



The influence of values on evaluations of energy alternatives



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ABSTRACT

Although both promoted as sustainable, nuclear and renewable energy elicit different evaluations in people. People expect (whether true or not) different implications for the environment and for consumers' resources from these energy alternatives. But what factors define the perceived importance of these environmental and individual consequences, and will this affect people's attitudes toward energy alternatives? Do these factors also influence perceptions of consequences of energy alternatives? The authors propose that people's biospheric (e.g. valuing nature) and egoistic (e.g. valuing wealth) values affect evaluations of energy alternatives in three important ways. First, as expected, the results showed that the stronger their egoistic values, the more important people find individual consequences of energy alternatives, whereas the stronger their biospheric values, the more important they find environmental consequences. Second, this indeed translated into attitudes: the stronger their egoistic values, the more people favored nuclear energy and the less they favored renewable energy, whereas the opposite was found for biospheric values. Third, values colored the perceptions of consequences. Specifically, whether people ascribed negative or positive consequences to energy alternatives aligned with their value-based attitudes toward these alternatives. The results were robust despite variations in energy alternatives and the methods used. Practical implications are provided.

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1. Introduction

Due to environmental problems and exhaustion of natural resources, the use of fossil fuels needs to be restricted and eventually replaced by alternative energy sources. Two such alternatives have been widely considered so far: nuclear and renewable energy [1,2]. Although both have been promoted as sustainable, nuclear and renewable energy are associated by people with different consequences for the environment and for consumers' resources. Despite being touted as a low-carbon energy alternative, nuclear energy is nevertheless perceived by people as having a relatively large negative environmental impact, larger than renewable energy [3–5]. People only 'reluctantly' accept nuclear energy as a means to combat climate change, if they have concluded that there is no other solution in the foreseeable future [6] or if nuclear energy is explicitly framed as a solution to tackle climate change [7,8]. People prefer alternative energy sources for combating climate change, particularly renewable energy sources [5–8]. They perceive renewable energy as more environmentally friendly than nuclear

energy [3–5] and see it as the most adequate option for sustainable energy transitions [9,10]. At the same time, however, renewable energy is often associated by people with disadvantages for consumers' resources. Specifically, people consider it to be relatively pricy [11] and inconvenient (e.g. for cooking; [9,10]), and they may perceive renewable energy technology as spoiling the scenery and noisy. In comparison, people tend to associate nuclear energy with cheap and reliable energy, employment, and economic growth [13–16].

To sum up, surveys reveal that nuclear energy is generally associated by people with disadvantages for the environment and advantages for consumers' resources, whereas renewable energy is generally associated with advantages for the environment and disadvantages for consumers' resources. In this paper, these perceived various (dis)advantages are referred to as *generally perceived positive or negative environmental and individual consequences* of nuclear and renewable energy. The focus of this paper is on people's *subjective* evaluations of energy alternatives, which may not necessarily correspond to the *actual* consequences; the authors deliberately refrain from making implications about the actual objectively assessed consequences of energy alternatives. People may differ in their evaluations of energy alternatives. But what factors define the perceived importance of different

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environmental and individual consequences of energy alternatives, and will this affect people's attitudes toward energy alternatives? Do these factors also influence the perception of consequences of energy alternatives? It is proposed here that people's values play an important role in evaluations of energy alternatives. Values are abstract life goals or ideals that define what is *generally* important to people in their lives [17,18]. As such, values may affect how people appreciate specific consequences of many different objects and behaviors, including energy alternatives [19–22]. This paper examines how values affect evaluations of nuclear and renewable energy. More specifically, the paper aims to study how values affect three types of evaluations: I) the perceived importance of various (i.e. environmental and individual) consequences of energy alternatives, reflecting the extent to which people rate these consequences as important to them; II) attitudes toward energy alternatives, reflecting the extent to which people generally (dis)favor energy alternatives; and III) the perception of consequences of energy alternatives, reflecting how likely, people think, energy alternatives are to have various positive or negative consequences.

1.1. Values and the perceived importance of consequences of energy alternatives

When explaining sustainable attitudes and behaviors, it is important to distinguish between self-transcendence values, which refer to primarily considering collective consequences, and self-enhancement values, which refer to primarily considering individual costs and benefits [23–28]. Self-transcendence values encompass altruistic values, focusing on the well-being of other people and society (e.g. equality), and biospheric values, focusing on the quality of nature and the environment (e.g. protecting the environment). Self-enhancement values encompass egoistic values, focusing on safeguarding and promoting one's personal resources (e.g. wealth), and hedonic values, focusing on improving the way one feels (e.g. pleasure; [29]). Value theory posits that people selectively attend to information that is relevant for their important values [25,26,30–32]. This implies that people should consider particularly the consequences of energy alternatives that have implications for their important values as important (Hypothesis 1). Hence, the stronger people's egoistic values, the more likely they are to rate individual consequences of energy alternatives as important, whereas the stronger their biospheric values, the more likely they are to rate environmental consequences of energy alternatives as important. This hypothesis stems from value theory, but it has not been explicitly tested so far. Values are abstract and reflect what people find important in their lives in general, whereas the perceived importance of consequences is a specific construct, linked to a specific energy alternative, and thus the question remains whether the proposed relationship exists [cf. 33].

Alternatively, one could think that it depends on a specific energy alternative how important its consequences are to people, for example, that people merely highlight the importance of the positive consequences of their favored energy alternative and the negative consequences of their disfavored energy alternative. Value theory would posit, however, that people consistently prioritize the same consequences that are congruent with their important values, irrespective of which energy alternative they are considering. The perceived importance of consequences should therefore not depend on people's attitudes and the perceived consequences of a specific energy alternative.

1.2. Values and attitudes toward energy alternatives

Attitude theories propose that people build their attitudes by weighing costs and benefits that are important to them [34]. Given

that values guide the perceived importance of consequences of energy alternatives (Hypothesis 1), it follows that people's attitudes toward energy alternatives will depend on what consequences, people generally think, these alternatives have for their important values (Hypothesis 2). Due to their generally perceived different environmental and individual consequences, nuclear energy is likely to be seen by people as supporting their egoistic values and threatening their biospheric values, whereas renewable energy is likely to be seen as supporting their biospheric values and threatening their egoistic values. As a result, these energy alternatives should yield exactly opposite patterns of the value–attitude relationship. Specifically, the stronger their egoistic values, the more likely people are to favor nuclear energy, whereas the less likely they are to favor renewable energy. In contrast, the stronger their biospheric values, the more likely people are to favor renewable energy, whereas the less likely they are to favor nuclear energy.

There is initial evidence that nuclear energy is less favored by people with strong (versus weak) biospheric values [7,14,35],¹ whereas it is more favored by people with strong (versus weak) egoistic [14] and traditional (e.g. security, discipline; [35]) values. Another study found that renewable energy (i.e. wind energy) was more favored by people with strong (versus weak) biospheric and altruistic values, whereas it was less favored by people with strong (versus weak) traditional values [36]. The evidence, however, comes from studies using various value measures and typically focusing on a single energy alternative, which makes it difficult to systematically compare the effects of values on attitudes toward different energy alternatives. If attitudes toward energy alternatives are indeed rooted in values, one should be able to find that these values lead to different attitudes toward different energy alternatives, depending on people's generally perceived consequences of these alternatives for their important values. The current study seeks to capture, if present, such systematic differences in the value–attitude relationship. This would suggest that the effects of values may generalize to attitudes toward many different energy alternatives, but yield different outcomes depending on the generally perceived consequences of these alternatives for people's important values.

1.3. Values and perceptions of consequences of energy alternatives

People differ in the extent to which they perceive energy alternatives as having various positive and negative consequences. Indeed, the environmental and individual consequences of nuclear and renewable energy have been widely debated. Both types of consequences of each energy alternative have been framed positively as well as negatively by, respectively, supporters and opponents, and both parties have provided arguments to support their position [37]. For example, while supporters argue that nuclear energy is 'good for the environment' (e.g. because, according to them, it emits relatively little CO₂), opponents argue that it is 'bad for the environment' (e.g. because, according to them, the risks of environmental pollution in case of nuclear accidents is very high) [13,14]. An important question is how people develop their perception of these consequences. Values may play an important role in this process.

¹ In some studies [e.g. 35], biospheric values were not measured separately but included in a scale including altruistic values as well, which together reflect a concern with the welfare of other people and other species. Since biospheric and altruistic values are typically positively correlated and have similar effects on attitudes and evaluations (as long as these values are not in conflict; see Ref. [26]), the effects of combined biospheric and altruistic values are interpreted and cited in this paper as the effects of biospheric values.

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