

# Are Interactive Web-Tools for Public Engagement Worth the Effort? An Experimental Study on Energy Transition

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## Introduction and research questions

Interactive web-tools are often regarded as powerful methods to familiarize and engage the public with complex problems, such as those related with a national energy transition [1]. Nevertheless, including interactivity is much more resource-consuming than traditional methods and, in some cases, may even complicate communication [2]. Although studies exist on how to design and assess interactive web-tools [3], there is little empirical evidence whether they can be more effective in comparison with static methods [4]. We studied this in an experimental design survey with non-experts in the German-speaking part of Switzerland. As a case study, we used the Swiss electricity supply scenarios for 2035 and their environmental, health, and economic impacts.

Our study [5] aimed to address the following questions:

1. How do interactive and static web formats of scientific information perform in terms of making this information understandable, trustworthy and engaging for non-expert users?
2. How do the demographics, prior experience with the topic, numeracy, and website navigation skills of the non-expert users, influence this performance for each format type?

## Methodology

We conducted a between-groups experiment online (N=313 total), where the two experimental groups differed in the format of scenario information they received: (a) an interactive web-tool that we have developed in a previous study [6] as an interface for exploring a large database of electricity supply scenarios and impacts (Figure 1), and (b) a static website presenting only four distinct electricity supply scenarios with their impacts (Figure 2). The selection of electricity supply technologies and impacts was informed by a series of non-expert interviews we did in a past study [7]. We compared the two groups in terms of (a) self-reported and tested understanding, (b) self-reported and tested engagement and (c) self-reported trust of information. The two groups of respondents were representative of the population in gender, age, and highest education level and with comparable previous experience with the energy subject, website-navigation skills, and numeracy.

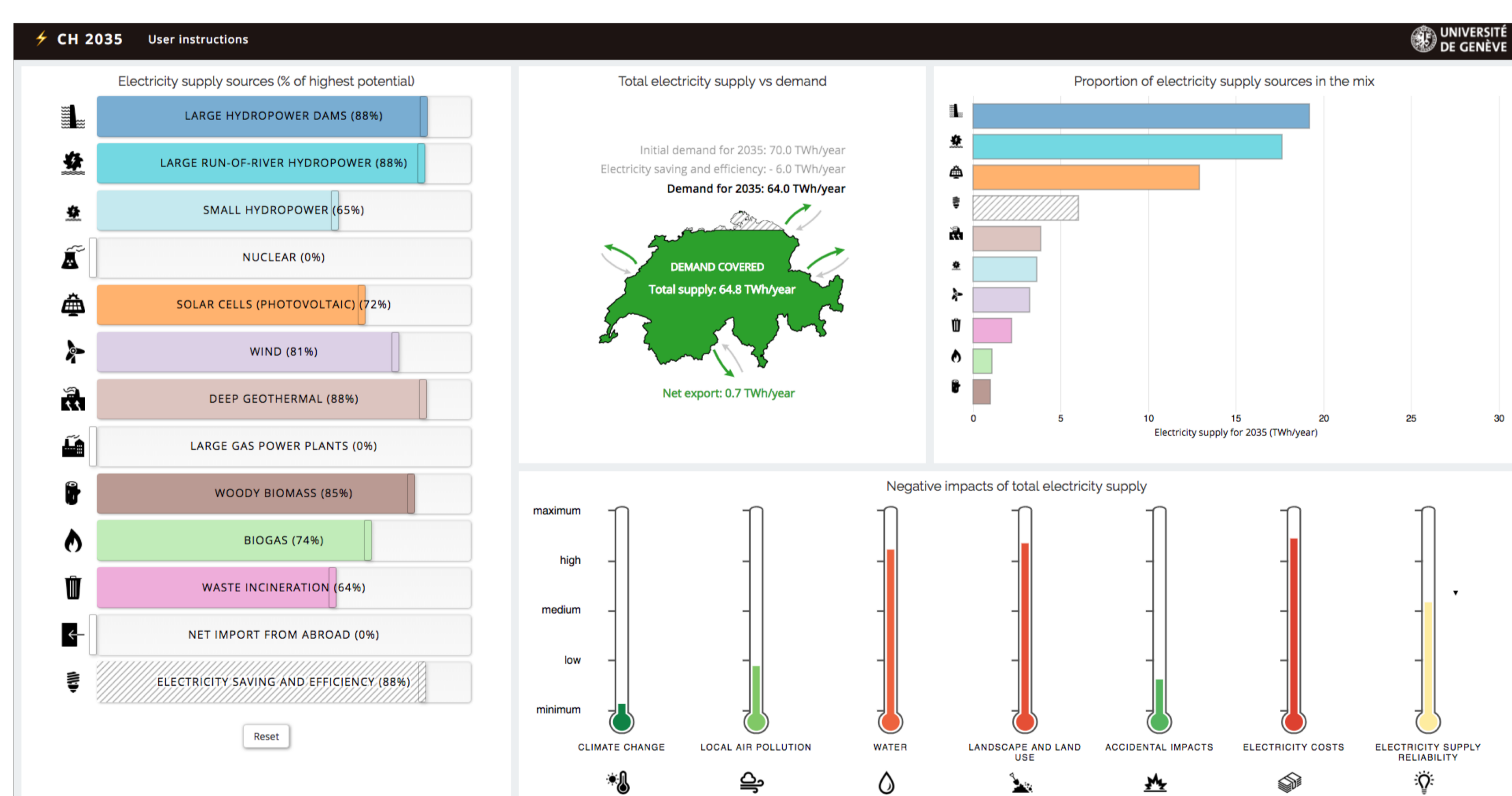


Figure 1. The interactive web-tool for exploring Swiss electricity supply scenarios for 2035 and related impacts.

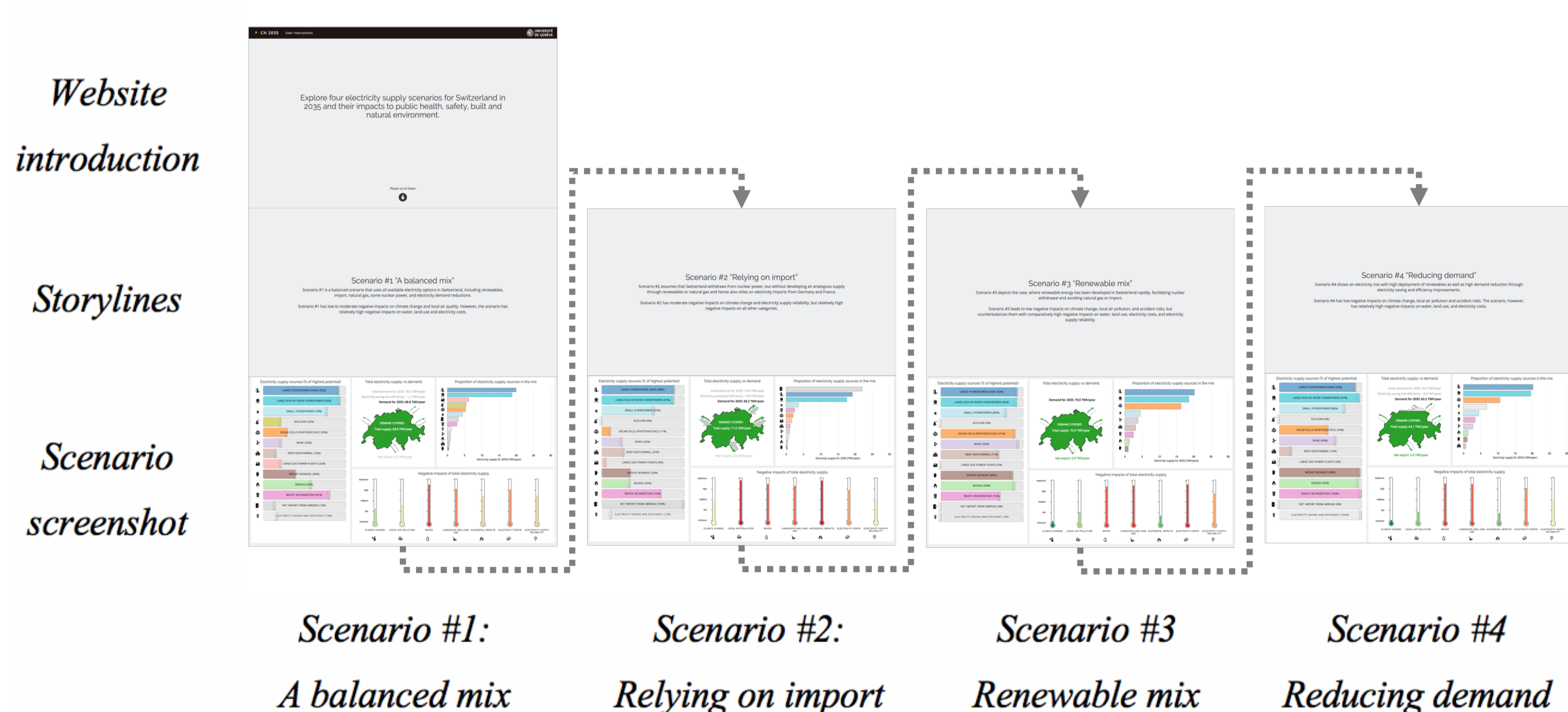


Figure 2. The static equivalent webpage, presenting four electricity supply scenarios along with short introductory storylines. The arrows show the order of the graphics and text in the website.

## Results

We found that the interactive condition did not lead to a perceived advantage over the static one, as there were no statistically significant differences between the two groups in self-reported understanding, engagement and trust of the information (Table 1). In fact, it seems that the interactive web-tool may even complicate the usability because we observed that the interactive web-tool's users scored statistically significantly worse than the users in the static condition, when they had to answer a quiz that required to extract information from the scenarios ("Understanding – tested" in Table 1).

In both conditions, we found a low to moderate correlation of website-navigation skills and numeracy with tested understanding, suggesting that these skills are important but not imperative. Participants with higher prior experience with the energy subject were also more engaged in both conditions, while demographics did not have any effect. Although the effects of the control variables varied between the conditions, only one statistically significant difference was found: high website navigation skills increased self-reported understanding in the static condition but not in the interactive one. This suggests that another factor might have moderated the effects of these skills in the interactive condition, such as a possible overload of information from the interactive web-tool.

Dependent variables	Experimental conditions		Statistic
	Static (n = 157)	Interactive (n = 156)	
Understanding – tested (quiz with 7 items, max. score: 7)	4.03 ± 1.99	3.54 ± 1.66	t (311) = 2.318*
Understanding – self-reported (6 items, 7-point Likert scale, max. score: 42)	26.64 ± 5.50	25.88 ± 5.82	t (311) = 1.195
Trust – self-reported (7 items, 7-point Likert scale, max. score: 49)	32.56 ± 5.95	32.62 ± 6.04	t (311) = -.090
Engagement – self-reported (7 items, 7-point Likert scale, max. score: 49)	31.55 ± 8.36	31.76 ± 8.60	t (311) = -.218
Engagement – tested			
Time spent in website (seconds)	339 ± 273	366 ± 334	t (311) = -.806
Drop-out rates in website (count)	7	10	χ <sup>2</sup> (1) = .504

Table 1. Dependent variables by experimental condition. \*p < .05.

## Conclusions

These results indicate that the interactive web-tools do not come automatically with the benefits of understanding and engagement claimed in the literature or believed by experts. In fact, they might lead to a discrepancy between the actual and perceived understanding in non-experts, making users believe they comprehend more than they actually do. As the trends of using such interactive web-tools for digital participation continue, more empirical research is needed to evaluate which formats meet the needs and abilities of the intended users.

## References

- [1] Pidgeon, N., Demski, C., Butler, C., Parkhill, K., Spence, A., 2014. Creating a national citizen engagement process for energy policy. Proc. Natl. Acad. Sci. U. S. A. 111, 13606–13613.
- [2] Zikmund-Fisher, B.J., 2012. The Right Tool Is What They Need, Not What We Have: A Taxonomy of Appropriate Levels of Precision in Patient Risk Communication. Med. Care Res. Rev. 70, 1–23.
- [3] Wong-Parodi, G., Fischhoff, B., Strauss, B., 2014. A method to evaluate the usability of interactive climate change impact decision aids. Clim. Change 126, 485–493.
- [4] Moss, R.H., 2016. Assessing decision support systems and levels of confidence to narrow the climate information "usability gap." Clim. Change 135, 143–155.
- [5] Xexakis, G., Trutnevyte, E., 2018. Are Interactive Web-Tools for Public Engagement Worth the Effort? An Experimental Study on Energy Transition. Under preparation.
- [6] Volken, S., Xexakis, G., Trutnevyte, E., 2018. Perspectives of informed citizen panel on low-carbon electricity portfolios in Switzerland and the empirical evaluation of informational materials. Environ. Sci. Technol. To be resubmitted after minor revisions.
- [7] Volken, S., Wong-Parodi, G., Trutnevyte, E., 2017. Public awareness and perception of environmental, health and safety risks to electricity generation: an explorative interview study in Switzerland. J. Risk Res. 9877, 1–16.