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Mixed feelings on wind energy: Affective imagery and local concern driving social acceptance in Switzerland

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ABSTRACT

Several countries are witnessing increasing levels of local opposition to wind energy projects. This is in contrast to opinion polls often showing that a large majority of the population is supportive of low-carbon policies, including deployment of wind energy. At the same time, project developers and policymakers are realising that social acceptance has an emotional component, but struggle to find ways to manage this phenomenon. We surveyed a representative sample of Swiss residents (n = 1111) using affective imagery, asking respondents to list their spontaneous associations with wind power and provide an affective evaluation of each association. We find a strong correlation between the affective imagery and respondents' likelihood to express concern about local wind projects, suggesting that affect matters in the formation of attitudes towards local wind energy projects. An in-depth analysis of the sequencing of affective imagery highlights that mild opponents have conflicting feelings about wind energy, and that "second thoughts" appear to tip the balance towards opposition for them. The study further reveals that important differences exist between mild and strong opponents, providing a basis for the segmentation of target groups in managing processes of social acceptance.

1. Introduction

Electricity supply is one of the principal contributors of CO_2 emissions, accounting for 41% of global emissions [1]. In various countries, policy measures are introduced to promote the use of renewable energy and to reduce dependency on fossil fuels and nuclear energy. This transition towards a cleaner energy future is also facilitated by the technology learning curves of renewable energies. Wind power, in particular, is now among the most cost-competitive sources of electricity [2,3,4] and accounts for more than half of new renewable energy capacity investment worldwide [5]. And yet, the diffusion of wind power has recently slowed down in key markets due to social acceptance issues [6,7]. While acceptance of renewable energies, and wind power especially, tends to be high on a general level [8–11], local implementation often faces opposition. Indeed, a discrepancy between general acceptance and local acceptance of wind power has been found in many countries, including Canada, Finland, the United States and the UK [12–15]. This emphasises the need to gain a more nuanced understanding of the dynamic processes that lead to acceptance or opposition on the local or community level e.g. [16–18].

One factor that has recently been gaining increasing attention is the affective component of social acceptance. From early work on nuclear power [19], research has lately started to include a focus on renewables [20,21]. Solar power has been shown to elicit highly positive imagery [20], while wind power projects have, in some cases, faced strong negative emotions [22,23]. Dual-process theories of decision making [24] suggest that affective and cognitive factors interact in complex ways [25]. Eliciting people's spontaneous associations to wind projects may therefore be a promising route towards gaining a deeper understanding of social acceptance issues on the local level. The present paper embarks on this route by using affective imagery [26], a two-step methodology to uncover emotional influences in the process of attitude formation. In a first step, respondents are asked to list up to five spontaneous associations that come to mind with regard to a stimulus, in this case, wind energy. In a second step, they are asked to rate these associations on an affective scale, indicating whether these images elicit positive or negative feelings.

Apart from investigating affective imagery, this paper also explores how such imagery is linked to local concern about wind energy. We use local concern as a proxy for (lack of) social acceptance on the local level because we are interested in the early stages of preference formation. Social acceptance is a dynamic process, where weak initial attitudes tend to become stronger over time as a planned project gets specified and ultimately implemented [18,27,28]. While, from an overall climate change mitigation perspective, the variable of interest is active support of, or opposition to a project [29], once this materialises, it is usually

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too late to intervene. Investigating concerns as a potential precursor of local opposition provides project developers with an opportunity to shape social acceptance processes as they unfold. This is important as previous research has highlighted that general attitude is a strong predictor of local acceptance [30].

On an individual level, preference formation is not necessarily a linear process. While some parts of the population tend to have strongly positive or negative feelings early on, there is often a silent majority with less pronounced initial views [31–33]. Investigating the decision process of these mild supporters or mild opponents can be crucial for forecasting local acceptance, similar to how political scientists interested in forecasting election outcomes tend to focus on swing voters e.g. [34]. By eliciting up to five spontaneous associations, our dataset gives us a unique opportunity to explore whether the sequence of positive and negative affective evaluations matters in tipping the balance from support to opposition.

Taken together, the objectives of this research are to (a) analyse the affective imagery elicited by wind power, (b) explore links between affective imagery and local concern, and (c) investigate whether the sequence of negative and positive affective evaluations can shed light on the preference formation process of supporters and opponents of wind energy projects. The findings will help policymakers and project developers craft new strategies for managing processes of social acceptance on the local level and thus support the implementation of low-carbon policies.

The remainder of this article is structured as follows: Section 2 outlines the literature review and research questions. Section 3 presents the sample used in the analysis and illustrates the research design. Section 4 describes the results of the study according to the research questions. Section 5 concludes the paper by reviewing the main findings, drawing policy implications and outlining recommendations for further research.

2. Literature review

2.1. Social acceptance of renewable energy

Research on public perceptions of renewable energy (RE) projects dates back to the 1980s [35–38]. Research interest started to increase a decade ago following the publication of an *Energy Policy* special issue edited by Wüstenhagen et al. [39] in which three dimensions of social acceptance were identified: *socio-political*, *market* and *community* acceptance [39]. Despite high levels of approval for wind energy at the national level [40,41], reflecting the acceptance level at the socio-political level, wind energy projects face a number of acceptance-related issues at the local level (i.e. community level) [42–45].

In an attempt to explain this gap, past studies have explored the concept of NIMBYism, which suggests that support for renewable energy technologies may be dependent on not being sited in people's vicinity. However, this concept has been criticised for offering an oversimplified explanation for the low level of community acceptance [27,39,46–48], and some have found evidence for an opposite effect, namely a PIMBY (Please In My Backyard) reaction [42,49–56]. Proximity to a proposed or existing wind energy project appears to be an important factor to consider [52] for a variety of reasons including noise and aesthetic concerns [57]. Other studies have also highlighted that noise disturbance is moderated by visibility of a wind park [58,59]. Other issues such as procedural and distributive justice, have shown to also be crucial in understanding social acceptance of wind power [16,60].

According to Wolsink [56] or Dimitropoulos and Kontoleon [61], in the context of social acceptance of wind energy, the main institutional factors are procedural justice, namely the extent to which different stakeholders are involved in the decision-making process and distributional justice, that is, whether the benefits and costs of the project are fairly distributed. In this regard, Walker and Baxter [16] have, for example, found that both the fair distribution and the amount of local benefits are important predictors of project support. More recently, a study from Vuichard et al. [62] highlighted that a local resource tax which benefits an entire community is preferred over individual financial participation models.

Other studies have found that familiarity with energy technologies can increase acceptance [63–66]. This change in acceptance over time have been depicted as a U-shaped curve [65]. The model states that public attitudes change from very positive before a project is announced, to negative during the planning and construction phase, to positive again after the project has been built [65]. While the link between familiarity and acceptance has been clearly identified e.g., [10,41,53], knowledge about how familiarity influences affect elicited by energy technologies is limited.

2.2. Affective imagery and energy technologies

Zajonc [67] argued that affective reactions to a stimulus happen automatically and guide following judgment. In fact, a large and growing body of literature has confirmed that affect plays a key role in decision-making e.g. [19,68,69]. However, while a large body of research has investigated the cognitive underpinnings of energy-related preferences e.g. [39,41,62,70–73], a smaller body of research has investigated affective factors [20,21,74–76].

Psychologists have used word associations techniques, such as the ones used in affective imagery, for a long time [77–79]. Affective imagery uses word associations to identify the positive and negative associations elicited by an object [80]. As they are spontaneous, the associations provided tend to avoid self-censorship and social desirability bias [81]. Further, when affective imagery is carried out with a representative sample, the results are generalisable, and can thus be quantitatively correlated to different sociodemographic variables or attitudes [81]. Scientists have used affective imagery in a wide range of research domains such as gene technology [82], risk perception of global warming [80,81,83], nuclear power [19] or smoking [84].

Specifically, in Slovic et al. [85], the authors found that affective imagery predicted public risk perceptions of nuclear energy and correlated strongly with intended voting behaviour and opposition to new power plant construction. Jobin and Siegrist [74] observed that affect was a significant predictor of energy portfolio preferences as individuals' affective reactions to energy technologies guided the percentage of the respective technology included in their preferred portfolio. Further, Truelove [21], found that her affective model was significant in predicting local acceptance (i.e., project implementation close to one's home), but not general acceptance (i.e., increased reliance of the country on wind energy). She also explored affective imagery elicited by wind energy and found that associations related to 'windmills' and 'turbines' were clearly dominant and that overall, associations to wind energy were positive. However, the study did not provide an exhaustive presentation of associations elicited by wind energy. Further, the sample used was small and not representative of the population. Visschers and Siegrist [76] looked into the effect of positive and negative emotions on acceptance of different energy sources (i.e. wind, solar, hydro, nuclear, gas). As one may have expected, the results highlighted that, in general, positive emotions significantly increase acceptance for any energy source. Further, Huijts et al. [86] reported in a review on psychological factors influencing sustainable energy technology acceptance that affect, together with perceived costs and benefits, influences attitudes.

While these results give us an interesting starting point, the following limitations have been identified. First, while previous research found that affect is significantly correlated with acceptance, there is a lack of insights about how the affect elicited by wind energy vary between individuals' characteristics. Second, previous analysis using

affective imagery aggregated all the associations provided by the respondents and did not look at the sequence in which they were given.[1] As such, the dynamics between the different and potentially conflicting associations about energy sources and their respective affective evaluations have not been analysed so far. However, the nature of these associations, their affective evaluations, as well as the order in which they are mentioned, may be essential to gain better insights on how people form their preferences.

2.3. Query theory, preference construction and affective evaluations

Psychologists and behavioural economists agree that most preferences are constructed, rather than innate. Query theory [87,88] is a psychological process model of preference construction, which assumes that options offered to an individual are evaluated by a sequence of queries that recover various aspects of possibly relevant knowledge about the option selected [89]. Query theory asks respondents to list thoughts that come to their mind as they make a decision, to better understand the process underlying the latter. In its simplest form, query theory holds that people use their past experience for evidence supporting different choice options and that the first query is more important to the final decision than the subsequent ones [88]. As such, a key prediction of query theory is that the order of queries matters and that the first query produces a richer set of answers than the subsequent ones. In other words, query theory predicts that reasons for choosing the preferred option will be queried first [88].

To the best of our knowledge, no studies using affective imagery in the energy context have so far looked into the sequence in which different associations were provided by the participants and the possible incidence of the sequencing on decision-making or preferences. According to query theory, one could expect that the order in which the images are provided matters in preference formation for energy sources. Thus, the first thought provided may have a more prominent weight on preference concerning the implementation of wind energy projects than the following thoughts. Accordingly, we looked into the different roles of first versus "second thoughts" provided by the participants concerning social acceptance of wind energy and we defined "second thoughts" as any thoughts provided by respondents after the very first thought indicated.

2.4. Research questions

This study investigated the affective imagery elicited by wind power and its effect on local concern for wind energy projects in order to answer the following research questions:

1. What affective imagery does wind power elicit, and how does it vary depending on individuals' characteristics?
2. What is the relationship between affect elicited by wind energy and local concern for wind energy projects, and how do associations vary between opponents and supporters?
3. How do "second thoughts" elicited by wind power differ from the first thought?

3. Methods

3.1. Sample

The data for this study were collected between March and April 2019 through a large-scale survey. Participants of our study were drawn from an actively recruited Swiss online consumer panel (N = 100,000) operated by an experienced market research agency.[2] A representative sample of the adult population from the German- and French-speaking parts of Switzerland was obtained by stratifying the population by gender, education, age, political orientation and geographical regions. Further, 19% of the respondents reported living in a city centre, 12% in the suburbs, 23% in an agglomeration and 46% in rural areas. Moreover, we boosted the sample (n = 180) with respondents living close to[3] existing or planned wind energy projects based on data from the Swiss Federal Office of Energy, in order to get a balance between national representativeness and a sufficient share of respondents living in areas that are affected by wind energy. In total, 187 of the respondents in the sample live close to a planned wind park while 87 live close to an existing one. The final sample size is made of 1111 respondents,[4] excluding incomplete responses, people failing to pass an attention test and those with regular response patterns (flatliners).[5] The respondents were remunerated the equivalent of 8 Swiss francs in gift cards for taking part in the study.

3.2. Measures

3.2.1. Affective imagery

Affective imagery consists of both cognitive contents, such as images or thoughts (i.e. imagery) and affective evaluation (i.e. affect) [80]. The images or thoughts were collected using the method of continued word associations [19,85]. Respondents were asked, "What are the first thoughts or images that come to your mind when you think of wind energy?". In response to this question, respondents could provide either single word associations (e.g., "bird") or brief narrative statements (e.g. "wind turbines on hills that can be seen from afar") [80]. In this study, participants had to provide at least one and a maximum of five thoughts.[6] The respondents subsequently evaluated each of their associations on a seven-point affect scale from 1 ("very negative") to 7 ("very positive").[7] The association evaluation scale was calculated by taking the mean of the associations' evaluations participants provided with higher scores indicating more positive evaluations.

In Section 4.3.2, to investigate the importance of first versus second thoughts (i.e. associations), we created a variable which indicates in which sequence respondents provided negative and positive thoughts. For this purpose, we compared the evaluation of the first association provided to the average evaluation of all subsequent associations. For example, if a respondent provided three associations in the following order (renewable = 6.0; bird = 3.0; noise = 1.0), then we compared the evaluation 6.0 (first thought), to the evaluation 2.0 (average of second and third thoughts). The respondents were further categorised in two different groups: 1 = first association negative, 2 = first

[1] For example, if the associations of a respondent were "wind turbine" (sequence 1), "environmentally friendly" (sequence 2), "noise" (sequence 3), "ugly" (sequence 3), "green" (sequence 4), "Germany" (sequence 5"), these five associations were aggregated without taking into account in which sequence they occurred.

[2] While opt-in panels are made up of a self-selected sample of volunteers, Intervista's actively recruited panel comes close to a probability sample of the Swiss voting population.

[3] "close to" refers to having a place of residence in the same postal code as the wind energy project

[4] Appendix A includes the sample distribution. Since German or French is the main language for 85% of the Swiss population and only 8% of the Swiss population live in the Italian-speaking region of Ticino [90], we limited the survey to the two dominant languages for research efficiency. Also, the boost of the sample for respondents living close to existing or planned wind parks led to having a slight over-representation of French-speaking respondents as detailed in Appendix A.

[5] The response rate was 98.63% while the completion rate reached 81.65%.

[6] While Truelove [21] compelled respondents to give five images, and Sütterlin and Siegrist [20] only asked for one, we opted for a middle solution to avoid meaningless answers while allowing for richness in the data.

[7] The respondents only saw the reference points "very negative" and "very positive" and not the respective numbers.

association positive.[8]

A large dataset of 2890 associations was produced using affective imagery from the 1111 respondents. Using a qualitative analysis, one author developed the coding system and categorised all the associations to the categories. In a second step, a second author coded all associations again, independently from the first author. Inter-rater reliability achieved satisfactory significance (82%) between the two coders. If an association was not categorised to the same category by both authors, a discussion ensued to find a common and adequate solution. Further, if no common nor adequate solution could be found, a new category was created, and all associations were re-coded using the revised coding system. We repeated this procedure until all associations were assigned to one category by common accord. Through this procedure, the different images were classified into 50 distinct categories, which can be found in Appendix G. The associations were categorised according to the theme they were related to and not according to their valence. This means that words such as "ecological" or "harmful for the environment" can be found under the same category "Environment & Ecology". To reduce interpretation bias to a minimum, we categorised responses in more than one category if the image could either be interpreted in different ways or if more than one image was expressed at a time.

3.2.2. Socio-demographic and control variables

Socio-demographic variables were also collected (political orientation, gender, education, age and language). With regards to political orientation, participants could select between one of the seven major parties in Switzerland or the category "others". Switzerland's political system is particular as its federal government includes all major parties, but the largest party, the national-conservative Swiss people's party (SVP), often opposes decisions on which other parties commonly agree on, including regarding the energy transition and also specifically regarding wind energy projects [91–93]. To reflect this cleavage, we defined the variable 'political orientation' as a dummy, where 0 indicates that the respondent indicated support for SVP, and 1 support for any other party as in a previous study by Tabi and Wüstenhagen [41].

We also controlled for awareness of a planned wind park close to one's home. We measured it by asking "Is a wind park planned to be built close to your home (less than 5 km)?" (Yes; No; I do not know). In a next step, a binary variable was constructed (0 = No or I do not know; 1 = Yes). The operationalisation of this variable is based on the appraisal theory of emotions which holds that emotions reflect the integration of the relevance of an event or object in the context of a person's concerns, goals, needs, and values [94]. As such, if one is aware that a wind park may be planned close to his or her residence, he or she may have a different reaction to wind energy and its implementation than someone who is not aware of it.

Further, we controlled for familiarity with wind energy. This variable was measured by asking respondents to evaluate the following statement: "I am familiar with seeing wind turbines in my immediate environment". The answer scale ranges from *I very much disagree* to *I very much agree* (4-point).

3.2.3. Local concern

As a proxy to social acceptance, we measured the extent to which respondents would be concerned about having a wind park built close to their home or other places they feel close to. Specifically, local concern was assessed with the following question inspired by Maehr et al. [95]: "I would be concerned if a wind turbine would be built in my neighbourhood or other places, I feel close to", on a scale from 1 (totally disagree) to 5 (totally agree). Respondents could also choose the option *I do not know*. Respondents who selected *I do not know* were removed from the sample (N = 30). Operationalisation of the variable was done as follows: respondents were categorised as opponents if they selected points 4 or 5, as supporters if they selected points 1 or 2 and as indifferent if they selected point 3 on the 5-pt scale. For some parts of the study, the sample was further divided between strong supporters (1), mild supporters (2), indifferent (3), mild opponents (4), strong opponents (5). While "local concern" does not measure actual opposition or support, it allows to investigate concerns as a potential precursor of local opposition.

3.3. Procedure

The survey data was analysed using SPSS. After categorising the associations, we used simple relative frequency and mean average to explore the affective imagery elicited throughout the sample group. In a second step, we used one-way ANOVAs to investigate how the affective evaluations varied based on the individuals' characteristics. In a third step, we used chi-squared tests to explore how the relative frequency of the associations previously categorized, varied between respondents. In a fourth step, a linear regression was run to measure the relationship between affect and local concern while controlling for important variables such as political orientation or rural versus urban environments. Next, as the regression established that affect was significantly related to local concern, we investigated how the associations about wind energy varied between supporters and opponents using relative frequency. We further compared how overall affective evaluations of the associations elicited by wind energy differed between strong or mild opponents and supporters. Finally, to investigate the importance of first thought versus second thoughts elicited by wind power, we used one-way ANOVAs.

4. Results

4.1. Affective imagery elicited by wind power

4.1.1. General overview of affective imagery elicited by wind power

The analysis identified 50 distinctive categories of affective images associated with wind energy. The definition of each category can be found in Appendix G. Mean affect scores indicate that respondents, as a whole, perceive wind energy as something moderately positive (N = 1111, $M_{overall}$ = 4.526, SD = 1.832; min = 1; max = 7). Overall, most responses (51%) were positive, while 38% were negative, and only 11% neutral.[9] The twenty main categories, based on their relative frequency, are pictured in Fig. 1.[10]

Dominant negative associations are linked to *landscape*, *noise* or *wildlife* ($M_{landscape}$ = 2.73, SD = 1.70; M_{noise} = 2.38, SD = 1.47; $M_{wildlife}$ = 1.81, SD = 1.15). More specifically, images related to *landscape*, *noise* and *wildlife* make up 19% of people's affective imagery related to wind energy. These results indicate that on average, the impact of wind turbines on the landscape, wildlife and concerns about potential noise disturbance are the most salient images among the Swiss public (e.g. "Difficult to integrate into the landscape and noisy").

Dominant positive associations are linked to *the ecology, power production* and *wind* ($M_{ecology}$ = 5.93, SD = 1.77; $M_{power\ production}$ = 6.23, SD = 1.42; M_{wind} = 5.70, SD = 1.41). This potentially highlights that positive associations about wind energy are less concrete than negative ones. Precisely, these images make up 15% of people's affective imagery related to wind energy. Further, the most positive

[8] For this measure, respondents were excluded based on the following criteria: provided only one association (n = 352) and had neutral evaluations for their first association or as the average evaluation of subsequent associations (n = 127).

[9] "Positive" corresponds to scores above 4, "negative" to scores below 4 while "neutral" to scores of 4.

[10] The categories "wind turbine" (15% of the associations) and "other" (2% of the associations) were not highlighted in the analysis because of their low symbolic meaning.

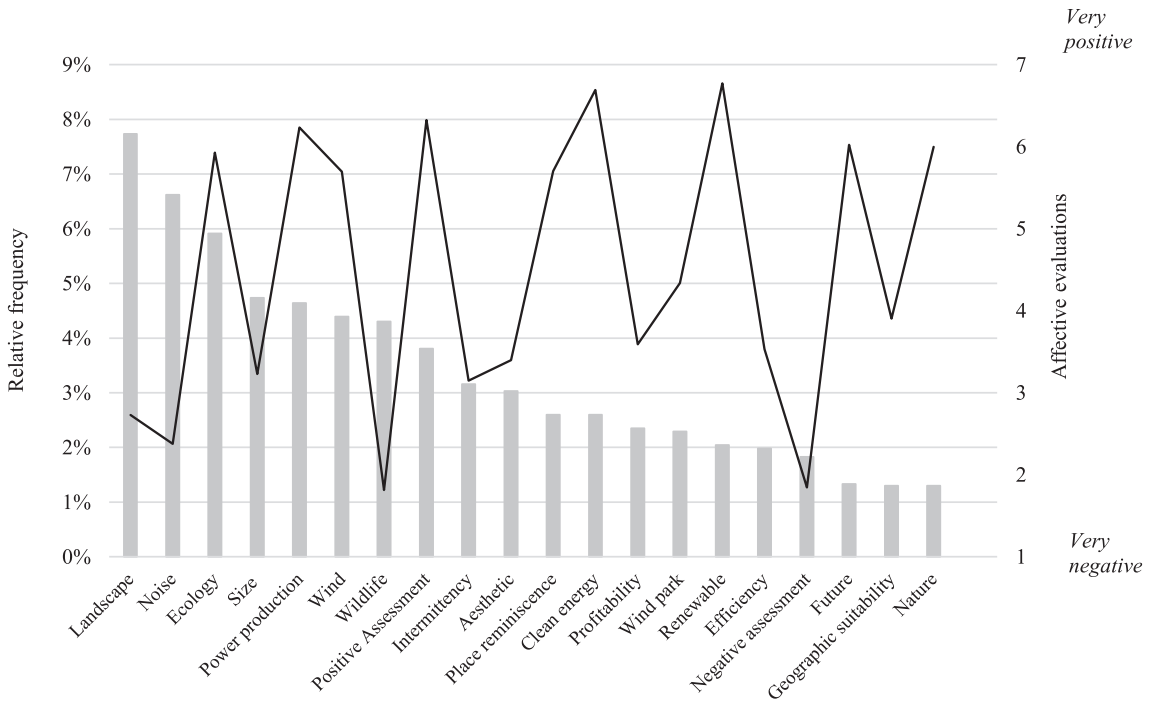

Fig. 1. Dominant imagery elicited by the stimulus "wind energy".

affective imagery is attached to *renewable energy* (M_{re} = 6.77, SD = 0.55), *sustainability* ($M_{sustainability}$ = 6.67, SD = 0.84), *air* (M_{air} = 6.24, SD = 1.15) and *clean energy* (M_{clean} = 6.69, SD = 0.66). Moreover, a contribution to *energy independence* as one of the potential positive impacts of increased production of domestic wind energy is only mentioned in 0.3% of the images.

4.1.2. Individuals' characteristics and affective imagery elicited by wind power

Next, we explored differences in affective imagery elicited by wind power based on individuals' characteristics: place of residence (rural versus urban), age, gender, political orientation, language, familiarity with wind energy and awareness about a planned wind park close to one's home. To explore differences in affective imagery, we first looked into variations in affective evaluations (i.e. the evaluation of the associations using a 7-pt affect scale) using t-tests of means and one-way ANOVAs. In a second step, we investigated whether any differences existed in the associations produced by the respondents by comparing the relative frequencies of the categories.

4.1.2.1. Differences in affective evaluations between individuals' characteristics. We used *t*-test of means to analyse how the affective evaluations of the associations elicited by wind power (i.e. affective imagery) vary based on political orientation (0 = national-conservative Swiss people's party (SVP); 1 = other political parties). The results highlight statistically significant differences based on political orientation (n = 1111, F = 29.744, df = 1, p = 0.000, η_p^2 = 0.026).[11] Specifically, supporters of the national conservative party have significantly less positive affective evaluations (M_0 = 4.029, SD_0 = 2.03, N_0 = 291), than other voters (M_1 = 4.702, SD_1 = 1.722, N_1 = 820).

We next applied a 1x4 ANOVA (n = 1111, F = 6.014, df = 3, p = 0.000, η_p^2 = 0.016[12]) to analyse differences between age groups (1 = below 30; 2 = 30–44, 3 = 45–59, 4 = 60 and above). Post-hoc tests applying Games-Howell correction for all four age groups (p_{12} = 0.003, p_{13} = 0.000, p_{14} = 0.001) revealed that respondents under 30 years of age have significantly more positive affective evaluations (M_1 = 4.976, SD_1 = 1.547, N_1 = 227) about wind energy than respondents from the other age groups (M_2 = 4.476, SD_2 = 1.694, N_2 = 282; M_3 = 4.373, SD_3 = 1.934, N_3 = 301; M_4 = 4.385, SD_4 = 1.995, N_4 = 301).

A 1x4 ANOVA was used to measure the variations based on familiarity (1 = very unfamiliar to 4 = very familiar) to wind energy (n = 1111, F = 41.14, df = 3, p = 0.000[13]). Post-hoc tests applying Games-Howell correction for all four levels of familiarity (p_{12} = 0.000, p_{13} = 0.000, p_{14} = 0.000) highlight that respondents that are not familiar at all with wind energy, have significantly less positive associations about the technology (M_1 = 3.988, SD_1 = 1.886, N_1 = 571) than respondents who are (rather) familiar with it (M_2 = 4.867, SD_2 = 1.606, N_2 = 283; M_3 = 5.233, SD_3 = 1.531, N_3 = 142; M_4 = 5.481, SD_4 = 1.528, N_4 = 115). We do not find significant differences for the other control variables.

4.1.2.2. Differences in associations elicited by wind power between individuals' characteristics. We tested differences in the content of associations between individuals using the chi-square test. We find significantly different associations between gender (χ^2 = 157.211, df = 49, p = 0.000), age group (χ^2 = 241.704 df = 147, p = 0.000), political orientation (χ^2 = 83.838, df = 49, p = 0.001), language group (χ^2 = 322.200 df = 49, p = 0.000) and familiarity with wind energy (χ^2 = 243.042, df = 147, p = 0.001).

Next, we compared the relative frequency of the main positive and

[11] Levene's test was significant at p = 0.000. Welch's ANOVA (F = 25.46, df_1 = 1, df_2 = 446.792, p = 0.000).

[12] Levene's test was significant at p = 0.000. Welch's ANOVA (F = 7.388, df_1 = 3, df_2 = 609.359, p = 0.000).

[13] Levene's test was significant at p = 0.000. Welch's ANOVA (F = 43.147, df_1 = 3, df_2 = 356.19, p = 0.000).

Table 1
Affective imagery of respondents - gender, age group, political orientation, language group, familiarity with wind energy.

	Frequency (percentage)							
	Total	**Gender**		**Age group**				**Political orientation**
		Males	Females	<30	30–44	45–59	>60	SVP
Landscape	250 (8%)	153 (9%)	97 (6%)	35 (5%)	60 (8%)	77 (8%)	78 (10%)	70 (9%)
Noise	214 (7%)	91 (5%)	123 (8%)	32 (5%)	48 (6%)	66 (7%)	68 (8%)	63 (8%)
Wildlife	139 (4%)	66 (4%)	73 (5%)	21 (3%)	35 (4%)	39 (4%)	44 (5%)	33 (4%)
Ecology	191 (6%)	97 (6%)	94 (6%)	52 (7%)	47 (6%)	56 (6%)	36 (4%)	39 (5%)
Power production	150 (5%)	90 (5%)	60 (4%)	42 (6%)	33 (4%)	39 (4%)	36 (4%)	22 (3%)
Wind	142 (4%)	75 (4%)	67 (4%)	37 (5%)	41 (5%)	45 (5%)	19 (2%)	35 (4%)
Total number of associations categorized	3231 (100%)	1690 (100%)	1541 (100%)	694 (100%)	798 (1005)	927 (100%)	812 (100%)	788 (100%)

	Frequency (percentage)							**Affective evaluation (M, (SD)) Total**
	Political orientation	**Language group**		**Familiarity with wind energy***				
	Other party	German	French	(1)	(2)	(3)	(4)	
Landscape	180 (7%)	154 (7%)	96 (10%)	145 (9%)	66 (8%)	23 (6%)	16 (5%)	2.73 (1.7)
Noise	151 (6%)	122 (5%)	92 (9%)	122 (7%)	55 (6%)	16 (4%)	21 (7%)	2.38 (1.47)
Wildlife	106 (4%)	104 (5%)	35 (4%)	94 (6%)	29 (3%)	9 (2%)	7 (2%)	1.81 (1.15)
Ecology	152 (6%)	131 (6%)	60 (6%)	91 (5%)	50 (6%)	30 (8%)	20 (6%)	5.93 (1.77)
Power production	128 (5%)	104 (5%)	46 (5%)	66 (4%)	43 (5%)	19 (5%)	22 (7%)	6.23 (1.42)
Wind	107 (4%)	45 (2%)	97 (10%)	66 (4%)	35 (4%)	15 (4%)	26 (8%)	5.7 (1.41)
Total number of associations categorized	2443 (100%)	2232 (100%)	999 (100%)	1684 (100%)	848 (100%)	376 (100%)	323 (100%)	

Note: To reduce interpretation bias to a minimum, we categorized responses in more than one category if the image could either be interpreted in different ways or if more than one image was expressed at a time. This explains the gap between the total of associations provided (n = 2890) and the total of number of associations categorized (n = 3231).

* "I am familiar with seeing wind turbines in my immediate environment"; The answer scale ranges from *I very much disagree* to *I very much agree* (4-point).

Table 2
Multiple regression analysis on the level of local concern for wind energy projects.

Independent variables	Local concern				
	B	SE	Beta	p-values	95% CI
Constant	5.036	0.231		0.000	[4.583, 5.489]
Affective evaluation (average)	−0.339	0.022	−0.417	0.000	[-0.383, −0.295]
Place of residence	−0.01	0.034	−0.007	0.774	[-0.076, 0.056]
Political orientation	−0.34	0.088	−0.1	0.000	[-0.513, −0.167]
Gender	0.033	0.077	0.011	0.663	[-0.117, 0.184]
Education level	−0.111	0.08	−0.037	0.167	[-0.268, 0.047]
Familiarity with wind energy	−0.217	0.04	−0.148	0.000	[-0.297, −0.138]
Awareness planned wind project	−0.009	0.131	−0.002	0.944	[-0.266, 0.248]
Age group	0.021	0.036	0.015	0.561	[-0.049, 0.091]
Language regions	0.579	0.084	0.179	0.000	[0.413, 0.744]
R^2 adjusted	0.281				
F	47.805			0.000	

negative categories of associations identified in Section 4.1.1. The results, depicted in Table 1, show that males tend to think more about *landscape* than women, while the latter tend to focus more on *noise* than males. We further find that respondents under 30 years of age appear to think about *landscape* about half as much as those above 60. The older generation also seems to have a greater focus on *wildlife* than those below 30. On the contrary, those under 30 have more associations related to the *environment* or the *ecology* than those above 60. Table 1 also shows that respondents who are very unfamiliar with seeing wind turbines in their immediate environment, think, on average, almost twice as much about issues related to the *landscape* and have three times as much associations about *wildlife* than those very familiar with it. Additionally, respondents who are very familiar, have more associations about the power produced from wind turbines than those very unfamiliar. The results further highlight that wind energy elicits about twice more associations about *noise* among French-speaking respondents than among German-speaking ones.

4.2. Affective imagery and local concern

4.2.1. Affective evaluations and local concern

We used a multiple regression model to explore the relationship between affect and local concern while controlling for socio-demographic variables, place of residence (rural versus urban), familiarity with wind energy and awareness about planned wind energy projects in one's neighbourhood.

The results (see Table 2) highlight that affect is significantly correlated with local concern. The more positive someone feels about wind energy, the lower the local concern. The results further show that political orientation, familiarity with wind energy and language regions (German- versus French-speaking) are highly correlated with local concern for wind energy. Specifically, we find that (1) voters from the national conservative party, (2) individuals self-reported as less familiar with wind energy and (3) respondents from the French-speaking region of Switzerland have a higher local concern about the implementation of a wind energy project close to their homes or other places they feel close to.

4.2.2. Differences in associations between supporters and opponents

While the results in Section 4.2.1 highlight a significant correlation between affect and local concern, they do not reveal how the associations elicited by wind energy vary between supporters and opponents. To gain insights on the latter, we divided our sample between strong supporters (n = 223), mild supporters (n = 241), indifferent (n = 185), mild opponents (n = 172), strong opponents (n = 290). This distinction between different types of supporters or opponents is important as recent research has highlighted that the silent part of the population may be a key component in social acceptance of wind energy [52]. The results are depicted in Fig. 2. In the left column, pie charts highlight the respective shares of positive, neutral and negative associations for each sub-group. In the right column, bar charts show the five most dominant categories (highest relative frequency) for each group along with the affective evaluations.

The results first show that while positive associations make up 76% of the total share of associations elicited among strong supporters, this share falls to 62% for mild supporters, 55% for individuals who are indifferent, 45% for mild opponents and 27% for strong opponents. Further, we also find differences in the share of neutral associations: while they make only 8% of the total share among strong supporters and opponents, this share rises to 15% for mild opponents. Interestingly, the figure also shows that mild opponents seem to be closer in affective evaluations and type of associations elicited to respondents who are indifferent, than to strong opponents. However, while those who are indifferent seem to recognize the benefit of wind energy in terms of power production, this benefit does not seem to be eminent among mild opponents. In this way, these results highlight that differences appear to not only exist between supporters and opponents, but also within these two groups. This nuance within groups is further highlighted by the nature of the associations. The results show that the more concerned people are, the more they have associations related to *landscape*, *noise*, or *wildlife*.

4.3. "Second thoughts" elicited by wind power.

An important assumption of query theory is that the order of queries matters. Specifically, the first query usually produces a set of answers that is richer than the subsequent ones and thus, the first query matters most in preference formation [88]. Applied to our study, we could expect that the first thought or association provided has a bigger weight on local concern for wind power projects than the subsequent thoughts. Importantly, while in query theory, the sequence of thoughts is shown to matter in the context of a specific decision setting, in our study, we did not measure associations about the implementation of a specific wind energy project. Instead, we measured associations elicited by wind energy in general and attitude towards a hypothetical wind energy project. As such, our aim here is to explore whether the first query also matters the most, outside of a specific decision context (e.g. when eliciting thoughts about wind energy in general).[14]

So far, we analysed all images and their evaluations provided in one

[14] Past studies using query theory looked at the impact of thoughts directly linked to the decision at hand (e.g. "What comes to your mind as you think about your decision to support or oppose wind projects?").

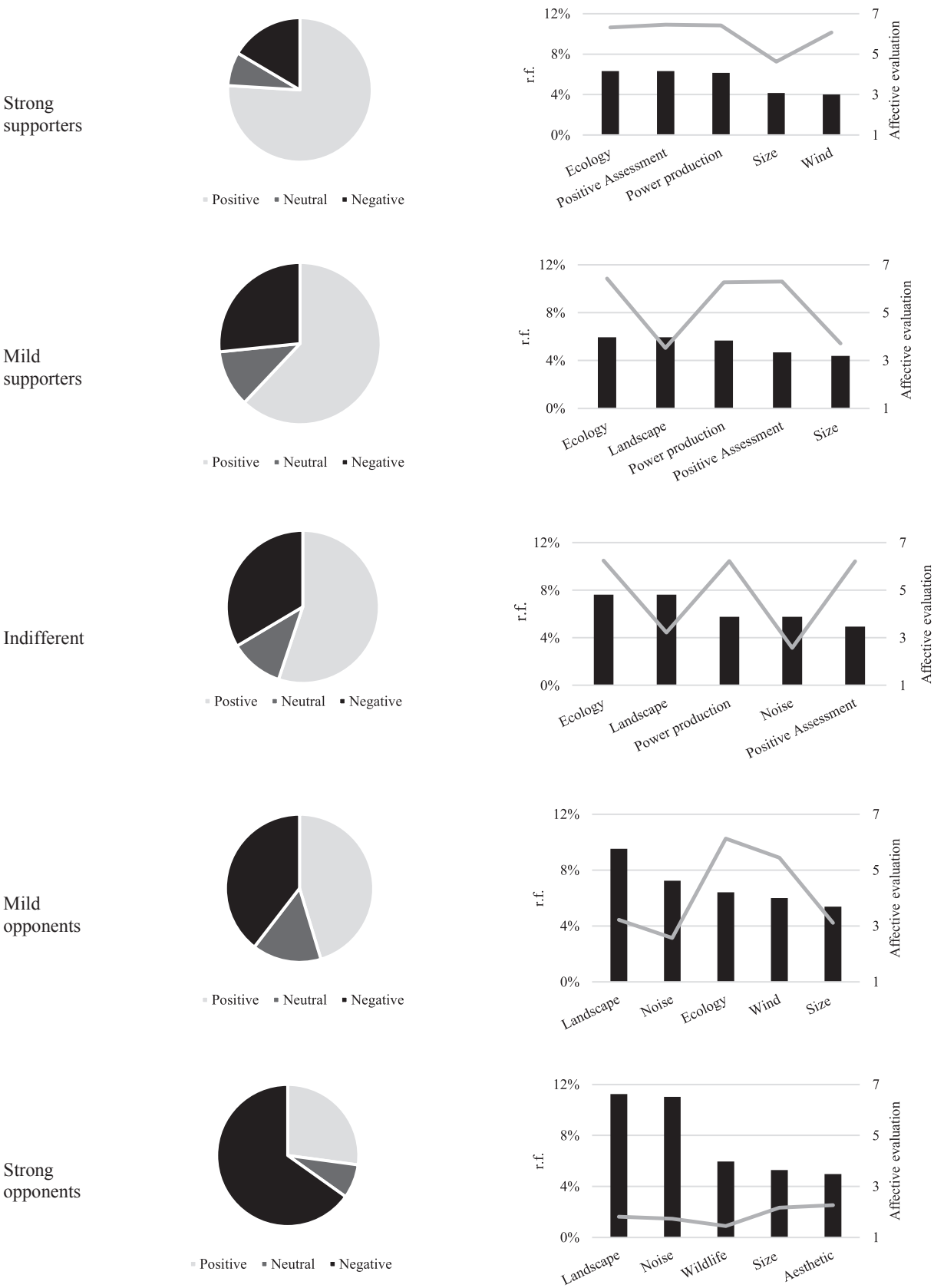

Fig. 2. Shares of positive, neutral and negative associations per level of concern and the five main categories of associations elicited.

Table 3
Mean affective evaluations per sequence.

Sequence	N	Mean (SD)
1	1111	4.77 (2.107)
2	759	4.29 (2.271)
3	557	4.07 (2.314)
4	294	3.81 (2.202)
5	169	4.13 (2.357)
Total	2890	4.37 (2.241)

Table 4
Multiple comparisons (Games-Howell) of mean affective evaluations per sequence.

Sequence	Mean Difference	SE	p-values
1 vs. 2	0.485*	0.104	0.000
1 vs. 3	0.699*	0.117	0.000
1 vs. 4	0.958*	0.143	0.000
1 vs. 5	0.640*	0.192	0.009

* $p < 0.05$.

single group, independent of the sequence in which they were given. However, to investigate the potential importance of second thoughts, we now compare how the mean of the affective evaluations varies depending on the sequence in which they were given. Respondents could give a minimum of one and a maximum of five associations when asked to list what came to their mind as they thought of wind power (i.e. five sequences).

4.3.1. General evaluation of first versus subsequent thoughts

The results, depicted in Tables 3 and 4, highlight significant differences in affective evaluations of the first thought versus subsequent ones. Specifically, the first thought is significantly more positive than *second thoughts*.

4.3.2. First versus subsequent thoughts per level of concern

Further, in the case of strong (=1) and mild supporters (=2), we observe that all associations provided are consistently positive on average (the neutral point is at 4, represented by the horizontal dotted line), but that mild supporters evaluate their first association less positively on average than strong supporters ($N = 464$, $F = 9.058$, $df = 1$, $p = 0.003$, $M_1 = 5.85$, $SD_1 = 1.699$) as well as their second

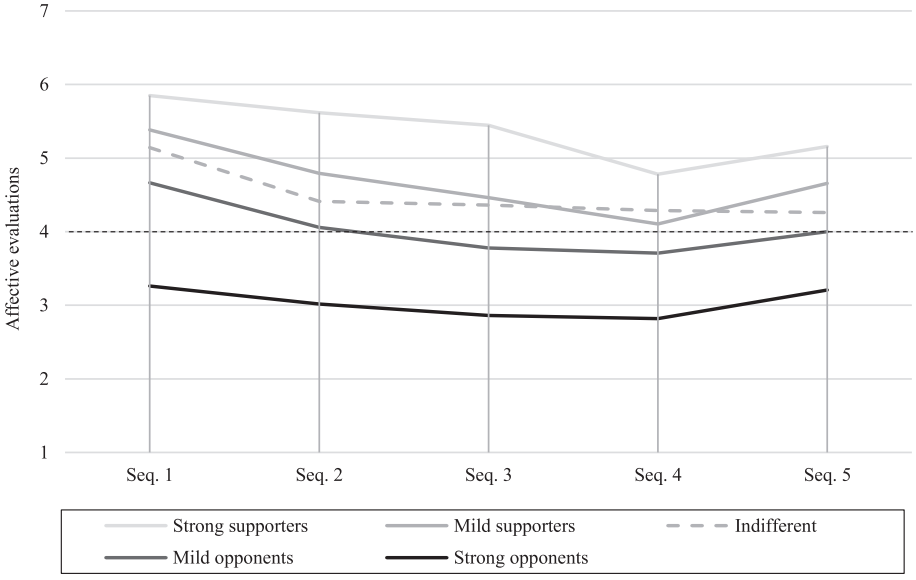

Fig. 3. Sequence of affective evaluations per level of concern.

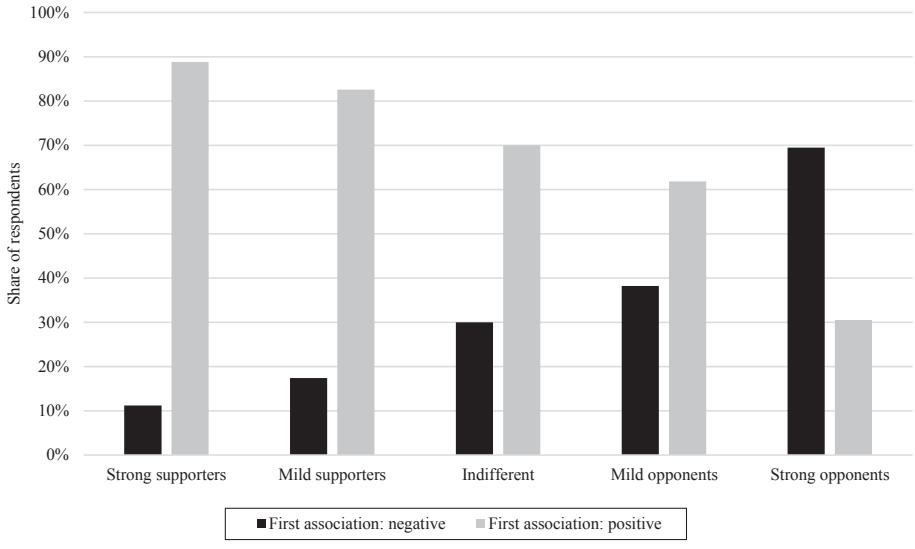

Fig. 4. Valence of first association or thought elicited per level of concern.

thoughts[15] (N = 732, F = 29.357, df = 1, p = 0.000). We find a similar pattern between mild and strong opponents for differences in affective evaluations of first (N = 462, F = 48.953, df = 01, p = 0.000[16]) and second thoughts (N = 781, F = 33.732, df = 1, p = 0.000). Interestingly, we do not find significant differences between mild supporters, and respondents who are indifferent, for the evaluations of both the first (p = 0.153) and second thoughts (p = 0.244). Fig. 3 also highlights that only the mild opponent group has both negative and positive thoughts, on average.

Next, applying query theory, on would assume the first thought to be positive for supporters of local wind energy projects, and negative, for opponents. However, we find that this is the case for all groups, except for mild opponents. Specifically, the results highlight that there exists a statistically significant difference (N = 632, F = 169.276, df = 1, p = 0.000[17]) in the sequence in which negative and positive associations are provided based on the level of local concern. Fig. 4 further highlights that while for 69% of strong opponents, the first association elicited about wind energy is negative, it is not the case for mild opponents. Indeed, we find that this is the case for only 38% of them. In general, the results show that the first association elicited seems to matter the most for all groups, except for those who are mild opponents. Indeed, while their first thought is positive, mild opponents eventually indicate negative attitudes towards the implementation of local wind energy projects.

5. Conclusion and policy implications

The main goal of this study was to investigate respondents' affective imagery to wind power, to better understand the processes determining local concern about wind energy projects. Specifically, we went beyond previous studies by (1) analysing the sequencing of the associations provided when respondents thought about wind energy rather than looking only at the most frequent associations elicited; (2) exploring how affective imagery varies based on individuals' characteristics; (3) comparing associations between opponents and supporters by differentiating between strong and mild ones to better understand the perceptions and concerns of the *silent majority* [32,33]. This study is the first to carry out a thorough analysis of people's affective imagery concerning wind power. We used a funnel approach by first analysing affective imagery at a general level, and then focusing on the sequence of positive and negative associations that occurred as people were thinking about wind energy. We could demonstrate that affective imagery plays a crucial role in shaping public perceptions and therefore influences support or opposition to the implementation of wind power projects. Further, our results show that significant differences exist between strong or mild supporters and opponents, signalling that segmentation of target groups is warranted when trying to manage processes of social acceptance. The results also highlight that the issue of social acceptance of wind energy is more complex than a pro-wind versus anti-wind discourse supporting previous results by Walker et al. [96] or Rand and Hoen [52].

5.1. Affective imagery elicited by wind power

Regarding general affective imagery elicited by wind power, this study adds nuances to previous findings which concluded that positive perceptions dominate [21]. Specifically, in contrast to Truelove [21], who found that wind power generated almost entirely positive associations in a U.S. sample, we find that affective evaluation of wind power among Swiss respondents shows mixed feelings, with 51% of positive associations. Differences between the two samples could be explained by: 1. increased controversy about wind energy in recent years [17], 2. Switzerland being more densely populated than the United States,[18] 3. a lack of representativeness in the sample (N = 94) of Truelove [21]. More precisely, in our study, the results highlighted that associations related to *landscape*, *wildlife* and *noise* make up 19% of the total associations elicited. These negative associations seem to be related to expected impacts, rather than actual perceived impacts of wind energy. Indeed, only 37 wind power installations are currently installed in Switzerland, and most people live far away from where they could see or hear those existing facilities. This observation is similar to what Leiserowitz and Smith [81] found regarding images elicited by *climate change*: while very few Americans live on the shores of the Arctic Sea, there was a predominance of associations to melting ice when respondents thought about climate change. The authors noted that it was likely due to the prevalence of melting ice images accompanying news stories about climate change. One could think of a similar phenomenon regarding wind power. Further, the results show that, in general, positive associations elicited by wind power (e.g. ecology, wind) are more abstract than negative ones. It thus appears that individuals have more difficulty grasping concrete benefits from wind energy than potential drawbacks from it. Thus, affective imagery, which is at the root of opposition against wind power, seems to be significantly more elaborated than the factors underlying support for wind power, suggesting that it is harder to change people's attitude from negative to positive than vice versa. This observation may be further supported by the fact that increased energy independence from local production of wind energy has rarely been mentioned by respondents. Moreover, the results showed that only 11% of the associations were rated neutrally, on average, which appears to show that a large part of the population has relatively strong feelings about wind energy.

When investigating differences in associations and related affective evaluations between respondents, we identified a significant generation gap. Not only are younger people more positive about wind energy, but also different types of associations are evoked. For example, associations concerning *landscape* or *wildlife* occur twice less among people 30 years of age than those 60 or above. This result suggests that younger generations may be more open to wind power projects, which is in line with studies that have shown that younger people appear to be more open to wind energy than older generations [40]. Also, we found that familiarity matters to explain associations elicited by wind energy. For example, the study highlights that those unfamiliar with the technology think three times more often about *wildlife* than those familiar with it, suggesting the existence of misconceptions about the impacts of wind energy production. Further, a higher focus on *noise* among the French-speaking respondents may be explained by the hypothesis about support for wind parks over time [65] described in Section 2.1. With several wind park projects currently in the planning phase in the French-speaking part of the country,[19] a share of the French-speaking population might find itself in the second phase of the U-shaped curve, namely the phase where public attitudes are most critical. If the hypothesis holds, we could expect the attitudes of this group to rebound as projects are completed. As such, similarly to the work of Leiserowitz [83] in the context of climate change, this research identifies the existence of distinct "interpretive communities"– each strongly predisposed to interpret wind energy and its potential benefits or nuisances in different ways. Communication strategies should thus be targeted based

[15] The evaluations of all second thoughts (or associations) were aggregated.

[16] Levene's test was significant at p = 0.001 but results of a Welch test indicated (F = 53.153, df_1 = 1, df_2 = 405.248, p = 0.000).

[17] Levene's test was significant at p = 0.047 but results of a Welch test indicated (F = 174.724, df_1 = 1, df_2 = 485.112, p = 0.000).

[18] 219 P/Km^2 for Switzerland versus 36 P/Km^2 for the Unites States. Source: https://www.worldometers.info/world-population/us-population/.

[19] Within our sample, 32.4% of the French-speaking respondents live close to a planned wind energy project versus 10.1% among the German-speaking respondents.

on specific demographic characteristics.

5.2. Affective imagery elicited by wind power and local concern

Controlling for important variables such as political orientation or place of residence (urban versus rural), we found a strong correlation between the affective evaluations of the associations about wind energy and respondents local concern about wind projects. This suggests that affect matters in the formation of attitudes towards local wind energy projects. Further, the results highlighted that French- speaking respondents, respondents from the national conservative party and individuals unfamiliar with seeing wind turbines in their immediate environment had a significantly higher concern level. These results are in line with results of the previous section highlighting the important role of affective imagery in attitudes. It also opens the way for further research to investigate these variables using structural equation modelling or log-linear analysis.

Segmenting further respondents according to their level of local concern, we were able to produce valuable insights into the affective mental representations latent to attitudes towards local wind energy projects. The results show that mild opponents have more similar associations and related affective evaluations to respondents who are indifferent about the implementation of local wind energy projects than to strong opponents. This highlights that this group of mild opponents may represent a silent part of the population which could change their mind in the process.

5.3. The importance of "second thoughts" for attitudes towards wind power

Another key contribution of our study is to look beyond the primary association or thought elicited. Energy-related decisions are often complex, and consequently, the thought process of people regarding different energy technologies is complex as well. Our study finds that "second thoughts" are, on average, more negative than the first one, and that within the first five thoughts that come to mind, many respondents go through some sort of a U-shaped curve. This would imply that if project developers want to succeed in gaining social acceptance, they would have to make sure that the local population actually overcomes the negative "second thoughts" and keep considering the issue thoroughly in order to return to their initial level of sympathy for the technology. In times of social media, where attention spans are short, half-truths tend to spread quickly and in-depth reflection may be a scarce resource, this might be a challenge. This finding may also be an explanation for the "acceptance gap" that has been identified in previous literature, in that general surveys tend to be better at capturing first thoughts, while the subsequent stages of the thought process actually matter for the overall evaluation of a project.

Moreover, an in-depth analysis of second thoughts may be particularly important to gain a better understanding of the large part of the population that shows neither strong support nor strong opposition to wind energy. Looking at the second thoughts of mild supporters and mild opponents may provide valuable insights about arguments that can actually tip the balance for them in the process. Fig. 2, in Section 4.2.2 may already give us some insights: while *power generation* is one of the main five associations elicited by mild supporters and indifferent individuals, this is not the case for mild opponents. Therefore, emphasizing the contribution of wind power towards securing domestic electricity supply and contributing to energy independence may be a factor tipping the balance towards support for mild opponents.

Finally, the analysis of first versus second thoughts reveals that the first thought is a robust predictor of preference formation for most but not all groups. In the case of mild opponents, while a large majority of them have a positive first thought about wind energy, their attitude towards local wind energy projects is negative. As such, query theory turns out to provide a useful framework for predicting attitudes of many respondents, but it does not seem to fully apply to one segment of the population which could actually be crucial in tipping the balance in processes of local acceptance.

5.4. Specific policy implications

Countries which are trying to implement a low-carbon energy strategy are facing challenges when it comes to local implementation of infrastructure projects, such as onshore wind. Understanding the affective components of local concern appears key to help with the implementation as the issue has become increasingly emotional in many countries [22,23]. This study contributes to this area by identifying the affective imagery elicited by wind energy and by pointing to the importance of "second thoughts" about the technology to tip the balance towards opposition for individuals who have mixed feelings about the technology. Policymakers and project developers looking for successful implementation of wind power projects should not be blinded by the vocal opinions of strong supporters or strong opponents but pay much more attention to the silent majority of people who are initially undecided. Better understanding their specific concerns, and especially better attending to their "second thoughts", which tend to be more critical than first thoughts, appears to be crucial in tipping the balance towards support.

Further, while a variety of studies have highlighted that people value energy independence [10,97,98], this is rarely reflected in respondents' associations with wind power. To increase social acceptance of renewables, policymakers could emphasize the link between generating wind power domestically and reducing import dependence. This may be particularly useful for conservative parts of the population, for whom independence is highly valued [99].

The study further indicates that affect plays a significant role in people's perceptions of wind power. Policymakers should, therefore, take emotions into account – one cannot rely only on addressing the population with facts and figures. Factual information can help to address some of people's concerns, for example, misperceptions. However, being mindful of negative emotions like fear and anger, and strengthening positive emotions like curiosity and pride, is an equally important part of the social acceptance equation.

The results also show that only looking at opinions on a general level, does not reflect the full picture. Instead, researchers and policymakers should make sure that their analysis is tailored to local processes. Strengthening a sense of local ownership, for example through the role of renewable energy cooperatives or citizen investment [16,100], may be an important element of social acceptance processes. Increasing people's involvement can make it more likely that they actually re-emerge from the negative second thoughts that may sometimes take precedence in more superficial evaluations of the pros and cons of wind parks.

Finally, our findings show that social acceptance is more than an individual-level phenomenon. We illustrate that different types of supporters and opponents exist depending on different socio-demographic variables such as political orientation or age group. Also, the results highlight that mild opponents are more similar to respondents who are indifferent about the implementation of local wind energy projects than to strong opponents. This can be a first step towards understanding the social dynamics of renewable energy acceptance, in particular polarization. While we acknowledge that each person is unique, similarities in individuals' reactions to wind energy highlight the opportunity to identify specific groups who share similar concerns. This can allow for a certain degree of segmentation, although it is important to keep in mind that in sparsely populated rural areas, a key bottleneck might not be the average perceptions of the wider population, but rather acceptance by a small number of relevant stakeholders in the local community. In sum, while the findings acknowledge the relevance of well-established factors like procedural and distributive justice as key prerequisites for the implementation of wind energy projects, social acceptance can be further supported by carefully targeted

communication strategies addressing the salient concerns of the local population.

5.5. Limitations and future research

While our study is based on a large-scale survey and has been carefully crafted to capture respondents' affective imagery related to wind power, we identify three limitations that can be the starting point for further research. First, public perception and acceptance of energy technologies are, to some degree, influenced by a country's geographical and political context. The empirical context of our study is a small and densely populated country with an emerging wind energy sector. Replications of our study in other geographic settings, including more mature wind markets, could provide important additional insights.

As an exploratory study, a second limitation is the correlational nature of the research findings. The survey data being cross-sectional, we cannot determine the causal relationship between variables, although a large number of past studies have shown that affective reactions guide following judgment e.g. [19,67,69].

A third limitation results from the operationalization of local acceptance of wind power. We measured local acceptance by asking how concerned participants would be if a wind park were to be built close to their homes or other places, they feel close to. The cross-sectional design of our study – and in fact, of most studies on social acceptance – does not allow us to assess if and how such concern actually translates into active opposition. Future research could try to take a longitudinal approach to measure affect, concern and local acceptance in the context of projects progressing through different planning stages. One challenge to overcome in doing so is to deal with inherently smaller sample sizes in the context of local wind projects.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Overall sample distribution

Variable	Sample before the boost (n = 933)	Boost sample (n = 178)	Total sample (n = 1111)	Swiss adult population
Age				
18-29	22%	10%	20%	18%
30-44	25%	26%	25%	26%
45-59	27%	29%	27%	28%
60+	26%	34%	27%	28%
Gender				
♂	50%	58%	51%	49%
♀	50%	42%	49%	51%
Region (excl. Ticino)				
Western Switzerland (French-speaking)	25%	56%	30%	25%
Alps & Prealps	25%	27%	25%	24%
Swiss Plateau West	22%	7%	20%	22%
Swiss Plateau East	28%	10%	25%	29%
Education				
low/medium	62%	46%	59%	62%
high	38%	54%	41%	38%
Political Orientation				
Swiss People's Party (SVP)	29%	14%	26%	29%
The Liberals (FDP)	16%	19%	16%	16%
Conservative Democratic Party (BDP)	5%	2%	4%	4%
Green Liberal Party (GLP)	5%	12%	6%	5%
Christian Democratic People's Party (CVP)	12%	12%	12%	12%
Green Party (GPS)	7%	10%	8%	7%
Social Democratic Party (SP)	20%	23%	21%	19%
Others	7%	8%	7%	8%

Notes: Information on socio-demographic characteristics of the Swiss voting population was obtained from the Swiss Federal Statistical Office. The political orientation's distribution corresponds to the results of the 2015 parliamentary election to the lower chamber of the national parliament (National Council): https://www.bfs.admin.ch/bfs/fr/home/statistiques/politique/elections/conseil-national/force-partis.html

Appendix B. Survey questions

Variables	Questions	Answer options
Affective imagery	"What are the first thoughts or images that come to your mind when you think of wind energy?"	1–5 association(s) listed
Affective evaluations	"What are your feelings regarding the thoughts or images you provided about wind energy?" *Please use the scale below to evaluate your feeling from very negative to very positive. Each thought or image needs to be evaluated separately.*	1 (very negative) to 7 (very positive)

Familiarity with wind energy	*Please indicate the extent to which you agree with the following statement:* "I am familiar with seeing wind turbines in my immediate environment".	1 (fully disagree) to 4 (fully agree); 5 (I do not know)
Local concern	*Please indicate the extent to which you agree with the following statement:* "I would be concerned if a wind turbine would be built in my neighbourhood or other places, I feel close to".	1 (totally disagree) to 5 (totally agree); 6 (I do not know/no opinion)
Awareness about planned wind project	"Is the implementation of wind turbines planned near your home (less than 5 km away)?"	1 (yes), 2 (No), 3 (I do not know)

Note: The questions were translated from German and French to English.

Appendix C. Descriptive statistics of variables used in the analyses

N = 1111	Mean	SD	Min.	Max.
Affective evaluations	4.53	1.832	1 (very negative)	7 (very positive)
Familiarity with wind energy	1.82	1.012	1 (very unfamiliar)	4 (very familiar)
Local concern	3.06	1.489	1 (not concerned at all)	5 (highly concerned)
Awareness about planned wind project	0.10	0.305	0 (not aware)	1 (aware)
Place of residence	2.97	1.152	1 (city center)	4 (rural area)
Socio-demographic variables				
Age	2.61	1.091	1 (below 30)	4 (60 and above)
Gender	1.49	0.500	1 (male)	2 (female)
Education	0.41	0.492	0 (compulsory education)	1 (University/higher education)
Language Region	0.3	0.460	0 (German)	1 (French)
Political Orientation	0.74	0.440	0 (Swiss national conservative party)	1 (other political parties)

Appendix D. Sample split of German- and French-speaking respondents based on proximity to existing and planned wind park

Proximity to wind park	German-speaking subsample (%/n)	French-speaking subsample (%/n)	Entire sample (%/n)
Live in proximity to an existing wind park	5.0%/39	14.3%/48	7.8%/87
Live in proximity to a planned wind park	10.1%/78	32.4%/109	16.8%/187
Do neither live in proximity to an existing nor to a planned wind park.	84.9%/658	53.3%/179	75.3%/837
Total	100.0%/775	100.0%/336	100.0%/1111

Appendix E. Sample split of German- and French-speaking respondents based on residential location

Residential location	German-speaking subsample (%/n)	French-speaking subsample (%/n)	Entire sample (%/n)
City centre	17.8%/138	20.0%/68	18.5%/206
Suburban	13.7%/106	8.8%/30	12.2%/136
Agglomeration	24.0%/186	20.3%/69	23.0%/255
Rural	44.5%/345	49.7%/169	46.3%/514
Total	100.0%/775	100.0%/336	100.0%/1111

Appendix F. Sample split per age group and residential location

Residential location	Below 30 (%/n)	30-44 (%/n)	45-59 (%/n)	Above 60 (%/n)
City centre	13.7%/31	21.3%/60	17.9%/54	20.3%/61
Suburban	15.4%/35	9.9%/28	8.0%/24	16.3%/49
Agglomeration	25.1%/57	19.5%/55	23.6%/71	23.9%/72
Rural	45.8%/104	49.3%/139	50.5%/152	39.5%/119
Total	100.0%/227	100.0%/282	100.0%/301	100.0%/301

Appendix G. Definition of the categories

Category name	The thought or short sentence contains...:
Wind turbine	...wind turbine, windmill (e.g. wind turbine; ugly wind turbine). In the second case, the thought was also categorized in the Aesthetic category.
Mill	... mill.
Wind park	… wind park or wind farm.
Wind	… the word wind or synonyms of wind such as "North Wind" (Bise) only.
Air	… air.
Environment & Ecology	… elements related to the environment and the ecology (e.g. Environmentally friendly, ecological).
Nature	… elements related directly to nature (e.g. nature protection).
Climate	... climate change.

Sustainability	… sustainability, sustainable.
Deficit	… elements related to a deficit of wind energy production (e.g. “Should be used more”)
Technology	… elements related directly to the technology.
Positive Assessment	… elements that assess wind energy positively but are unspecific (e.g. interesting).
Negative assessment	… elements that assess wind energy negatively but are not specific (e.g. unpractical).
Size	… elements related to the size of wind turbines (e.g. big, huge).
Space scarcity	… elements related to the space wind turbines take (e.g. “lack of space”; “needs a lot of space”).
Noise	… elements related to the noise wind turbines may emit.
Profitability/costs/economy	… elements related to the (un)profitability, costs of wind turbines (e.g. “maintenance is too expensive”; “cost savings”; “cheap”).
Efficiency	… elements related to efficiency (e.g. “simply produces a lot of electricity”; “large expenditure for little energy”).
Intermittency/reliability/storage	… elements related to the intermittency of wind energy production (e.g. “fluctuating power generation”).
Landscape	… elements related to the landscape (e.g. “landscape”; “destroys the landscape”).
Wildlife/Fauna	… elements related to fauna as a whole (e.g. “Deadly for birds, bats and insects”).
Aesthetic	… elements related to the aesthetic of wind turbines (e.g. “ugly”; “beautiful”).
Shade	… elements related to the shade wind turbines may cause.
Geographic suitability	… elements related to the suitability of wind energy installations (e.g. “at the right place”; “Question of location”).
Place reminiscence	… thoughts or statements mentioning specific locations (e.g. “Mont Crosin”; “Germany”).
Suitability in Switzerland	… thoughts or statements mentioning suitability of wind energy production in Switzerland.
Independence	… thoughts or statements mentioning energy independence.
Danger	… elements linked to danger.
Acceptance challenges	… elements mentioning acceptance challenges linked to wind turbines (e.g. “false anxieties”; “many objections”).
Implementation	… elements linked to the implementation of wind energy projects (e.g. “transport” or “strategies”).
Colour	… mention of colours (e.g. “white”).
Coldness	… elements linked to coldness.
NIMBY	… elements related to not wanting a wind turbine close by (e.g. “I'd rather it to be in my neighbour's house than mine!”).
Power production	… elements related to energy, electricity or power production (e.g. “power”; “energy”).
Unlimited source	… elements linked to the availability of the wind to produce energy (e.g. “Infinite Energy”).
Renewable energy	… renewable energy.
Free energy	… elements mentioning that wind energy is “free”.
Clean energy	… elements related to the idea that wind energy is clean (e.g. “clean energy”). To be differentiated from “green energy” categorized in Environment & Ecology.
Alternative energy	… elements related to ideas that wind energy is an alternative energy.
Field	… elements related to “fields” (e.g. “grazing areas”).
Storm	… elements related to “storms” (e.g. “storm damages”).
Mountains	… elements related to the mountains or thoughts picturing wind turbines in the mountains (e.g. “mountain”; “wind turbines in the mountains). In the second case, the thought was also categorized in the Wind turbine category.
Ocean	… elements related to the ocean or thoughts picturing wind turbines in the ocean (e.g. “ocean”; “wind turbines in the sea). In the second case, the thought was also categorized in the Wind turbine category.
Tower	… elements related to the tower of wind turbines (e.g. “tower”, high towers“). For instance, in the case of ”high towers“, it was categorized two times: 1. in Tower; 2. in Size.
Propeller	… elements related to the rotors of wind turbines (e.g. “propeller”, “ huge propeller”). In the case of “huge propeller” for example, it was categorized two times: 1. in Propeller; 2. in Size.
Subsidies	… elements related to subsidies given to wind power projects.
Future	… elements related to the future (e.g. “future”; “Kinderschuhe”).
Knowledge gaps	… elements linked to lack of knowledge (e.g. “not informed enough”).
Energy Mix	… any elements linked to other energy sources or the role of wind energy in the energy mix.
Other	… any elements that could not be categorized in the above categories.

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