

# Distal and proximal determinants of the public acceptance of energy technologies

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19th of March, 2019



# Taiwan votes in favor of nuclear power

On Saturday, voters in Taiwan approved a referendum to stop the phase-out of nuclear power. Some fear the decision could slow down the development of the renewable energy industry on the island.

NOVEMBER 26, 2018 [PV MAGAZINE](#)

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# Taiwan government maintains nuclear phase-out

01 February 2019



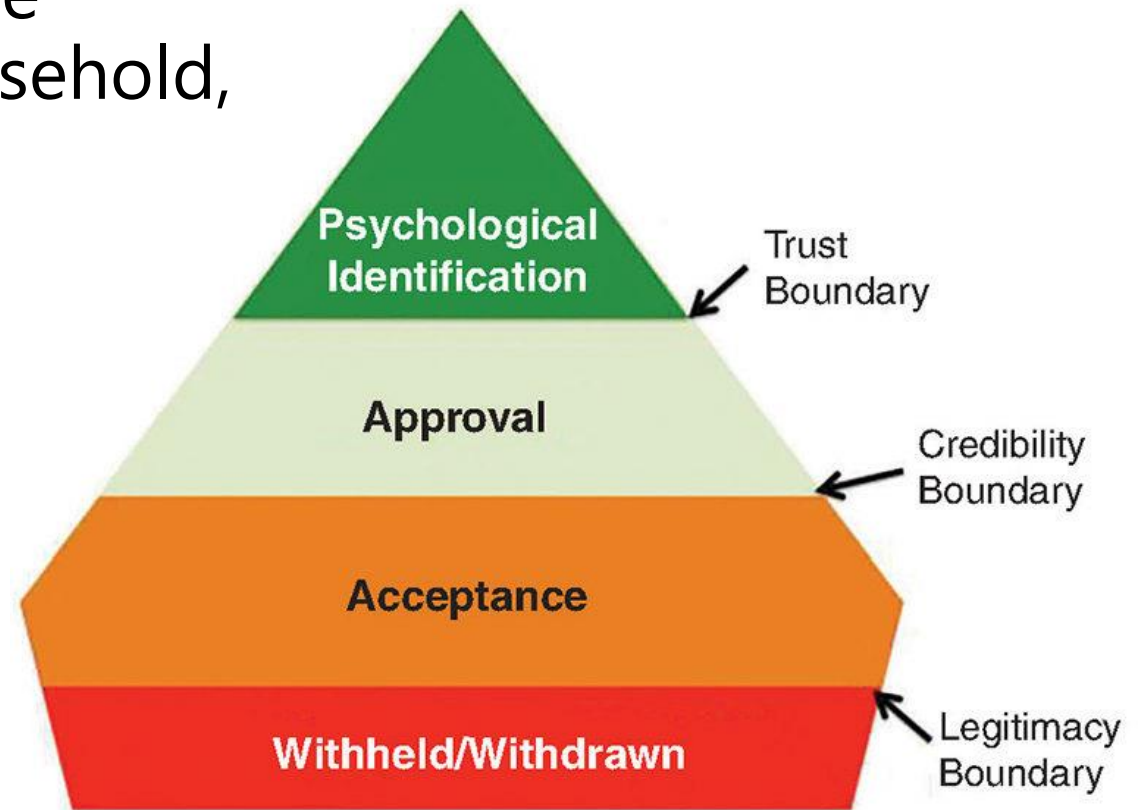
**The Taiwanese government will proceed with its plan to phase out the use of nuclear energy, despite citizens voting against the policy in a recent referendum, the country's economic minister announced yesterday.**



*The Lungmen nuclear power plant (Image: Taipower)*

# Social and public acceptance of energy technologies

Technology **acceptance** is a **positive evaluation** of, or attitude towards, an existing **energy technology** by the members of a "decision unit" (household, organization, community, society)



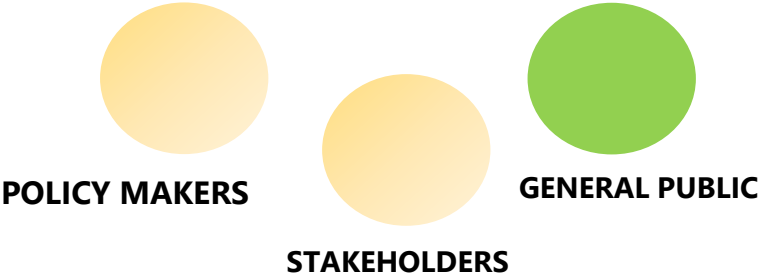
*Social License to Operate framework*

# SOCIAL ACCEPTANCE OF ENERGY TECHNOLOGIES

## ENERGY TECHNOLOGY/ POLICY



IN A SOCIETY



## ENERGY INFRASTRUCTURE



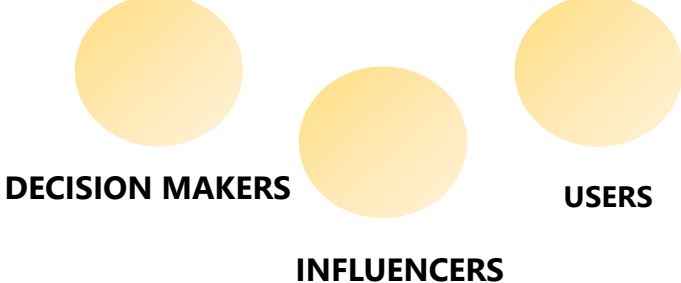
IN A COMUNITY



## ENERGY APPLICATION



USER/HOUSEHOLD/ORGANIZATION



Upham, P., Oltra, C., & Boso, À. (2015). Towards a cross-paradigmatic framework of the social acceptance of energy systems. *Energy Research & Social Science*, 8, 100-112.

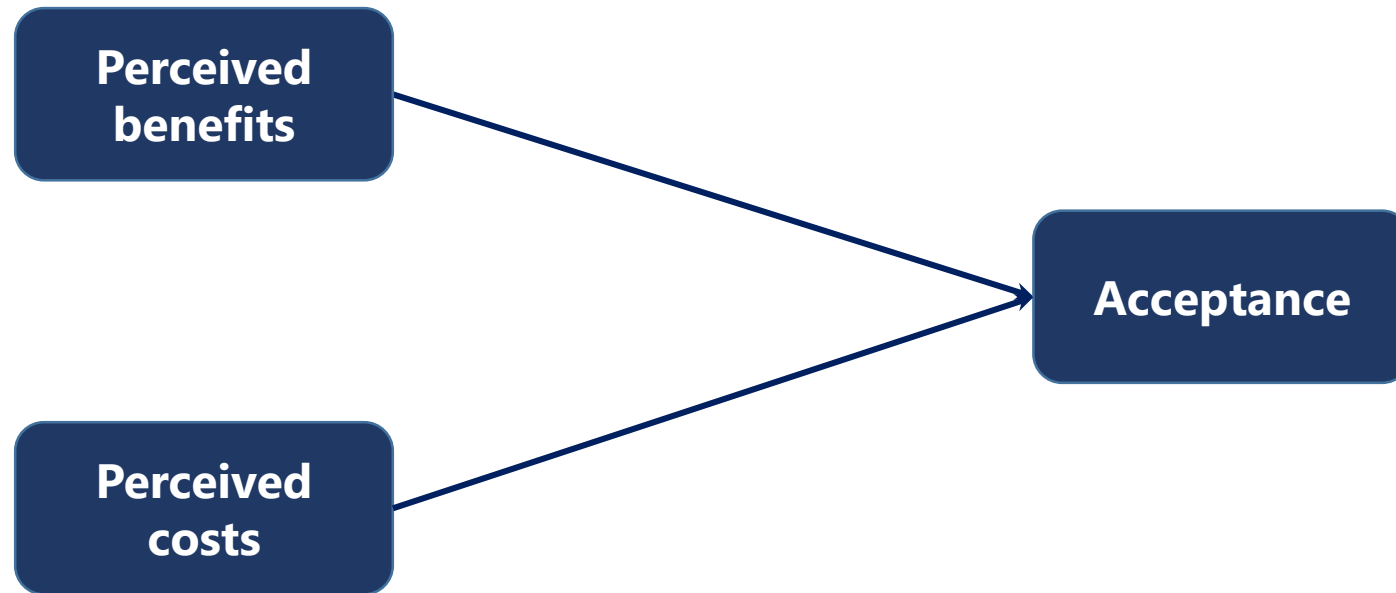
What determines the **public acceptance** (by the general public and the local population) of energy technologies?

# Information-deficit model

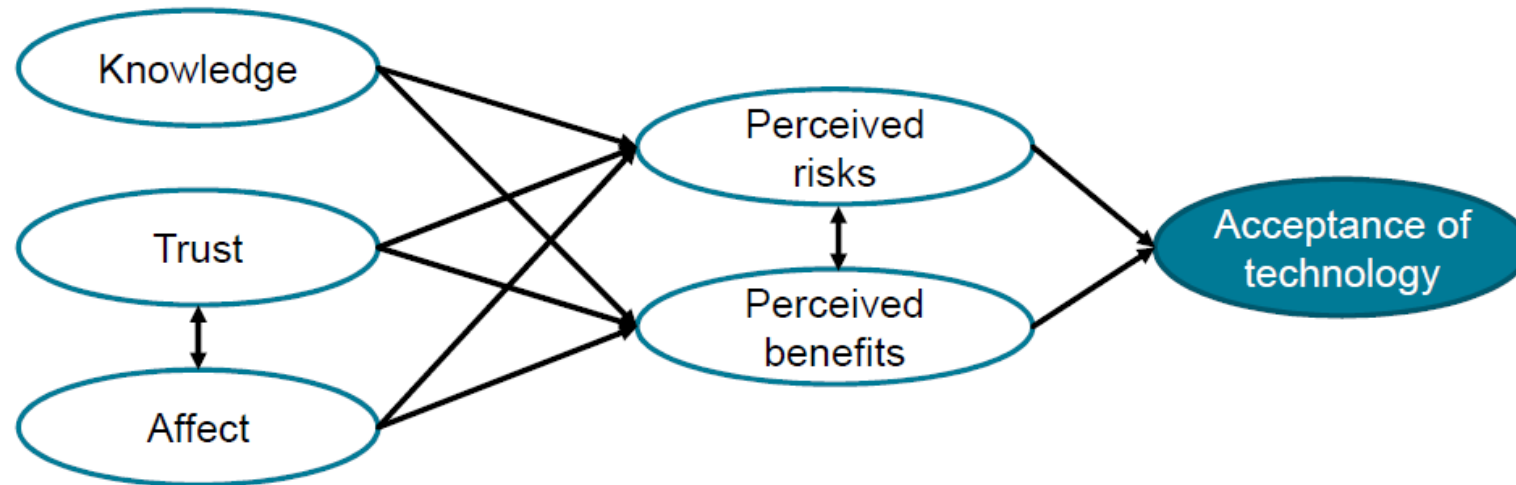




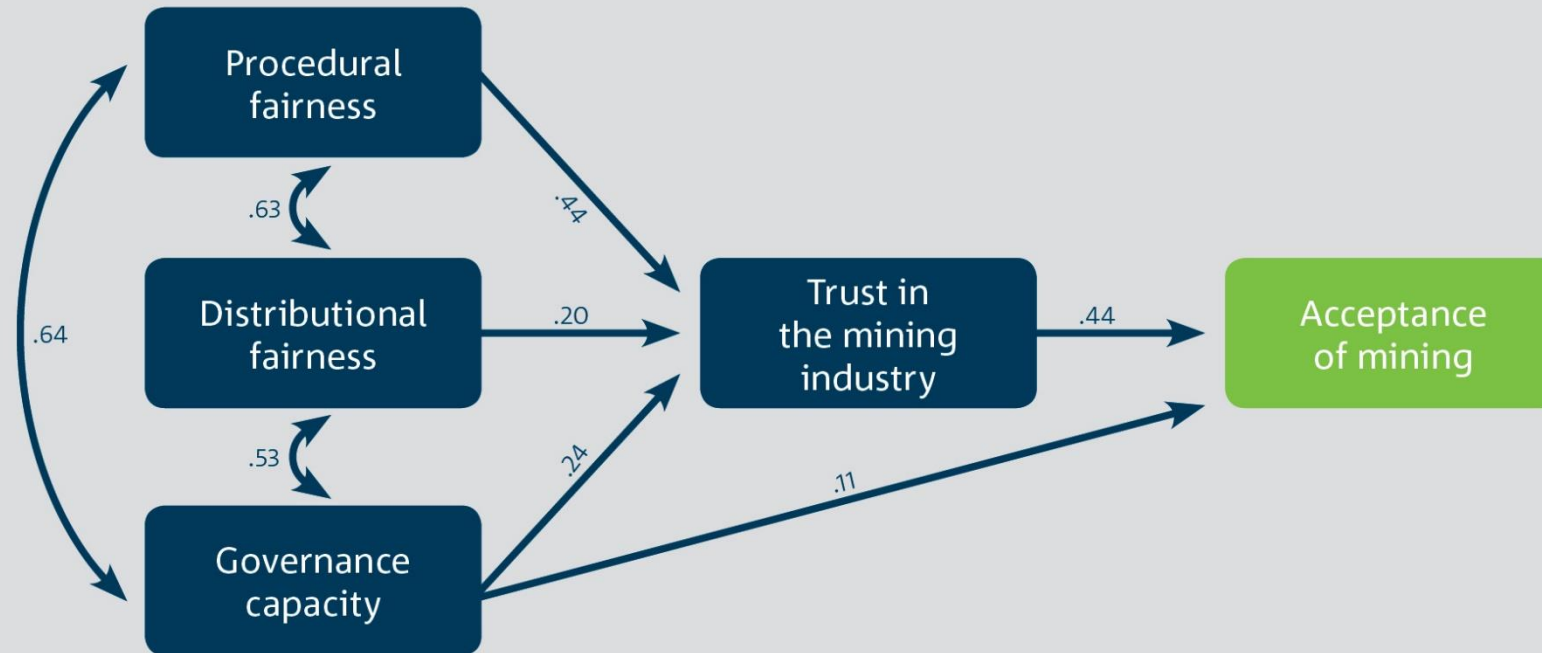
# Basic attitudinal model of acceptance



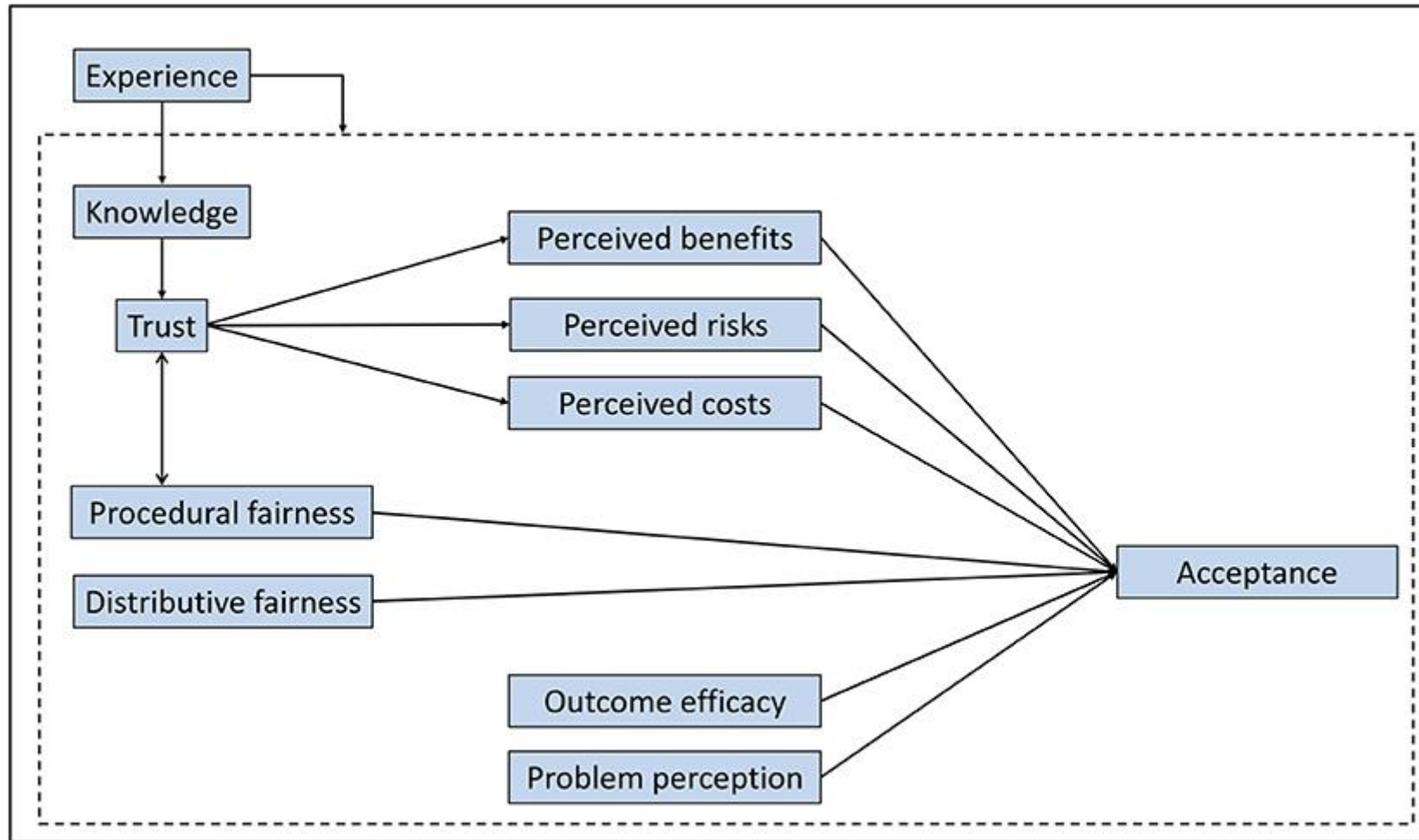
# Attitudinal model of acceptance (beliefs and affects)



# A MODEL FOR SOCIAL LICENCE TO OPERATE



# Public acceptance of energy technologies model

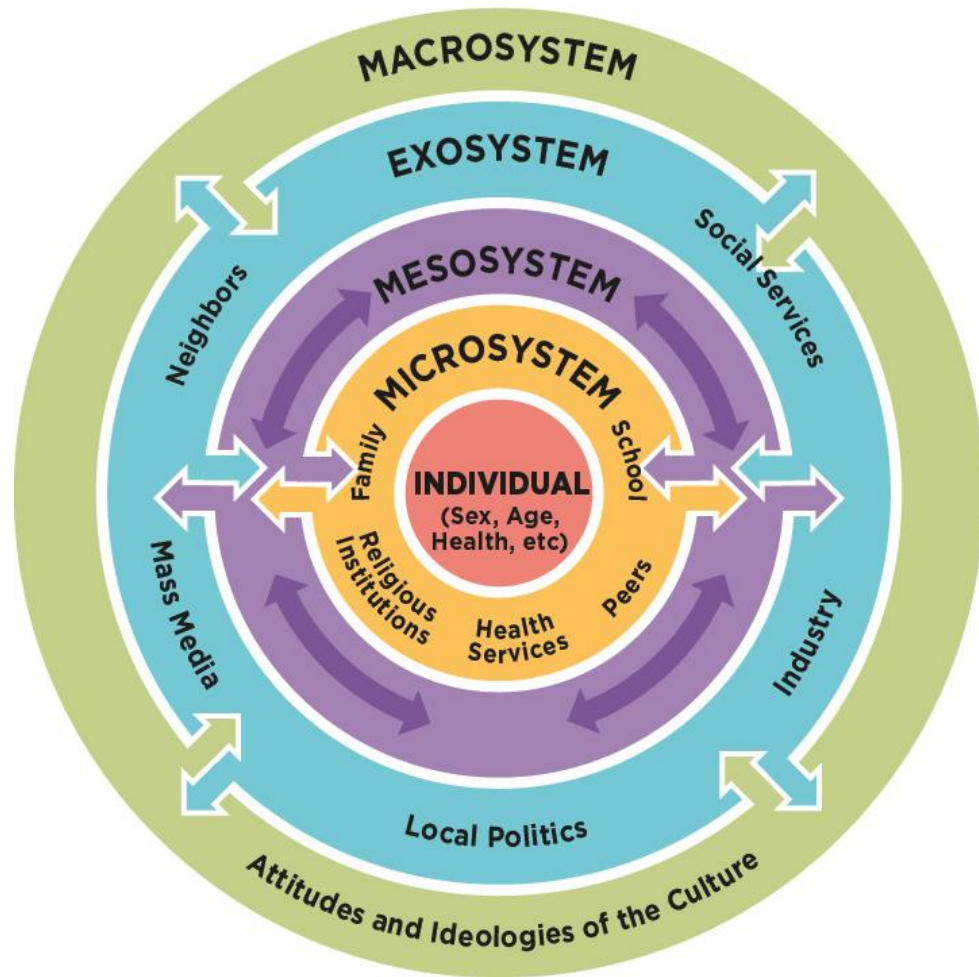


Huijts, N. M., Molin, E. J., & Steg, L. (2012). Psychological factors influencing sustainable energy technology acceptance: A review-based comprehensive framework. *Renewable and sustainable energy reviews*, 16(1), 525-531.

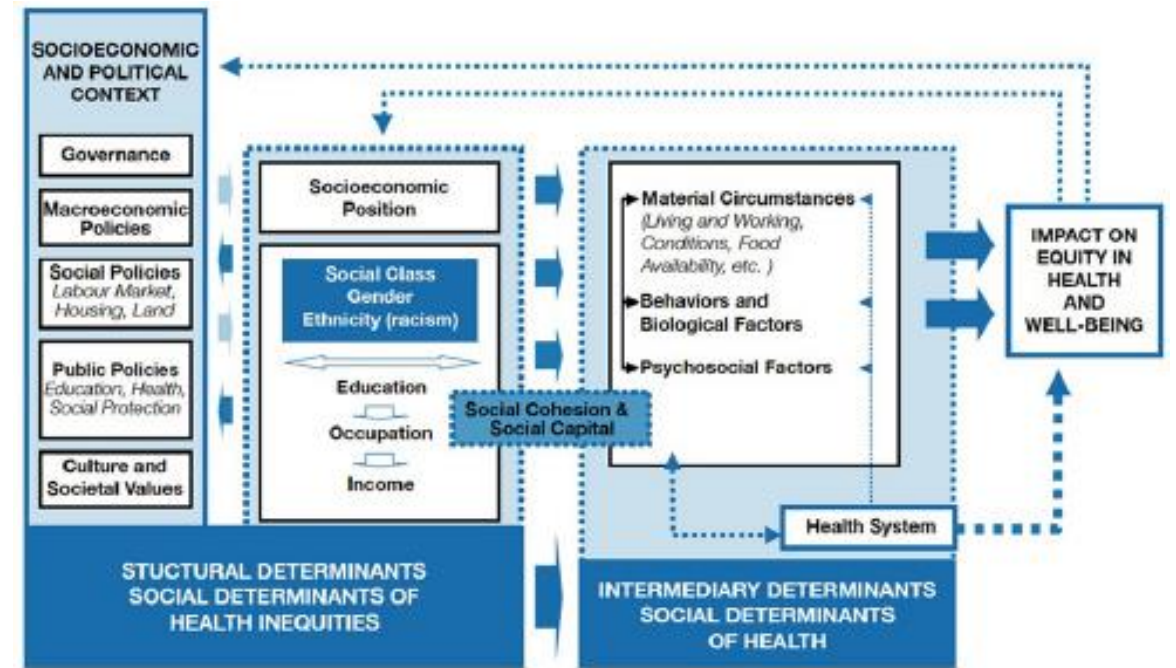
Are there other determinants of the **public acceptance** of energy technologies?



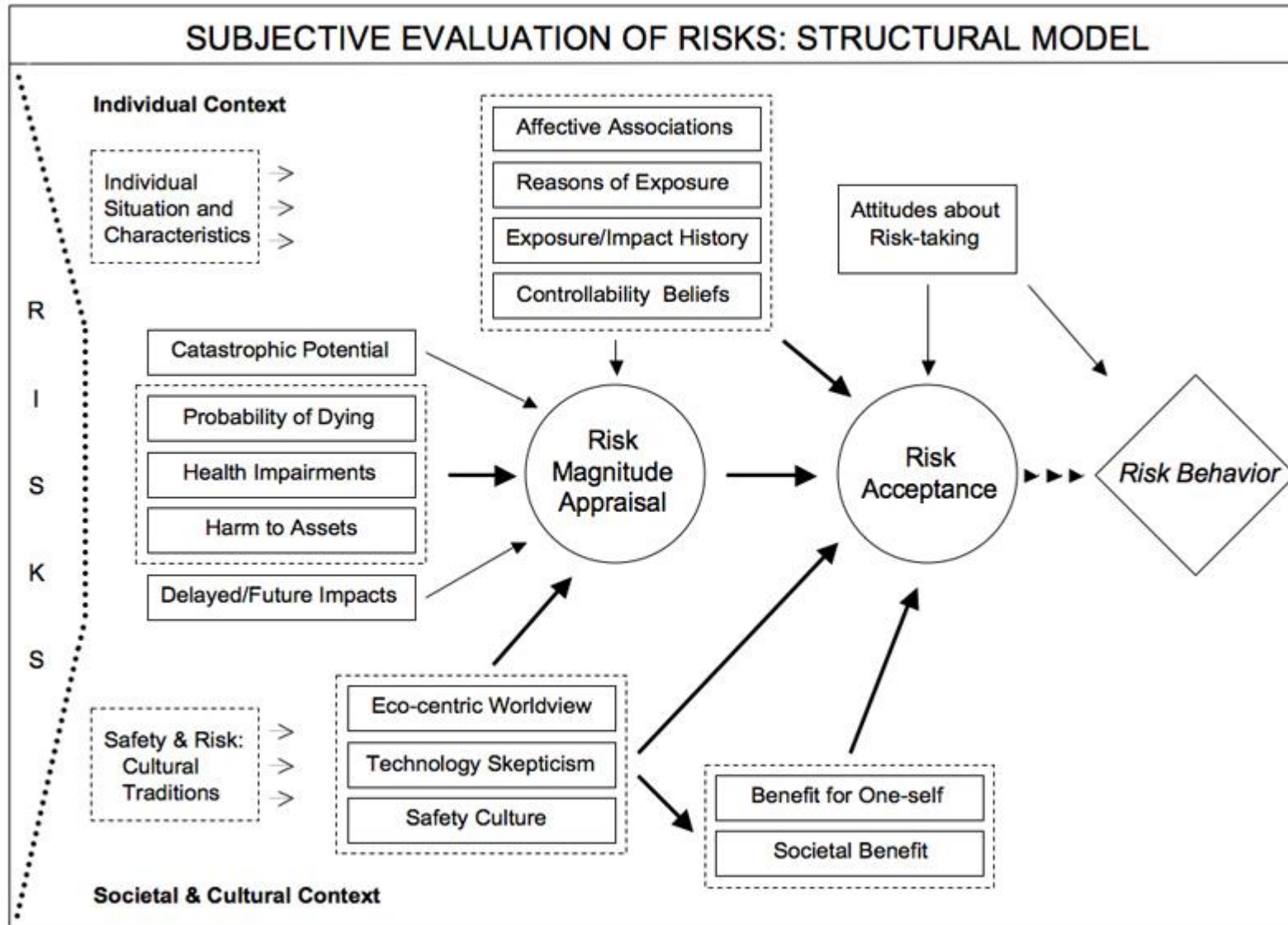
# Holistic models of determinants in parallel fields



**FIGURE 3-2** Bronfenbrenner's ecological theory of development. SOURCE: Adapted from [Bronfenbrenner \(1979\)](#).



**FIGURE 3-3** World Health Organization (WHO) conceptual framework. SOURCE: [Solar and Irwin, 2010](#).



*Source: Rohrman 1998 & 2007*



Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

## Renewable and Sustainable Energy Reviews

journal homepage: [www.elsevier.com/locate/rser](http://www.elsevier.com/locate/rser)



### Contextual and psychological factors shaping evaluations and acceptability of energy alternatives: Integrated review and research agenda



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Psychological factors

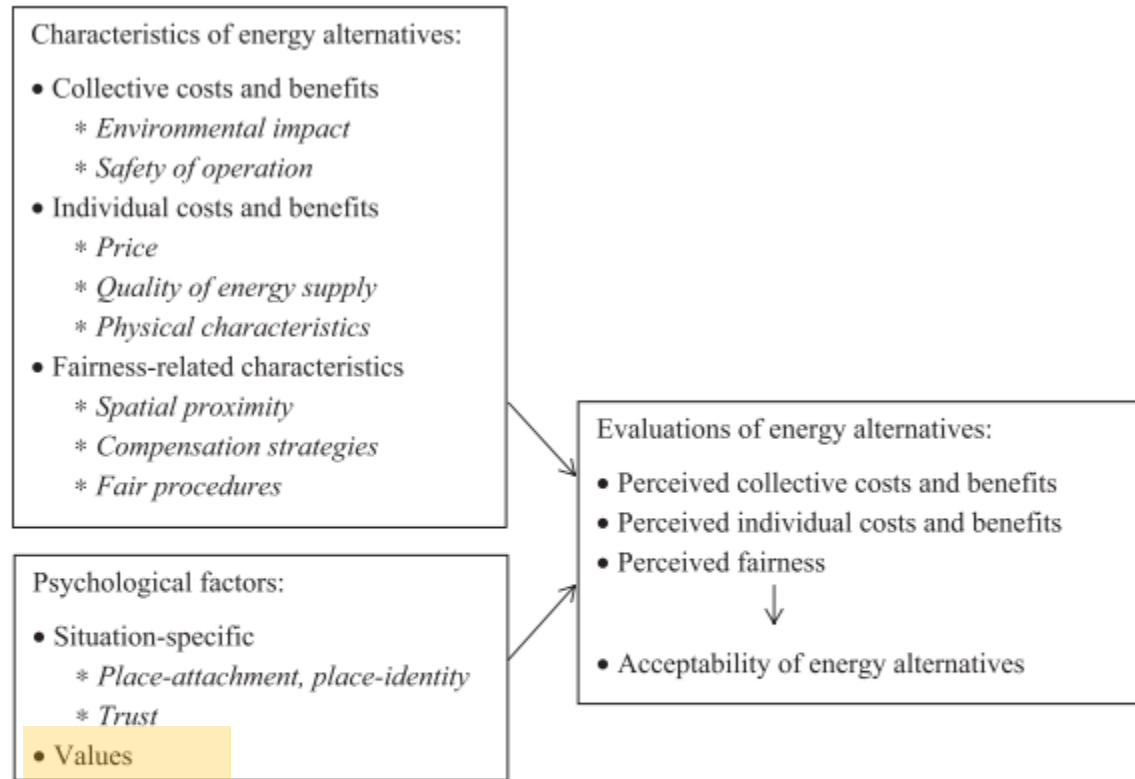
Sustainability

Values

#### ABSTRACT

Sustainable energy transitions will be hampered without sufficient public support. Hence, it is important to understand what drives public acceptability of (sustainable) energy alternatives. Evaluations of specific costs, including risks, and benefits of different energy alternatives have been linked to acceptability of these alternatives. But how do people come up with these evaluations, and which evaluations are the key drivers of acceptability? In this review, we propose a comprehensive conceptual framework in which we integrate two growing but so far unconnected bodies of research on how objective characteristics of energy alternatives (i.e., contextual factors), on one hand, and, on the other hand, general psychological factors shape evaluations and acceptability of energy alternatives. Importantly, we identify general factors, particularly values, that may influence evaluations and acceptability of many different energy alternatives on a general as well as community level. We put forward a research agenda with two major themes. First, we lay out possibilities to strengthen the current knowledge basis for a conceptual framework that explains evaluations and acceptability of energy alternatives. Second, we suggest how the framework could be extended to explain evaluations and acceptability of energy alternatives in a more comprehensive and accurate way. Based on the knowledge developed, we discuss policy implications, some of which have not been put forward yet and hence propose new possibilities for interventions aimed at enhancing sustainable energy transitions.

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**Fig. 1.** Conceptual framework that explains evaluations and acceptability of energy alternatives. *Note.* The framework reflects how contextual and general psychological factors have been addressed so far in the literature, namely as independent predictors. Yet, contextual and general psychological factors interact when shaping evaluations and acceptability of energy alternatives, and should therefore be studied in combination; we elaborate on this in the research agenda presented later in this paper.

The role of values and prior orientations in the  
**public acceptance** of energy technologies?





**Environmental values**

| <b>Author</b>                       | <b>Year</b> | <b>Scale Name</b>                                                     | <b>Construct(s)</b>                                                                                                                                            |
|-------------------------------------|-------------|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dunlap and Van Liere                | 1978        | New Environmental Paradigm                                            | (1) nature balance, (2) growth limits, (3) men's dominance over nature                                                                                         |
| Thompson and Barton                 | 1994        | Ecocentric and Anthropocentric Attitudes Toward the Environment Scale | (1) ecocentrism, (2) anthropocentrism, (3) environmental apathy                                                                                                |
| Kaiser                              | 1998        | General Ecological Behavior                                           | (1) pro-social behavior, (2) rubbish removal, (3) preservation, (4) consumer behavior, (5) waste reduction, (6) volunteer work, (7) use of ecological vehicles |
| Stern, Dietz and Guagnano           | 1998        | Brief Inventory of Values                                             | (1) self-transcendence, (2) self-accomplishment, (3) openness to changes, (4) conservatism                                                                     |
| Schultz                             | 2000        | Environmental Motives Scale                                           | (1) selfish values, (2) altruist values, (3) biospheric values                                                                                                 |
| Dunlap, Van Liere, Mertig and Jones | 2000        | New Ecological Paradigm                                               | (1) growth limits, (2) anti-anthropocentrism, (3) nature balance, (4) human anti-exemption, (5) ecological crisis                                              |

Pires et al. 2014. Ecocentrism and behavior: a bibliographic review on environmental values. *Psicol. estud.* vol.19 no.4 Maringá Oct./Dec. 2014. <http://dx.doi.org/10.1590/1413-73722201204>

# Environmental-SVS (E-SVS)

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**E-SVS; Steg et al., 2014**

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## Biospheric

|      |                                                     |
|------|-----------------------------------------------------|
| Bio1 | PREVENTING POLLUTION (protecting natural resources) |
| Bio2 | PROTECTING THE ENVIRONMENT (preserving nature)      |
| Bio3 | RESPECTING THE EARTH (harmony with other species)   |
| Bio4 | UNITY WITH NATURE (fitting into nature)             |

## Altruistic

|      |                                                          |
|------|----------------------------------------------------------|
| Alt1 | EQUALITY (equal opportunity for all)                     |
| Alt2 | SOCIAL JUSTICE (correcting injustice, care for the weak) |
| Alt3 | -----                                                    |
| Alt4 | A WORLD AT PEACE (free of war and conflict)              |
| Alt5 | HELPFUL (working for the welfare of others)              |

## Hedonic

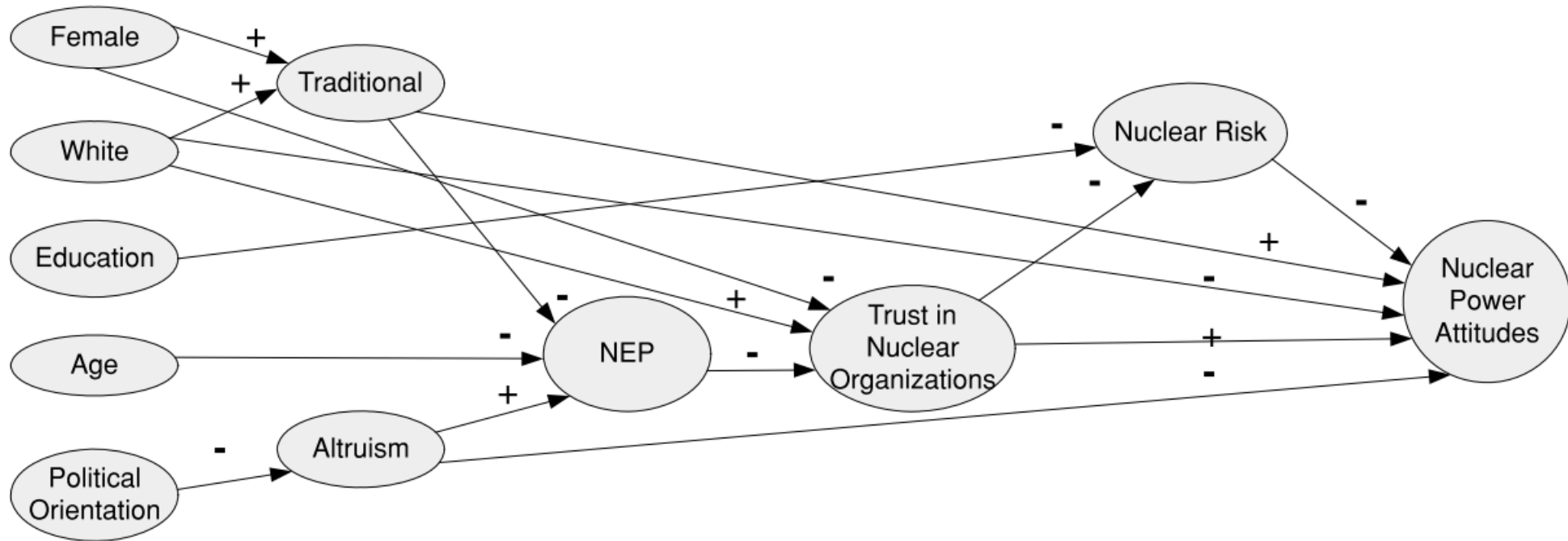
|      |                                                   |
|------|---------------------------------------------------|
| Hed1 | PLEASURE (gratification of desires)               |
| Hed2 | ENJOYING LIFE (enjoying food, sex, leisure, etc.) |
| Hed3 | SELF-INDULGENT (doing pleasant things)            |

## Egoistic<sup>b</sup>

|      |                                                     |
|------|-----------------------------------------------------|
| Ego1 | SOCIAL POWER (control over others, dominance)       |
| Ego2 | AUTHORITY (the right to lead or command)            |
| Ego3 | INFLUENTIAL (having an impact on people and events) |
| Ego4 | WEALTH (material possessions, money)                |
| Ego5 | AMBITIOUS (hardworking, aspiring)                   |

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# Environmental values and attitudes towards nuclear energy



**Fig. 2.** Reduced structural equation model (SEM) version of the Stern-Dietz (S-D) model: Statistically significant causal paths.

Whitfield, S. C., Rosa, E. A., Dan, A., & Dietz, T. (2009). The future of nuclear power: Value orientations and risk perception. *Risk Analysis: An International Journal*, 29(3), 425-437.

# Environmental values and attitudes towards wind developments

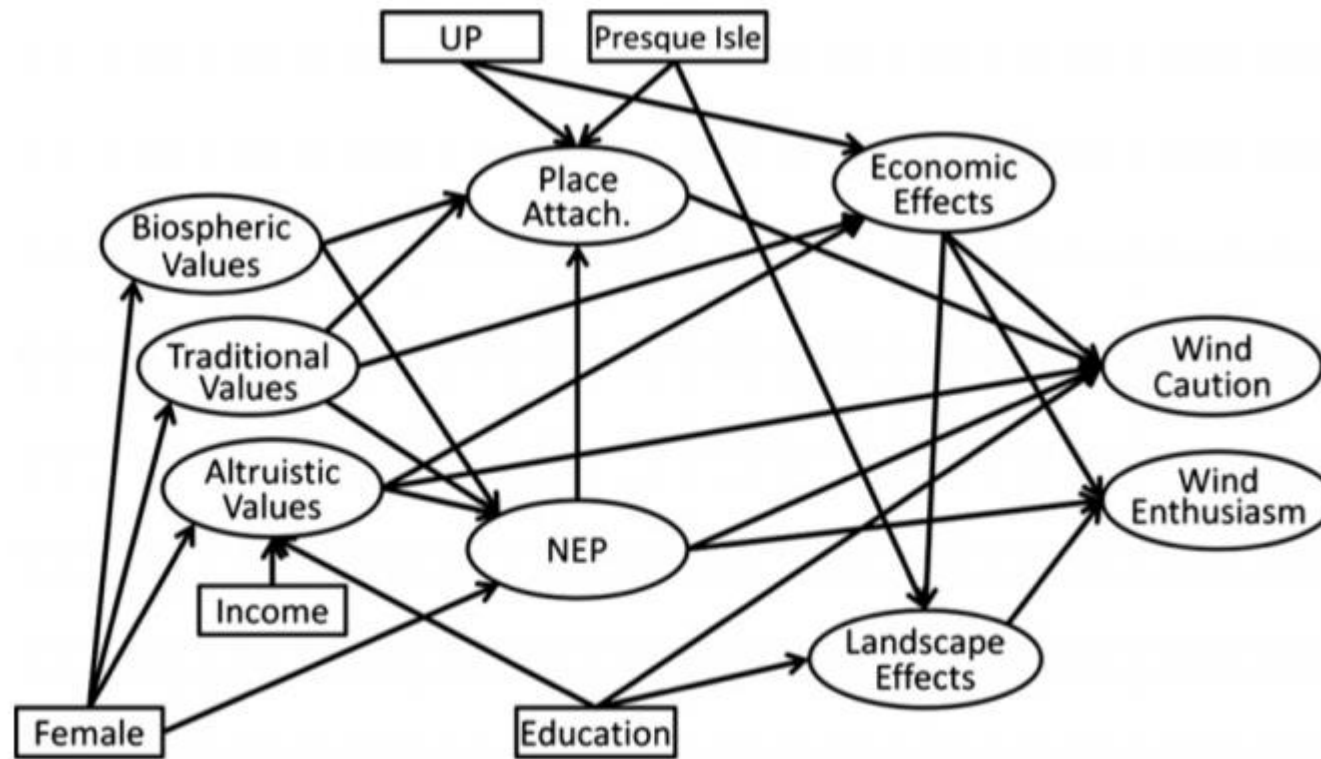


Fig. 3. A parsimonious model of attitudes towards the development of commercial wind farms.

Bidwell, D. (2013). The role of values in public beliefs and attitudes towards commercial wind energy. *Energy Policy*, 58, 189-199.

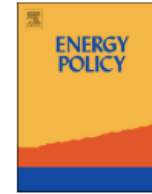




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Energy Policy

journal homepage: [www.elsevier.com/locate/enpol](http://www.elsevier.com/locate/enpol)

## Citizen acceptance of new fossil fuel infrastructure: Value theory and Canada's Northern Gateway Pipeline



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### HIGHLIGHTS

- Acceptance of the proposed Northern Gateway Pipeline (NGP) varies by region.
- Regional variations in perceptions correspond with differing risks and benefits.
- Opposition is highest among citizens with strong biospheric–altruistic values.
- Acceptance is highest for citizens with strong traditional or egoistic values.
- Values may shape citizen perceptions of economic benefits and environmental risks.

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Values

Climate change

Survey

Cluster analysis

### ABSTRACT

Development of unconventional fossil fuels is generating controversy in North America, where citizen support or opposition can shape political decisions. This study explores the role of values in citizen perceptions. The case study is Canada's proposed Northern Gateway Pipeline (NGP), which would transport bitumen from Alberta's oil sands to British Columbia's (BC) northern coast for export. Data were collected in 2013 from a sample of Canadian citizens ( $n=2628$ ). The survey instrument elicited citizen perceptions of the NGP, as well as values and attitudes. Respondents in the Alberta subsample are the most likely to support the NGP and to perceive economic benefits. Respondents in the BC subsample are the most likely to oppose the NGP and to perceive environmental risks. To explore heterogeneity in motivations among both subsamples, respondent clusters are constructed based on values. In both regions, opposition is highest in clusters with strong biospheric–altruistic values, while acceptance is highest in clusters with strong traditional values. Regional effects are also substantial; NGP acceptance is higher in each of Alberta's clusters relative to equivalent clusters in BC. Regional context seems to shape how values correspond with perceptions. Insights are drawn for energy project development, public consultation and energy planning.

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“In both regions, opposition is highest in clusters with strong **biospheric–altruistic values**, while acceptance is highest in clusters with strong **traditional values**”

**Other related social values**

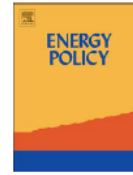




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Energy Policy

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## Public perception of energy transition in Korea: Nuclear power, climate change, and party preference

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### ARTICLE INFO

#### Keywords:

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Nuclear power  
Political preference

### ABSTRACT

Since President Moon Jae-in took office in May 2017, South Korea has been embroiled in a major social controversy about energy transition. The president's pledge to transition toward renewable energy represented a dramatic change in Korean energy policy, which has been focused on nuclear and coal-fired plant expansion policies since the 1970s. This study examines public perception of energy, with focus on the relationship between nuclear power and climate change as well as party preferences, based on a nationally representative survey of Korea. The survey data shows that the risk-risk tradeoff strategy, reframing nuclear power generation as a way to mitigate the risks of climate change, seems to be ineffective in Korea. Furthermore, nuclear power represents the values of the elderly, materialists, developmentalists, and conservative political parties. These results suggest that Korean energy policy is a very political issue rather than a strictly scientific or economic one. Therefore, this issue should be deliberated through a democratic process.

### 1. Introduction

Since the 1960s, South Korea has achieved rapid economic development called “compressed development.” The Korean government has sought to secure energy resources that can be supplied inexpensively and consistently to maintain rapid economic growth. As a result, electric power production, primarily in the form of coal and nuclear power, soared from about 1.8 TWh in 1961 to 433 TWh in 2015 (Korea Electric

nuclear electricity production was 30.3%, at number 13 in global rankings (IAEA, 2017).

As the risk of climate change has deepened, shifting to a low-carbon economy has been emphasized internationally. Transitioning to a low-carbon economy implies entry into the new climate regime. The global community recognizes the seriousness of climate change and strives to mitigate risks through the Kyoto Protocol established in 1997 and the Paris Agreement of 2015. Korea also aims to reduce greenhouse gas

“Therefore, in almost every country, materialists prefer nuclear power, whereas **post-materialists** have a strong sense of rejection”

## The public's trust in scientific claims regarding offshore oil drilling

Juliet E. Carlisle, Jessica T. Feezell, Kristy E.H. Michaud,  
Eric R. A. N. Smith and Leeanna Smith

Our study examines how individuals decide which scientific claims and experts to believe when faced with competing claims regarding a policy issue. Using an experiment in a public opinion survey, we test the source content and credibility hypotheses to assess how much confidence people have in reports about scientific studies of the safety of offshore oil drilling along the California coast. The results show that message content has a substantial impact. People tend to accept reports of scientific studies that support their values and prior beliefs, but not studies that contradict them. Previous studies have shown that core values influence message acceptance. We find that core values and prior beliefs have independent effects on message acceptance. We also find that the sources of the claims make little difference. Finally, the public leans toward believing reports that oil drilling is riskier than previously believed.

**Keywords:** energy policy, environmental communications, public understanding of science

“The results show that message content has a substantial impact. People tend to accept reports of scientific studies that support their values and prior beliefs, but not studies that contradict them. Previous studies have shown that core values influence message acceptance. **We find that core values (individualism, egalitarianism and political ideology) and prior beliefs have independent effects on message acceptance**”.

 Full Access

## Risk Perception and New Age Beliefs

Lennart Sjöberg , Anders af Wåhlberg

First published: 03 October 2002 | <https://doi.org/10.1111/0272-4332.00066> | Cited by: 48



PDF



TOOLS



SHARE

### Abstract

This is a study of risk perception in relation to New Age (NA) beliefs, including traditional folk superstition and belief in paranormal phenomena, as well as use of alternative healing practices. Data were also obtained on trust dimensions and on personality and psychopathology variables, as well as religious involvement. It was found that four factors accounted for the investigated NA beliefs, which were termed higher consciousness beliefs, denial of analytic knowledge, traditional superstition, and belief in the physical reality of the soul. NA beliefs were strongly and positively related to religious involvement, and negatively to educational level. These beliefs were also positively related to maladjustment and to concerns over tampering with nature. In regression analyses, it was found that NA beliefs explained about 15% of the variance of perceived risk, and that the most powerful explanatory factors were higher consciousness beliefs and beliefs in paranormal phenomena. Traditional superstition and use of healing practices did not contribute to explaining perceived risk.

“**New Age beliefs** explained about 15% of the variance of perceived risk”



# Cultural cognition of the risks and benefits of nanotechnology

Dan M. Kahan<sup>1\*</sup>, Donald Braman<sup>2</sup>, Paul Slovic<sup>3</sup>, John Gastil<sup>4</sup> and Geoffrey Cohen<sup>5</sup>

**How is public opinion towards nanotechnology likely to evolve? The 'familiarity hypothesis' holds that support for nanotechnology will likely grow as awareness of it expands. The basis of this conjecture is opinion polling, which finds that few members of the public claim to know much about nanotechnology, but that those who say they do are substantially more likely to believe its benefits outweigh its risks<sup>1-4</sup>. Some researchers, however, have avoided endorsing the familiarity hypothesis, stressing that cognitive heuristics and biases could create anxiety as the public learns more about this novel science<sup>5,6</sup>. We conducted an experimental study aimed at determining how members of the public would react to balanced information about nanotechnology risks and benefits. Finding no support for the familiarity hypothesis, the study instead yielded strong evidence that public attitudes are likely to be shaped by psychological dynamics associated with cultural cognition.**

Cultural cognition refers to the tendency of people to base their factual beliefs about the risks and benefits of a putatively dangerous activity on their cultural appraisals of these activities<sup>7,8</sup>. From a psychological point of view it is easier to believe that behaviour one finds noble is socially beneficial, and that behaviour one finds debased is dangerous, than vice versa<sup>9,10</sup>. Those who are

'no-information condition' were told nothing about nanotechnology other than it is a scientific process for producing and manipulating very small particles. Those in the 'information-exposed condition,' in contrast, were furnished with two paragraphs of equal length and comparable information content, one identifying possible benefits of nanotechnology, the other possible risks. We then compared the two groups' perceptions of nanotechnology risks and benefits to see what effect information exposure had.

Like most members of the American public<sup>1,2</sup>, our study subjects reported being relatively unfamiliar with nanotechnology. The vast majority—over 80%—reported having heard either 'just a little' (28%) or 'nothing at all' (54%) about it. Only 4% reported having heard 'a lot' about nanotechnology before the study, and 14% reported having heard 'some,' an amount in between 'just a little' and 'a lot.' Among subjects in the no-information condition, familiarity with nanotechnology was positively correlated with the perception that nanotechnology's benefits outweigh its risks ( $r_s = 0.38$ ,  $P < 0.001$ ), a finding also consistent with previous public opinion studies<sup>1-4</sup>.

Information exposure had no discernable main effect on subjects' perceptions of nanotechnology risks and benefits. The mean assessment on a four-point risk-benefit measure (NANORISK) for subjects in the information-exposed condition ( $M = 2.37$ ,

"Public attitudes are likely to be shaped by psychological dynamics associated with **cultural cognitions**"

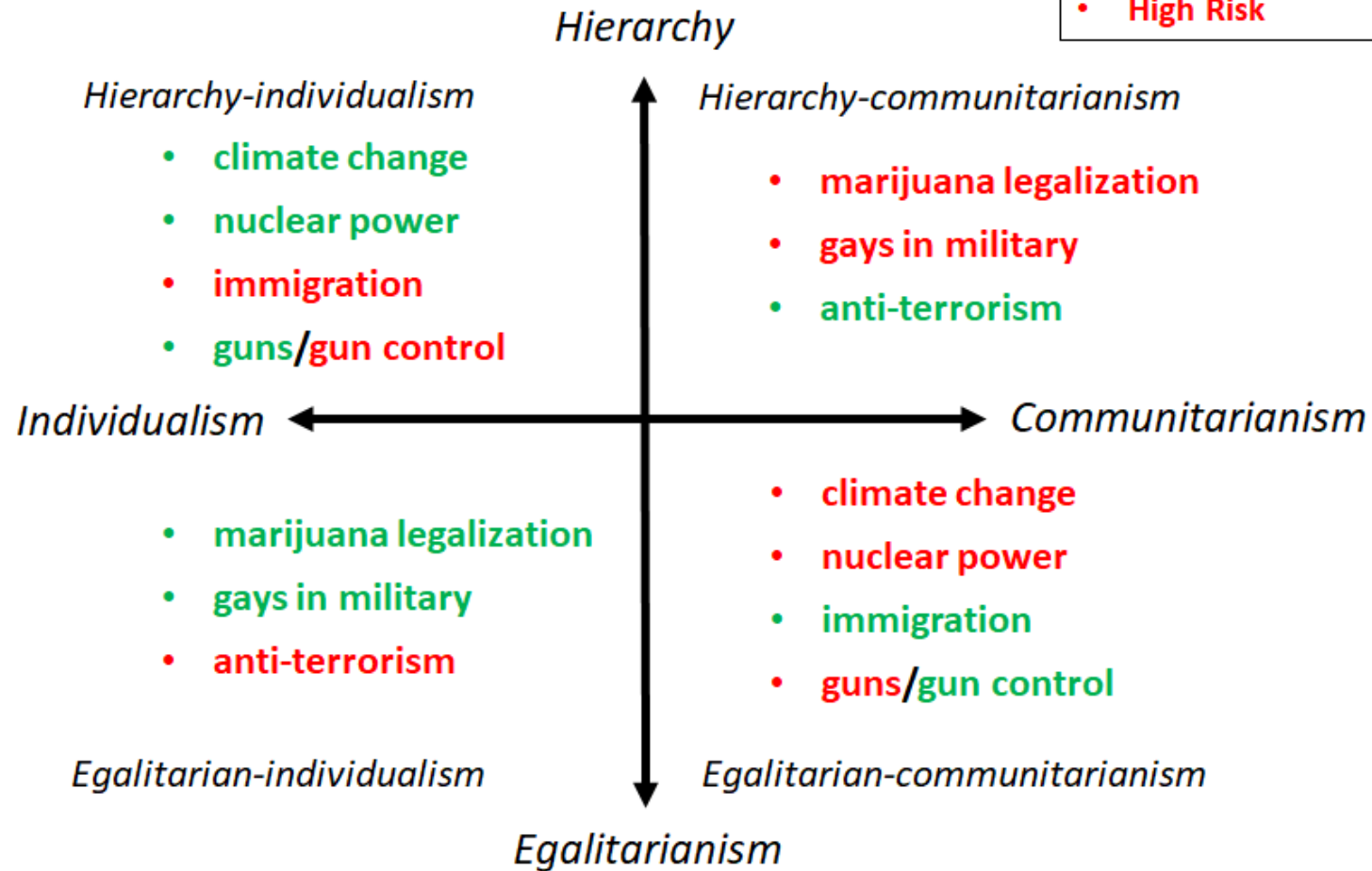
# Cultural cognition theory

- Individuals' **values** are connected to their **beliefs about risks and related facts**.
- **Subjects** do not **react** in a uniform, much less a uniformly positive manner, to new information, but rather **polarized along lines consistent with cultural (and political) predispositions** toward technological risk generally

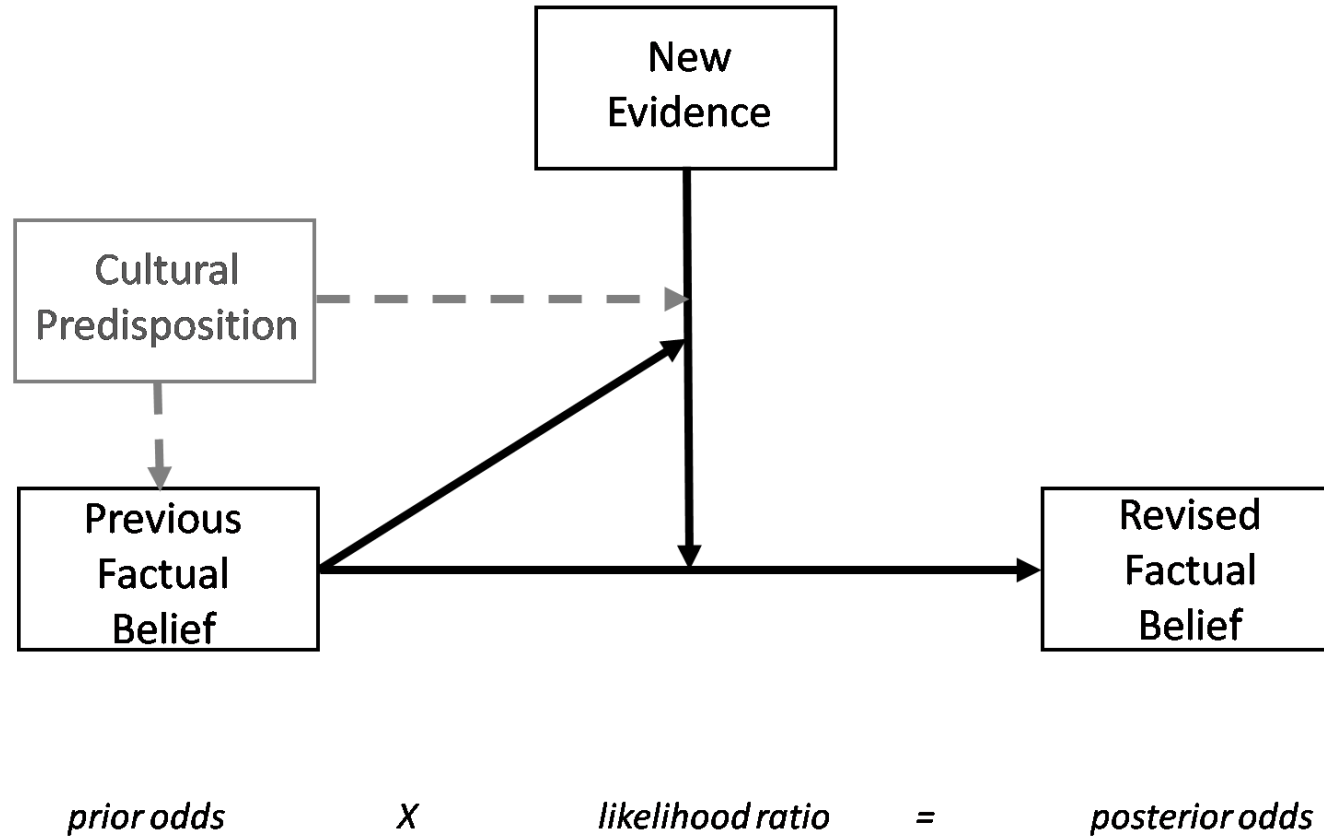
# Cultural Cognition Worldviews

**Risk Perception Key**

- Low Risk
- High Risk



## Cultural Cognition & Spurious Confirmation Bias



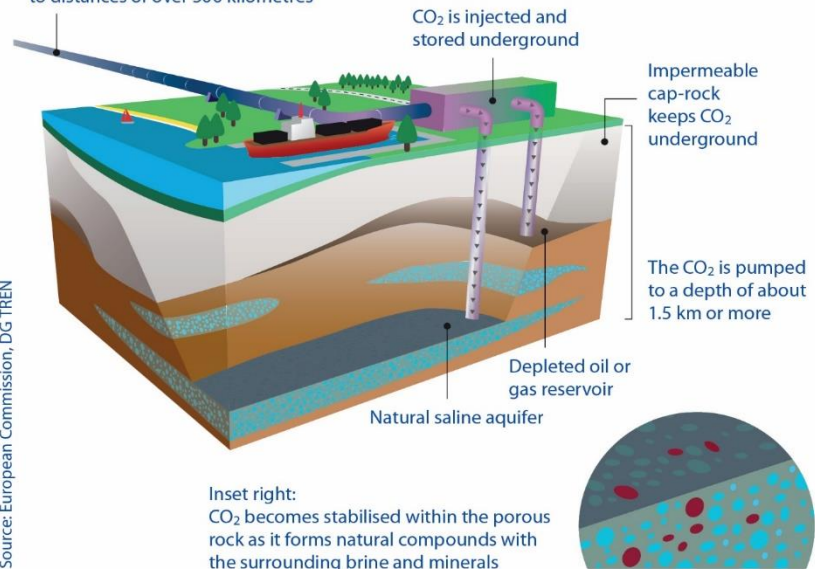
Kahan, D. 2012. Is cultural cognition the same thing as (or even a form of) confirmation bias? Not really; & here's why, and why it matters

Our study on public acceptance of two energy technologies

## STUDY 1

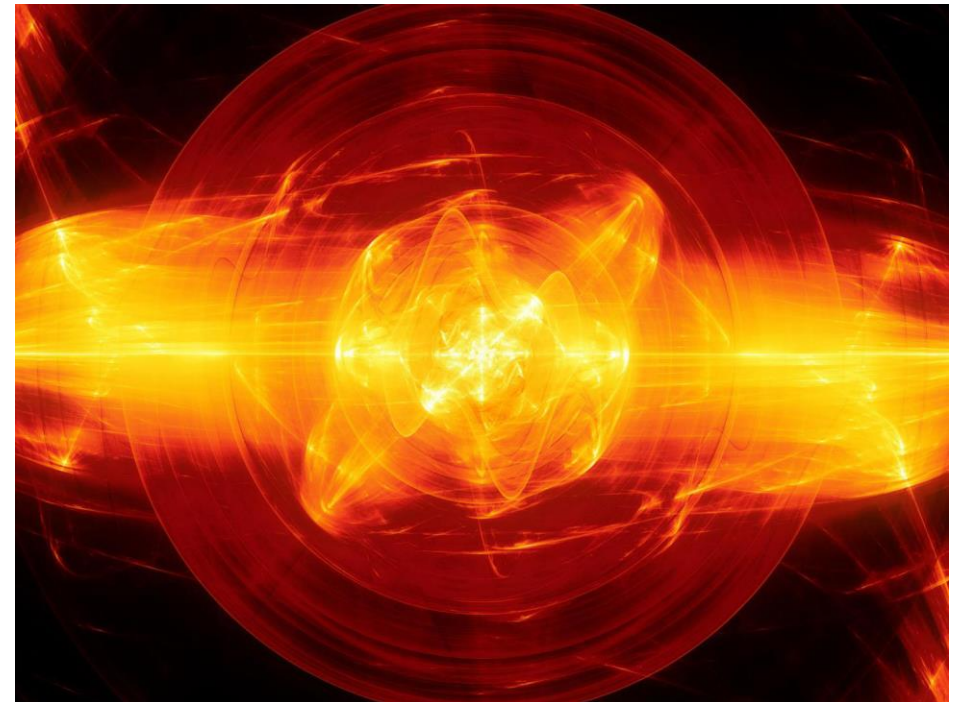
### Carbon Capture and Storage (CCS)

The distance between the power station and the CCS storage facility can extend to distances of over 500 kilometres



Source: European Commission, DG TREN

## STUDY 2





# Ecocentrism-technocentrism

**Table 1.** The ideological structure of modern environmentalism.

| Ecocentrism                                                                                                                              |                                                                                                                                | Technocentrism                                                                                                                    |                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| gaianism                                                                                                                                 | communalism                                                                                                                    | accommodation                                                                                                                     | optimism                                                                     |
| belief in the rights of nature and of the essential coevolution of humans and natural phenomena                                          | belief in the cooperative capabilities of societies to be collectively self-reliant using 'appropriate' science and technology | faith in the adaptability of institutions and mechanisms of assessment and decisionmaking to accommodate to environmental demands | faith in the application of science, market forces, and managerial ingenuity |
| redistribution of power towards a decentralised, federal political economy based on the interlinkage of environmental and social justice |                                                                                                                                | maintenance of the status quo in existing structures of government power                                                          |                                                                              |

O'Riordan, T. (1985). Research policy and review 6. Future directions for environmental policy. *Environment and Planning A*, 17(11), 1431-1446.

Table 3  
Environmental value factors

| Factor                            | Variables included                                                                                                                                                                                                                                               |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Faith in growth: anthropocentrism | There are no limits to growth for nations like the UK<br>Modifying the environment seldom causes serious problems<br>Science will help us to live without conservation<br>Humans were created to rule over nature                                                |
| Spaceship Earth: biospherism      | The balance of nature is delicate and easily upset<br>The Earth is like a space ship, with limited room and resources<br>Plants and animals do not exist primarily for human use<br>One of the most important reasons for conservation is to preserve wild areas |
| Ecocentrism-technocentrism        | Technology will solve many environmental problems<br>Exploitation of resources should be stopped                                                                                                                                                                 |

Barr, S., & Gilg, A. (2006). Sustainable lifestyles: Framing environmental action in and around the home. *Geoforum*, 37(6), 906-920.

CHARLES C. MANN

*Author of 1491*

THE  
**WIZARD**  
AND THE  
**PROPHET**



TWO REMARKABLE SCIENTISTS  
*and* THEIR DUELING VISIONS *to*  
SHAPE TOMORROW'S WORLD

# Hypothesis

H1: Ecocentric-technocentric worldviews influence evaluation of and acceptance of CCS and fusion energy

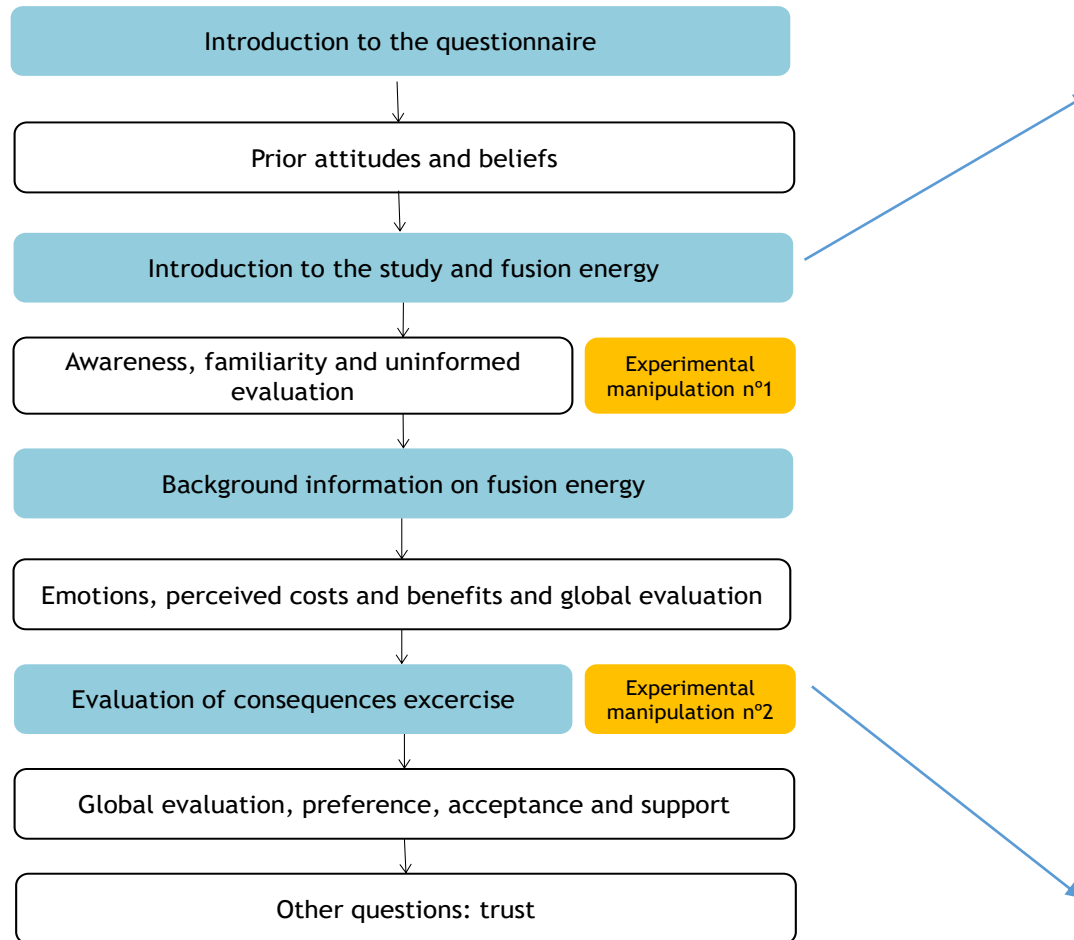
H2a: Individuals with different worldviews (clusters) have a different reaction to information about the technology

H2b: The type of information provided interacts with the worldview.

Reasoned information vs controversial information will reduce the differences among clusters of individuals

# Method

**Figure 1. Design of the questionnaire (Study 2)**



Please read the information carefully before proceeding

Energy consumption is expected to grow dramatically over the next fifty years as the world's population expands and developing countries become more industrialised. **Governments and companies are looking for alternative ways of producing energy.** Coal and natural gas contribute to air pollution and climate change; Governments are divided over whether to include nuclear energy in the energy mix; and renewable sources might not be enough by themselves to reliably meet the demand.

In this sense, **nuclear fusion energy could be an important long-term energy source to complement other options.** Fusion energy is created by fusing two atomic nuclei. The heat produced by the reaction turns water into steam, which drives turbines to generate electricity. The basis of fusion energy is similar to fission energy, the one produced in current nuclear power plants. Both fission and fusion are nuclear processes by which atoms are altered to create energy. However, while nuclear fission is the division of one heavy atom into two, nuclear fusion is the combination of two lighter atoms into a larger one.

**Fusion energy promises to be an almost inexhaustible and clean source of energy.** Fuel for fusion energy (deuterium and tritium) is readily available and abundant in seawater. The nuclear fusion reaction produces helium, which is an inert gas – no greenhouse gases or acid rain-causing particles are emitted. The radioactive products, once the plant is decommissioned, are short lived (50-100 years) compared to the waste from a conventional nuclear power plant (which lasts for thousands of years). Fusion reactions are intrinsically safe as only a few grammes of fuel are ever in the reactor. The reaction stops in the event of the failure of any sub-system. There is no chance of a chain reaction.

**However, fusion power also presents scientific and engineering challenges very difficult to overcome.** Fusing two nuclei together requires heating the fuel to very high temperatures into a *plasma*, and so far, scientists have not been able to figure out a way to get more energy out of a reaction than they put in. Physicists and engineers have been at work on this question for decades. Many breakthroughs have been made, fusion energy has been produced in laboratories, and there are a number of major projects under development that may bring fusion closer to commercialization. However, fusion energy is yet unproven as a reliable energy source.



Based upon what you have just read, how do you feel about fusion energy? I think that fusion is a \_\_\_\_\_ energy option

Very Poor      Poor      Fair      Good      Very Good

Please evaluate how positive or negative you find each consequence of fusion energy  
Place each card into a bucket.

**It will take years to build the technology**

Fusion power presents significant scientific and engineering challenges. So far, the main problem with fusion power generation is that it doesn't produce more energy than the electrical energy required to keep the reaction going. The first commercial fusion power plant, if ITER -the larger fusion experiment going on now- succeeds, is not expected to enter the energy mix before 2050.

Very negative      Negative      Not important      Positive      Very positive

**Tabla. Characteristics of the sample (study 1)**

|           |                        |      |
|-----------|------------------------|------|
| Muestra   | Spain                  |      |
| N         | 963                    |      |
| Sex       | Men                    | 51.9 |
|           | Women                  | 48.1 |
| Age group | 16-24                  | 11.9 |
|           | 25-34                  | 17.1 |
|           | 35-44                  | 22   |
|           | 45-54                  | 21.1 |
|           | 55-64                  | 16   |
|           | More than 65           | 11.8 |
| Education | Primary (Nivel 0-2)    | 46.4 |
|           | Secondary (Nivel 3-4)  | 32.2 |
|           | University (Nivel 5-8) | 21.5 |

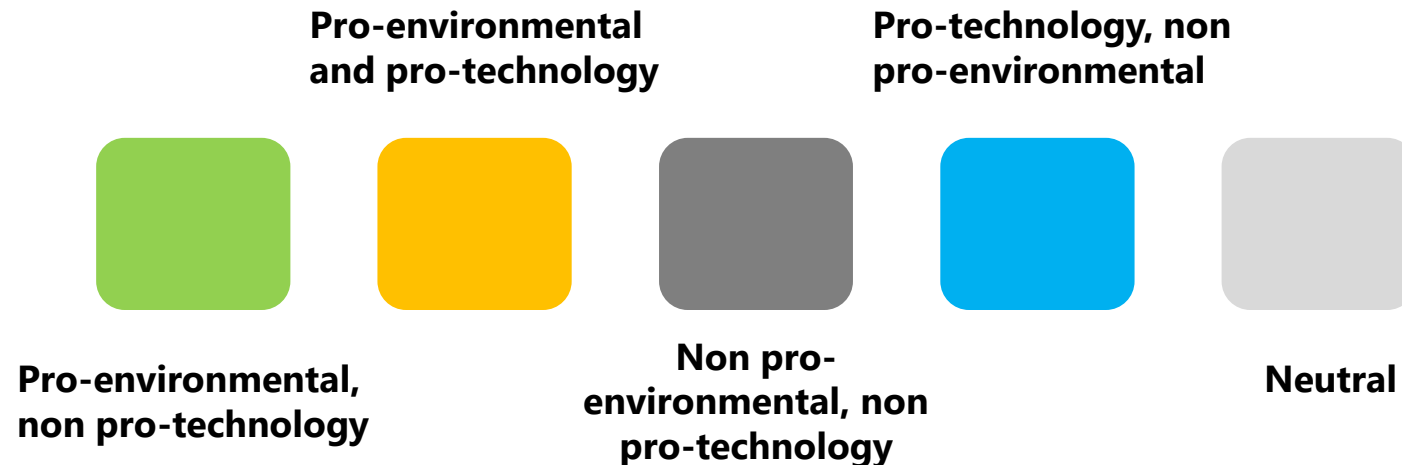
**Table 1. Characteristics of the sample (study 2)**

| Id | Country         |     | Sample | date of fieldwork |
|----|-----------------|-----|--------|-------------------|
| 1  | Austria         | AT  | 900    | Nov-2018          |
| 2  | Belgium         | BE  | 900    | Nov-2018          |
| 3  | Bulgaria        | BG  | 900    | Nov-2018          |
| 4  | Czech Republic  | CZ  | 900    | Nov-2018          |
| 5  | Denmark         | DK  | 900    | Nov-2018          |
| 6  | Finland         | FI  | 900    | Nov-2018          |
| 7  | France          | FR  | 900    | Nov-2018          |
| 8  | Germany         | DE  | 900    | Nov-2018          |
| 9  | Greece          | GR  | 900    | Nov-2018          |
| 10 | Italy           | IT  | 900    | Nov-2018          |
| 11 | Latvia          | LV  | 900    | Nov-2018          |
| 12 | Lithuania       | LT  | 900    | Nov-2018          |
| 13 | The Netherlands | NL  | 900    | Nov-2018          |
| 14 | Poland          | PL  | 900    | Nov-2018          |
| 15 | Portugal        | PT  | 900    | Nov-2018          |
| 16 | Romania         | RO  | 900    | Nov-2018          |
| 17 | Slovenia        | SI  | 900    | Nov-2018          |
| 18 | Spain           | ES  | 900    | Nov-2018          |
| 19 | Sweden          | SE  | 900    | Nov-2018          |
| 20 | Ukraine         | UKR | 900    | Nov-2018          |
| 21 | United Kingdom  | UK  | 900    | Nov-2018          |



# Procedure

Participants were classified based on agreement with two items measuring ecocentrism-technocentrism: "Humans have the right to modify the natural environment to suit their needs" (Scale 1-5) and "Technology alone will solve many environmental problems" (Scale 1-5)



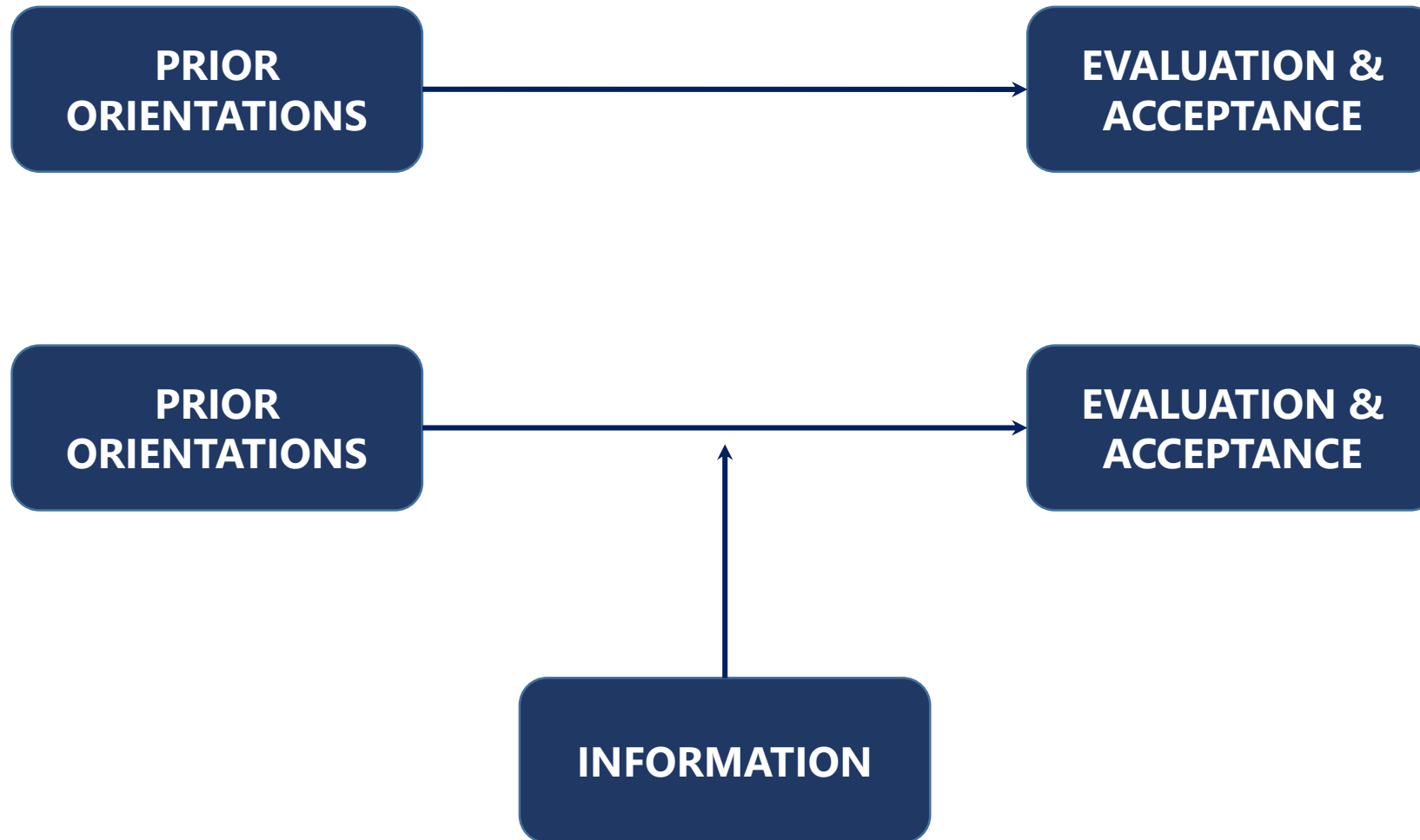
**“Humans have the right to modify the natural environment to suit their needs” - How much you disagree or agree with the following statements: \* “Technology alone will solve many environmental problems” - How much you disagree or agree with the following statements: Crosstabulation**

|                                                                                                                                               |                            |            | “Technology alone will solve many environmental problems” - How much you disagree or agree with the following statements: |          |                            |       |                |       |
|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------|---------------------------------------------------------------------------------------------------------------------------|----------|----------------------------|-------|----------------|-------|
|                                                                                                                                               |                            |            | Strongly disagree                                                                                                         | Disagree | Neither agree nor disagree | Agree | Strongly agree | Total |
| “Humans have the right to modify the natural environment to suit their needs” - How much you disagree or agree with the following statements: | Strongly disagree          | Count      | 340                                                                                                                       | 434      | 423                        | 380   | 117            | 1694  |
|                                                                                                                                               |                            | % of Total | 4,0%                                                                                                                      | 5,1%     | 4,9%                       | 4,4%  | 1,4%           | 19,7% |
|                                                                                                                                               | Disagree                   | Count      | 124                                                                                                                       | 782      | 915                        | 938   | 89             | 2848  |
|                                                                                                                                               |                            | % of Total | 1,4%                                                                                                                      | 9,1%     | 10,7%                      | 10,9% | 1,0%           | 33,2% |
|                                                                                                                                               | Neither agree nor disagree | Count      | 61                                                                                                                        | 365      | 1045                       | 699   | 94             | 2264  |
|                                                                                                                                               |                            | % of Total | ,7%                                                                                                                       | 4,3%     | 12,2%                      | 8,1%  | 1,1%           | 26,4% |
|                                                                                                                                               | Agree                      | Count      | 29                                                                                                                        | 219      | 311                        | 800   | 127            | 1486  |
|                                                                                                                                               |                            | % of Total | ,3%                                                                                                                       | 2,6%     | 3,6%                       | 9,3%  | 1,5%           | 17,3% |
|                                                                                                                                               | Strongly agree             | Count      | 18                                                                                                                        | 19       | 42                         | 59    | 153            | 291   |
|                                                                                                                                               |                            | % of Total | ,2%                                                                                                                       | ,2%      | ,5%                        | ,7%   | 1,8%           | 3,4%  |
| Total                                                                                                                                         | Count                      | 572        | 1819                                                                                                                      | 2736     | 2876                       | 580   | 8583           |       |
|                                                                                                                                               | % of Total                 | 6,7%       | 21,2%                                                                                                                     | 31,9%    | 33,5%                      | 6,8%  | 100,0%         |       |

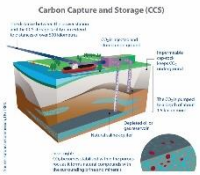
**Profile**

|         |                                         | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------|-----------------------------------------|-----------|---------|---------------|--------------------|
| Valid   | Pro-environmental non pro-technology    | 1680      | 19,6    | 29,6          | 29,6               |
|         | Pro-environmental and pro-technology    | 1524      | 17,8    | 26,9          | 56,5               |
|         | No pro-environmental non pro-technology | 285       | 3,3     | 5,0           | 61,5               |
|         | No pro-environmental and pro-technology | 1139      | 13,3    | 20,1          | 81,6               |
|         | Neutral                                 | 1045      | 12,2    | 18,4          | 100,0              |
| Total   |                                         | 5673      | 66,1    | 100,0         |                    |
| Missing | System                                  | 2910      | 33,9    |               |                    |
| Total   |                                         | 8583      | 100,0   |               |                    |

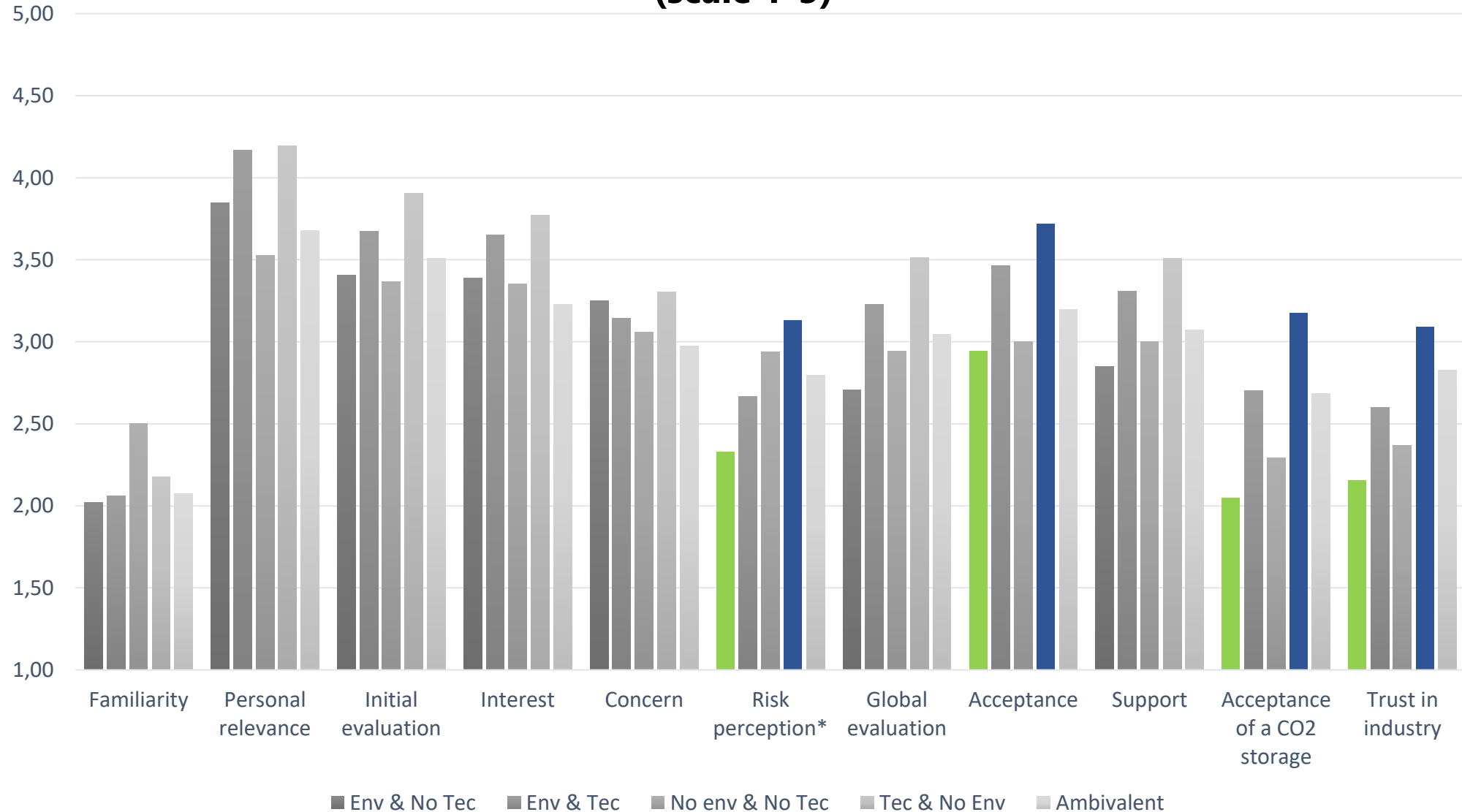
# Analysis

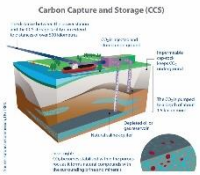


**H1: Prior orientations are associated to reactions to both technologies**



**Figure. Studied variables (Mean) in the five groups (scale 1-5)**

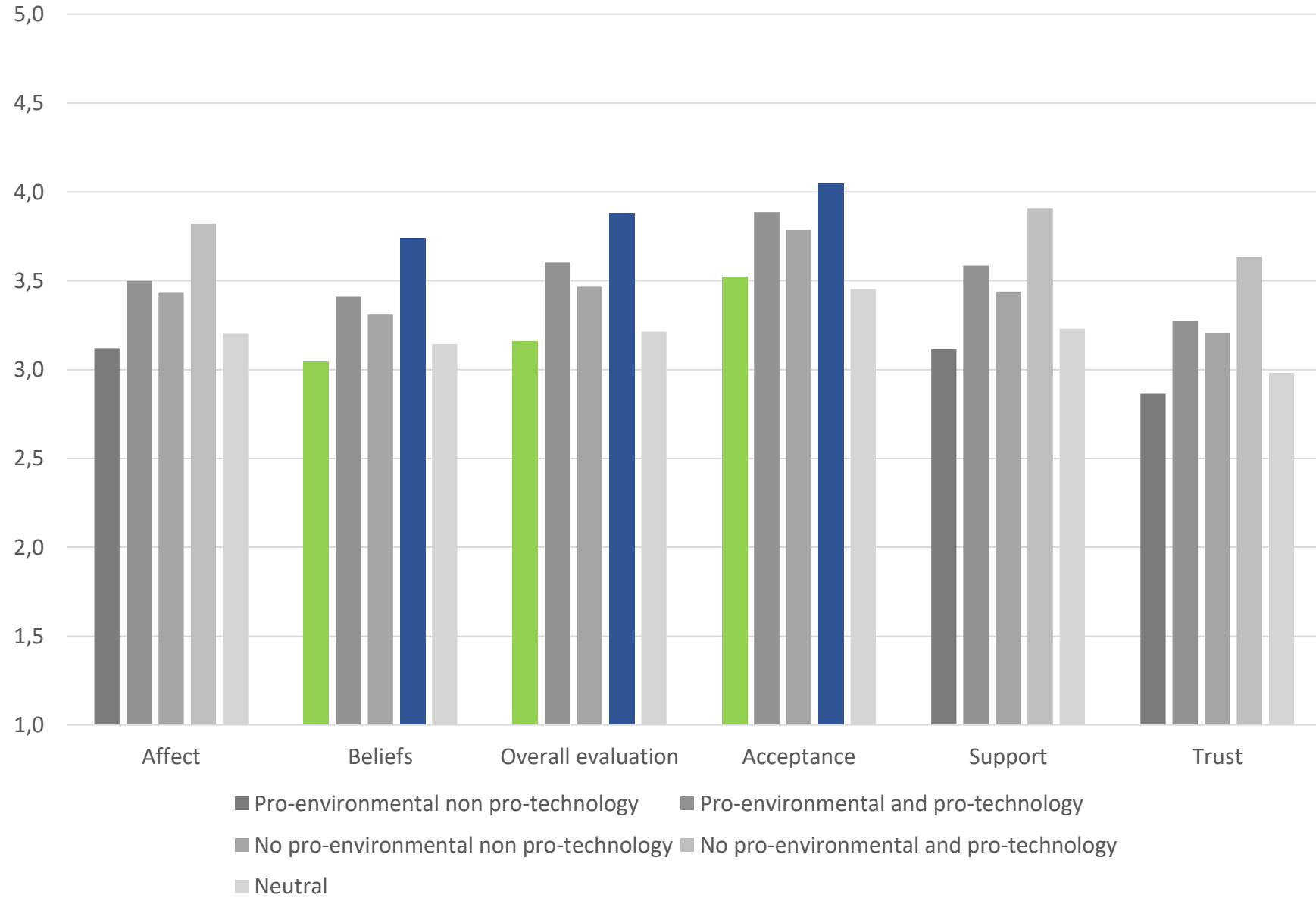
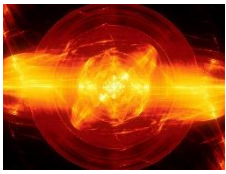


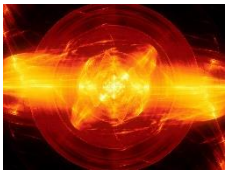


**Table. Studied variables (Mean) in the five groups**

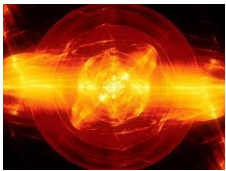
|                                            | Env & No<br>Tec<br>(M) | Env & Tec<br>(M) | No env &<br>No Tec<br>(M) | Tec & No<br>Env<br>(M) | Neutral<br>(M) | <i>Difference</i> | <i>p-value</i> |
|--------------------------------------------|------------------------|------------------|---------------------------|------------------------|----------------|-------------------|----------------|
| Familiarity                                | 2,0                    | 2,1              | 2,5                       | 2,2                    | 2,1            | 0,20              | 0,60           |
| Personal<br>relevance                      | 3,8                    | 4,2              | 3,5                       | 4,2                    | 3,7            | 0,30              | 0,00           |
| Initial evaluation                         | 3,4                    | 3,7              | 3,4                       | 3,9                    | 3,5            | 0,22              | 0,00           |
| Interest                                   | 3,4                    | 3,6              | 3,3                       | 3,8                    | 3,2            | 0,22              | 0,00           |
| Concern                                    | 3,2                    | 3,1              | 3,1                       | 3,3                    | 3              | 0,13              | 0,09           |
| Risk perception*                           | 2,3                    | 2,7              | 2,9                       | 3,1                    | 2,8            | 0,30              | 0,00           |
| Global<br>evaluation                       | 2,7                    | 3,2              | 2,9                       | 3,5                    | 3,0            | 0,30              | 0,00           |
| Acceptance                                 | 2,9                    | 3,5              | 3,0                       | 3,7                    | 3,2            | 0,32              | 0,00           |
| Support                                    | 2,8                    | 3,3              | 3,0                       | 3,5                    | 3,1            | 0,26              | 0,00           |
| Acceptance of a<br>CO <sub>2</sub> storage | 2,0                    | 2,7              | 2,3                       | 3,2                    | 2,7            | 0,43              | 0,00           |
| Trust in industry                          | 2,2                    | 2,6              | 2,4                       | 3,1                    | 2,8            | 0,37              | 0,00           |







|                    | <b>Pro-<br/>environme<br/>ntal non<br/>pro-<br/>technology</b> | <b>Pro-<br/>environme<br/>ntal and<br/>pro-<br/>technology</b> | <b>No pro-<br/>environment<br/>al non pro-<br/>technology</b> | <b>No pro-<br/>environmenta<br/>l and pro-<br/>technology</b> | <b>Neutral</b> | <b>Dif.<br/>(eta)</b> | <b>P-value</b> |
|--------------------|----------------------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|----------------|-----------------------|----------------|
| Affect             | 3,1                                                            | 3,5                                                            | 3,4                                                           | 3,8                                                           | 3,2            | 0,28                  | 0,00           |
| Beliefs about b&c  | 3,0                                                            | 3,4                                                            | 3,3                                                           | 3,7                                                           | 3,1            | 0,31                  | 0,00           |
| Overall evaluation | 3,2                                                            | 3,6                                                            | 3,5                                                           | 3,9                                                           | 3,2            | 0,27                  | 0,00           |
| Acceptance         | 3,5                                                            | 3,9                                                            | 3,8                                                           | 4,0                                                           | 3,5            | 0,26                  | 0,00           |
| Support            | 3,1                                                            | 3,6                                                            | 3,4                                                           | 3,9                                                           | 3,2            | 0,27                  | 0,00           |
| Trust              | 2,9                                                            | 3,3                                                            | 3,2                                                           | 3,6                                                           | 3,0            | 0,28                  | 0,00           |



Which of the following statements best expresses your views on fusion energy? \* Profile Crosstabulation

% within Profile

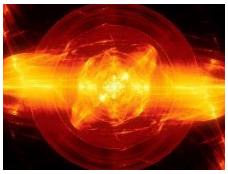
|                                                                               |                                                                                                                          | Profile                              |                                      |                                         |                                         |         | Total  |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------------|-----------------------------------------|---------|--------|
|                                                                               |                                                                                                                          | Pro-environmental non pro-technology | Pro-environmental and pro-technology | No pro-environmental non pro-technology | No pro-environmental and pro-technology | Neutral |        |
| Which of the following statements best expresses your views on fusion energy? | Fusion power might be an important source of electricity in the future, and interested countries should fund research on | 31,5%                                | 43,6%                                | 40,0%                                   | 53,8%                                   | 29,2%   | 39,3%  |
|                                                                               | Fusion might or might not be a viable source of electricity. We should keep research on fusion energy but prioritize oth | 49,6%                                | 46,9%                                | 50,5%                                   | 42,0%                                   | 61,8%   | 49,7%  |
|                                                                               | Fusion power is unnecessary and dangerous. We should reduce or cancel the nuclear fusion program and invest on other ene | 18,8%                                | 9,4%                                 | 9,5%                                    | 4,2%                                    | 9,0%    | 11,1%  |
| Total                                                                         |                                                                                                                          | 100,0%                               | 100,0%                               | 100,0%                                  | 100,0%                                  | 100,0%  | 100,0% |

Symmetric Measures

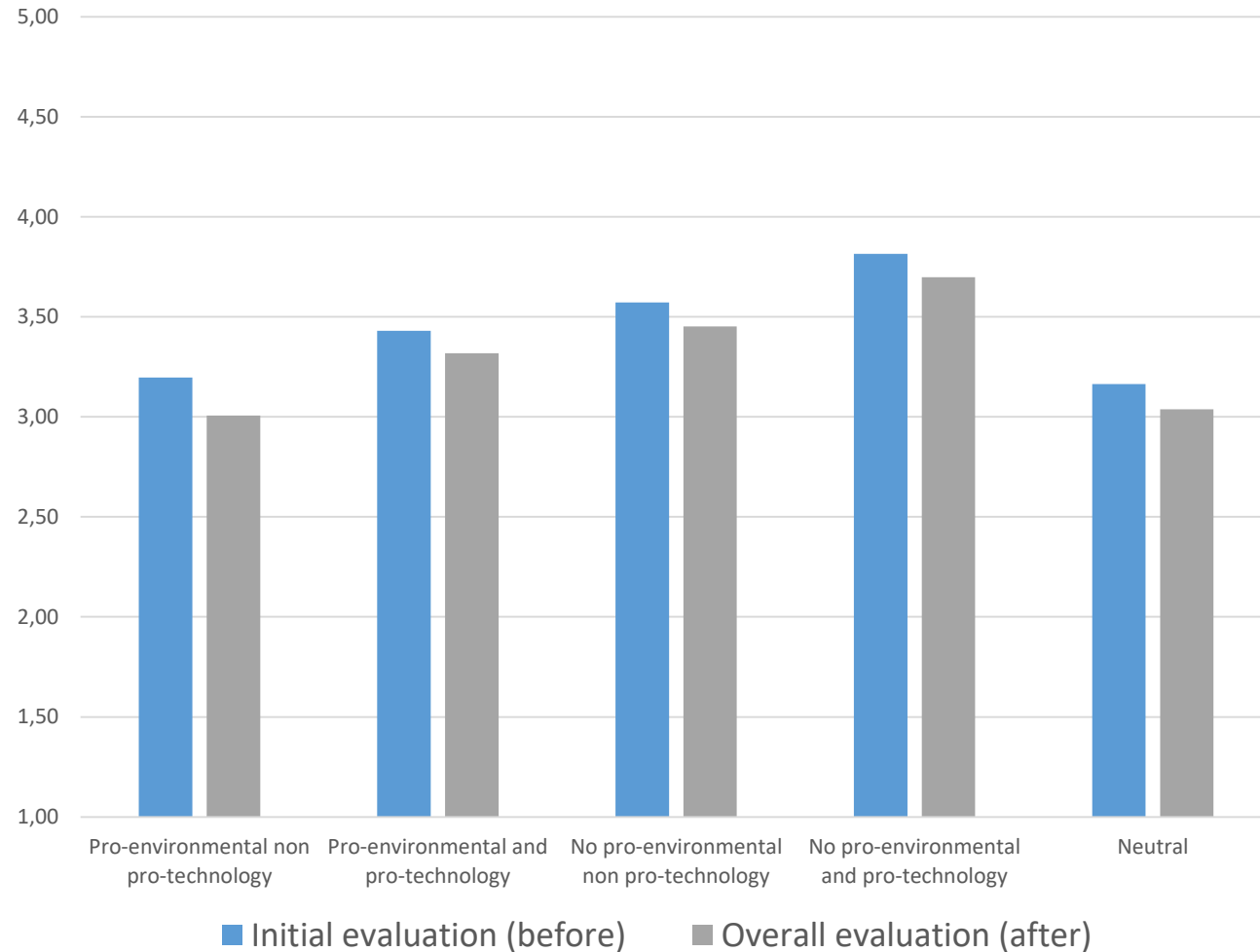
|                    |            | Value | Approx. Sig. |
|--------------------|------------|-------|--------------|
| Nominal by Nominal | Phi        | ,236  | ,000         |
|                    | Cramer's V | ,167  | ,000         |
| N of Valid Cases   |            | 5673  |              |

**H2: Individuals' prior orientations interact with information**





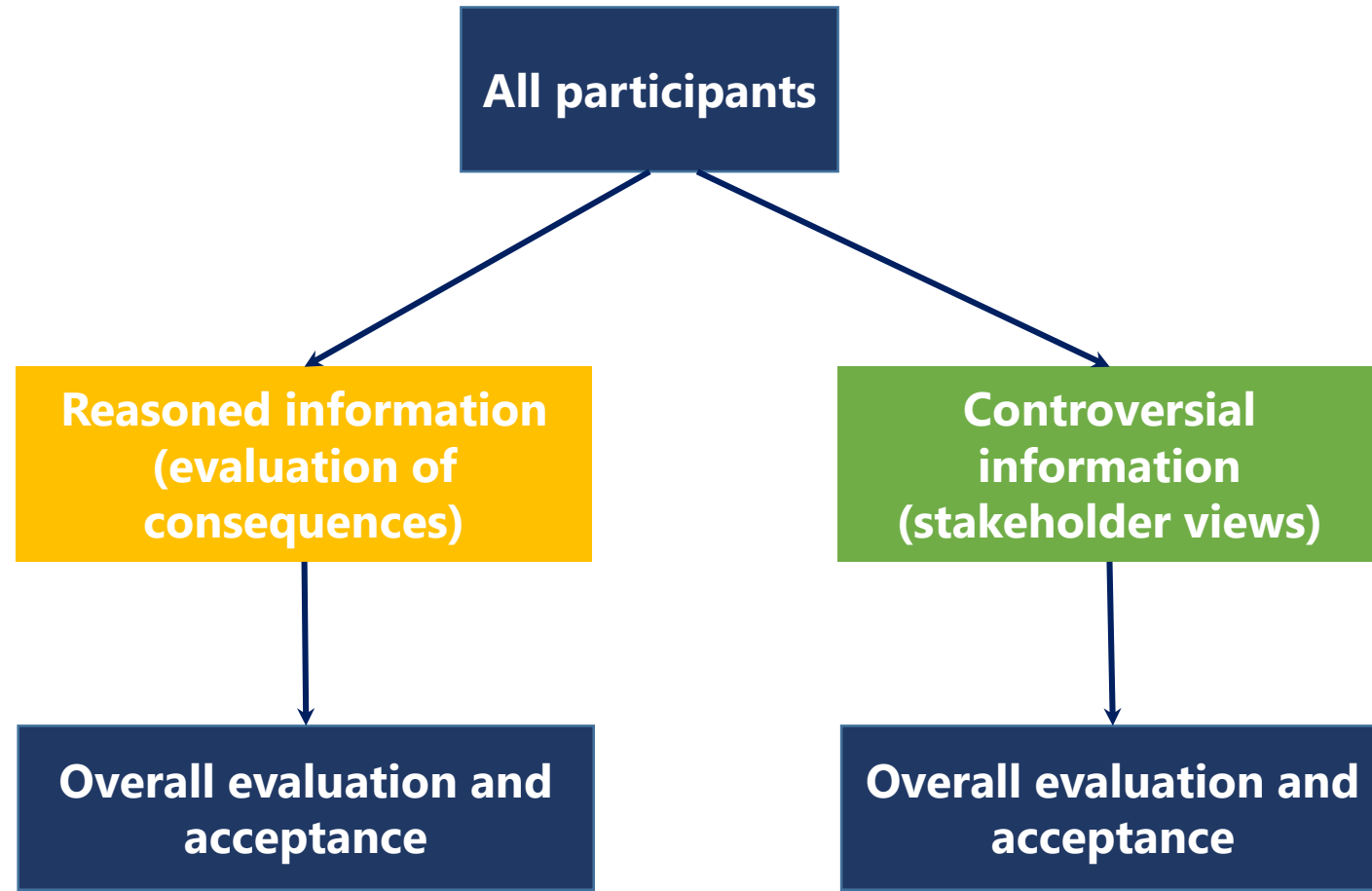
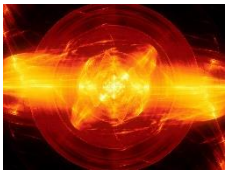
**Figure. Change from initial evaluation to global evaluation in the five groups (after controversial information)**

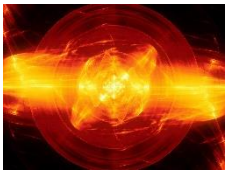


|                                         | Initial evaluation (before) | Overall evaluation (after) | Dif    |
|-----------------------------------------|-----------------------------|----------------------------|--------|
| Pro-environmental non pro-technology    | 3,20                        | 3,01                       | -0,19* |
| Pro-environmental and pro-technology    | 3,43                        | 3,32                       | -0,11* |
| No pro-environmental non pro-technology | 3,57                        | 3,45                       | -0,12* |
| No pro-environmental and pro-technology | 3,82                        | 3,70                       | -0,12* |
| Neutral                                 | 3,16                        | 3,04                       | -0,13* |

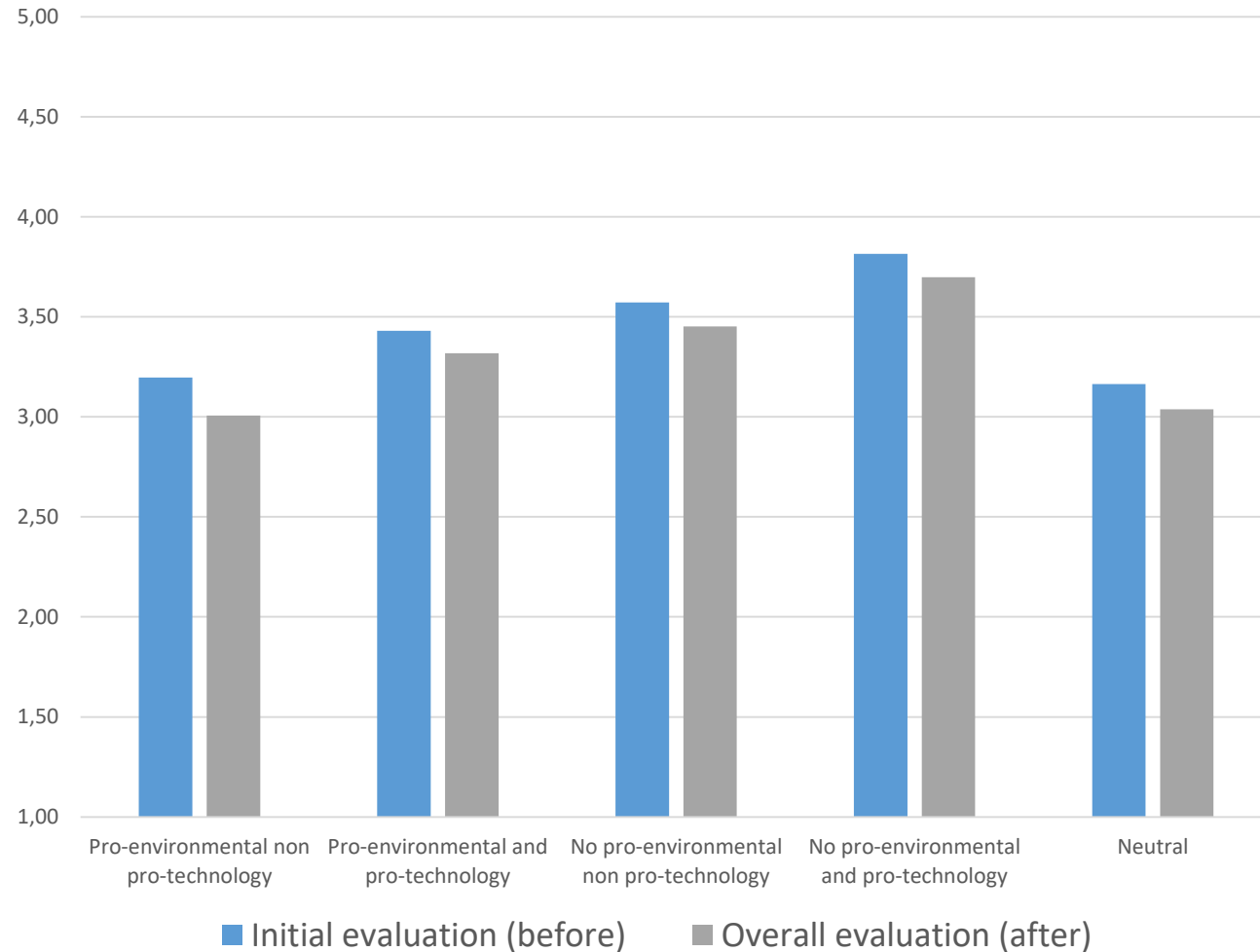


**H2b: The type of information interacts with the relationship between prior orientations and the evaluation**

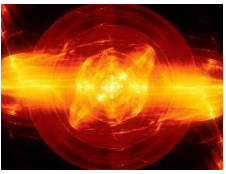




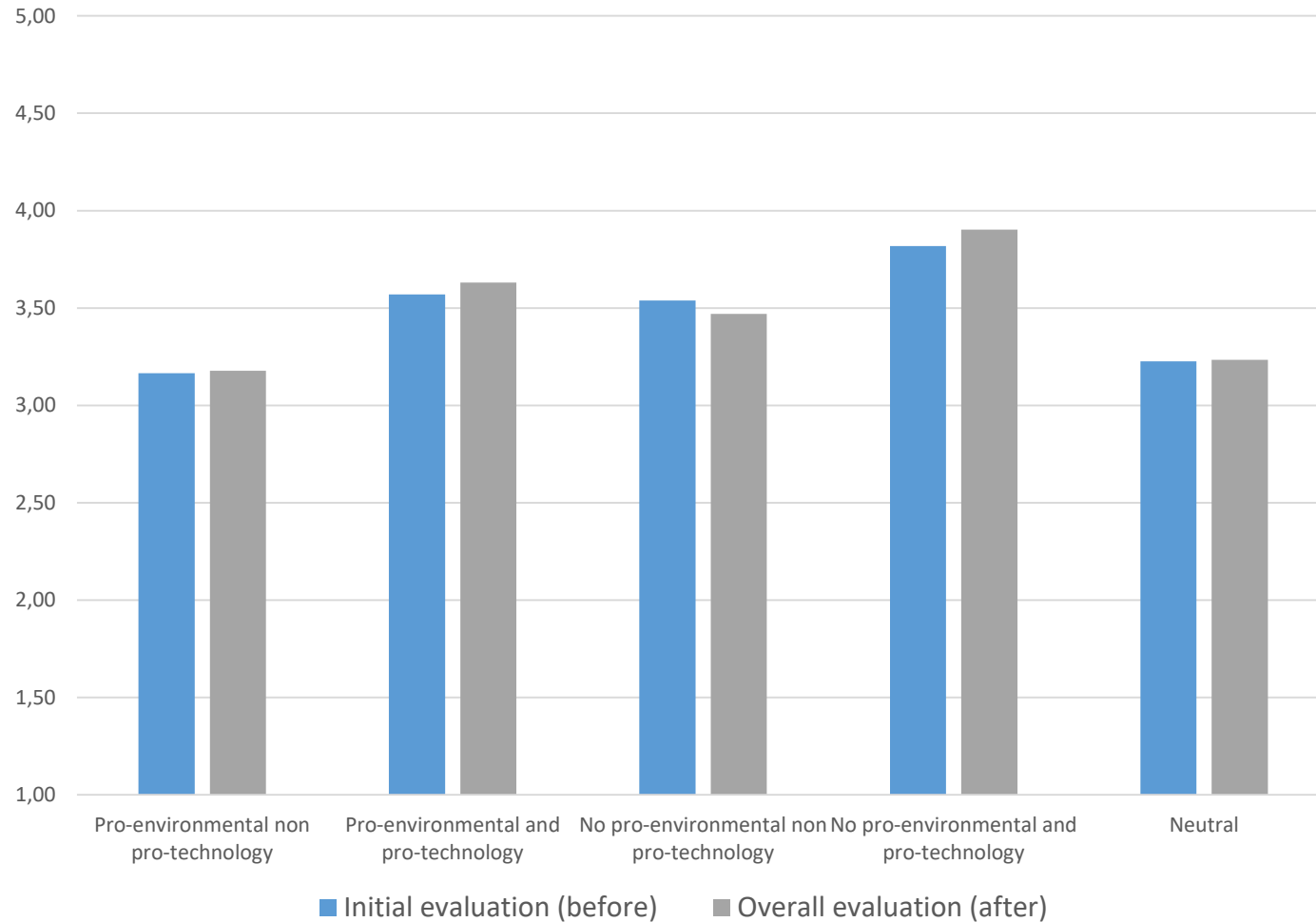
**Figure. Change from initial evaluation to global evaluation in the five groups (after controversial information)**



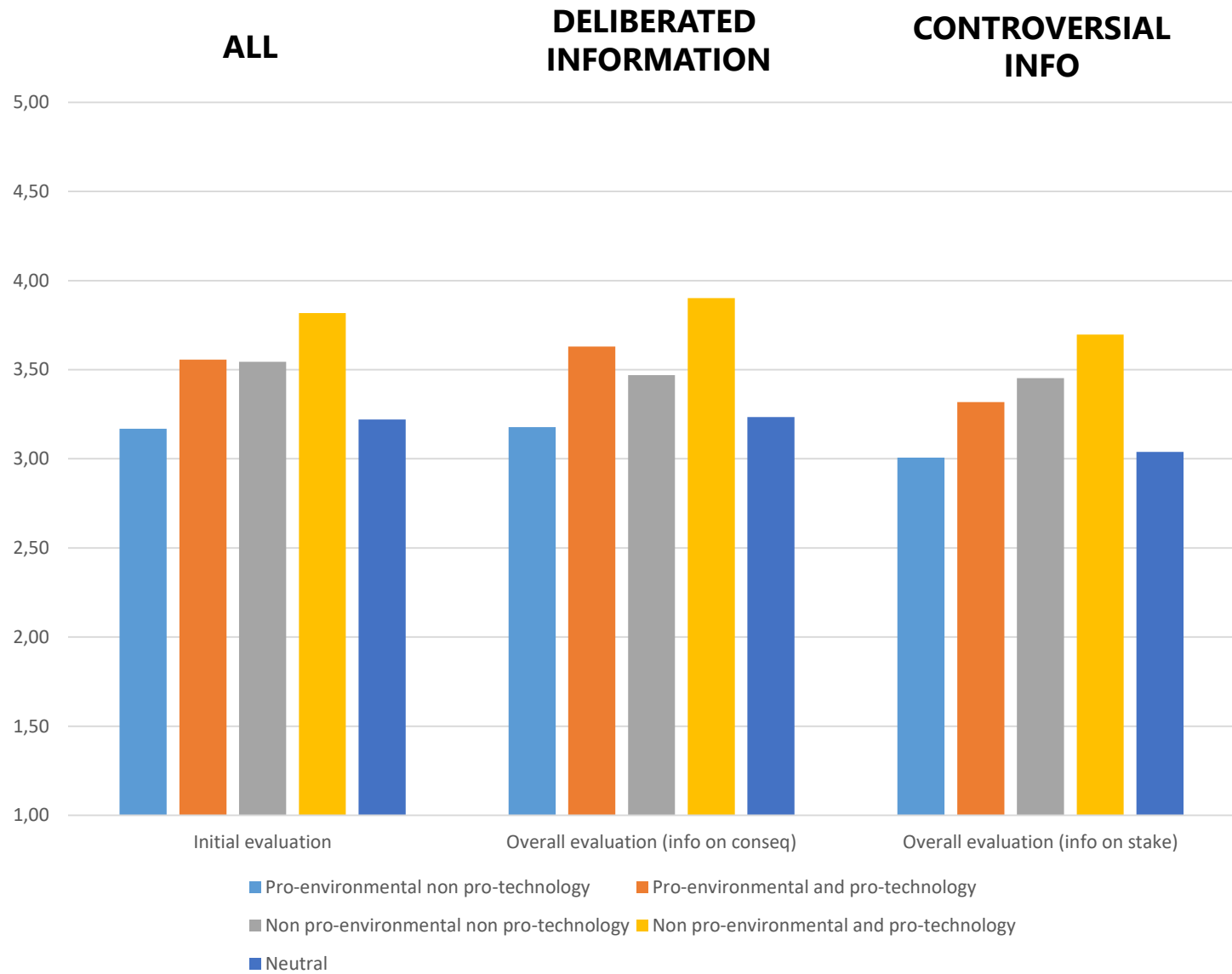
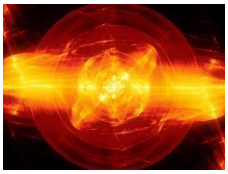
|                                         | Initial evaluation (before) | Overall evaluation (after) | Dif    |
|-----------------------------------------|-----------------------------|----------------------------|--------|
| Pro-environmental non pro-technology    | 3,20                        | 3,01                       | -0,19* |
| Pro-environmental and pro-technology    | 3,43                        | 3,32                       | -0,11* |
| No pro-environmental non pro-technology | 3,57                        | 3,45                       | -0,12* |
| No pro-environmental and pro-technology | 3,82                        | 3,70                       | -0,12* |
| Neutral                                 | 3,16                        | 3,04                       | -0,13* |



**Figure. Change from initial evaluation to global evaluation in the five groups (after the evaluation of consequences)**



|                                         | Initial evaluation (before) | Overall evaluation (after) | Diff   |
|-----------------------------------------|-----------------------------|----------------------------|--------|
| Pro-environmental non pro-technology    | 3,17                        | 3,18                       | 0,01*  |
| Pro-environmental and pro-technology    | 3,57                        | 3,63                       | 0,06*  |
| No pro-environmental non pro-technology | 3,54                        | 3,47                       | -0,07* |
| No pro-environmental and pro-technology | 3,82                        | 3,90                       | 0,08*  |
| Neutral                                 | 3,23                        | 3,23                       | 0,01*  |

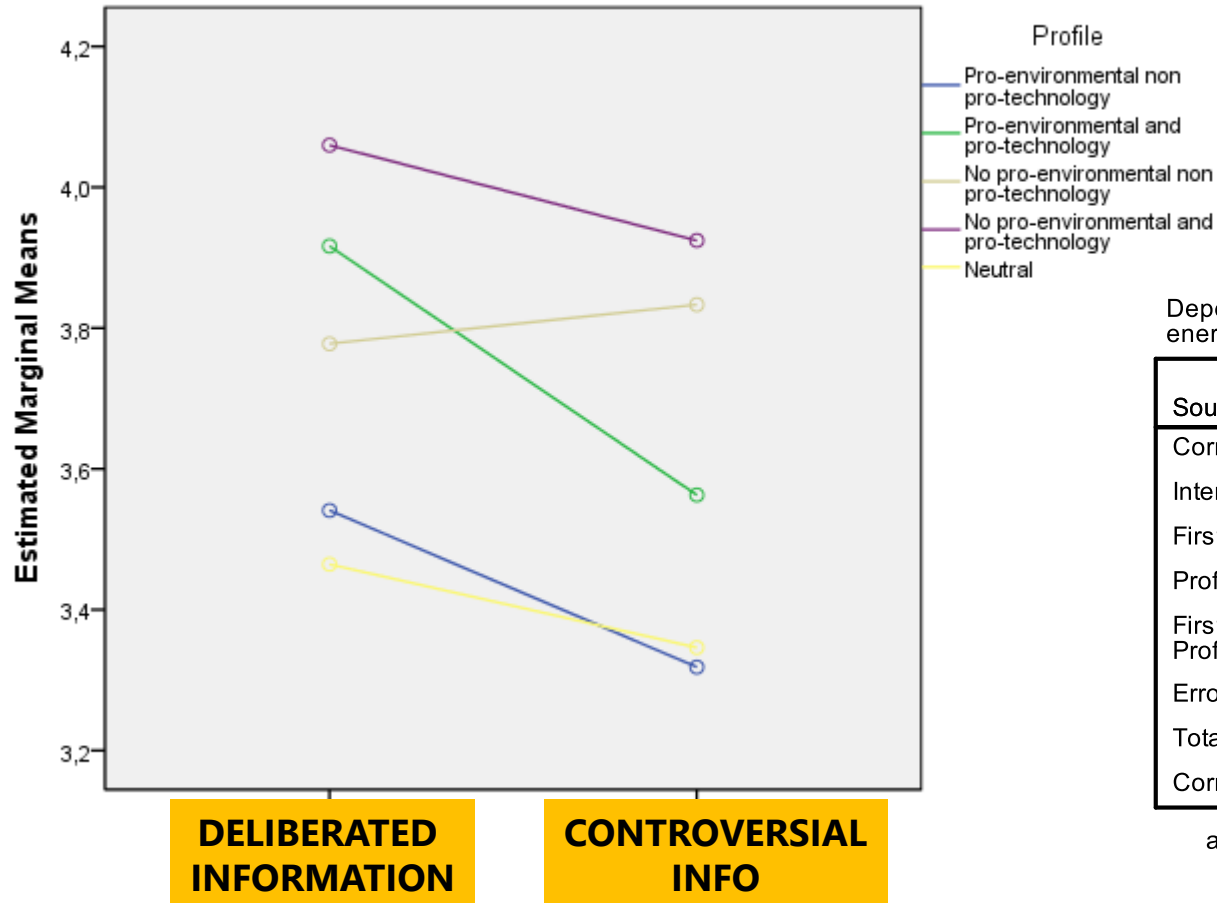


### Strength of the difference

| Initial | OE (info con conseq) | OE (info on stake) |
|---------|----------------------|--------------------|
| 0,25    | 0,27                 | 0,28               |

# Profile vs acceptance vs type of information

Estimated Marginal Means of Overall, do you personally consider the research and development of fusion energy to be...?



Tests of Between-Subjects Effects

Dependent Variable: Overall, do you personally consider the research and development of fusion energy to be...?

| Source                       | Type III Sum of Squares | df   | Mean Square | F         | Sig. |
|------------------------------|-------------------------|------|-------------|-----------|------|
| Corrected Model              | 331,031 <sup>a</sup>    | 9    | 36,781      | 50,619    | ,000 |
| Intercept                    | 21383,923               | 1    | 21383,923   | 29429,018 | ,000 |
| FirstSectionRecode           | 9,493                   | 1    | 9,493       | 13,065    | ,000 |
| Profile                      | 107,351                 | 4    | 26,838      | 36,935    | ,000 |
| FirstSectionRecode * Profile | 6,376                   | 4    | 1,594       | 2,194     | ,067 |
| Error                        | 4114,889                | 5663 | ,727        |           |      |
| Total                        | 83148,000               | 5673 |             |           |      |
| Corrected Total              | 4445,920                | 5672 |             |           |      |

a. R Squared = ,074 (Adjusted R Squared = ,073)



## Discussion

Prior orientations, information and the **public acceptance** of energy technologies

# Prior orientations matter in technology acceptance

“Citizen acceptance is not just a matter of materialism or self-interest—energy projects can resonate with a **variety of citizen values** in ways that differ substantially by context, such as across regions with real or perceived differences in potential benefits and risks” (Devine-Wright, 2011).

“Governments seeking to navigate public opinion will need to understand the complexities of citizen acceptance, and carefully frame political decisions to propose, accept or reject such large-scale energy projects—anticipating **how these frames will connect or clash with different core values**” (Axen, 2014)

# But...

*International Review of Sociology—Revue Internationale de Sociologie*  
Vol. 15, No. 2, July 2005, pp. 327–362



## Lifestyles, and Risk Perception Consumer Behavior

Lennart Sjöberg & Elisabeth Engelberg

*In this article, the concept of lifestyle is traced to its early roots in personality psychology and in marketing. In the latter field, many commercial marketing firms have made strong claims as to the explanatory power of lifestyle dimensions, often based on procedures which have been kept secret, but researchers have seldom been able to verify such claims. In spite of this, the approach is very popular, has wide credibility and is often given very favorable media coverage. Probably because of this, it is often considered as a very important and promising approach by administrators working with the regulation of risk and risk communication. It may also be credible in some quarters because it affords a way of 'explaining' risk perception as being non-rational. In this paper, we give results from an empirical study of nuclear waste risk perception which is related to a basic risk perception model and three approaches to lifestyles: Kahle's List of Values, a Swedish adaptation of the 'Agoramétrie' approach suggested by a group of French researchers, and Duke and Wildavsky's Cultural Theory dimensions. It was found that nuclear waste risk perception could be modeled successfully with risk attitudes and perception data (basic model about 65% of the variance explained), but that lifestyle dimensions added virtually nothing to the explanatory power of the model. Lifestyle dimensions in isolation only explained a minor part of the variance.*

Risk perception has been an important research topic since the 1970s (Sjöberg, 1979). The reason is probably that risk is believed to be a crucial factor in policy attitudes and decisions. There are several problematic aspects to risk management, e.g., the often observed gap between experts and the public when it comes to socially and economically important hazards, such as those associated with nuclear technology. Another type of hazard of much current concern is food risk and genetically modified organisms, a third would be cellular telephones and the 'electrosmog' debate. Much of the important work on risk perception was summarized in a volume edited by Slovic (2000).

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“It has been demonstrated repeatedly that **substantial explanatory power usually can only be found with concepts which are ‘proximal’ to the dependent variable**, i.e. concepts which are closely related in their contents. ‘Distal’ variables with very different contents rarely explain more than a few percentage points of variance, and almost never add anything beyond a model based on proximal variables and demographics”

*“In the prediction of specific behavior, ‘proximal’ variables constitute the only known efficient basis”*

# If prior orientations matter, is polarization inevitable?

“Nothing in our study suggests that cultural polarization over nanotechnology is inevitable. Social psychology is making important advances in identifying techniques for framing information on controversial policy issues in a manner that makes it possible for people of diverse values to derive the same factual information from it. With further study, it is likely that these techniques can be used to guide risk communication and thus enhance democratic deliberations on risk-regulation policy—on nanotechnology and other issues”

Kahan, D. M., Braman, D., Slovic, P., Gastil, J., & Cohen, G. (2009). Cultural cognition of the risks and benefits of nanotechnology. *Nature nanotechnology*, 4(2), 87.

## Bridging the Partisan Divide: Self-Affirmation Reduces Ideological Closed-Mindedness and Inflexibility in Negotiation

Geoffrey L. Cohen  
University of Colorado at Boulder

David K. Sherman  
University of California, Santa Barbara

Anthony Bastardi  
Stanford University

Lillian Hsu and Michelle McGoey  
Yale University

Lee Ross  
Stanford University

Three studies link resistance to probative information and intransigence in negotiation to concerns of identity maintenance. Each shows that affirmations of personal integrity (vs. nonaffirmation or threat) can reduce resistance and intransigence but that this effect occurs only when individuals' partisan identity and/or identity-related convictions are made salient. Affirmation made participants' assessment of a report critical of U.S. foreign policy less dependent on their political views, but only when the identity relevance of the issue rather than the goal of rationality was salient (Study 1). Affirmation increased concession making in a negotiation over abortion policy, but again this effect was moderated by identity salience (Studies 2 and 3). Indeed, although affirmed negotiators proved relatively more open to compromise when either the salience of their true convictions or the importance of remaining faithful to those convictions was heightened, the reverse was true when the salient goal was compromise. The theoretical and applied significance of these findings are discussed.

*Keywords:* self-affirmation, attitudes, bias, negotiation, conflict

## Political Extremism Is Supported by an Illusion of Understanding

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and Steven A. Sloman<sup>5</sup>

<sup>1</sup>Leeds School of Business, University of Colorado, Boulder; <sup>2</sup>Center for Public Leadership, Harvard Kennedy School; <sup>3</sup>Anderson School of Management, University of California, Los Angeles; <sup>4</sup>Department of Psychology, University of California, Los Angeles; and <sup>5</sup>Department of Cognitive, Linguistic, and Psychological Sciences, Brown University

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### Abstract

People often hold extreme political attitudes about complex policies. We hypothesized that people typically know less about such policies than they think they do (the illusion of explanatory depth) and that polarized attitudes are enabled by simplistic causal models. Asking people to explain policies in detail both undermined the illusion of explanatory depth and led to attitudes that were more moderate (Experiments 1 and 2). Although these effects occurred when people were asked to generate a mechanistic explanation, they did not occur when people were instead asked to enumerate reasons for their policy preferences (Experiment 2). Finally, generating mechanistic explanations reduced donations to relevant political advocacy groups (Experiment 3). The evidence suggests that people's mistaken sense that they understand the causal processes underlying policies contributes to political polarization.

**Thank you**

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*This research received funding from the EUROFUSION SES-Programme.*



# Dominant Social Paradigm (DSP)

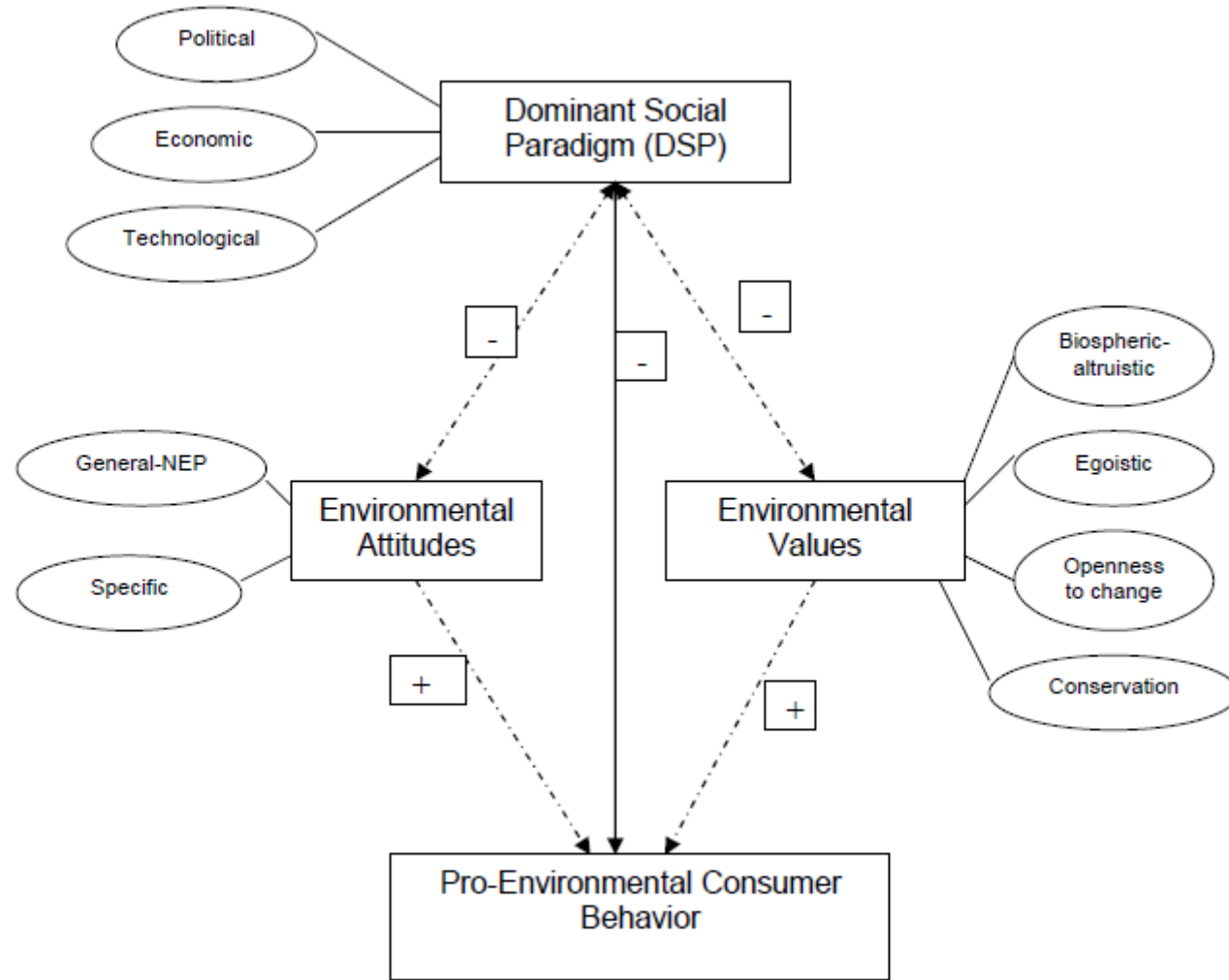
Dominant Social Paradigm (DSP). According to Albrecht *et al.* (1982, p. 39), the DSP entails:

1. A belief in limitless resources, continuous progress, and the necessity of growth.
2. Faith in the problem-solving abilities of science and technology.
3. Strong emotional commitment to a laissez-faire economy and the sanctity of private property rights.

TABLE I  
DSP Components

| Dunlap and van Liere (1984)                          | Kilbourne et al. (2002)                |
|------------------------------------------------------|----------------------------------------|
| 1. Support for free enterprise                       | <i>Economic dimension</i>              |
| 2. Belief in unlimited economic growth               | 1. Support for free markets            |
|                                                      | 2. Belief in unlimited economic growth |
| 3. Commitment to limited government                  | <i>Political dimension</i>             |
| 4. Devotion to private property rights               | 3. Limited government regulation       |
| 5. Emphasis on individualism                         | 4. Focus on private property           |
|                                                      | 5. Focus on the free individual        |
| 6. Faith in science and technology                   | <i>Technological dimension</i>         |
| 7. Faith in future material abundance and prosperity | 6. Faith in the “techno fix”           |
| 8. Support for the <i>status quo</i>                 |                                        |

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