



Internal report

Relevance of SSH in the energy transition

1. Introduction to the social research

Social sciences and humanities are deeply committed to the issue of energy transition, and the current international debate offers different theoretical and analytical frameworks developed to unfold the green energy transition.

As obvious, a particular effort is being made to address those challenges that affect the social sphere of our communities. The energy transition towards a more sustainable production and provision systems involves an incremental reshaping of the socio-material arrangements featuring local contexts and the related multilevel governance. This complex transformation is performed in a “hybrid world” in which the hard side (objectivity, techno-science, materiality) is tightly intertwined with the soft one (subjectivity, politics, values). Actually, very often sustainability is a problem more than a solution in itself and needs to be investigated in order to grasp how this hybrid configuration performs the transition in practice, and how civil society and political actors are pursuing it.

The SSH involvement aims also at extending and translating the energy transition discourse into the “civic engagement” one because at national as well as local level the energy transition has to cope with several societal challenges.

ASSET project is focusing on these issues also from sociology and anthropology epistemological points of view, in particular exploring two research components:

1. dynamics of participation, public engagement (as well as the controversies) related to the energy transition. In this case, the social costs and benefits of those transition processes replacing the energy systems of production and provision are studied. The analysis are covering a wider spectrum of variables and analytical dimension, from the institutional strategies to enhance the public debate and to inform, to the socio-territorial analysis (energy poverty, conflicts, technological awareness, energy commodification/commonification trade-offs, territorial controversies, NIMBY local conflicts, land grabbing and land degradation experiences, gender gap etc.).
2. the role of the experts, professionals and institutional actors in fostering energy transitions and the transformation of the education system providing new green skills in different disciplinary fields.

The research strategy is twofold along distinct but interconnected strands addressing the main issue above mentioned and were detected as follows: the first strand is devoted to retracing how energy transition impacts on local communities, deepening the conflict/cooperation nexus with reference to the institutional strategies of public engagement featuring energy transition experiences. A socio-territorial analysis is carried out to deal with this point. The second strand is focused on the role of the experts, professionals and institutional actors in fostering energy transitions. In this case a particular focus about the mismatch between the profile of experts and actual skills requested by the energy transition is given.

The two strands have to be understood as mutually constituent both in conceptual/theoretical, and methodological terms. Indeed, criticalities and societal challenges of energy transition can be

ascribed to a lack of expertise and, vice versa, skills and knowledge can frame very specific paths of energy transitions. Moreover, moving from the conceptual to the methodological argument, both strands are interlaced in our approach by a quali-quantitative strategy of research that is sketched in accordance with the figure n.1 depicting the research deployment plan. We are therefore conducting a survey among stakeholders and experts at European level to investigate two main areas of investigation:

- a) the policy frameworks of energy transitions
- b) green professions and educational needs.

2. The method

The construction and design of the research techniques and the assemblage of the overall methodology are continuously inspired by a co-production orientation, through the involvement of the consortium partners, in a dynamic fashion. Similarly, the research activities are involving a wide population among stakeholders, techno-scientific (and professional) communities, learning communities, institutional actors and decision-makers, local populations “dwelling” the energy transition.

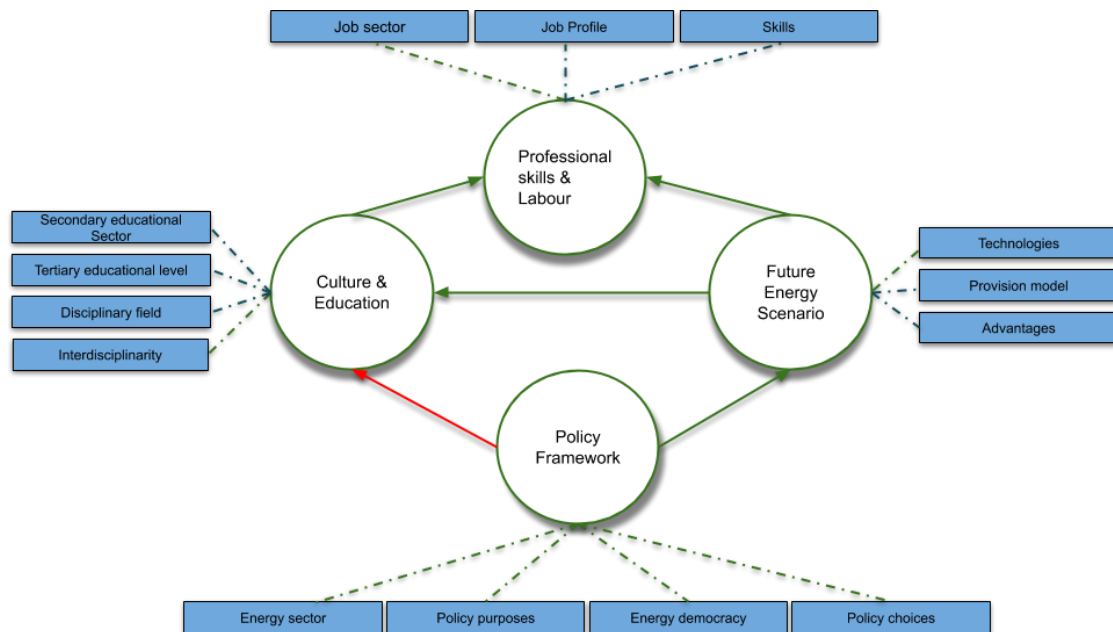


Fig. 1 - Theoretical map underpinning the ASSET research directions

The research design involves both quantitative and qualitative techniques, in order to achieve several tasks. Main techniques are:

- The survey tool is intended both for an exploratory and explanatory aim because of the abductive logic of the overall research project. It is designed to deal with individuals as units of analysis checked by a typology of stakeholders.
- The qualitative method is based on comparative ethnographic accounts developed on case studies of energy transitions experiences, the conduction of focus groups and in-depth open interviews. These research techniques are designed taking into account the findings of the survey and will address the following analytical focuses: energy transition “in action and practice”; values, knowledge, ethics and social legitimation of energy transition.



3. (Very) early results

3.1. The questionnaire to Stakeholders

In order to identify the stakeholders we have adopted the multi-level perspective (MLP) focuses on the socio-technical regimes and detects their analytical dimensions (norms, structures, practices, technologies, innovation trajectories). Within the MLP argument development a typology of stakeholders can be drawn up:

Stakeholder type	Description
1. Market and customers	Energy companies & their associations, consumer associations, condo associations, an association of large energy users, energy cooperatives & their associations, etc.
2. Industrial networks	Manufacturing/component industries & their associations, trade unions, etc.
3. Policy and Administration	Local representatives & association of municipalities, national representatives & national regulatory authorities, etc.
4. Infrastructures managing agencies	Infrastructures managing agencies/transmission system operators, local energy agency or authorities, etc.
5. Cultural agencies	Heads of high schools & teachers / school associations, local & national environmental associations etc.
6. Science and technological actors	Universities and their associations, research centres both public and private, etc.

Tab. 1 – Stakeholders typology

THE SAMPLE

For what concerns questionnaires administered to stakeholders, to date we collected 60 questionnaires, that is only a share of the overall. We consider in this phase only the questionnaires that have been completed at 100%, with no uncomplete or missing answers.

This first phase of the research involved mainly the Mediterranean Area. The Nordic Area and the West-European Isles have been less investigated so far. We depict to date the average profile of the interviewed; we recall that these findings come just from a preliminary analysis, and so they have to be intended as a first draft.

The sample consists of 39 men and 15 women (6 refused to select a gender). This could be an indication of an unequal distribution of the gender in the context of the energy transition that needs to be investigated better.

The average age is 44 years old, and this is consistent with other sectors. The most represented education qualification is a very high one, as a PhD title or a Post-Master degree. The main disciplinary field of education is “Engineering and Technology” (34 of them), and this is not a surprise. The Social Sciences and Humanities follows with 10, then there is Economics and Management with 7. This allows us to think how important social sciences and humanities within this sector are, and so the social structures dynamics challenges implied in this transition cannot be underestimated. Among stakeholders, 20 of them is involved in private sector, such as companies of private professional activities; 17 is in public sector, such as public administration or

public authorities. Third sector (NGO/Unions) is represented by 13 interviewed. For what concerns the organization sectors, it is mainly energy production, followed by education agency and manufacturing industry. It is important to note how big is the impact of the education sector; it is also an ethical, cultural and social transition, as well as a technological/economic one. The main level of action of such organizations is the national one, followed by local and regional ones. The most represented position inside the organization-chart is a management position (17) with high responsibilities within the company. Then there are 13 employees and then people with technical and staff responsibility (12). Thus, from the top management to the bottom of the company, in this sample all the different levels are well represented.

You can find below a table of the prevalent profile of the interviewee to date:

Gender	Man (39) [Woman (15) – Prefer not to say (6)]
Average age	43,9 years
Education	PhD, Master, etc.
Main disciplinary field of education:	Engineering and technology
Type of organization	Private sector (20) Public sector (17) Third sector (13) Others (10)
Sector of the organization	Energy production
Multilevel-governance position (main level of action)	National (20) Local (13) Others (27)
Position in the organization	Management position with high responsibilities

Tab. 2 - Prevalent profile of respondents

OVERVIEW ON ENERGY TRANSITION

Several dimensions have been investigated about stakeholders' opinions on energy transition most important features.

First hints given by stakeholders with respect to energy transition are about which one, small or big, is the most developed technological scale of their Country. Big scale concentrated system and Small scales distributed system share both about 45% of the answers.

The most relevant categories are: Energy production System (solar, wind, hydro) and Energy efficiency/reduction (net zero buildings, hit pumps and co-generation). They think that in the next 5 years it will be crucial to develop small scales distributed systems (40 of the stakeholders), while they give same importance to energy production system, energy storage, energy management, energy efficiency and energy consumption reduction. Most of them, as said, are involved at national level or even higher level, but they strongly believe that also small scales should be developed. Among the respondents, 38 thinks that more socially shared energy production is one of the priorities; 32 aims to reduce the CO2 pollution, 31 supports a simplified regulatory model about energy transition. In the next 5-10 years, manufacturing sector should be involved in energy transition. This is the opinion of 32 respondents, as well as local administrators and energy agency/authorities.

As regards research and education, they think that universities and public research centers have to be involved (46). Again, they suppose that education and research sector is a very important engine to give energy to this transition.

One of the shared aim is to develop connections with Civil Society field, even in the form of simple citizens (single energy consumers) and users. Transition cannot be real if the base of the pyramid is not involved as well as the vertex.

PROFESSIONAL SKILLS AND LABOUR MARKET

One of the objectives of our research is, as anticipated, to provide the initial results on the knowledge, skills and professionalization of the experts working in the field of energy transition and finding the discrepancy between the expert profile and the actual skills required by the energy transition projects.

Thus, a section of the questionnaire has been focused on the skills needed to undertake an energy transition process. Hard skills necessary to foster energy transition are: software knowledge and big data analysis, digital and local context skills and path analysis (network analysis). Soft skills considered to be most important are communication skills, adaptability/creativity, team working, problem solving, networking/lobbying (you can see the table below).

Hard skills	Soft skills
Software knowledge and Big Data analysis	Communication skills
Digital skills	Adaptability/creativity
Local context and paths analysis (Network Analysis)	Problem-solving
Management	Team-working

Tab. 3 – Hard and soft skills that should be trained in the near future to foster the energy transition

More than half of stakeholders thinks that it will be possible to re-employ workers from traditional energy sector to the new energy transition one, but only after a process of specific skills/competencies acquirement. A non-negligible quota of them believe that no acquirement process is required, and people belonging to traditional sectors can always be an added-value to the energy transition sector. So, whilst they think as education and research sector as a crucial one, they also suppose that a lot of experts of traditional energy framework can be successfully adapted to the new sector.

Fields that most urgently require reorganization to fit energy transaction challenges, are engineering and technology, economics and management and social sciences and humanities. This ranking resembles the most represented field of study of the respondents.

Stakeholders claim that the policy actors that need to be more supported in this process are: energy infrastructures and smart grids; buildings eco efficiency; mobility and transports.

3.2 In-depth open interviews to key informants

The qualitative approach of the research is closely related to the quantitative one: it allows to explore in depth some dimensions crossed in the questionnaire of the key-testimonials of the energy transition (ET) in the academic and industrial sector as well. Our starting point is that connection in our sample allows us to highlight the perception of the experts on the basic issues to guide the next phases of the research. At the same time this technique has been designed and is used to involve experts and, in general, key informants who will be able to reconstruct some key features of the energy transition, both in terms of the field of socio-technical practices and diachronic process.

This data collection technique is based on a very unstructured procedure which allows us to explore both the interpretative dimensions selected ex ante by the researchers and the topics spontaneously evoked by the experts interviewed. The key informants thus guide the researchers within the cultural and semiotic space of the energy transition.

So far, we have covered half of the expected sample – as shown in Table 4 –, we will limit ourselves to presenting the first characterizations emerged in the groups of information about the dynamics of the ET, in relation to the labour market, the job profiles, the educational/competence emerging needs and related ethical issues.

As soon as the sampling is completed, we will move on to the second stage of interviews modifying and adapting the guidelines on the basis of the emerging cognitive needs of the research

We will try to put together some narrative elements that have emerged up to now and that seem to illustrate important suggestions and directions for research.

Cod.	Qualification
I.01	Lecturer of Economic and managerial engineering
I.02	Associate professor of Sociology of the Environment and Territory
I.03	Full professor of Economics
I.04	Full professor of Chemical Plants
I.05	Assistant Professor of Thermal Sciences and General Secretary of ANEV
I.06	Leading Scientist, RSE S.p.A.
I.07	Assistant professor and director of the Educational Content, Methodology and Technology (e-CoMeT) Lab
I.08	Full professor of Architecture technology
I.09	Environmental historian, director of Environmental Humanities
I.10	Nuclear physicist, Neutral Beam Coordination Officer at ITER Organization

Tab. 4 - List of interviewees

ENERGY TRANSITION AND LABOUR MARKET

In relation to the issue of ET and the composition, functioning and actors of the labour market, some very interesting aspects have emerged.

According to the experts interviewed, the market would be progressively automated and digitized. The regulation of energy flows today is characterized by high levels of digitization and remote control. For this reason, classes of professionals experienced in platform management are employed. It is also confirmed that the complexity of the topic impacts different economic, technological and social areas, for which different skills are required: at least engineering, sociological, and economic. It is pointed out that the diffusion of policies that favour the energy transition have led to the entry of new players, smaller players that with more limited capital costs

enter the market. Many people refer to the issue of regulation and recall the importance of the intervention of politics and institutions, because although a growing sensitivity to environmental and energy issues has spread and developed; on the other hand, many choices are still not shared by all political parties, hindering the process in its complexity. Finally, the importance of cultural policies and good communication practices to encourage behavioural change is highlighted. On the latter topic, some experts have referred to a conflictual situation regarding the tendency of governance to de-responsibilize itself and hand over its competence to citizens.

These first elements introduce some useful reflections in relation to research objectives; first of all in terms of skills, it is necessary to reflect on the changes in the energy market and discuss the aspects related to the forms of digitisation. In addition, it seems appropriate to look at the mechanisms for the functioning of new small enterprises entering the market. Finally, the role of governance actors at the different levels needs to be explored further.

EDUCATION, TRAINING, CAREER

Looking at the necessary trajectories in terms of education, the profiles and careers involved in the transition process, the long-standing role of the hard sciences persists. The profiles most requested and socially perceived as prestigious are very technical ones, mostly digital engineers and technicians. However, most of the interviewees in different forms affirm the plurality of areas invested by the issue of ET, referring to the importance of the role of the professions related to the economic, managerial, financial, administrative and communicative field. More specifically, almost everyone agrees that universities provide a good knowledge base in their educational path, but that skills develop on other levels of training.

The most recent assessments of gender workforce imbalances suggest a wider gap in the energy sector than in other large industries, our findings confirm the trend – with a small difference between the fossil energy sector from renewables, where a slightly higher percentage of women are employed. Although, respondents say they have many female colleagues, but few of them in management roles. Gender roles are therefore confirmed as a critic analytical dimension that opens new research questions, on which it will be necessary to activate new tools to deepen their importance. The key question persists as to how we can encourage women to adopt and pursue jobs in the energy sector and, in general, how the existing 'skills gap' as a whole is treated.

Finally, respondents are often reminded of the scarcity of training courses focused on the issue of sustainability in the academic field.

INVOLVEMENT IN THE ENERGY TRANSITION FIELD

The growing debate on climate change and environmental issues alone does not seem to animate public participation. It appears to be very weak, although the collective perception of it seems to be increasing. At the same time, much emphasis is placed on the role of some citizens' associations that are able to animate local communities by providing them with an important knowledge, both in terms of behaviour and regulation. Citizens are portrayed as main actors in the energy transition process, but their actions need to be informed. It is therefore necessary to increase the forms for the dissemination of knowledge in the energy field. Expand new tools to strengthen communication and circulation of positive narratives and good practices.

At the same time, some respondents stressed the fact that while consumption and habits of citizens can certainly influence environmental issues, the management of markets and political agreements play a more decisive role.

In short, many people are calling for synergy between local communities and governance. The greater involvement of citizens in decision-making processes can be transformed into a channel of

information for increased awareness and therefore also into a stronger propensity to take action in order to adopt behaviour in favour of the environment.

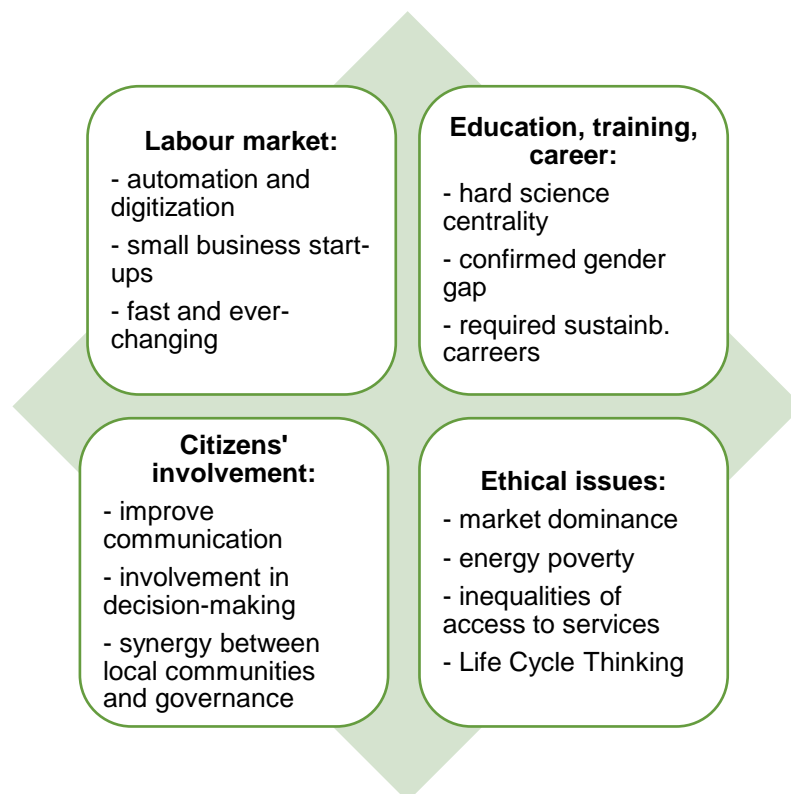
ENERGY TRANSITION AND ETHICS

Many interesting points of view have emerged on the relationship between ET and ethical issues, first of all the difficulties of political actors in translating the objectives set at the supranational level into political instruments. The dominance of the market is underlined in the choices and guidelines of governance which – according to many – does not look at the real needs of the populations and the common good.

In addition, there is a need to diversify the perspectives of analysis on ET issue, shifting the focus away from the problems of the North in order to pay more attention to issues such as energy poverty, inequalities of access to services, for a framework of social equity and geopolitical equity.

A systemic vision that expands the boundaries of what has to be taken into consideration is often recalled, evoking the centrality of an approach based on "Life Cycle Thinking", i.e. thinking about the whole life cycle, in which to associate to process the consideration of local impacts limited in space and time and, at the same time, all the other impacts that derive from the supply chain.

Many conclude by calling for greater energy democracy that can be translated into fair global policies, questioning the current systems of exploitation of different areas of the globe.



3.3 Ethnographic account

In the wide and varied bouquet of renewable energy sources that the European Union has adopted to implement the principles of the energy transition, very different technologies have been used, often, over the years, developing a gradual hierarchical process. While some are widespread and

enjoy wide public support, others are still rather unknown, and relegated to a decidedly marginal niche.

This is the case of heating and cooling systems powered by low-enthalpy geothermal energy (LEGE). The latter, in fact, are widespread in the national territory in a way that is anything but homogenous, not only because of the geological characteristics of the *subsoil*, which in reality, in terms of energy, are almost similar everywhere, but, rather, for some variables of socio-cultural and political nature that characterize the *soil*.

Through research carried out directly in the field in various Italian regions, including the Marche, Campania and Basilicata, and with the help of digital information sources for Tuscany, Molise, Puglia and Calabria, the Anthropological research has highlighted how much the development of this sector is subordinated not only to the technological aspects, connected to an adequate knowledge of the salient characteristics of the plant engineering, and economic framework, related to the evaluation of the construction and management costs of the plants, but also to those of an ethical and moral nature.

During the research, the close relationship with the designers (engineers, architects, geologists and surveyors), the technicians and also with the installation companies, public officials and real estate agencies responsible for selling in the new buildings, and finally with the populations directly affected, has highlighted.

On the one hand, the presence of a pernicious cognitive traffic jam, which does not enhance the various technical skills but puts them in competition in some way and, on the other hand, a negative economic and technical-scientific reductionism, which obscures the intangible component, are the most relevant characteristics. Therefore, if an adequate public policy of training, financial support and tax exemption can be strategic for the dissemination of geothermal energy, the consolidation of a targeted action towards a new culture of sustainability is equally decisive.

The issues of clean energy and the reduction of the ecological footprint are now guiding a substantial part of the real estate market; so, it is useful to move in this direction, so that the energy transition is not only a matter of economic convenience and profit, but also of ethical value.

The spread of geothermal energy, therefore, requires the development of a socio-cultural context (the *soil*) in which the transition to clean energy is charged with moral and ethical added value. While in the past it was difficult to go beyond economic rationalization, recent ecological crises have opened an important passage in which moral policies that favor the introduction of important energy innovations can find a proper place.

Hence the importance assumed by specific training and awareness policies, of which trade associations, local authorities, universities, etc. must be protagonists.

4. Future developments

In conclusion, with the assumption that a good design practice should interpret the needs of a local community, in order to address new policy trajectories aimed at activating new lines for ET, we can conceive as crucial a deep discussion on the concept of transition in a perspective able to understanding its polysemic nature. It is necessary to look at the geographical space keeping in mind its dynamism, which translates into anthropic reifications, geographical specificity, nature, social relations and lived place.

The first indications, that emerged from this preliminary interpretation of the visions perceived by the stakeholders involved in the research, are already able to suggest some thoughts to better calibrate the next research activities.

Further (potential) developments:

- 1) We have to complete the administration of questionnaires in order to get the designed sample size and a good representativeness of all the stakeholders typologies.

- 2) Given that most data refer to Mediterranean Stakeholders, one research task could be to compare these stakeholders to West-European Isles and Nordic actors when their answers will be available.
- 3) To Compare how similar/different are the priorities, ideas and point of view of stakeholders belonging to different disciplinary fields, different position within companies and with a different age.

Stay tuned to see the results or, even better, join us to expand our study!

To help us with the questionnaire, please link to: <https://it.surveymonkey.com/r/3T7VZQ3>