

## Energy and sustainability: public perspectives on what are the issues, who should address them and how

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**Abstract:** In this work we present the results of a Q-study aimed to systematically represent lay-people's perspective on energy and sustainability issues. Especially we explored lay-people's perspectives on what are the overriding issues related to energy, (e.g. energy security and environmental crisis) as well as which actors are responsible to address these issues. In this context we elicited people's opinions on contested alternative technologies (e.g. nuclear power, wind energy, hydrogen). We were able to identify three different environmental perspectives and a non-environmental one. Despite interesting common points (e.g. mistrust in the government) the data show dissimilarities in the perception of how the future energy system might look like. The main divergences turn around the employment of nuclear energy and in general of large scale decentralized system vs. small scale one. Although the presence and the distribution of the results in the larger population it is still to further enquire we retain the results useful for policy makers and practitioners involved in the designing, the decision making or implementation phase of new technologies to achieve energy sustainability as well as in the communication activity with the large public.

**Keywords:** Lay-people's perspectives, Energy, Sustainability, Q-methodology,

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### 1. Introduction

Challenges like climate change, energy security or air pollution require a long-term strategic decision making where different policies are designed and implemented today to develop the sustainable energy system of tomorrow. These strategies will change the shape of the current system by supporting certain technologies and promoting certain behaviors (e.g. less car use, more solar panel installations in households).

Ideally these strategies result from the negotiation of the different actors' perspectives in the policy arena. We can define a perspective (or frame [1]) as a constellation of values, beliefs, assumptions and interests, which determines not only the problem that matter but also the boundaries of the solution space. Given that no perfect solution is possible, these strategies reflect the negotiated priorities, values, the issues that should be solved (e.g. energy independence or carbon emission) and how (e.g. biomass, nuclear energy or bicycles).

However this negotiation process is not isolated within the boundaries of the policy arena, but is affected by more or less stable exogenous factors like cultural or technological innovation. A relatively unstable and influential exogenous factor is public opinion, which can affect the process by determining the discussion agenda or by giving more power to certain actors in the arena [2].

In this context we aimed to explore people's opinion on energy related issues, controversial technologies (e.g. biomass, hydrogen or nuclear energy) and other non technical solutions. Especially we aimed to explore how people look at the issue, if and how they construct the problem boundaries and thus define the solution space (perspective thus as a combination of beliefs on what are the problems, who is responsible to solve them and how).

The research aims are resumed in the following research questions: *What are the lay people's perspectives on energy related issues? How are these perspectives agreeing and/or conflicting?*

We expected that divergences in the acknowledgement of the issues and responsibilities by the public would have led to the preferences towards different technologies. Moreover we expected to find other perspectives beside the largely explored environmentalism. Similarly to the environmentalism we expected these other perspectives to lead to the preference (or rejection) towards the different technologies but for different reasons.

Aiming to understand the line of reasoning behind the preferences we opted for a qualitative research method, rather than a quantitative one. After a brief description of the chosen method (section 2) we will present the results of the study (section 3) and discuss them in section 4. We reserved some considerations in the conclusive section (section 5). The study, which is an ongoing research, has been designed to be an intercultural project in two countries: the Netherlands and Italy. For the sake of clarity, in this paper we will be presenting and discussing only the results from the Italian work.

## 2. Methodology

To pursue our research scope we chose for the Q-Methodology, which combines qualitative and quantitative techniques to make explicit the different perspectives on a certain topic [3] [4] [5]. The Q-methodology was thought to be particularly suitable to overcome the possible lack of knowledge on the technical aspects of the topic or the absence of a preexisting opinion in the respondents. In fact in a Q-study the subjects are asked to assess a set of sentences through a *likert* scale (for example agree vs. disagree) but in the context of an interview. We thought the sentences, formulated as opinions, would have facilitated people to give reactions at least on the sentences themselves. Moreover, unlike conventional R-surveys in a Q-sort the sentences are not considered singularly but rather ranked and put in relation one to each other. The respondents are asked to distribute the sentences written on small cards in a predefined grid accordingly to how much they agree or disagree with them. The task of ranking is enriched by comments and explanations on the different choices. In this way through a Q-sort (a particular disposition of the cards) it is possible to build up and organize in a structure the personal point of view, even if it was not present before. In other words, the Q-method can either elicit an existing perspective or help in constructing one.

In a second quantitative phase all Q-sorts are statistically related and grouped in shared perspectives. Given the nature of the statistics used, the q-methodology doesn't require big samples, as far as the sample guarantees a sufficient variety of perspectives. This technique hence does not aim to give a representative distribution of the opinions among the population (such an opinion pool) rather to disclose the variety of perspective on a certain topic and dig into them [4]. The "extreme" positions are frozen as cardinal points between which everybody will then distribute their opinions.

The use of statistic helps the researcher to process more information at the same time and can reveal unexpected results when combining the subjects' profiles. The comments collected during the interviews are used to reconstruct the narratives. Contrarily to a conventional quantitative analysis, the perspectives are enriched with useful qualitative data about the "how" and the "why" certain variables are related. The interpretation of the links among variables derives directly from the point of view of the interviewees and not from the free interpretation of the researcher.

A Q-study entails different steps. Firstly it is necessary to record and resume all the variety of opinions and beliefs that represent the *flow of communication* object of the study. In our case we organized 7 focus groups for a total of 49 people interviewed covering different age and

background. We asked people to discuss about what are the main problems related to energy production and consumption and which actors are responsible to do something about it. The entire flow of communication has been reduced into 40 sentences (a sample of them is showed in table 2), which have been chosen to represent the variety of perspectives rather than for their frequency or relevance.

In the second step of a Q-study the respondents (the P-set) are asked, in the context of a single interview, to dispose the sentences written on 40 small cards in a predefined grid, with the shape of a quasi normal distribution. As in qualitative studies the P-set is selected so to represent the maximum variety of perspectives. In our case, we started by collecting the environmentalist's perspectives by interviewing people belonging to association or companies working in the sustainability field but also people living in the countryside and having solar or photovoltaic panels. Starting from few of these people we continued contacting people by snowballing: each interviewee was asked to put us in contact with somebody who thought similarly and someone who thought very differently. With the snowball method we contacted up to the 5<sup>th</sup> level of interconnection. As a further control variable we looked for people with very different political preference. In this way we got to a P-set of 36 subjects whose characteristics are resumed in table 1. Together with the task of disposing the cards into the grid the subjects were asked to comment the cards and explain the reasons behind their disposition.

*Table 1 Socio-demographic characteristics of the Italian P-set. The subjects are all living in the province of Ancona, in the center of Italy. We organized the data dividing the P-set in subgroups according to the political preference. We show the average age ( $\bar{X}$ ) and its standard deviation ( $\Delta$ ); gender (M=male; F=female) and the education level measured in years (high-school degree or less =13y; bachelor degree=16y; master degree or more+18y)*

Socio-demographics →	Age		Gender		Education (in years)		
↓ Political preference	$\bar{X}$	$\Delta$	M	F	≤13y	16y	≥18y
Left (PC, 5Stelle, SeL)	29	11	5	2	1	2	4
Center-Left (PD)	46	14	3	4	-	-	7
Center (non specified)	41	10	1	3	-	1	3
Center-Right (PDL-UDC)	40	11	3	2	1	-	4
Right (FN, exAN, LN)	39	13	6	1	3	1	3
No preference	39	13	3	3	3	1	2
TOTAL	39	14	21	15	8	6	22

The last step of a Q-study is the data analysis. With the PQMethod program, we performed a centroid factor analysis and we orthogonally rotated the 7 resulting factors through the varimax. To perform the Q analysis we selected four of the seven the factors, which had the Eigenvalues higher than 1.4 of and at least four subjects loading purely (subjects highly correlating only with one of the four factors). The selected factors explained alone the 55% of cumulated variance and are presented in section 3.

### 3. Results

Through statistic analysis we identified four different factors representing four shared perspective on the matter of energy related issues. Recalling the qualitative information collected during the interviews we reconstructed the narratives of the factors. We also labeled each factor with a title resuming the core of the perspective.

In the following sections (3.1 to 3.4) we resume in few lines the main points of the logics behind the different factors.

### 3.1. Factor 1 the hopeless environmentalist.

Whatever problem there is with energy (like climate change, pollution or overconsumption) the point is that nobody cares about. People don't care, the newspapers don't talk about these things, the Government does nothing, the technologies are ready but there is a powerful lobby that is blocking their venue in the market. The only way out is that future generation will become more responsible in energy consumption. Therefore education since the primary school is the key solution. Nuclear should not be implemented, because of the waste, because it's dangerous, because it is hold. The decentralization of the energy production is a good idea, so to avoid the transport energy and to keep multinational's hands off the energy. Off-grid houses, usage of urban waste or biomass to produce energy, small-scale renewable energy plants, this is how the future should look like.

Table 2 Example of the 40 sentences composing the set of cards that people have been asked to q-sort in a scale from -5 to +5. On the right side of the table we can see the ranking value of each sentence per each of the 4 factors identified.

Sentences	Factors			
	1	2	3	4
I am a climate-skeptical. I don't think climate change is an issue. There are even scientists that say that it is a normal process and that it has nothing to do with our energy consumption.	-3	-1	0	-5
Humans are more important than nature, we are on top. We should satisfy our needs, but not completely disregard the nature.	-1	-4	3	-2
The majority of oil comes from political unstable countries. We would have a serious problem if the Middle East would close the tap of oil. We should not depend on them.	2	4	5	1
I wish it would be possible to completely independent from the electric grid. I would prefer producing the energy at home on my own.	3	-3	3	2
Maybe we could come back in doing things locally, also energy. It would be nice to produce energy locally and not to transport it	4	-2	2	4
Nuclear energy is good way to solve the issues related to energy.	-4	2	2	-4

### 3.2. Factor 2, the practical environmentalist

This factor underlines the socio-political aspects of the issue. The real problem is the uncontrolled consumerism: the overconsumption is an issue in itself. This overconsumption is also bringing issue with the energy like the environmental problems: human being is part of the nature and we have to respect it since everything we do against nature will backfire on us anyway. Noteworthy in this perspective the environment is intended as the landscape, the air-quality thus the local natural resources rather than the global issues like climate change. The overconsumption may also lead to less availability of energy and in anyway it is unacceptable to depend on other countries for our energetic needs, especially if they are politically unstable, totalitarian and culturally outdated like the Middle East.

From this perspective the government is incapable of handling this situation, although it should have only a marginal role. The mistrust in the government is compensated by the trust in the liberal market: the change will come from down-up, when the people consume less and better, new sustainable products will diffuse in the liberal market. The Government should support this chain through education, which makes of people responsible consumers.

Concerning the solutions, decentralization is not the future, nor the local production and certainly not the independent houses. Decentralizations means too much responsibility on people and it would be impossible for them to manage all this. Centralized production and the use of existing infrastructure: that is the key. Nuclear is a good compromise: it can increase our energy independence in an economically viable way without harming too much the environment. Using urban waste to produce energy is indeed a good idea, since it solves two problems in one (i.e. where putting the waste and energy availability) while using potential food might be an issue (table x.4.3).

### **3.3. Factor 3 No to no - Yes to progress, the futuristic citizen**

This is the economic and technical focused perspective. The real issue is not the environment: climate change is a natural process and the human activity is too small to have any effect on it. Pollution? We are much more aware of our environment now than in the past and definitively air was more polluted during the industrial revolution than nowadays. The reality is that we need energy for everything we do. We cannot come back to stone-age and consume less: the progress lead us to an increase in the quality of life, we cannot go back! We are at the top of the chain, therefore we have to find a way to have enough energy to satisfy our needs, of course without completely disregard nature. Developing countries are their energy consumption, but in the end energy availability is not a problem: we don't know which technological surprise science holds for us in the future.

The focus of the issue with energy is at the geo-political level. The worries are not for the increasing consumption of developing countries, which means more people pulling the corner of the same blanket, but rather the energy dependence issue. Particularly it is not seen favorably the dependence from Middle East countries (but also from Russia) for our energy supply. For these issues people cannot do a lot. The government should take instead a key role, not only by giving the guidelines, but also giving clear directives to people on what to do. In this discourse technology has a central role. For example if hydrogen is the future, we should go for it. What ever change in the system or in people behavior is needed to realize the future it should have to be pushed top-down, promoted or even imposed if necessary. An example is the smoking-ban. People might be not so open-minded or lack of long-term vision and therefore block the progress.

Progress and technology will give us the solution and it is not possible to say always no to any new technology, like the incinerators or hydrogen. Why not having hydrogen at home or in a car?! What is scaring of new technologies? Terrorism? Why no to nuclear energy? Why no to Methane? Say yes to progress.

### **3.4. Factor 4 the liberal environmentalist.**

From this perspective the current (over)consuming model is leading our society nowhere. We should consume less and better. For instance we should consume locally. This doesn't hold only for seasonal-local food but also for the energy sources. Although technology can help us no technical fix is possible: we need to change our behavior, that is why education to sustainability is so important.

The responsibility of making our world more responsible is equally divided among the different actors: it is true that industry consume and pollute a lot, but we buy their products. We should stop to blame the industry or China for pollution. Also the Government has limited power, since it is a complex international issue, with delicate geopolitical balance.

The government can help with taxation or monetary incentives and especially with education, since a real change cannot come without a deep awareness. The change should be realized bottom-up: the responsible and aware consumers will pull the market, the companies will invest in research and better technologies will be developed. Decentralization is definitively the way to go, so using waste or biomass to produce energy? OK, but these are buffering solutions not the future. In the future we should produce less waste rather than count on them for our energy supply! Nuclear is a 30 years old question, and the answer is NO! (x.4.5)

#### 4. Discussion

In the previous section we described the narratives resuming the four identified perspectives on energy issues and sustainability. The Eigenvalues of the factors are higher than 1.4 and they explain alone the 55% of cumulated variance, both values indicating rather strong results.

The Hopeless, the Practical and the Liberal environmentalist (factors 1, 2 and 4) substantially share an environmental position especially if compared with the Futuristic citizen (factor 4) that instead focuses on the geo-political and technical aspects of the issue minimizing the environmental crises. The three perspectives sharing the environmental focus however, give different meanings the word “environment”: from the global aspects of climate change (the *liberal* and the *hopeless environmentalist*) to the aesthetic view of the natural surroundings (the *practical environmentalist*). The fourth perspective (the *futuristic citizen*) claims also the need of a change but in the name of progress rather than a supposed environmental crisis.

The responsibilities of this change are distributed in a different way in the four perspectives: some see the need of a top-down change, with clear indication of what to do, since citizens do not have a long-term view nor enough knowledge. From another perspectives, sustainability can come out of the liberal market as far as people want it: through a bottom-up change the citizens/consumers pull the market by changing their consuming behavior.

As we hypothesized, the four lines of reasoning drive to different vision of the future energy system. It is noticeable the clear-cut anti-nuclear position of environmentalists (the *liberal* and the *hopeless*) as well as the pro-nuclear position of the other two perspectives: the practical environmentalists see nuclear energy as an inevitable necessary compromise, while the futuristic citizen welcome it as any other alternative technology. Although everybody seems to be in favor of the diffusion of the renewable and alternative energy sources, in different measure wind, solar, biomass but also urban waste there is a clear distinction of their role in the future energy system. The decentralization of the energy production, i.e. communities and single individuals producing energy, is seen as a key change from the environmentalists (the *liberal* and the *hopeless*). At the opposite side is the other environmentalist sub-group, the *practical environmentalist*, which sees decentralization as an excess of responsibility on lay-people, while centralized production system should guarantee lower cost of energy and security of supply. The *futuristic citizen* instead seems to give a different meaning to the (de)centralization: the production of energy will be with but not limited to local/individual systems because this is the direction that technology is taking.

Last, we would like to underline an interesting pattern observed in our data: an apparent coherence (but not statistically proven) between the perspective and the political preference. In our sample the *futuristic citizen* seems to be consistent with a *rightist* political perspective; the *liberal environmentalist* compatible with a *leftish* one; the *centrists* (center left and center right) divided themselves among the *hopeless* and the *practical* environmentalist.

## **5. Conclusion**

We started this work asking two questions, formulated in section 1 of this paper as: What are the lay people's perspectives on energy related issues? How are these perspectives agreeing and/or conflicting? We hypothesized that differences in looking at the issue would have led to a divergence in defining the solution space and thus what is acceptable or not from the lay-people's point of view.

We performed a Q-methodology study, which combines qualitative and quantitative techniques to identify the different perspectives and the agreeing/conflicting points. Through this methodology we were able to identify the nuances among the three identified environmental point of views, i.e. the difference meanings given to the word "environment" and the different attitudes towards the issue, i.e. hopeless. Remarkably we identified a fourth non-environmental perspective, which is, to the best of our knowledge, still unexplored in the literature.

According to our results these different frames correspond to different solution space demarcation, e.g. different ways of looking at the future. The hopeless and the liberal environmentalist, these who look at the global environmental issues, claim for a deep societal change. This change is expressed also in a revolution in the current energy system, where the energy is locally produced and managed by people's organization. The same deep change is claimed as well by the other environmental group but it is expressed in a completely opposite way: a business as usual but clean. At the implementation level, the futuristic citizen surprisingly comes in the middle: for different reasons they envisage a combination of the two. If the data result to be externally valid, a special attention should be given in the communication, firstly distinguishing which kind of environmentalist are addressed and secondly by taking into account that other frames are in audience that would also step onboard but for different reasons.

Interestingly but not surprisingly, the data suggest a possible political conflict around the energy issue. Notably political preference and solutions space seem to be strongly related a priori, since few political parties in the Italian political arena have a clear program on the topic energy and sustainability.

However, being a qualitative study we are careful in claiming a systematic relationship among frames, solution space and political preference. These aspects could find a (dis)confirmation in a quantitative study. Concerning the external validity of the data, many authors [3] [4] claim that the Q-methodology is capable of disclosing the variety of perspective by means of small samples provided that the latter offers a sufficient variety of way of thinking. However, given the difficulties in our work to identify a priori the "sufficiency" of the variety, it would be interesting to verify how stable are the data and if and how these perspectives are distributed in the larger population.

In conclusion we underlie that according to our results, other frames beyond environmentalism justify the shift towards a new energy system in lay-people perspective; in addition, different frames seem to lead to the preference towards different kind of future energy system (especially concerning the implementation of centralized vs. decentralized systems and the employment of the primary energy sources, like nuclear power.), this aspect deserve further research to be (dis)confirmed. Future research will address the definition and the distribution in the larger population of the above-described frames and solution spaces

(i.e. technology preference and policy acceptance). We think that the results can be used by policy makers and practitioners both in the designing and decision making process as well as in the communication phase.

## **References**

- [1] D.A. Schön and M. Rein, *Frame Reflection: Towards the resolution of intractable policy controversies*, New york, Basic books, 1994
- [2] P.A. Sabatier, *An advocacy coalition framework of policy change and the role of policy oriented learning therein*, *Policy Sciences* 21, 2, 1988 p. 129-168.
- [3] Stephenson W., *The Study of Behavior: Q Technique and its Methodology*, University of Chicago Press, Chicago, 1953
- [4] Brown S., *Political Subjectivity: Applications of Q-Methodology in Political Science*, Yale University Press, 1980
- [5] NJA van Exel, G de Graaf. *Q-methodology: A sneak preview* [[www.qmethodology.net](http://www.qmethodology.net)]. 2005E.

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<sup>i</sup> Six focus groups were conducted with Dutch participants, while one was conducted with Italians (living in the Netherlands from less than 4 years). It might be argued that organizing the focus groups in the Netherlands might have led to overlooked some important issues from the perspective of the Italians. However, during the interviews, we asked to the Italians interviewee if some important aspects were missing. Only one over 36 remarked that a sentence about the “future threat of a war among nations because of energy depletion” was missing. The same topic raised up during the Italian focus group and during the coding was classified under the geo-political topic and thus included in the sentence “The majority of oil comes from political unstable countries. We would have a serious problem if the Middle East would close the tap of oil. We should not depend on them”. In this light we think that the 40 selected sentences are indeed representing the main points of the energy related issues including a sufficient variety of point of views.