulations for the construction permit by topic; whether cantonal assessments of wind energy-projects are subject to deadlines and conducted in parallel/sequentially; extent of the federal agency assessment effort; whether municipalities reach (self-declared) performance thresholds in the realms of construction, spatial planning, landscape and cultural heritage protection, energy supply, environmental protection; the importance of the Energy Strategy 2050 to the municipality; the importance of energy politics to municipalities, the importance of construction politics to the municipality.



4.1 Effects on duration

Figure 5 depicts a survival curve based on a model that does not contain any explanatory variables. Technically, in these models, not receiving (i.e., still waiting for) a construction permit means surviving. The curves show when and under which conditions the authorization process ends. On the x-axis, the duration of the authorization procedure in months is depicted. The y-axis depicts the probability of *not* receiving (of surviving) a construction permit. This serves as the baseline model that will be used to compare future survival curves to. The figure shows that the probability of receiving a construction permit does not increase up until about month 170 (14.2 years). Starting there, the probability begins to increase (i.e., the probability to survive decreases), reaching a maximum of 75% (=25% probability of not receiving a construction permit) at around month 300 (25 years). The empirical data does not indicate a decline to zero, showing that there is still the possibility that even after 300 months, having a construction permit is not guaranteed. The gray band surrounding the survival curve shows the 95%-confidence intervals and indicate that even in the timespan of months 170-300, a high probability of not receiving a construction permit is still within the confidence interval.

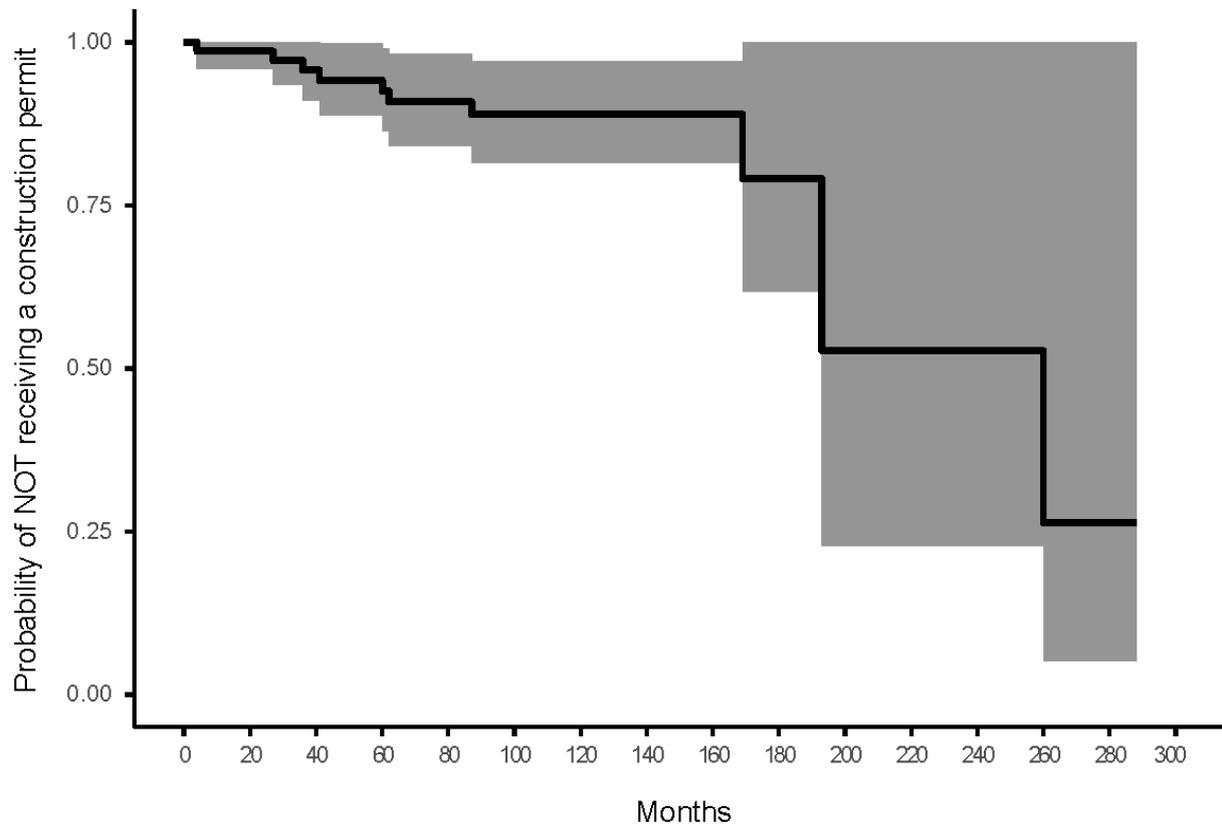
Figure 6 demonstrates the significant effect of whether developers feel blocked in their project development through the cantonal elaboration of the CSP (yes=1, no=0). As the calculation of effects was automated, the graphical summary shows effects of four different strata: The minimally detected effects of the variable in question across the various estimated models is shown, as well as the maximal effect. Both effect magnitudes are shown for both groups of developers that either answered yes or no to the question of whether they felt blocked by the cantonal CSP-elaboration and validation. This equals four different lines that figure 6 indicates in shades of gray and lines/dots/dot dashes. This set-up will remain the same also for the second significant policy-predictor of efficiency (duration). The proportional hazard assumption was tested and fulfilled for each model, Cox-Snell and deviance residuals show an acceptable model fit.²⁸

Materially, what can be detected in the top panel of figure 6 is that both the minimal and maximal effects of non-blocking show a similar effect regarding the probability of survival of a wind energy-authorization procedure. Regarding the blocking=yes lines, only the black solid line is visible because the gray dots are fully covered by it. Compared to the empty baseline model (figure 5), the line(s) where developers feel blocked are situated substantially “above” the baseline, meaning that if developers feel blocked by the CSP, the probability of receiving a construction permit, especially in the months starting at around 170, is much lower. The survival curves that indicate no blocking, however, show a similar curvature like the baseline. In other words, not being blocked does not help in terms of a greater probability of receiving a construction permit, as it is similar to the baseline. However, being blocked by the CSP is statistically detrimental to efficiency (duration).

²⁸ Detailed explanations on model fit can be found in Schmid (2023)



Figure 5: “Survival” curve based on Kaplan-Meier estimates for all strata (no covariates).



Source: Schmid (2023).

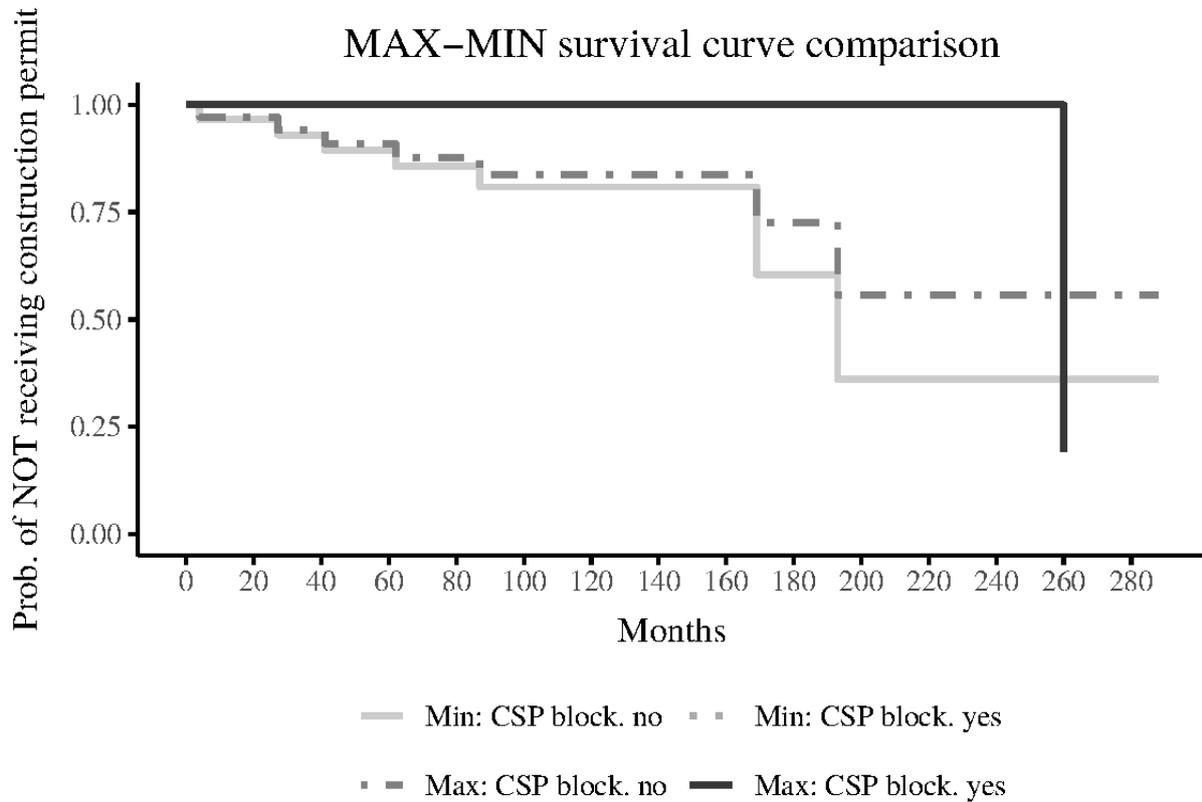
Fehler! Verweisquelle konnte nicht gefunden werden. depicts a survival curve for the second statistically significant explanatory factor, namely an indicator of associational complaints that a project has met during its authorization procedure. The indicator ranges from “0” meaning no associational complaints to “3”, meaning many and strong associational complaints.²⁹ This factor is often debated politically, and there is indeed evidence that a greater extent of judicial opposition by associations negatively affects the probability of receiving a construction permit. In other words, at the same point in time, a wind energy-project that has received extensive legal complaints has a higher probability of not receiving a construction permit than one that has not had legal complaints. Again, as before, the maximal and minimal effects are very similar to each other (survival curves in top panel). Here, compared to the baseline (Figure 5), those wind energy-projects with complaints above-the-mean are rather similar to the baseline. In contrast to the item measuring the blocking through the CSP, here, the survival curve of projects with below-the-mean associational legal complaints shows a substantially higher probability to receive a construction permit than the baseline, even though the data are limited (stumps that end at months 120).³⁰ The stump is due to a lack of data beyond this point because of censoring. It is not the case that projects with below the mean complaints maximally take 120 months to be permitted (in this case, the curve would need to be at zero).

²⁹ An ordinal indicator has been chosen instead of the count of the number of judicial oppositions to better capture outliers and to also capture the number of opponent associations that lodge a complaint.

³⁰ These are census data; the problem is that the models would need more data that the population cannot deliver. It is not a sampling, rather a modelling problem.



Figure 6: Survival curve based on Cox proportional hazard model and model fit graphs for the effect of perceived blocking of a project by developers through the elaboration and validation of the CSP.

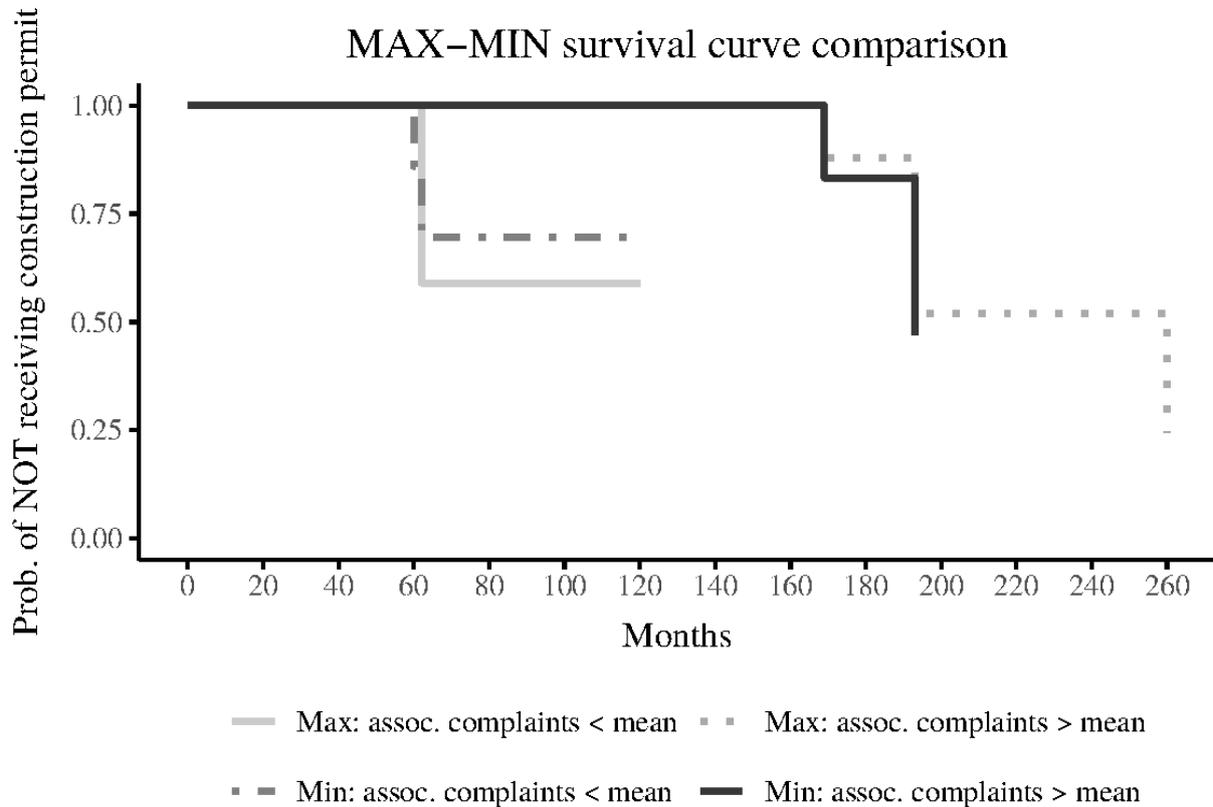


Source: Schmid (2023). The survival curve divides the strata at the empirically observed arithmetic mean.

It is also interesting to highlight some factors that did not show a robust statistical effect on the efficiency (duration) of the procedure: Most notably, when planning phases run parallel, authorization procedures are not systematically faster than if the LLUP-phase and the construction procedure phase are run sequentially. This finding, however, is in line with econcept's (2015) study from the construction of roads, where such concentrated procedures also exist but also proved not to significantly affect duration of procedures. This paints a bleak image of the possible effect of formally running the two phases in parallel. Crucially, however, as developers must combine elements of the LLUP-phase with elements of the construction phase anyway (i.e. for matters of deforestation, see Klaber 2014, 175), the combination can be said to be purposeful for planning reasons in any case.



Figure 7 Survival curve based on Cox proportional hazard model and model fit graphs for the effect the extent of associational complaints in a project.



Source: Schmid (2023). The survival curve divides the strata at the empirically observed arithmetic mean.

4.2 Effects on effectiveness

For 30 (out of 85) wind energy-projects in Switzerland, all identifiable stakeholders – including opponents and proponents – were contacted and asked to rate five different aspects of effectiveness of the authorization procedures, in which they were involved. These ratings, condensed into an indicator of perceived effectiveness,³¹ were then regressed against policy-related project-variables.³²

Figure 8 below presents the first of two effectiveness graphs that will subsequently be discussed, namely the relationship between the number of associational complaints and perceived effectiveness, as well as the extent of federal coordination required to assess a project. The primary conclusion drawn is that intensive associational opposition, as well as more labor-intensive federal coordination cause stakeholders to perceive the overall process as less effective.

For the overall perceived effectiveness scores and each significant dimension ($p < 0.05$), the median effect slope, and both the minimal and maximal effect slope according to the models are depicted. The slopes of all three regression lines seem very similar to each other, but they are drawn on different scales. For fairness, transparency, and perceived efficiency,³³ they show a decrease of -44.3% to -

³¹ There are five individual ratings (fairness, transparency, competence, perceived efficiency, and satisfaction). Using factor analysis, these were combined into a sixth combined factor that has been labelled as "overall perceived effectiveness score".

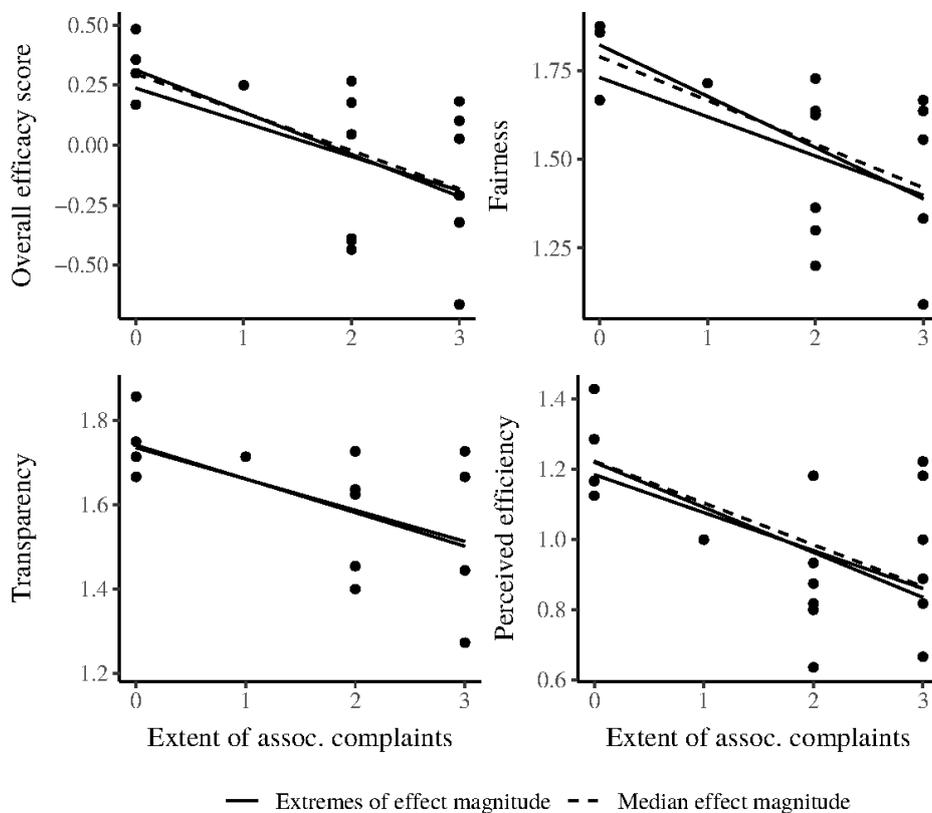
³² Automated multiple linear regressions were used to estimate a large variety of model specifications, providing many estimates for each variable. If all the models passed the reporting threshold based on the overall perceived effectiveness scores, these variables were reported as significant. Additionally, estimates using the five component dimensions as dependent variables were also estimated and are shown, when the overall perceived effectiveness scores pass the threshold. All procedural details may be found in Schmid (2023).

³³ Not to be confused with efficiency measured as negative duration of the authorization procedure.



57.8% for a 1-point increase of the extent of associational complaints (ordinal range 0-3, 0=minimum, 3=maximum). The median slope of the overall perceived effectiveness measure shows a less strong magnitude of -16% for a 1-point increase in the extent of associational complaints. For the dimensions of overall satisfaction and competence, there are no statistically significant models to present. It might seem surprising that overall satisfaction with the procedure and the perceived competence of parties involved are not significantly related to associational complaints. However, this finding must be seen against the background that the group of stakeholders also includes opponents of the project. Hence, while proponents of the project may indeed experience less satisfaction with the procedure (and deem the involved organizations less competent) if they have to deal with many complaints, conversely, greater legal complaints might bring greater satisfaction and competence ratings to (fundamental) opponents.

Figure 8: Effects of the extent of association complaints (0-4) on all significant effectiveness dimensions, as rated by stakeholders.



Source: Schmid (2023)

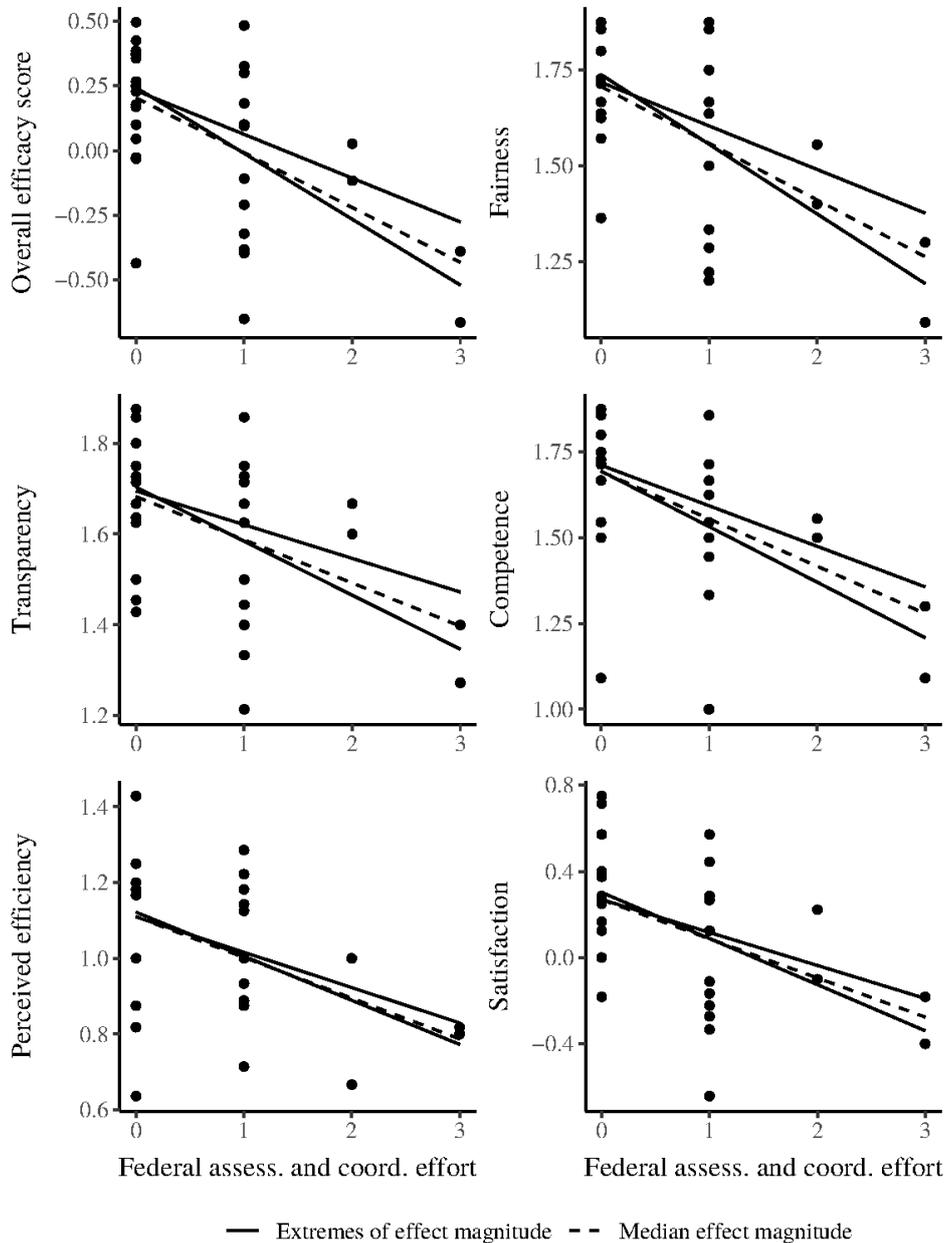
Figure 9 shows the second of two policy-related variables, the effect of the extent of federal assessment and coordination workload in a wind energy-project (ordinal range 0-3, 0=minimum, 3=maximum). This coordination and assessment workload represents estimates by federal level agencies based on whether they had “much to do” concerning a project or whether a project barely crossed their desks. It can be seen that higher federal coordination leads to lower overall perceived effectiveness, as rated by all stakeholders. It needs to be emphasized that most projects exhibit rather low levels of federal coordination. Hence the statistical effect seems to be driven by two very special projects with strong federal coordination. However, even if the analysis is restricted to projects with lower levels of federal coordination, the negative relation persists.

In figure 9, a 1-point increase in federal coordination workload is projected to reduce the overall effectiveness score by 21% of its standard deviation. The results for all individual effectiveness



dimensions are similar. This shows that complicated projects that touch upon many federal interests are generally perceived as less effective than those that do not pose federal assessment challenges.

Figure 9: Effects of the extent of federal coordination and assessment effort on all significant effectiveness dimensions, as rated by stakeholders.



Source: Schmid (2023)

5 Implications and Conclusion

This report sought to provide an overview of the federalist competence distribution on the matter of wind energy and the policy landscape at the different levels of government, as of September 2023. Regarding policies, the focus was laid on (1) incentive-based instruments and (2) regulatory instruments that can be expected to affect the deployment of wind parks. In concrete terms, the report listed and described all wind energy subsidy schemes in Switzerland and further explained the federalist functioning of wind energy authorization procedures. Moreover, it (3) addressed the key problem of ineffectiveness and inefficiency of wind energy authorization procedures by testing effects of procedural design and policies.



The point of departure was that on average, a wind project in Switzerland is predicted to take 15 years to complete (Schmid 2023), whereas in Europe, the mean duration amounts to a mere 3.5 years (Ceña et al. 2010), less than a quarter of the duration in Switzerland. This empirical observation led to the guiding assumption in this report and the presented analyses, namely that procedural characteristics and policies might centrally be related to efficiency and effectiveness. These three points are elaborated on subsequently, followed by some limitations of the present report and by an outlook for further research.

Implications of findings

A first conclusion is that incentive-based instruments for wind energy are largely a federal matter. The only scheme that financially supports wind energy deployment consistently, is to be found on the Federal level. Financial support by cantons is rare: It is non-existent in 24 out of 26 cantons. On the municipal level, only 4 out of 2'136 municipalities provide incentives (0.18%). Without exception, the few municipalities that have foreseen support of wind energy installations, carry the label of "Energiestadt". The Federal level incentives provide investment grants starting at an installed capacity of 2 MW. This means that below this threshold, and outside of the few exceptional cantonal and municipal programs, wind energy is not incentivized financially – if income tax deductions, that are likely applicable and exist in all cantons, are ignored. As homeowners are likely to invest in PV instead of roof-attached or garden-sized wind turbines, the lack of subsidies for house-scale wind energy is understandable. However, given that several pilot-technologies exist, and there is likely to be a compensatory effect between solar and wind energy (that has been shown time and again for Switzerland), pilot subsidy studies and programs could be formulated by the cantons. Getting active in wind electricity promotion is in line with cantonal competences, as additional incentives-programs could be complementary to federal programs. Legal competences in promoting renewable energies are clearly shared (Schaffhauser and Uhlmann 2014; Müller and Vogel 2012).

Moreover, while cantonal energy competences are primarily centered around buildings (Art. 89 para 4 BV), cantons have traditionally promoted efficiency measures in heating and more recently, subsidy-programs to produce renewable heat have been added. Yet, following Schmidt et al. (2022), nine of the 26 cantons have also subsidized the production of renewable electricity through photovoltaics. If summed across a region, the production of renewable electricity from photovoltaics might well have grid stability and fortification implications. However, the same argument of substantive electricity grid implications from cantonal programs could be brought forward with regards to wind parks. Especially in regions with higher solar radiation and during summertime, when PV-peaks are high, grid stability implications from already existing support programs for PV are likely to be just as strong than for a hypothetical wind parc in the same region (assuming about equal installed capacity). This is because both technologies cause fluctuations that need to be technically accommodated. In other words, if some cantons subsidize the production of electricity from photovoltaics, why do only two cantons financially support wind energy installations? The point is especially important given that the macro-economic trends of sector coupling (here: electricity, heat) and the continued decentralization of electricity production are not likely to abate soon.

Second, whereas incentive-based policies gravitate around the Federal level, competences regarding authorization procedures are shared between the three levels of government. These procedures are a quintessential example of administrative cooperation in the federalist country of Switzerland and shape the effectiveness and efficiency of these procedures. Whereas the majority of pertinent policy-rules are defined on the national level (environmental, energy, spatial planning), the federal prescriptions differ in density depending on policy-field: In energy and environmental law, federal rule-density is high. In contrast, in spatial planning, cantons are accorded larger margins of maneuver to set their own procedures and complement federal prescriptions. However, cantonal legislative freedom is restricted to questions of procedural design if a wind energy project is situated outside a dedicated zone of



construction.³⁴ In addition to these cantonal legislative competences that are restricted for projects outside of dedicated construction zones (certain complementarity in i.e. forests, hunting, etc.), cantons have a much larger and substantively meaningful margin of maneuver due to their task of implementing federal energy, environmental and spatial planning laws and ordinances. The process of implementation means that cantons have some degrees of liberty in “how to” concretize and apply federal dispositions – a process which has also been called “administrative” or “secondary” politics. Cantons may also hand out certain implementation tasks to municipalities. These implementation liberties result in an astounding wealth of procedural design in the cantons. Schmid (2023) identified 16 meaningful differences in authorization procedures between cantons.

Coupled with unique projects, locations and with a low number of projects, this procedural richness has meant that authorization procedures have been practically tailored to each larger wind energy project. In this sense, permitting is still very “experimental” to each canton. However, it can be expected that the effects of a learning curve will begin to materialize in cantons that will undergo procedures for multiple projects. This also implies that non-standardization of the procedure complicates the sharing of best-practices (e.g. “Vollzugshilfen”) across cantons, because of problems of applicability to other cantons.

Third, the report tested the question of impacts of 22 variables of procedural design and policies on effectiveness and efficiency of authorization procedures. Four factors have been identified to statistically correlate with long duration and low effectiveness (Schmid 2023): Efficiency (duration) is negatively affected by whether developers feel blocked by the elaboration of the Cantonal Structure Plan (CSP) and by the extent of associational legal complaints. Effectiveness, denoting quality judgements on authorization procedures on transparency and fairness, among other aspects, is negatively affected by the extent of associational complaints, but also by the extent of Federal coordination and assessment workload. An important non-finding for the current political discussion is further that no effect on either duration or effectiveness could be found regarding whether cantons proceed in a concentrated procedure (land-use planning-phase and construction permit-phase in parallel, as opposed to in sequence) or not. This is in line with previous research from the construction of roads (Econcept 2015). However, there is also no negative effect from pursuing a concentrated procedure, and as developers need to combine elements of these two phases for the IEA anyway (Klaber 2014, 175), it could still purposeful to do so.

These findings may inform current political debates, which has focused only on duration, but has neglected (other) aspects of effectiveness that are crucial to the well-functioning of authorization procedures: As an example, fairness and transparency, just to name two aspects, remain largely unaddressed in the most recent reform of the Federal Assembly called “Windexpress” that seeks to accelerate the procedure. For an additional installed capacity of 600 MW (compared to 2021), it foresees that cantons, rather than municipalities, hand out the construction permit. But in 10 out of the 26 cantons, given that most projects are outside dedicated construction zones, they would have done so already anyway. The “Windexpress” further limits judicial cascades after the construction (and side permits) to the cantonal level, unless “there is question of judicial principle” (Art. 71c para. 1 lit. c EnG). What exactly a “question of judicial principle” means will likely need to be established by the Federal Courts.

Limitations of report

There are two main limitations regarding the policy- and competences overview and the inferential findings on duration and effectiveness: For the former, the development of legislation has been limited by diving deep into the federal dispositions, but not in the details of the cantonal and the municipal policies, for questions of analytical focus and in view of the scope of applicability of the present report. On all three levels of government, the development of wind energy-policies are evolving rather quickly, and thus, the present paper is limited in terms of its applicability across time. Regarding the inferential findings, the main limitation is given by the cross-sectional data that was necessary to limited numbers

³⁴ Given the nature of wind speeds and spatial requirements for siting, such locations tend to be the norm.



of cases across territorial entities of government and across time. The findings may thus not be interpreted as causal but are strictly correlational.

Outlook

What remains for further studies to analyze are the role of other factors than policies. Institutional factors (e.g. decentralization) play a role, as well as personal convictions or political parties. Especially salient given the findings of associations delaying wind energy authorization procedures and lowering their effectiveness, would be a study that comparatively investigates the circumstances of lodging oppositions and the characteristics of the actors that raise them. In view of attempting to reach the aims of the Energy Strategy 2050, such an analysis could provide of societal, but also scientific value.

6 Bibliography

- Abegg, Andreas, and Leonie Dörig. 2019. "Energiekompass --- Schritt für Schritt durch die Planungs- und Bewilligungsverfahren." Dossier zur Raumentwicklung für Mitglieder des Verbands für Raumplanung, EspaceSuisse 3. Raum & Umwelt: Dossier zur Raumentwicklung. Bern: EspaceSuisse.
- Aemisegger, Heinz, and Arnold Marti. 2021. "Energiewende --- Vereinfachung der Planung für Projekte zur Nutzung erneuerbarer Energien." Küsnacht; Schaffhausen.
- ARE. 2020. "Konzept Windenergie." Bern: Bundesamt für Raumentwicklung ARE. <https://www.are.admin.ch/are/de/home/raumentwicklung-und-raumplanung/strategie-und-planung/konzepte-und-sachplaene/konzepte/konzept-windenergie.html>.
- BFE. 2023a. "EIV-Bezüger 2014-2022 Nach Kantonen." Ittigen: Bundesamt für Energie BFE. <https://opendata.swiss/de/dataset/einmalvergotung-fur-photovoltaikanlagen/resource/fa6d4858-79d2-41d6-95d6-853906986244>.
- . 2023b. "Liste aller KEV-Bezüger in den Jahren 2011-2022." Ittigen: Bundesamt für Energie BFE. <https://www.bfe.admin.ch/bfe/de/home/foerderung/erneuerbare-energien/einspeiseverguetung.html>.
- . 2023c. "Marktprämie Grosswasserkraft." Ittigen: Bundesamt für Energie BFE. <https://www.bfe.admin.ch/bfe/de/home/foerderung/erneuerbare-energien/marktpraemie-grosswasserkraft.html>.
- BFS. 2012. "Gemeindetypologie der Schweiz in 9 Klassen." Neuchâtel: Bundesamt für Statistik BFS. https://www.atlas.bfs.admin.ch/maps/13/de/12360_12482_3191_227/20593.html.
- . 2023. "Die 2136 Gemeinden der Schweiz am 1.1.2023." Neuchâtel. <https://www.bfs.admin.ch/asset/de/24065856>.
- Broughel, Anna, and Rolf Wüstenhagen. 2022. "The influence of policy risk on Swiss wind power investment." In *Swiss energy governance: political, economic and legal challenges and opportunities in the energy transition*, edited by Peter Hettich and Aya Kachi, 346–68. Cham: Springer International Publishing. <https://doi.org/10.1007/978-3-030-80787-0>.
- Ceña, Alberto, Dorina Iuga, Emilien Simonot, Nicolas Fichaux, Sharon Wokke, and Sune Strom. 2010. "WindBarriers---Administrative and Grid Access Barriers to Wind Power." Brussels: European Wind Energy Association EWEA. http://www.ewea.org/fileadmin/files/library/publications/reports/WindBarriers_report.pdf.
- Deroubaix, José-Frédéric, and François Lévêque. 2006. "The Rise and Fall of French Ecological Tax Reform: Social Acceptability versus Political Feasibility in the Energy Tax Implementation Process." *Energy Policy* 34 (8): 940–49. <https://doi.org/10.1016/j.enpol.2004.08.047>.
- Ebers, Anna, and Rolf Wüstenhagen. 2017. "Local acceptance of wind energy in Switzerland, Estonia and Ukraine. A cross-country analysis based on choice experiments." Presented at the IAEE, Vienna. <https://www.alexandria.unisg.ch/252431/>.
- Econcept. 2015. "Effizienz von Planungs- und Bauverfahren sowie den damit einhergehenden Rechtsmitteln." Zurich: econcept. <https://www.news.admin.ch/newsd/message/attachments/40096.pdf>.



- GEnergie. 2023. "GEnergie Subventions 2023." Geneva: République et Canton de Genève. <https://www.ge-energie.ch/sites/default/files/inline-files/2023-03-07-catalogue-des-subventions.pdf>.
- Griffel, Alain. 2017. "Die Grundsatzkompetenz gemäss Art. 75 Abs. 1 BV: Tragweite und Grenzen." Zurich: RWI University of Zurich.
- Guy-Ecabert, Christine, and Florence Meyer. 2016. "Leitfaden zur Optimierung der Praxis bei der Planung von Windparks." Neuchâtel: UniNE.
- Haelg, Leonore, Tobias Schmidt, and Sebastian Sewerin. 2022. "The design of the Swiss feed-in tariff." In *Swiss energy governance: political, economic and legal challenges and opportunities in the energy transition*, edited by Peter Hettich and Aya Kachi, 93–113. Cham: Springer. <https://doi.org/10.1007/978-3-030-80787-0>.
- iNFRA. 2022. "Ökologiefonds der iNFRA. Leitlinien für die Bemessung von Unterstützungsbeiträgen." Meilen: iNFRA. https://www.infra-z.ch/images/downloads/2023_iNFRA-Leitlinien_Unterstützungsbeitrge_Oekologiefonds.pdf.
- Kirchgässner, Gebhard, and Friedrich Schneider. 2003. "On the Political Economy of Environmental Policy." *Public Choice* 115 (1): 369–96.
- Klaber, Fabian. 2014. *Öffentlichrechtliche Vorgaben für Windenergieanlagen*. Basler Studien zur Rechtswissenschaft. Reihe B, Öffentliches Recht, Bd. 87. Basel: Helbing & Lichtenhahn.
- Küsnacht. 2021. "Programm Klima, Grünraum und Energie 2022–2025." Küsnacht: Gemeinderat Küsnacht. https://www.kuesnacht.ch/public/upload/assets/13853/1_Programm_Klima-Energie-Gr%C3%BCnraum_2022-2025.pdf?fp=1.
- . 2022. "Förderreglement Klima, Grünraum und Energie Küsnacht 2022–2025." Küsnacht: Gemeinderat Küsnacht. https://www.kuesnacht.ch/public/upload/assets/15463/F%C3%B6rderreglement_KGE_222-25_2023.pdf?fp=1.
- Meilen. 2022. "Reglement für den Ökofonds Meilen." Meilen: Gemeinderat Meilen. https://www.infra-z.ch/images/downloads/2023_Reglement_fr_den_kologiefonds_Meilen.pdf.
- Melchnau. 2019. "Verordnung zur Elektrizitätsversorgung per 01.01.2019 mit Konzessionsabgabe." Melchnau: Gemeinderat Melchnau. https://melchnau.ch/wp-content/uploads/2019/07/Verordnung_zur_Elektrizitaetsversorgung_per_01.01.2019_mit_Konzessionsabgabe.pdf.
- Meteotest. 2022. "Windpotenzial Schweiz 2022. Schlussbericht." Bern: Meteotest. <https://www.newsd.admin.ch/newsd/message/attachments/72771.pdf>.
- Müller, Georg, and Stefan Vogel. 2012. "Kompetenzverteilung zwischen Bund und Kantonen auf den Gebieten der Energie-, Umwelt- und Raumordnungspolitik." Rechtsgutachten. Zurich: Konferenz Kantonalen Energiedirektoren.
- Prognos, Infras, TEP Energy, and Ecoplan. 2011. "Die Energieperspektiven für die Schweiz bis 2050--Anhang III---Energienachfrage und Elektrizitätsangebot in Zahlen; Emissionen." https://www.prognos.com/uploads/tx_atwpubdb/120912_Prognos_Bundesamt_fuer_Energie_Energieperspektiven_Schweiz_2050_Anhang_III.pdf.
- Rieder, Stefan, Andreas Balthasar, and Ingrid Kissling-Näf. 2014. "Vollzug und Wirkung öffentlicher Politiken." In *Handbuch der Schweizer Politik = Manuel de la Politique Suisse*, edited by Peter Knoepfel, Yannis Papadopoulos, Pascal Sciarini, Adrian Vatter, and Silja Häusermann, 5th ed., 563–98. NZZ Libro. Zurich: Neue Zürcher Zeitung.
- Schaffhauser, René, and Felix Uhlmann. 2014. "Art. 89." In *Die schweizerische Bundesverfassung: St. Galler Kommentar*, edited by Bernhard Ehrenzeller, Benjamin Schindler, Rainer Schweizer, and Klaus Vallender, 3rd ed., 1725–37. Zurich: Dike ; Schulthess.
- Schmid, Jonas. 2023. "Decentralization and Wind Energy Permitting. An Evaluation of Implementation Effectiveness in Switzerland and Europe." PhD, Bern: University of Bern.
- Schmidt, Tobias, Isabelle Stadelmann-Steffen, Mak Đukan, David Giger, Nicolas Schmid, and Valentin Schneuwly. 2022. "Policy White Paper: Quantifying the Degree of Fragmentation of Policies Targeting Household Solar PV in Switzerland." Zurich: SWEET-EDGE. https://www.research-collection.ethz.ch/bitstream/handle/20.500.11850/596612/SWEETEDGEWhitePaper_Deliverable_D8.1_reformatted_corrected.pdf?sequence=1&isAllowed=y.
- Stadelmann-Steffen, Isabelle. 2011. "Citizens as Veto Players: Climate Change Policy and the Constraints of Direct Democracy." *Environmental Politics* 20 (4): 485–507. <https://doi.org/10.1080/09644016.2011.589577>.



- Stadelmann-Steffen, Isabelle, and Clau Dermont. 2018. "The Unpopularity of Incentive-Based Instruments: What Improves the Cost–Benefit Ratio?" *Public Choice* 175 (1–2): 37–62. <https://doi.org/10.1007/s11127-018-0513-9>.
- . 2021. "Acceptance through inclusion? Political and economic participation and the acceptance of local renewable energy projects in Switzerland." *Energy Research & Social Science* 71 (January): 101818. <https://doi.org/10.1016/j.erss.2020.101818>.
- Stadelmann-Steffen, Isabelle, Karin Ingold, Stefan Rieder, Clau Dermont, Lorenz Kammermann, and Chantal Strotz. 2018. *Akzeptanz erneuerbarer Energie*. Bern; Luzern: Universität Bern; Interface; Eawag.
- Stadelmann-Steffen, Isabelle, Stefan Rieder, and Chantal Strotz. 2020. "The politics of renewable energy production in a federal context: the deployment of small hydropower in the Swiss cantons." *The Journal of Environment & Development* 29 (1): 75–98. <https://doi.org/10.1177/1070496519886005>.
- Vedung, Evert. 2017. "Policy Instruments: Typologies and Theories." In *Carrots, Sticks & Sermons: Policy Instruments and Their Evaluation*, edited by Marie-Louise Bemelmans-Videc, Ray C. Rist, and Evert Vedung, 21–58. Abingdon: Routledge, Taylor & Francis Group.
- Versorgungswerke Melchnau. 2020. "Verordnung mit Änderungen für Förderbeiträge an Produktionsanlagen erneuerbarer Energien, an Projekte für Energiesparmassnahmen sowie Projekte wie 'Energistadt Melchnau.'" Melchnau: Versorgungswerke Melchnau. <https://melchnau.ch/wp-content/uploads/2020/11/Verordnung-F%C3%B6rderbeitr%C3%A4ge-mit-%C3%84nderungen-vom-25.09.2017-und-23.09.2020.pdf>.
- Villeneuve. 2015. "Règlement sur la taxe communale spécifique sur l'énergie électrique." Villeneuve: Municipalité de la Commune de Villeneuve. <https://www.villeneuve.ch/net/com/5414/Images/file/R%C3%A8glements/Reglement%20taxe%20energie%20electrique.pdf>.
- Vuichard, Pascal, Alexander Stauch, and Nathalie Dällenbach. 2019. "Individual or collective? Community investment, local taxes, and the social acceptance of wind energy in Switzerland." *Energy Research & Social Science* 58 (December): 101275. <https://doi.org/10.1016/j.erss.2019.101275>.
- Vuichard, Pascal, Alexander Stauch, and Rolf Wüstenhagen. 2021. "Keep It Local and Low-Key: Social Acceptance of Alpine Solar Power Projects." *Renewable and Sustainable Energy Reviews* 138 (March): 110516. <https://doi.org/10.1016/j.rser.2020.110516>.
- Walter, Götz. 2014. "Determining the local acceptance of wind energy projects in Switzerland: the importance of general attitudes and project characteristics." *Energy Research & Social Science* 4 (December): 78–88. <https://doi.org/10.1016/j.erss.2014.09.003>.