Part I
INTRODUCTION

Chapter 1: The problem of wind energy-authorization procedures

1.1. What is the problem? Research question and goals of this study

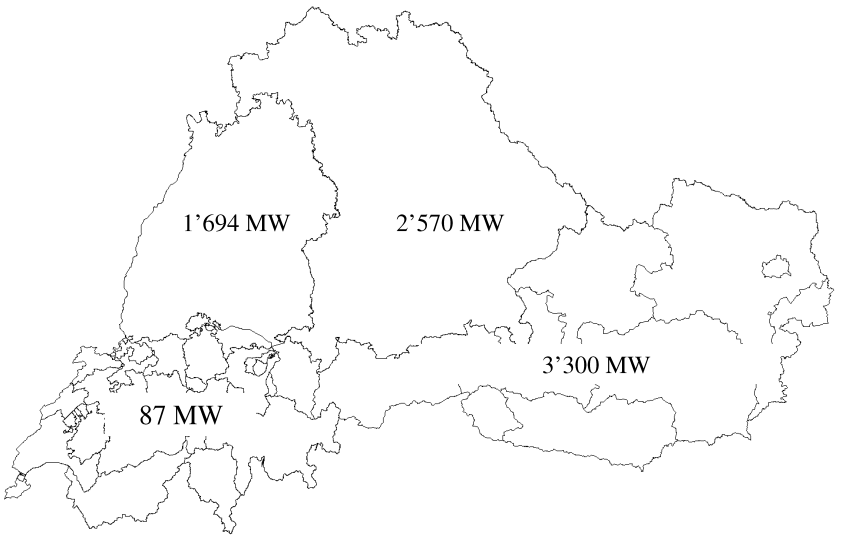
In May 2017, Swiss citizens accepted the federal Energy Strategy with 58.2% of yes-votes (BBl 2017 4865). In an attempt to further the growth of renewable electricity to combat the long-enduring and continually aggravating climate and biodiversity crises, the strategy contained — among many measures — several legal changes designed to facilitate the production of electricity from wind turbines. For example, the strategy set a goal of 4.3 TWh of produced electricity from wind by 2050 (see Prognos et al. 2011a, 43). For 2050, based on 2021 data (BFE 2022c), a stupendous growth factor of 29.5 would be needed to attain the goal of the Energy Strategy 2050. The target number of 4.3 TWh of produced electricity is roughly equal to the annual consumption of electricity of the cities of Zurich, Basel and Olten in 2020 or, put differently, to 610'000 inhabitants in Switzerland (BFS 2022b). In contrast, with the current production from wind turbines of 146 GWh in the year 2021 (BFE 2022c), the city of Zurich could be powered for less than three weeks. Hence, it is not surprising that experts are strongly pessimistic about reaching the goal (Duygan et al. 2022).

In European comparison, Switzerland is at the very bottom in terms of installed onshore wind energy capacity:[2] Out of 32 European countries, Switzerland ranked 27th in 2018. Switzerland also stands out compared to its neighboring countries: Figure 1.1 compares Switzerland to Austria and the two Southernmost German states, Baden-Württemberg (left) and Bavaria (right). In 2021, Switzerland had an installed capacity of onshore wind energy of 87 MW. Austria, which has comparable mountainous territorial conditions, had 38 times more installed capacity in the same year. Baden-Württemberg, in turn, had 19 times and Bavaria 30 times more installed capacity. Obviously, Bavaria and Austria are larger territories, but not by factors 19, 30 or 38. In fact, Baden-Württemberg is even smaller in territorial size than Switzerland.

This begs the question: Why does Switzerland lag so far behind in European and neighboring region comparison — or put differently, why has the Swiss rate of deployment been so (s)low? Some suggest that it might

2 Installed capacity refers to the maximally possible amount of energy that a power station is able to produce (see glossary in the online appendix).

Figure 1.1: Switzerland's onshore installed wind energy capacity compared to Austria and the German states of Baden-Württemberg and Bavaria.



Notes: Data from 2021. Sources: WindEurope (2022), SR BY (2022), UM BW (2022).

simply be for the lack of harvestable wind speeds. But factually, this is not the case: A recent study by Meteotest has estimated an economically and ecologically feasible energy production potential of 29.5 TWh (2022). This amounts to about half of the Swiss annual electricity consumption. Or in more illustrative terms, if all this potential were converted into electricity, it could power the city of Zurich for about a decade. So there is no shortage of harvestable potential, especially with regard to the fact that in 2021 less than 0.5% of this potential was harvested.

Others argue that too much (or too little) of the Swiss territory is protected, meaning that not enough (or too much) land is available for energy infrastructure construction projects. But again, taking a closer look, this argument also does not withhold scrutiny: If one investigates the map of territorial interests by the federal authorities (Swisstopo 2022), there are indeed sizeable territories on which construction is allowed only marginally or not at all. Additional territorial interests from the cantonal and municipal levels further complicate the picture. Nevertheless, there are still sizeable territories with

high enough wind speeds that would allow for the production of 4.3–29.5 TWh, as previously mentioned (Meteotest 2022; see also Spielhofer et al. 2023).

The same is true for the commonly voiced argument that the Swiss population density is simply too high to allow the building of such projects when respecting the commanded distance from humans and vulnerable fauna. Let us examine this argument: Switzerland's population density in 2020 was at 218.6 people per km^2 (World Bank 2022b). In comparison to the neighboring countries, Austria's was roughly half as densely populated (107.6 people/km^2, ibid.). This would fit the narrative — but certainly could not explain the difference of factor 38 in installed capacity between the two countries. Bavaria, with 0.85 times as dense a population as Switzerland (DeStatis 2022), has 30 times as much installed capacity. Even Baden-Württemberg, which is populated 1.4 times as densely as Switzerland, shows a 19 times more installed capacity than the whole of Switzerland (ibid.). When comparing the canton of SO and the state of Baden-Württemberg that have roughly the same population density, the territory of SO would need to have about 37 MW installed capacity if it were proportional to territorial size. As of the end of 2022, SO had 0 MW. In consequence, the argument about population density cannot explain why Switzerland lags behind so much.

Still others maintain that few wind turbines have been constructed because it is not financially profitable to do so. Yet this is also not the case. It is true that in the absence of subsidies it is, and has been, hard for project owners to make a case for profitability with regard to potential investors (Broughel and Wüstenhagen 2022). However, public subsidies *can* make a wind energy project highly profitable.[3] Indeed, Broughel and Wüstenhagen (ibid., 364) define the Swiss wind energy project investment profile as "high-risk/high-return". Hence, at least since the start of larger-scale subsidies in 2009, well-designed projects can be profitable; thus the argument of profitability also does not meet the facts (see also Wüstenhagen et al. 2017).

But if physical, territorial and economic factors cannot explain this overwhelming "Swiss lag", what can? Sectoral experts, scientific experts and politicians concur on this point: It is the long and complicated authorization procedure (*syn.* siting or permitting procedure) — a feat of policy implemen-

3 Between 2009–2022, federal authorities paid a 15- to 20-year-fixed feed-in tariff to shield them from potential market losses. Starting in 2023, new projects may profit from a federal investment contribution, amounting to maximally 60% of eligible costs (BFE 2022b).

tation, involving municipalities as well as the cantonal and federal administrations. With an average of 15 years, the longest authorization procedure to date has been ongoing for 24 years. This exceptionally long duration illustrate that procedures are very risky for developers and investors alike (Broughel and Wüstenhagen 2022; Wüstenhagen et al. 2017; Wüstenhagen and Bürer 2008). In fact, developers regularly name it the single-highest obstacle on the way towards deployment (e.g. Stadelmann-Steffen et al. 2018, 131). For organizations that are critical of wind energy projects, the many "slots" for complaints embedded in an authorization procedure entail high costs to them, but they also present windows of opportunity to cancel or delay potentially unwanted wind energy projects. Moreover, changing requirements of regulation over time have made an already complicated procedure even more intransparent. This has led some heavyweight environmental NGOs to become favorable towards a concentration and simplification of the procedure (see Umweltallianz 2022).[4]

As part of their task of developing legislation, many federal and cantonal politicians have entered parliamentary requests to get closer to solving the problem of making these authorization procedures more effective: Since the adoption of the Energy Strategy 2050 and with the cut-off data of the 1st of December 2022, the federal database on parliamentary items of business (Parlamentsdienste 2022) contains 35 requests on wind energy-authorization procedures, of which there are nine motions, five parliamentary initiatives, four postulates, ten interpellations and seven questions.[5] Some of the requests (e.g. 19.3730 Po. Chevalley [GLP/VD]) explicitly call for studies on how to make the authorization procedure more effective. Others (e.g. 22.3896 Ip. Steinemann [SVP/ZH]) request more data as to be able to better comprehend the problem. Keep in mind: These parliamentary examples only represent data for the federal level, but some legislative activity has also been present on the cantonal level. Importantly, even though there have been some partisan activities, the detection of whether there has been systematic engagement of political parties on the cantonal level that has mattered for policy-outcomes remains open and is in need of analysis.

4 The "Umweltallianz" or "Environmental Alliance" consists of four strongly involved NGOs in wind energy in Switzerland: Greenpeace, Pro Natura, VCS and the WWF.

5 The Curia Vista database (2022) was searched using the search term "Windenergie OR Windkraft". I selected results from 22.05.2017 onwards, one day after the acceptance of the Energy Strategy 2050. Based on these hits, I checked each single result based on the criterion of whether it contained an authorization procedure aspect on wind energy developments and discarded those that did not.

The topic of wind energy authorization procedures has also kept legal experts busy. Many have already been charged to propose how to improve these authorization procedures (e.g. Guy-Ecabert and Meyer 2016; Aemisegger and Marti 2021). First and foremost, however, the controversies surrounding wind energy authorization procedures have neither circled around federal and cantonal politicians nor around experts. It is in the general public where the topic of wind energy authorization procedures has been debated intensely. Especially in affected municipalities, wind energy has become very politically salient and also deeply entrenched (see Schneider 2022, 50ff.): For example, and as an anecdote, the author has been told by concerned municipal officials that proponents and opponents have stopped greeting each other on the streets due to their differences of opinion on the matter. This is a difficult feat for municipal social capital.

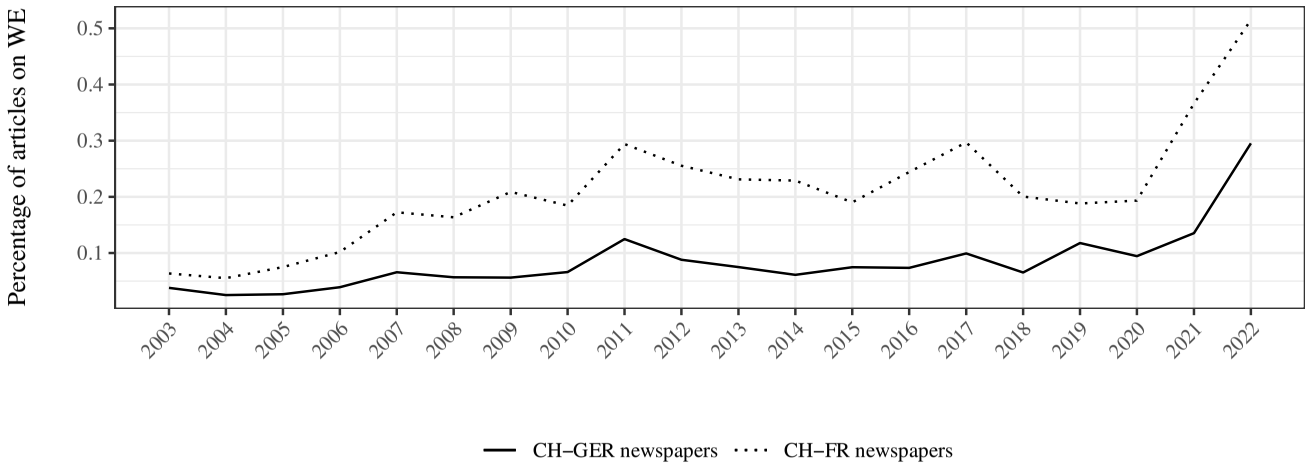
In order to investigate the saliency of the topic in the public debate, I scraped the "Swissdox" newspaper database (2022) and calculated the percentage of all articles in selected Swiss German- or French-speaking newspapers between 01.01.2003 and 31.12.2022[6] that were concerned with wind energy. Figure 1.2 presents the results. It shows two trends: First, and most importantly, the saliency of the topic has increased greatly since 2003. In 2003, about every 2000th article (at 0.05%) dealt with wind energy. In 2022, about every 200th article in the Romandie (the French-speaking part of Switzerland) and every 350th in a German-speaking Swiss newspaper wrote on the topic.[7] Second, the French-speaking newspapers deal with wind energy relatively more often than German-speaking newspapers. The reason this is the case is that there are disproportionately many wind energy projects in the Romandie. Overall, what the figure shows is an increasing public saliency of the topic of wind energy in Switzerland over time, with the year 2022 showing an all-time high.[8]

6 The data of 01.01.2003 was selected due to availability of articles by several important newspaper in the Swissdox-archive.

7 If one considers that the selected German-speaking newspapers produced 150'720 articles, then every 350th amounts to 445 articles in German in the time span 01.01.2022–31.12.2022. For the selected French-speaking newspapers, in the same time span, 47'582 articles were produced. Every 200th article amounts to 245 articles in total.

8 As a third observation, the curve for the French-speaking newspapers shows three peaks, the German-speaking newspaper curve shows four: In 2011, the Fukushima accident is the likely case for higher interest in wind energy for both. In 2017, the Energy Strategy 2050 containing many rules on governing wind energy was voted on. In 2022, the war in Ukraine triggered the fear of gas shortages, and the Federal Council's announcement of a "looming power shortage" in September gave the Federal Council

Figure 1.2: Quantified newspaper articles on wind energy in German- and French-speaking print media in Switzerland.



Notes: Sourced from Swissdox 2022. Included is the selection of Swiss German- and French-speaking newspapers as cited by the BFS print media statistics (2021b) and available in Swissdox without interruption since 01.01.2003. Search terms: CH-GER: (Windenergie* OR Windkraft*) AND Schweiz* AND (erneuerbar* OR Energie*). CH-FR: ?olien* AND Suisse* AND (renouvelable* OR ?nergie* OR ?nergie* renouvelable*). Newspapers covered: CH-GER (11): “Basler Zeitung”, “Blick”, “Der Bund”, “Berner Zeitung”, “Neue Zürcher Zeitung”, “NZZ am Sonntag”, “Sonntags Blick”, “St. Galler Tagblatt”, “Die Südostschweiz”, “Tages-Anzeiger”, “Sonntags Zeitung”. CH-FR (4): “24 Heures”, “Tribune de Genève”, “Le Matin Dimanche”, “Le Temps”. Articles that have appeared online but not in print were excluded due to inconsistent data availability across time.

Not only is the problem of wind energy authorization procedures highly salient for the Energy Strategy 2050, but for experts, and for the general public, the problem is also formidably complicated. If the authorization procedure consisted only of distributed competences in energy policy, which the Federal Court already called "highly complex" (BGE 1C_36/2011), then it could be analyzed by getting acquainted with a single policy-field. But an authorization procedure is governed by many rules of other policy-fields as well: First of all, spatial planning regulations guide these infrastructure projects. And the most powerful actors in spatial planning are the cantons. Within certain limits, cantons are free to organize their internal procedure leading to strong divergences between how cantons grant construction permits (Nahrath and Ingold 2024). Next to energy and spatial planning policy, there are also cantonal and municipal construction policies as well as federal (cantonally implemented) environmental policy, which play key roles. Klaber (2014) has disentangled the problem from a legal perspective in his dissertation, but unfortunately it remains inaccessible for non-legal specialists and does not follow either a chronological or policy-field logic. For political scientists and sectoral specialists interested in the material and comparative aspects of how wind energy authorization procedures have worked in Switzerland, it has unfortunately not provided systematized knowledge.

Cantonal differences in the granting of construction permits present the starting point of the present research project. Such differences do not only exist in the policy-fields of energy, spatial planning, environment and construction. In fact, cantons have been constitutionally granted very wide-ranging organizational, financial and task-autonomy (Art. 43 and 47 BV, see Uhlmann 2013, 16), which have resulted in a great diversity (and comparative inequality) of treatments and solutions to political problems. This *institutional* diversity has been particularly overt in matters of how cantons divide their powers between their municipalities and themselves. I will refer to this balance of powers between cantons and municipalities as cantonal decentralization — and this concept will serve as the main independent variable in the present study. More concretely, I refer to decentralization, until it is defined in detail, as the vertical balance of powers between territorially organized units of government that are nested within each other.

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additional competences (see BirrV). The German-speaking peak in 2019 is likely due to the turning-off of the first nuclear power plant at Mühleberg (BE) in December and because prominent debates about projects in Central and Eastern Switzerland took place at the time.

Indeed, in the public debate, institutional preconditions, especially the complex entanglement of fragmented competences between levels of government, are often named as being an important factor of why wind energy- or similar construction procedures are ineffective and inefficient in Switzerland and in the cantons (e.g. Müller 2018; Martinu 2023). Intuitively, the public debate on authorization procedures has been associated with the theory of institutional veto points (Tsebelis 2002; Crepaz 2002), because the often-heard assumption is that more people and organizations make it harder to lead the procedure efficiently and effectively. But if, for example, municipalities are veto players of the procedure in some cantons but not in others, does this mean that procedures in the cantons where they are veto players are more ineffective? As I will show theoretically and empirically, it is not that simple.

Moreover, debates surrounding the extent of local autonomy are highly politically salient as the "ancrage local" has been constitutive of Swiss identity (see e.g. Blickle 2000). Hence, the transfer of power from municipalities to the canton is generally viewed very critically (Tanner 2023). With regard to wind energy projects, the recent reform proposal by Aemisegger and Marti (2021), which proposed to take away municipal competences in spatial planning for such projects, triggered an unusually strong backlash. The strong municipal uproar about losing autonomy that ensued is a case in point: Local autonomy is and has been an undeniably highly important topic of political practice.

This is why Switzerland has been chosen as a case. Out of the 39 European countries whose local autonomy was measured by the "Local Autonomy Index" in multiple waves between 2000–2014 (Ladner et al. 2015; Ladner and Keuffer 2021), Switzerland showed the highest local autonomy in most waves and on average, only once giving up the first rank to Finland. This goes to show that Swiss municipalities are indeed very powerful in international comparison. In consequence, if municipal powers should indeed present an obstacle to efficiency and effectiveness, then Switzerland would likely be the country where this blocking could be expected to be strongest. In other words, if the test in this extreme case (Seawright and Gerring 2008) fails, then local autonomy is not likely to have effects in other countries as well. Thus, in terms of case selection, choosing the case of Switzerland amounts to a most likely case, as local autonomy is present most strongly.

From an academic point of view, there is also no shortage of arguments why investigating the link between decentralization and wind energy authorization procedures is a valuable scientific endeavor: Wind energy-authorization pro-

cedures represent a multi-level policy-implementation problem. In the literature, implementation arrangements and their effects as well as the functioning of multi-level implementation have been strongly under-investigated, even though the literature on implementation has been generally well-developed since the mid-1970's. There has especially been a lack in knowledge on effects of organizational arrangements (Sager and Gofen 2022) and in systematic knowledge of success factors stemming from comparative implementation studies (Hupe 2014).[9] In short: There is dearth of an in-depth analysis of multi-level implementation dynamics that compares within-country implementation between (subnational units of) countries. This study seeks to provide an illustration of such dynamics using wind energy authorizations as an example. The dynamics will not only be limited to actors that *directly* take part in implementation arrangements. Crucially, effects of political parties that *indirectly* affect implementation arrangement dynamics shall also be analyzed.

Specifically, the question of how decentralization affects the efficacy and efficiency of Swiss energy policy making has been left unanswered: This is not to say that there are no studies on the Swiss political system that evaluate the performance[10] of an institution; there are quite a few of them. Most, however, have applied broad and cross-sectoral understandings of performance, like the quality of democracy (e.g. Bernauer et al. 2016), public spending (e.g. Vatter and Freitag 2007; Feld et al. 2010), satisfaction with democracy (e.g. Leemann and Stadelmann-Steffen 2022) or economic growth (Feld and Savioz 1997; Freitag and Vatter 2006). Some studies have also addressed institutional effects on policy-field outcomes in health care (Vatter and Rüefli 2003; Freiburghaus et al. 2023) or education (Freitag and Bühlmann 2003). But studies measuring policy outcomes in the energy and spatial planning policy fields have been rare to non-existent. Hence, what I propose here are highly refined evaluative measures of efficacy and efficiency for concrete policy outcomes applied to a timely energy question. To capture efficacy and efficiency in a single concept, I will refer to efficiency and efficacy as dimensions of the umbrella term of problem-solving effectiveness. Importantly, the

9 To be complete, there is a growing literature on the functioning of national implementation of European Union legislation (e.g. Thomann 2018; Benz et al. 2016), but European Union dynamics are hardly applicable to within-country implementation experiences.

10 In this study, performance denotes a judgment about the value, merit or worth of a thing (Scriven 1991). It denotes "how well" a problem has been solved in a very broad sense.

study can also be seen in the light of testing the often repeated argument of Switzerland being slow and incremental in problem-solving due to the strong interdependence of the many decision makers and institutional constraints (see e.g. Scharpf 1988; Daehler 2014; Fischer 2015b).

Additionally, the present study also addresses the lack of policy knowledge on the problem of wind energy authorization procedures: No political science study known to the author has dealt with the *organizational* and *implementation* aspects of the Swiss wind energy authorization procedure comparatively. Rather, there have been plenty of studies that deal with the social acceptance of wind energy projects in Switzerland (e.g. Schneider 2022; Knauf 2022; Stadelmann-Steffen and Dermont 2021; Spiess et al. 2015; Walter 2014; BFE 2009) or its visual or acoustic determinants (Schäffer et al. 2019; Ribe et al. 2018; Manyoky et al. 2016). Potential electoral impacts of wind energy projects have also been addressed already (Umit and Schaffer 2020; Otteni and Weisskircher 2022; Stokes 2016; Walker et al. 2018). Yet the studies that have focused on authorization procedures are rare internationally (Liljenfeldt 2015; Lauf et al. 2020; Peterson 1995) and non-existent for Switzerland.

In summary, the problem of wind energy authorizations and the role that decentralization plays in making them (in)effective is in dire need of well-founded analysis. But before any investigation on problem-solving effectiveness may occur, it is first necessary to lay down the essentials of the procedure itself. Thus, this book follows the following overarching research question:

> How does decentralization affect implementation arrangements of wind energy authorization procedures in Switzerland and how do these arrangements affect the problem-solving effectiveness of public decision-making?

The question is two-pronged and formulates a sequence of two subsequent analytical steps. There are two additional preconditions that must be met before these two research questions can be answered: First, the analysis requires definitions and operationalizations of the concepts of decentralization, implementation arrangements and problem-solving effectiveness, as well as an analytical framework. Secondly, one must have an overview over how the authorization procedures work, who is involved and how involved actors relate to each other. Thereafter, the present study starts with answering the first prong of the question that asks how decentralization affects implementation arrangements. Subsequently, it continues to examine how aspects of implementation arrangements impact their problem-solving effectiveness.

This will answer the second prong of the research question. In order to account for the two-step structure and the three main concepts, I have labeled the research design an "intermediary research design", with decentralization being an independent variable, implementation arrangements acting as an "intermediary" variable and problem-solving effectiveness as a dependent variable. An additional study on effects of decentralization and implementation arrangements in wind energy authorization procedures in Europe will investigate the same conceptual relations on an international comparative level, albeit in less detail.

Given the research question, I formulate four goals that guide the present study. The first is for the guidance of the theory part, the three remaining will direct the empirical part. The study shall ...

1. ... integrate the empirical phenomena in an appropriate theoretical analytical framework that could be used for other studies on performance effects of political institutions.
2. ... present in detail how wind energy authorization procedures work in Switzerland.
3. ... discover which aspects of decentralization and implementation arrangements affect the problem-solving effectiveness of wind energy authorization procedures and how and with which strength they do so.
4. ... investigate factors of decentralization and implementation arrangements of wind energy authorization procedures on deployment in the wider European context.

Having briefly spearheaded the salience of the problem for practice and political science, proposed a research question and formulated the study's goals, it is now time to dive into detail. There are two branches to this endeavor: A detailed account of social importance treats the political, economic and environmental implications of getting the problem solved. It will be followed by an in-depth treatment of scientific importance that seeks to identify the gaps in the current literature and points out how this study might be able to alleviate them.

1.2. The social relevance

There are three main arguments why seeking solutions to the problem of Swiss wind energy authorization procedures is highly pressing. The first is climate change, the second is the current biodiversity crisis, and the third is the concern on cost-efficiency of public subsidies. They shall be discussed in this order.

Climate change

The Swiss nationally determined contribution of 2022–2030 to climate change abatement under the Paris Agreement foresees a reduction of 45% of CO_2 emissions by 2030 compared to 2010 and aims to reach net zero greenhouse gas emissions by 2050 (EDA and UVEK 2022). In 2020, Switzerland emitted 2.7 megatons of CO_2 eq[11] for its electricity production (IEA 2022).[12] This represents only 6.25% of total CO_2 eq. emissions in the same year (BFE 2022a).[13] This low share, in international comparison, is mainly due to Switzerland's dominant low-carbon electricity generation technologies of roughly 60% hydropower and about 30% nuclear power in 2021 (BFE 2022c).

So if Swiss electricity production is already very low in carbon intensity, why bother with the costly tediousness of further expanding renewables? Although this is an often made argument in public debates on their deployment, it is severely flawed from a climate perspective: First, official statistics only account for emissions stemming from electricity production but not for electricity consumption. If consumption were examined, the Swiss carbon intensity of electricity would deteriorate strongly.[14] In Switzerland, absolute imports amount to roughly half of Swiss electricity consumption (BFE

11 "Eq" denote "equivalents".

12 Emissions from main producers of electricity that also produce heat as a minor activity are included in this number as well.

13 The lion's share of emissions stems from other fuel combustion processes, the largest activity of which is transportation.

14 Between 1970–2021, net annual imports have ranged from 6.4 TWh (net import) to 11.8 TWh (net exports). Whereas Switzerland was a net exporter in every year from 1970–2004, since 2005 it became a net importer seven of the 17 remaining years until 2021 (BFE 2022c).

2022c).[15] Imported power has an emission intensity that is factors 10.4–27.5 higher than domestically produced power.[16] A back-of-the-envelope calculation under commonly held assumptions[17] shows that a consumption emission statistic would amount to 6.2–6.9 times more CO_2 eq [18] than if one examines the production statistic. Thus, on average, importing is not a climate-sensitive option. And although Switzerland cannot directly influence the CO_2 emissions of foreign power production, it could produce more electricity of low-emission intensity for domestic consumption instead of exporting it. Or it could focus on importing renewable electricity only.

A second reason why domestic renewable electricity deployment is beneficial in the fight against climate change stems from the fact that electricity demand is likely to grow in the near to mid-term future. This expected growth is predominantly due to the ongoing electrification of the transport sector: A meta-study by the Paul Scherrer Institute (2014, 16) compared 16 electricity-demand scenarios from 2020 to 2050 and found that the demand for electricity will likely range between 60 to 90 TWh by 2050. Hence, in the most extreme growth case, the assessed studies project a growth of roughly 50% of Swiss overall electricity consumption compared to today. Only in the bottommost scenarios, which assume that Switzerland has adopted ambitious climate targets, stringent implementation, and strict and encompassing efficiency measures, electricity demand is projected to stay at about 60 TWh in 2050, in essence remaining where it is today. Hence, if electricity demand is likely to grow substantially and importing stays an unviable option given the climate imperative, the remaining option is to deploy domestic renewable electricity production plants.

Third, with the Energy Strategy 2050, Swiss citizens voted to fully withdraw from nuclear powered electricity production by 2050. What the decision means concretely is that no new general operation licenses will be issued, and a step-by-step withdrawal with safety as the guiding criterion has been

15 In 2021, Switzerland imported 30.95 TWh and exported 28.05 TWh (net import: 2.9 TWh, Swissgrid 2022).

16 Based on 2018 data, the emissions intensity of imported power (lifecycle analysis) ranges from 520 to 550 gCO_2/kWh (Rüdisüli et al. 2022). Domestically produced power (lifecycle analysis) shows an emission intensity of 20 to 50 gCO_2/kWh (see also Weiss et al. 2021).

17 I assume that imports are not re-exported and I simplify the calculation of domestically produced power consumption as full consumption minus imports (62.5 − 30.95 = 31.55 TWh).

18 The estimate in consumption emissions would be 16.7–18.6 mto CO_2 eq due to electricity consumption.

planned (BFE 2017a, 5). The four remaining nuclear power plants in Switzerland will reach their decommissioning points in the upcoming years — and Switzerland will be left with replacing roughly 30% of the domestic electricity production, unless it wants to become even more dependent on electricity imports.

Biodiversity crisis

The second argument why it is imperative that the problem-solving effectiveness of wind energy authorization procedures is investigated is the biodiversity-crisis: A specialized United Nation's body estimates that 25% of all animal and plant species — which amounts to about 1 million species — are currently threatened for extinction (IPBES 2019, 11). Climate change and the changes in land-use are the unequivocal drivers of these developments (ibid., 13; Dawson et al. 2011). For vertebrates, the "Living Planet Index"[19] has detected a decline of 69% of monitored populations in 2018 compared to 1970 (World Wildlife Fund and Zoological Society of London 2022). For insects, the decline in biodiversity has also been well-documented, and the sheer magnitude and speed of the decline have been alarming (Wagner 2020; Miličić et al. 2021; van Klink et al. 2020b,a). A study from Germany shows a 76% decline of total flying insect biomass in protected areas between 1990 and 2017 (Hallmann et al. 2017). A recent study by Van Klink et al. (2020b) estimates the decline slightly more conservatively, but the trend is no less worrisome: Summarizing evidence from 166 long-term studies across 1676 test sites, the study found a 9% decline in insect abundance *per decade*.

How does this concern wind energy? Birds and bats may collide with the turbines or they can be displaced due to visual, auditive or vibration disturbances (Drewitt and Langston 2006). Moreover, the sheer size of turbines may alter the local or migratory flight paths ("barrier effect"), or they might also lead to habitat loss. Bats may experience a so-called "barotrauma" leading to internal injuries due to the difference in air pressure at the rotor blades compared to the surroundings (Schuster et al. 2015). Studies show that these negative effects strongly vary in strength and magnitude due to local territorial conditions, time of day, season and species (Nateco et al. 2015, 10; see also Msigwa et al. 2022). Although the actual number of killed bird

19 The Living Planet Index has documented 31'283 populations across 5'230 wild species since 1970.

and bats is highly different across siting contexts, Rydell et al. (2012) have counted an average of 2.3 dead birds and 2.9 dead bats per turbine and year in Europe and North America. Regarding the wind energy-toll on insects, a German study from 2018 (DLR 2018) estimated 1200 tons of rotor-blade- or tower-killed insects for all German wind turbines. Translated to a single turbine in a temperate climatic zone, this would amount to approximately 40 million insect fatalities per year and single turbine (Voigt 2021). While at first glance this seems like an incredibly high amount, the number needs to be put in perspective. Compared to what birds in Germany eat in terms of insect tons every year[20], the number of insects killed by wind turbines amounts "only" to 1/360th to 1/479th. However, even though this makes the number of insects killed by wind turbines seem very small, it cannot be excluded that this amount might be critical for some local insect populations. This is also the case for bats and birds: There is the possibility that vulnerable local populations might not bounce back in the surroundings of a larger wind park.

In Switzerland, under the Federal Act on the Environment (USG), potential sites must demonstrate in their integrated environmental project assessments that they have taken measures to avoid such fatalities, reduce them to the minimum if they cannot be fully avoided, and compensate for the irreducible amount. This potential negative impact on biodiversity is one of the main reasons why wind energy projects are so politically entrenched: Their clean energy benefit must be weighed against their environmental impact, with widely diverging results dependent on perspective. Moreover, opinions on the appropriate level of compensation tend to be divergent, with developers feeling that they already overcompensate what their project will cause and opponents thinking that not enough is done or claiming that clean energy benefit is "not worth" a project's environmental impact.

However, the important point of comparison with regard to biodiversity loss is what the decline would look like if one did not take action to mitigate climate change. Warren et al. (2013), studying 50'000 species, found that 34±7% of widespread and common animals would show a decline in their range by more than 50% by 2080 when the temperature reaches +3.5°C above pre-industrial levels. Fischlin et al. (2007, 213) found that "approximately 20–30% of plant and animal species assessed so far are likely to be at increasingly

20 Nyffeler et al. (2018) found that birds in temperate and boreal forests eat about 44.1±6.2 kg of insects per year and hectare of forest. Scaling this by the number of hectares of forest in Germany (11'419'124 ha, BMEL 2018), this amounts to 432'788–574'382 tons of eaten insects by year.

high risk of extinction as global mean temperatures exceed a warming of 2 to 3°C above preindustrial levels". For bats and birds, depending on habitat and species, Thomas et al. (2004) calculated a range of 0%–51% of species extinct due to unabated climate change in 2050. So if one puts these data in perspective to the biodiversity loss due to wind energy-projects, even their widespread deployment is likely to be many magnitudes lower in biodiversity effects than unabated climate change.

Moreover, as wind energy may be considered a direct substitute to the production of electricity using nuclear reactors or fossil fuels, a comparison of wind turbines with other electricity production plants is in order. Sovacool (2009, 2012)[21] argued that bird and bat mortality per unit of energy due to fossil fuel power stations is higher than for the same unit of energy produced by wind energy by a factor of 35. Even for nuclear power stations, he argued that bird and bat mortality is about two times higher per unit of energy produced than for wind energy. Whether the exact numbers are correct is context-dependent and difficult to assess, but what is important is that bird and bat mortality needs to be put in context with non-renewable electricity production, and when this is done, the balance is clearly in favor of wind energy.[22] Concerning insects, a recent meta-analysis by Wagner (2021) reported an important cause of insect decline to stem from nitric oxides (NO_x), which happen to be a side-product of burning fossil fuels. If additionally human health effects of burning fossil fuels were to be included as well (e.g. McCubbin and Sovacool 2013), then the balance even more clearly shifts in favor of deploying renewable electricity plants.

Public subsidies

The problem of authorization procedures has also been salient because wind energy operators have received public subsidies for producing clean electric-

21 Sovacool's 2009-article led to heavy critiques (Willis et al. 2010), a corrigendum (Sovacool 2010b), an addendum (Sovacool 2010a) and a re-publishing of a fully reworked study in 2012.

22 As causes of avian mortality in fossil-fuel power stations, Sovacool (ibid., 260) mentions upstream factors such as coal mining (oil and gas rigs), onsite collisions, electrocution with operating plant equipment, but also downstream "poisoning and death caused by acid rain, mercury pollution, and climate change". For nuclear power plants, he includes uranium milling and mining ("open pit uranium mines with hazardous lake formations"), but also cooling tower collisions (ibid., 261).

ity. And there is a debate on whether this has been an efficient use of public money. These subsidies can be costly, potentially taking away funds for other important public tasks. Under the subsidy-scheme of 2008, capturing projects running between 2006–2022, 43 wind turbines have received feed-in-tariffs in 2021. A total of CHF 8.5 million has been paid to 15 companies and five natural citizens[23] operating wind turbines (BFE 2023). Under the old scheme of subsidy contracts between 1999–2005 (capturing projects until 1992), an additional CHF 270'000 were paid to 12 wind energy projects in 2021 (Pronovo 2022). In the same year, owners of photovoltaic plants received a total of CHF 381.7 million (factor 43). In total, CHF 774.3 million were spent on these feed-in-tariffs for all renewable electricity technology installations (BFE 2023; Pronovo 2022). Again, to put this figure in perspective, the total cost of these feed-in-tariffs would represent 0.89% of total federal expenditure in 2021 (see EFV 2022). Rather than stemming from income-, company- or value-added taxes, which represent the largest federal source of finances, these funds are collected and paid through a flat tax in the pay-per-use grid tariffs.

Another economic argument that is often made is the economic cost of inaction. Obviously, this debate is much broader than only on the contribution of wind energy projects to climatic mitigation, but it is still worth illustrating it using a GDP-comparison. Kahn et al.'s (2019) study estimated costs up to 4% of GDP per annum in 2050 for Switzerland if climate change continues unabatedly (see BR 2021, 54). Assuming Switzerland's GDP in 2021 of CHF 743 billion[24] (World Bank 2022a) to be the same as in 2050, climate change cost in 2050 alone would amount to CHF 29.7 billion per year. If federal spending were to remain the same as it was in 2021, these CHF 29.7 billion would represent a bit more than one third of federal spending in 2021. Such an amount would be due annually. In comparison, with this single annual amount, one could finance the feed-in tariffs for over 38 years. Of course, there are so many other climate mitigation costs than renewable electricity deployment investments that save money over the long term. However, the point is that the opportunity costs of not investing in renewable electricity deployment are very high indeed.

23 The highest installed capacity of wind energy turbine held by a private citizen is 25 kW, which is small and therefore excluded in this study's wind energy project population.

24 This was calculated at an average exchange rate in 2021 of 0.91 CHF per dollar (Exchange Rates UK 2022).

1.3. The academic relevance

Now that the three arguments have demonstrated why it is imperative that the problem be investigated for people and the environment, the next step is to reason why and how this study brings academic value. This is the purpose of this section. I shall first present an overview over the relevant branches of the political science literature to which this study refers and then explain how the present study contributes to them. I first offer some more general contributions and then dive into those specific to the Swiss case.

1.3.1. The relevant branches of the literature

Among other literatures, the present study inscribes itself in the literature of institutional performance. It checks whether decentralization — an institution understood as being part of the polity — has an effect on the effectiveness of a concrete policy problem. This undertaking is in line with a rich literature that has developed on performative effects of political institutions. Dahl (1967) is often credited of introducing performance evaluations into political science in the 1960's, although the link between political institutions and performance has been discussed much earlier already (see section 3.3.2.). Indeed, there has been a very lively branch of the literature relating political institutions to macro-scale performance outcomes. The test of effects of types of democracies on the quality of democracy has been especially prominent: Its modern origin was formulated in Finer's (1975) seminal contribution on the negative effects of British adversial "stop-and-go" politics, which has sparked a lively debate on performance contributions of types of government. However, most famous in this branch is Lijphart's seminal book named "Patterns of Democracy" (1999, 2012) that has guided the further development of the question ever since its publication (Bernauer et al. 2016; Bernauer and Vatter 2019). A closely related strand of the literature has sought to explain the stability and change of political systems with types of democracies (Tsebelis 1999; Crepaz 2002; Vatter 2006). Whether change and stability in political systems are indicators of institutional performance could certainly be debated, but the point is that even this branch of the literature has resorted to using only macro-level outcomes as a variable to be explained by institutional patterns. As examples of how change- and stability-outcomes have been measured, scholars have often drawn on indicators of government spending (e.g. Freitag and Vatter 2009; McGann and Latner 2013) or redistribution measures (e.g.

Crepaz 2002), have examined the force of innovation (e.g. Fischer 2015b) or have evaluated systemic blockades of political processes (e.g. Scharpf 1988). Yet another branch of institutional performance studies — and the one to which this study subscribes — has applied a "polity-on-policy" design to examine effects of types of democracies on concrete policy outcomes, not on macro-level indicators of democratic quality, stability or change. Pursuing this design, there are studies that have investigated effects of democratic institutions on environmental outcomes (Finnegan 2022; Povitkina 2018; Jahn and Suda 2022; Bernauer and Koubi 2009; Congleton 1992) or on the growth of renewable electricity (Hamid et al. 2022; Chen et al. 2021; Pfeiffer and Mulder 2013), just to name two policy sectors that are relevant to the present study.

Concerning decentralization, many studies in the past have attempted to find its *direct* effects on the performance of institutional or organizational arrangements. Indeed, whether "local governments do it better" (Guccio et al. 2014) has been a steady companion in the problem-solving literature. I contend that there have been five differing approaches towards analyzing the relation.

First, there are those studies that seek to test effects of decentralization comparatively across countries: Wachendorfer-Schmidt's (2000) study has been polity-oriented, Braun (2000a,b, 2008) and Keman's (2000) comparative works have followed a public policy focus, and Palermo and Kössler (2017) have offered a performance discussion embedded in comparative legal terms. Yet these studies only focus on a handful of cases at most. In consequence, little systematic knowledge is available (Braun 2000a), besides a few studies' individual findings: Decentralization has been found to impact government efficiency positively in high-GDP countries and negatively in low-GDP countries (O'Dwyer and Ziblatt 2006); Biela et al. (2013) have found a greater diversity in fiscal outcomes in more decentralized settings.

In the institutionalist literature, performance effects have often been investigated based on whether an institution has contributed to stability, change or innovation (see e.g. Lemco 1991). Scharpf's "joint-decision trap" (Scharpf 1976, 1988), which has found deadlock in the German bureaucracy of the 1970/80's due to many actors at the negotiating table with veto powers, has been very influential. Closely related is a focus on "robustness" of federations. Bednar's (2008) study is famous in this regard: She noted that a federation is robust only because it has installed "federal safeguards" that are capable of presenting encroachment by either side. The debate on effects of additional

institutional constraints in policy-making due to decentralization (e.g. Braun 2000b) can also be classified as investigating the stability and change of political systems. Tsebelis' (1999, 2002) formulation of a veto player theory has been groundbreaking on this matter, as it has allowed a burgeoning debate on incrementalism, status quo-bias or immobilism of political systems as a function of the behavior of their veto players. Although the veto player and system stability literature has been much broader than only focusing on decentralization, the link between decentralization and a greater number of veto players that impose additional policy-making constraints has been a central aspect of it (Braun 2000b; Braun et al. 2002; Wälti and Bullinger 2000; Blume and Voigt 2011).

The third approach to effects of decentralization on problem-solving effectiveness takes a less comparative focus but has conducted an in-depth quest of identifying the optimal territorial scale of one or multiple public tasks. This economic approach called "fiscal federalism"[25] has formalized the search for scale and efficiency mathematically (Oates 1972, 1968; Tiebout 1956; Frenkel 1977; Wittmann 1973; Hulten and Schwab 1997; Dafflon 2006; Kappeler et al. 2013). In this literature, the central government only exists because of economies of scale and transaction costs (Alesina and Spolaore 2005, 138), there is no path dependency or institutional rigidity. Because each task for each country would require a different territorial scale (Filippov et al. 2004, 69), general-purpose government levels tend to be inefficient. This has led prominent scholars to decry fiscal federalists as non-pragmatically pursuing "the fantasy of the optimal scale" (de Vries 2000, 203). General answers on appropriate scale by nature of task also remain "conspicuously absent" (ibid., 196). Still, this branch of the literature has inspired many researchers to investigate decentralization effects on fiscal outcomes. In fact Oates' (1968, 1972) models have given rise to studies that examined a connection between the size of the public sector, as measured by public spending,

25 As will be seen, the term of federalism is erroneously applied to fiscal federalism studies if this study's understandings of decentralization and federalism are applied. Fiscal federalists tend to investigate the effects of distributions of competences across territorially defined levels of government, and thus of degrees of decentralization (self-rule). However, they tend to disregard these entities' shared competences at the central level of government (shared rule; see Elazar 1987). Only the inclusion of these shared rule competences would make it a federalism study in the present study's understanding. But the false labeling persists across all strands of the literature of, e.g., environmental and/or energy federalism. For an elaborated discussion on the difference between federalism and decentralization, see section 3.1.2.

and decentralization. Most famously, in this regard, has been Brennan and Buchanan's (1980) "Leviathan hypothesis", which expected a smaller size of the public sector with increasing degrees of decentralization. This hypothesis has been corroborated, among else, for Switzerland (Mueller et al. 2017). Today, there is a large richness of studies that assess decentralization effects on varying measures of cross-sectoral fiscal performance (Biela et al. 2013; Egner 2012).

I label the fourth approach simply as "governance", but in the literature it goes by many labels (polycentrism, multi-level governance, problem-solving capacity, just to name a few). Common to them is the systematic incorporation of complexity, agency and institutions as a context factor. Many theoretic frameworks, among which the Advocacy Coalition Framework (Sabatier and Weible 2007), the Institutional Analysis and Development Framework (Ostrom 1990; Ostrom et al. 1994; Ostrom 2011) and Actor-Centered Institutionalism, have grown out of the desire to understand and manage complexity. In such approaches, institutions, such as decentralization, have been understood as structural constraints or enablers of actors, who remain at the center of analytical attention (see section 2.4.2.). Decentralization is only one among many structural constraints that the policy-analysis frameworks have incorporated, and its role and effects are often not explicitly developed (e.g. Sonnhoff et al. 2021). In addition to the policy-analysis frameworks, the multi-level governance perspective (Hooghe and Marks 2003) has also added to the discussion on performance: For example, it has led to theorizing the (dis)advantages of flexible jurisdictions (Eichenberger and Frey 2006), to examining the performance implications of multi-level administration (Benz et al. 2016) or to investigating the benefits of cross-level interagency collaboration (Mullin and Daley 2010). Especially prominent has been the discussion on how multi-level governance in the European Union has contributed to problem-solving (see Trein et al. 2019; Thomann et al. 2019; Thomann and Sager 2017; Irepoglu Carreras 2019).

Understandings of performance in this governance literature diverge sharply. Nevertheless, there are two aspects of the "quality of governance" that have received especially widespread attention: decentralization effects on corruption and decentralization effects on governance in post-conflict societies. More often than not, greater decentralization has been associated with an increase in corruption (Fisman and Gatti 2002; Von Maravic 2007), linking decentralization to venue-shopping (Baumgartner and Jones 1993) or even state capture (Fazekas and Tóth 2016). The post-conflict assessment of effects of decentralization has also been prominent. For example, scholars

have assessed to what extent decentralization has led to greater power sharing and better public goods provision (Clayton et al. 2015; Acemoglu et al. 2014). Accountability of public mandate holders and of administrations are also frequently tested effects of decentralization in post-conflict societies (e.g. Edwards et al. 2015).

The fifth approach has studied decentralization and performance by selecting a policy problem in a policy field. For example, the debate on whether polycentrism or monocentrism is more effective when governing metropolitan (or remote) areas has been very productive (see e.g. Kwon et al. 2014; Lewis 2004; Klok et al. 2018; Kübler 2005). Regarding the present study's topical focus, one can find two corpora of literatures named environmental and energy federalism, with studies of decentralization effects on spatial planning/construction being still absent (see Gerber et al. 2013 for an exception). The relationship between decentralization and environmental policy performance in the international environmental federalism literature (Arnold 2015; Millimet 2014; Oates 2001; Keman 2000) and the Swiss-specific one (Knoepfel and Boisseaux 2013; Wälti 2010; Jahn and Wälti 2007; Wälti 2004; Knoepfel 2002; Wälti 2001; Vatter 1999; Bussmann 1988) has led to highly ambivalent results: Scruggs (2003, 183–187) and Keman (2000) maintain that there is no difference between environmental policy performance in unitary and in federalist states. Oates (2001) even posits that federalist organization may be detrimental to environmental performance because externalities can be better integrated in central states. However, Wälti (2004), Müller-Brandeck-Bocquet (1996) and Pollack (Pollack 1997) contend otherwise by pointing out that the federal organization permits flexibility, innovation and locally optimized environmental solutions. Similarly, the much less developed literature on energy federalism has so far been equally inconclusive (Schmid et al. 2020; Balthasar et al. 2020; Karapin 2019; Schaffer and Bernauer 2014; Osofsky and Wiseman 2013; Sovacool 2008; Wälti and Bullinger 2000; Hettich and Kachi 2022; Strebel 2011).

The present study inscribes itself in the first, second, fourth and fifth branch of the decentralization performance literature(s): It is comparative, integrates institutional debates around the role of veto players, uses a policy-analysis framework that has been originally designed for governance inquiries, selects a policy problem and resorts to "low-level" policy outcomes as measures of performance. It measures the problem-solving effectiveness of onshore wind energy authorization procedures and tests whether decentralization has an impact on it. The two corpora of the decentralization performance

literatures that come closest to this undertaking have already been mentioned: environmental federalism and energy federalism. They generally aim to evaluate whether federalist state organization makes a difference for the respective outcomes (see e.g. Balthasar et al. 2020; Arnold 2015; Millimet 2014; Vatter 1999). Results of studies with outcomes of both policy-fields tend to be highly context-specific and, as mentioned, seem inconclusive. This is especially the case for the nascent literature of energy federalism that has only recently gained traction.

1.3.2. General contributions

In this section, I shall provide an overview over the main contributions that this study makes for the general (non-Switzerland-specific) political science literature. I will follow the broad trichotomous heuristic of polity, policy and politics, as understood by Bernauer et al. (2018, 34). Thus, the polity contributions will focus on contributions to debates on political institutions, structures and organizations; policy contributions discuss benefits of the subject matter at hand; last, the politics contribution presents additions to debates surrounding political processes.

Polity

The present study seeks to advance the decentralization performance literature in the branch called energy federalism, with one of the first studies on Europe on the topic of decentralization and wind energy authorization procedures. It aims to do so using a well-defined theoretical framework that might be usable for other researchers investigating aspects of energy federalism. The overall theoretical framework that I have resorted to is Mayntz and Scharpf's (1995; 1997) time-tested Actor-Centered Institutionalism. The theoretical framework needs some adaptations for the present purpose. There are multiple advantages of embedding the entire research project into an overall theoretical framework. First, the framework is able to guide readers by providing simplification. In the present project, I treat the concepts of decentralization, of institutions, problem-solving effectiveness, implementation arrangements, evaluations and networks, among many others, and the analytical framework permits the integration of all of these terms and concepts, providing an overall orientation at all times. Moreover, the application

of the time-tested analytical framework of Actor-Centered Institutionalism ensures strict theoretical coherence regarding assumptions (agency vs. structure, normativity, etc.). Especially in the implementation literatures that is often guided by practice instead of theory, such a theory guidance is an advantage. Moreover, and this is the contribution to the literature applying Actor-Centered Institutionalism, this research project presents an innovative application of this theoretical framework: Instead of its traditional dependent variable of explaining how past policy choices come about, I apply it to implementation decisions and evaluate the value, merit and worth that these decisions have produced. Furthermore, I apply the framework using quantitative methods mostly, which is novel in comparison to the existing body of qualitative-heavy case studies using this theoretical framework. In addition, the advantage of tweaking the analytical framework in this study is that it may be used for future performance effect studies of political institutions, as it demonstrates a high degree of portability.

Hence, the present study seeks to make its main contribution in this nascent literature of energy federalism. It further wants to provide a theoretical framework that allows subsequent researchers to test for decentralization effects on performance.

Policy contributions

In policy studies is where this study seeks to make another contribution: The nexus between spatial, energy and environmental policies has been completely underresearched. For one, the energy federalism literature has not advanced yet to incorporating the complexities of the policy cycle. So far, the literature that seeks to identify factors of renewable electricity deployment has not differentiated its findings by phase of policy-making either (see Bourcet 2020; Can Şener et al. 2018; Darmani et al. 2014 for more recent overviews). Although the nexus between land use and energy permitting has been widely acknowledged in geography (Dale et al. 2011; Guo et al. 2020), it has received only scant attention in political science, even though spatial planning would be an important policy field to scrutinize. As an illustration, in the three literature overviews on renewable electricity deployment that were just mentioned, only a single study on the UK has named "granting a site license" as a condition for deployment. In terms of material importance of deployment factors, this amounts to analytical negligence. Such negligence is even more remarkable for deployment studies incorporating the technology

of wind energy. In fact, studies often cite the crucial role of spatial planning authorization dynamics (e.g. Diógenes et al. 2020; Boie et al. 2015; Pettersson et al. 2010; Liljenfeldt 2015), but without diving into the issue. Thus, it is high time that studies turn their attention to the authorization procedure dynamics that are governed by this policy nexus.

In fact, political scientists dealing with wind energy have often investigated the social acceptance of projects (Leiren et al. 2020; Enevoldsen and Sovacool 2016; Sovacool and Lakshmi Ratan 2012; Vuichard et al. 2019, 2021; Stadelmann-Steffen and Dermont 2021; Walter 2014; Batel et al. 2013; Stigka et al. 2014; Ebers 2017; Dütschke et al. 2017; Sequeira and Santos 2018). While there is no doubt that this is a crucial factor, a socially accepted project is a necessary but insufficient condition for its deployment. In other words, even a socially accepted project eventually needs to be built. In some countries, citizen acceptance is a formal and necessary condition for a construction permit, in others, social acceptance — in the strict sense of community acceptance (Wüstenhagen et al. 2007), meaning affected citizens needing to decide favorably on a project — is not strictly necessary. What is required in all modern democracies, however, is an authorization procedure that checks whether the project conforms to the energy-, environmental, safety-, spatial planning and construction legislation and can therefore be given an operation/construction permit.[26] Certainly, these authorization procedures are highly specific to each country, and in decentralized countries specific to each region in a country, making comparisons difficult. But ignoring the issue in a comparative perspective, as the literature has done so far, does not serve the further development of theory, neither does it support an understanding of the role of authorization procedures as a deployment factor. This is why this study seeks to advance the literature on the matter through cantonal comparison in Switzerland and through a comparison of European countries.

Politics

Another general contribution that this study seeks to make is in the realm of implementation in decentralized countries. Wind energy authorization issues are negotiated between public administration and developers, with different roles ascribed to civil society organizations that participate. The process of

26 The name of the final permit differs between countries.

granting an authorization culminates with the handing out, or denial of, a final and judicially valid construction or operation permit. In this process, administrators assess whether a developer's proposed project conforms to the legislation in force. In other words, authorization procedures implement the applicable law. Hence, authorization procedures should be understood as implementation of a policy — and it is this stage of policy-making that I will concentrate on in this study.

Even after several generational cycles of analytical approaches in implementation research after Pressman and Wildavsky's (1973) study establishing policy implementation as a field of research (see section 3.2.), the literature still has many shortcomings: For example, Sager and Gofen (2022, 349) maintain that specifying the institutional and organizational dimensions of the "implementation polity" is in dire need of greater scholarly attention (see also Imperial 2021). By "implementation polity", Sager and Gofen (2022) understand the dynamics between implementation actors and the conditions that shape their work. More classically, these dynamics and conditions could be captured under the heading of "politics of implementation" (Bernauer et al. 2018). Such an emphasis in the literature would be important, Sager and Gofen (2022) argue, to improve the scholarly understanding of political power, administrative politics and multi-level governance.

In fact, the incorporation of politics into implementation studies has been at the forefront of the modern literature: Many authors have argued that an exclusion of politics in implementation processes has been strongly counterproductive (Kettl 2022; Peters et al. 2022; Nabatchi 2022). Following these authors, it is essential that politics are reintegrated (back) into studies on administrations. Such a (re)integration requires a conception of agency not as one of apolitical discretion — as bureaucratic power is commonly referred to — but as a bringing back in of the essentials of politics, namely power, negotiation and ideology, into administration (Ladner and Sager 2022; Sager and Gofen 2022). Although there has never been an unequivocal dichotomy in this regard, and especially "bottom-up" implementation researchers have always referred to their agency as political, these authors argue that it is essential to treat administrations as political actors, not as some aseptic machinery that strictly obeys the principal's will at all times. In treating implementation as politics, the present study seeks to heed this call.

The scant literature on energy federalism has not yet paid attention to implementation dynamics, although there have been calls to further explore implementation dynamics in related literature, like multi-level governance (e.g. Gollata and Newig 2017; Mullin and Daley 2010). Some, especially

environmental, scholars have heeded this call (Knill and Liefferink 2013; Newig and Koontz 2014). Recognizing the lack of systematicity in the existing studies on implementation, Benz et al. (2016) developed a typology of European administration interaction with European Union actors and labeled it "multi-level administration". Notably, Trondal and Bauer (2017) have complemented this effort. Yet, for present purposes, the multi-level administration discussion is strongly based on the European Union and is hardly portable to contexts and levels of government. The US-American literature on implementation has been similarly plagued from the problem of having been largely non-cumulative in nature (Imperial 2021; O'Toole 1986). What is more, the literature's incorporation of decentralization in the US-American context (e.g. Whitford 2007; Hedge et al. 1991) is only difficultly applicable to "less dual" and more cooperative dynamics of implementation. Hence, there is dearth in exploring multi-level administration on national and subnational government and in a more cooperative context of implementation. To this end, the present study proposes an examination of multi-level implementation dynamics in Switzerland. Most important in this regard is that it seeks to provide *comparative* evidence of such implementation dynamics, the lack of which has been an incessant weakness of implementation studies more generally (Hupe 2014).

It is with an eye to these gaps in the implementation literature that the present study has been conceived: It addresses the current lack of knowledge on the "implementation polity" (Sager and Gofen 2022) by treating implementation arrangements as networks and through routines of Social Network Analysis; in addition it calculates various descriptors of these arrangements, which it also uses analytically. By measuring actor constellations and orientations, it explicitly integrates politics into its analysis. It also heeds the call to examine in greater detail how multi-level implementation works in practice, but not with regard to the European Union but within countries. An in-depth analysis of how implementation works in the Swiss cantons (empirical chapters 5–8) and an exploratory study between countries of Europe (chapter 9) are conducted. Doing this in a comparative study between cantons and countries of Europe brings benefits to the case-study-dominated literature on implementation.

Additionally, from a methodological point of view, this study treats implementation in an innovative way, using it both as a dependent and independent variable: Because wind energy authorization procedures are implementation procedures, a polity-on-policy design must necessarily examine the politics of implementation dynamics, namely decentralization effects on im-

plementation arrangements, as well as implementation arrangement effects on policy-outcomes. Hence, an investigation into the effects of decentralization on policy outcomes calls for at least one "intermediary", an implementation arrangement.

1.3.3. Swiss-specific contributions to the literature

Because I focus on the Swiss case, there are several Switzerland-specific contributions that need to be established. In the following, I structure them following the same triad of polity, policy and politics as above.

Polity

As a first Switzerland-specific contribution, the research project seeks to add to the literature on performance effects of political institutions by diving deep into analyzing impacts on performance of wind energy authorization procedures. Around the turn of the millennium, investigating performance effects of political institutions on policy-field outcomes has been popular in Swiss political science, regressing institutional variables on cantonal economic growth (Freitag and Vatter 2004), cantonal public spending (Vatter and Freitag 2002), cantonal health care expenditures (Vatter and Rüefli 2003) or education (Freitag and Bühlmann 2003). Yet the testing of institutional effects has since lost traction. At the time, the scholarly community has been especially active in what later came to be subsumed under the label of "environmental federalism" (Wälti 1996, 2004; Knoepfel et al. 2001; Knoepfel 2002; Jahn and Wälti 2007; Herzog et al. 2022). It examined sector-specific effects of federalism on a diverse array of environmental policy outcomes in Switzerland. Looking back, these studies suffer from various shortcomings: They are not comparative, often heavy on theory and low on empirics and do not treat implementation dynamics full-on.

In fact, no study known to the author has tested effects of decentralization on outcomes of wind energy authorization procedures in Switzerland. The present study thus hopes to lay the groundwork for a debate on the role of decentralization in Swiss energy policy development. Still, there are related studies that the present undertakings can speak to: Stadelmann-Steffen et al. (2020, 2018), for example, examined governance determinants of wind energy project success or failure in the recent past. None of these studies, however,

investigate the role of decentralization for wind energy. A closely related research project, named "Gouvéole" (2014–2017), examined the territorial governance of wind energy in Western Switzerland, but from a perspective of participation, social acceptance and cognitive mechanisms that lead to support or rejection of wind energy-parks (Cherqui and Bombenger 2019; Kodjovi and Bombenger 2019; Cherqui et al. 2019). Blake et al. (2020), in a publication also resulting from the "Gouvéole" project, evaluated why one wind energy project was successful and the other was not, but they did not incorporate implementation dynamics. Moreover, the Gouvéole research did not include institutional effects on success or failure and took a handful of projects in the Romandie as their case studies (interviews). In contrast, in the present study the focus is on all of Switzerland's wind energy projects, and it proposes a comparative evaluation methodology, evaluates decentralization effects and treats implementation dynamics in full.

Policy

Concerning the Swiss-specific policy contribution, the value of providing an overview over wind energy authorization procedures is certainly to be mentioned first. Policymakers need to base the further development of wind energy policy on data, but until now a comprehensive overview over Swiss wind energy authorization procedures has been lacking. Such an overview is not only helpful to practically address the problem but may also provide value to the literature on wind energy in Switzerland, which has so far relied on (anecdotic) single or low-n evidence from Swiss wind energy projects. Further, this overview should serve to open up the debate on wind energy authorization procedures to political scientists — a topic which has so far been confined to a small circle of Swiss legal experts (e.g. see Klaber 2014; Aemisegger and Marti 2021).

In contrast to the descriptive value that was just explained, the policy contribution of this study may further be derived from the analytical treatment of the subject. The study will assess the role of factors of performance in wind energy authorization procedure and, by doing so, could help policymakers identify those factors that could make a difference in solving the problem. To do so, the study will measure the efficacity and effectivity of wind energy authorization procedures, thereby relating goals to outcomes and goals to interventions (see Knoepfel et al. 2015). Using this multifaceted testing strategy, the present study's aim is to inform the public debate on how to

improve wind energy authorization procedures to the greater satisfaction of all involved parties, including opponent NGOs. This envisaged gain in concrete problem-solving knowledge is certainly a gain for the literature, which has not yet identified the relative explanatory force of performance factors. This evaluative character of the study has been inspired by, in part, assessing to which extent cantons have implemented their legal obligation stemming from Art. 14 of the Federal Act on Energy that was accepted in the Energy Strategy 2050. The article calls on "cantons to foresee fast authorization procedures for the construction, expansion and renewal of renewable electricity infrastructure." Hence, the study's value could also be understood as an evaluation of the outcomes of this legal proposition.

Politics

Regarding aspects of politics, the present study seeks to make two Swiss-specific contributions. The first is that the dynamics of implementation arrangements are illustrated in holistic fashion. Given that this study examines all aspects of implementation arrangements that Actor-Centered Institutionalism has detected as relevant for decision-making, the holistic treatment can certainly be viewed as a plus for the literature on the Swiss "implementation polity" (Sager and Gofen 2022). The findings also aim to speak to Linder's (1987) and Linder and Mueller's (2017) analytical scheme on how consensus on the levels of the federal principal and the cantonal agent determine whether a federal policy is implemented by the cantons. While this scheme is by no means outdated, it is also overly simplistic: For example, the scheme ignores the municipal level, the reasons behind the appearance of conflict and the role of NGOs in implementation, and it disregards the cantonal implementation of cantonal legislation. To be clear, this study does not attempt to theorize beyond their productive heuristic scheme of federal implementation by cantons. Rather, this study presents the "nuts and bolts" of what multilevel implementation in Switzerland means in reality, with a high degree of empirical detail.

The second contribution to Swiss politics concerns the examination of the role of political parties on (the problem-solving effectiveness of) wind energy authorization procedures. So far, whether and how Swiss political parties have positioned themselves on the topic of wind energy has not received much attention in the scholarly literature. There is the general yet superficial expectation from renewable electricity debates that wind energy opinions

follow a left-right divide, with the left being more in favor of wind energy promotion and the right being more against it (Cousse et al. 2020; Vuichard et al. 2019; Stadelmann-Steffen and Dermont 2019). But this is not etched in stone: Wurster and Hagemann (2019) find a null-result regarding the effect of green parties on renewable electricity deployment in the countries of Switzerland, Germany and Austria. Recently, there has also been a survey experiment that tests whether and which parties were punished if one imagines that a wind turbines has been built in the respondent's municipality (Umit and Schaffer 2020). It equally detected a null-effect regarding all its partisan variables. Contradicting the preliminary left-right expectation, Lüth and Schaffer (2022) found that in the most recent national election the left party of the Swiss Greens (GPS) has devoted relatively less attention to energy and environmental issues than in previous elections, with the center party of the Green-Liberals (GLP) gaining in issue ownership. This could point to an increased renewable electricity promoter role of the political center traditionally not expected. But overall, the state of the literature on partisan effects on wind energy projects has remained unsatisfactory: What is known is anecdotal, and much is simply assumed "by extension from" findings of more general renewable electricity politics. Furthermore, results of surveys are difficultly applicable to real-world settings. No study that I am aware of has so far tested partisan effects on the problem-solving effectiveness of concrete wind energy projects that are currently in the making.

The non-convincing null-effects of the studies mentioned so far are not surprising: Given that the construction of wind energy has been highly politicized, it seems likely that political parties fear taking position because of the looming potential of losing votes. But for voters the position on wind energy is a relevant piece of information — especially concerning the further development of the Swiss energy transition. How have political parties acted in the past when it came to concrete wind energy projects in Switzerland? Based on data on the locality of concrete wind energy projects as well as partisan information from surveys and from official election results, statistical associations between problem-solving effectiveness and political parties are estimated, and this question will tentatively be answered. The investigation is strictly non-causal; still, even a systematic effort that works only by controlled statistical correlations is deemed insightful, as it combines — for the first time — partisan effects with performance data on real-world wind energy projects in Switzerland.

1.4. Research design, data and methods

Having shown what the problem is about and why it is important to investigate it for social and academic reason, it is high time to present *how* the study will be going about the promised analyses. I will first briefly explain this study's research design, then give an overview over the data. Thereafter, I will lay down the basic methodological proceedings of this study.

Research design

The study pursues a research design with three main sets of variables, an independent, an "intermediary" and a dependent variable set. As a consequence, the analysis foresees an investigation into three analytical "links": from independent to intermediary, from intermediary to dependent and from independent to the dependent variable. This is the setup of the comparative Swiss study. The first link tests for effects of the main independent variable of decentralization on the intermediary of implementation arrangements, as measured by the analytical categories of Actor-Centered Institutionalism. The second link examines to which extent these aspects of implementation arrangements affect the problem-solving effectiveness of wind energy authorization procedures. The third link investigates the direct relation between decentralization and problem-solving effectiveness. A similar setup is used for the European study "on the bigger picture" that follows the Swiss comparative study.

Data

For the present research project, three surveys and an additional 20 interviews were conducted. The entire data collection effort was fully self-managed, with the help of a part-time student assistant, and took roughly 1.5 years. Additionally, there was a lot of secondary data that was drawn upon. For the reader to get a glimpse into what the data collection phase consisted of, I shall briefly go over the basic information for all three surveys and the interviews. Detailed presentations of the data used can be found in the data sections in the empirical chapters where the respective data are worked with first and most prominently. Questionnaires are available upon request.

The Project Characteristics Survey was conducted between April 2020 and February 2021. 318 questionnaires to 188 different organizations were sent out. These 188 organizations were divided into four categories: wind energy developers (n = 44), municipalities (n = 122), cantons (n = 17) or federal agencies (n = 5). The survey inquired about a total of 85 projects. It was designed as a population survey that did not rely on a sample but questioned the full population. The response rate, based on the number of questionnaires, not on the number of organizations, was at 62.5% (response rate 2, AAPOR 2016). In terms of content, the survey asked each stakeholder group about different details of the wind energy authorization procedure for the wind energy project that they were or still are involved in. Each survey was available in German, French and Italian.

The second survey, the Network Characteristics Survey, was conducted between September 2020 and April 2021. The survey sample contains a set of 30 wind energy projects. For each wind energy project, I sought to contact all involved stakeholders that I could identify based on media reports, interviews and phone calls, official project-webpages and judicial decisions. The list of stakeholders was validated and complemented by a project-independent policy expert. In total, I contacted 197 organizations divided into six different stakeholder groups. Each of these groups received a separate survey, and each survey was available in German, French and Italian. The response rate was at 54.5% (response rate 2, ibid.). Its main purpose was to ask "network"-style questions on which other involved stakeholder the respondent organization collaborated with, trusted or were in conflict with.

I further held 20 interviews with representatives of all stakeholder categories on the (Swiss) wind energy projects in which they were involved. These were conducted between October 2020 and April 2021, mostly by video-conference software due the pandemic's meeting restrictions at the time. They followed the semi-structured standard (Adams 2015) and lasted 45 minutes to 2.5 hours each. One to three respondents were present in each interview. Each interview was transcribed, following the scientific standard. In a first part, the prepared questions were highly individualized to the wind energy projects in which the respondents were involved in. In a second part, standardized questions were asked. Although I resort to these data only in a very limited way because much information is project-specific, I will use them to illustrate and give weight to certain points and arguments.

Last, the survey on European wind energy authorization procedures was held between June and December 2020. 22 experts from 20 different countries took part. I identified these experts by snowballing, based on contacts-of-

contacts, which is why no response rate can be indicated. Respondent experts worked at NGOs, developer companies or in public agencies. The survey was labor-intensive and took about 1 hour to complete. Its main purpose was to learn about how authorization procedures work in the respondents' countries. The survey was available online, but because it required quite some investment of time, there were several instances in which the respondent and I held a video conference, in which I explained the questions and guided the respondent through answering the survey.

Confidentiality of data

Due to the politicized nature of the topic of wind energy authorization procedures and the resulting debates on whether greater transparency is a service or disservice to the project, the raw data that I collected needed to be treated in fully confidential manner. This was a request by many respondents in the surveys, and confidentiality was often formulated as a precondition of filling in answers. I even signed a handful of non-disclosure agreements to be able to collect important but sensitive data. This has certain ramifications for the level at which the present study can illustrate the results.

For treatment and analysis, all data has been anonymized to the fullest possible extent. Because, however, the number of Swiss experts and projects is small, the publication of raw data would still allow for limited back tracing. Therefore, only aggregated data is shown. Yet even when aggregated data are presented, limited back tracing is still possible, which is why all data in the present book were approved for publication by the relevant stakeholders that sought confidentiality.

For the level of reporting in the text, this means that I generally avoid illustrating with evidence from individual wind energy projects, unless the point made is information that is demonstrably available to the public. This means that the text quite strictly interprets results on the comparative level, without drawing from the wind energy project level. On one hand, this is an advantage, as the major benefit of this study is that it is the first larger-scoped comparative and statistical study on the subject, as far as the author is aware. On the other hand, this means that some results might be difficult to grasp for the reader due to the lack of concrete project-level illustrations.

Methods

Concerning the methods applied, the study follows a chapter-by-chapter approach, with each empirical chapter pursuing different methodological strategies. Descriptive summaries are often resorted to, yet all methods are statistical, ranging in complexity from simple Wilcoxon means tests to Bayesian mediation analyses. The reader is referred to the methods section of the respective empirical chapter (in part III) for concrete methodological estimation and robustness strategies as well as for methods- and software-citations.

To be a bit more specific, I shall briefly summarize the methods that were used based on this study's intermediary research design. To produce the required overview over the sector of wind energy in Switzerland, I collect, classify and report data from the Project Characteristics Survey, along with interview results. Moreover, I show graphs based on calculated network routines from the Social Network Analysis toolbox. Thereafter, the investigation into the first analytical link of effects of decentralization fully relies on Social Network Analysis routines, multiple linear regressions, exploratory factor analyses, mediation models and exponential random graph models. This chapter relies mainly on data from the Network Characteristics Survey and on secondary data. Regarding the second link examining effects of implementation arrangements on problem-solving effectiveness, I mostly draw on automated Cox-proportional hazard survival models and automated multiple linear regressions. Results also rely on variables that have been prepared using hierarchical cluster analysis. It is based on data from the Network Characteristics and from the Project Characteristics survey. The third link, testing the overall relation between decentralization and problem-solving effectiveness, pursues a similar strategy like the second link, only adding logistic regressions and mediation analyses to the methods pool. It also uses the same sources of data. For the European study, which follows a similar research design like the Swiss analysis, many additional methods were employed: Panel analyses and mixed models (random intercept and slopes) were estimated first. Then I pivoted to the Bayesian statistical paradigm for the second part of the European analysis: This latter part contains results from (restricted) Bayesian exploratory factor analyses, automated Bayesian linear regressions and Bayesian mediation analyses. It employs data from the European expert survey and lots of secondary data. Hence, the present study presents a diverse set of quantitative methodological approaches (with the exception of reporting interview results).

1.5. Outline

Finally, before diving into the substantial part, I shall briefly present the structure of this book. After a theoretical buildup, it follows the analytical links of the research design just enunciated. Yet I shall be a bit more specific:

This book is divided into four parts: The present introduction (part I, chapter 1) is followed by a theoretical part (II, chapters 2–4), an empirical part (III, chapters 5–9) and a single-chapter part (IV, chapter 10) serving as a conclusion. The function of the present introduction has been to set up the research question, show why it is socially and academically relevant, and provide an overview of what to expect. In chapter 2, the theory part starts with presenting this study's theoretical framework, Actor-Centered Institutionalism, and demonstrating how it is applied in this study. The subsequent chapter 3 traces, develops and operationalizes the three main concepts of decentralization, implementation arrangements and problem-solving effectiveness. Chapter 4 then discusses empirical findings of the literature on the three "analytical links" examined for the Swiss case and derives hypotheses. Going over to the empirical part, the first chapter (chapter 5) maps the topic of wind energy authorization procedures in Switzerland. It explains how they work and how they differ between cantons. It also summarizes key aspects of wind energy projects and describes the functions of most important actors in the field. The following chapter 6 begins with presenting results of the first "analytical link", tying together decentralization with implementation arrangements. Chapter 7 then presents evidence of the second link that models effects of implementation arrangements on problem-solving effectiveness. Chapter 8 investigates the third link that models effects of decentralization directly on efficiency and effectiveness. It also completes the empirical investigation into the Swiss case. Chapter 9, the last empirical chapter, labeled "the bigger picture", offers a study on the role of decentralization in wind energy authorization procedures with European countries as the units of analysis. It is also the last chapter in the empirical part, making way for the conclusion that follows. The conclusion in chapter 10 summarizes the results and answers the hypotheses. It further establishes the study's contributions to science and practice, points the reader to the study's limitations and suggests avenues for future research. The references are last. A glossary explaining the most important terms and concepts, and a range of additional tables are available in an online appendix.