A holistic and Scalable Solution for research, innovation and Education in Energy Transition

D2.5 Final Report on Societal Challenges

Work Package	WP2 Training needs identification and societal aspects
Author (s)	Annamaria Zaccaria, Dario Minervini, Fabio Corbisiero, Enzo Vinicio Alliegro, Ivano Scotti, Ilaria Marotta, Elena Musolino, Rosanna De Rosa (UNINA)
Quality Reviewer(s)	Emin Aliyev (EASE), Sara Verbeeren (ECOPOWER)
Version	Final
Due Date	30/04/2021
Submission Date	30/04/2021
Dissemination Level	Public

Funded by the Horizon 2020 Framework Programme of the European Union under Grant Agreement n. 837854

Document History

Version	Date	Change editors	Changes
0.1	16/04/2021	Rosanna De Rosa, Ilaria Marotta (UNINA)	Shared initial draft with consortium for comments and feedback
0.2	23/04/2021	Emin Aliyev (EASE)	Peer review feedback
0.3	26/04/2021	Sara Verbeeren (ECOPOWER)	Peer review feedback
0.4	29/04/2021	Ilaria Marotta (UNINA)	Incorporated peer review feedback and prepared version ready for final QA check.
1.0	30/04/2021	Nadia Politou (ATOS)	Final quality check and submission to EC.

Executive Summary

Energy transition 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 of facts (objectivity, techno-science) is tightly intertwined with the “soft” one of values (subjectivity, politics). 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.

The social science approach aims to explore the “hybrid world” of energy transition retracing the connections between a) the hard side (objectivity, techno-science, materiality) and b) the soft side (subjectivity, politics, values). The involvement of the fields of Social Sciences and Humanities (SSH) aims 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.

In the framework of task 2.1, the research along two directions/strands already started and will be followed:

- Societal challenges in the energy sector
- Energy transition and green skills

The main research findings are the following:

- The future of the energy transition is small, decentred, democratic, inclusive, redistributive, smart.
- Universities and public agencies are expected to lead and promote this prefiguration.
- Old (hard/technological) skills are confirmed, SSH is welcomed, new disciplinary dialogues need to be practiced.
- Interdisciplinarity is warmly claimed but challenging (both theoretically and practically).
- Institutions have to learn how to know social networks and trust dynamic work in their communities.
- Gender is formally claimed but not actually addressed as a relevant priority in/for educational systems.

Table of Contents

List of Tables

List of Figures

List of Acronyms

Abbreviation / acronym	Description
ET	Energy Transition
STEM	Science, Technology, Engineering and Mathematics

1. Introduction

1.1 Purpose & Scope

The purpose of this document is to provide the results of the research conducted on the social aspects of the energy transition. First, this paper provides a theoretical framework of the energy transition at the European level, then provides a better understanding of the research design and data collection techniques. Specifically, each paragraph is dedicated at presenting the results of each research technique used, ending with the triangulation of all the work.

1.2 Structure of the deliverable

This deliverable follows the classical structure of a research project according to the methodology of the social sciences. In the first place, the question was addressed starting from the definition of the policy framework (chapter 2). Then, the research lines and questions are defined and explained in order to highlight the main directions of the research agenda and its objectives (chapter 3). This chapter also presents the characteristics of the sample reached, the stakeholders interviewed, the dimensions of the focus groups. Finally, the ethnographic research and the limits deriving from the spread of the pandemic condition from Covid-19 are illustrated. Chapter 4 is entirely devoted to the results of social research. Chapter 5 elaborates the conclusions, through a triangulation of the results. References are listed at the end of the document.

1.3 Relation to other WPs & tasks

This deliverable concerns the work performed in the two years of social research. The deliverable aims at providing the results on knowledge, skills, and professionalization of the experts operating in the field of the energy transition and finding on the mismatch between the profile of experts and actual skills required by energy transition projects. For these aspects, it is strongly connected to T2.2 Skill shortage, training and education needs and to the work carried out in WP3 (T3.2, T3.3).

2. Policy Framework

The energy transition (ET) is a pathway towards transformation of the global energy sector from fossil-based to zero-carbon by the second half of this century. At its heart is the need to reduce energy-related CO2 emissions to limit climate change. Decarbonisation of the energy sector requires urgent action on a global scale, and while a global energy transition is underway, further action is needed to reduce carbon emissions and mitigate the effects of climate change. Renewable energy and energy efficiency measures can potentially achieve 90% of the required carbon reductions. The ET can serve as a tool to track countries' performance and readiness as well as to identify energy systems' strengths and improvement areas, business opportunities and threats.

Social sciences 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.

Social Sciences 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.

There are several major findings from the ET that social sciences are studying on territories:

1. Over the last five years, more than 80% of countries improved their energy systems, but further effort is needed to resolve the world's energy-related challenges. Particle emission levels deteriorated in more than 50% of countries, carbon intensity stayed flat and energy productivity improved by 1.8% per annum, falling short of the 3% per annum threshold believed to be required to meet the "Paris climate change agreement".
2. Security and access remains the area with the biggest gap between highest- and lowest-performing countries. Almost all countries without universal electricity access have seen progress. However, at the global level, the absolute number of people without access still exceeds one billion. Household electricity prices have been rising in real terms since 2013 in more than one-half of countries globally, despite an overall fall in primary fuel prices. These developments increase pressures to improve the affordability of energy.

Countries follow different transition paths and need to develop country-specific roadmaps.

For instance, countries with high performance and most enablers in place have led the improvement in environmental sustainability, while countries with relatively low performance or readiness narrowed the gap in security and access, and economic development and growth.

Countries are encouraged to benchmark themselves against comparable peer groups (e.g. geographies, development status, energy trade balance) to identify good practice examples and develop suitable improvement levers, applicable to their circumstances.

Energy importing economies showed higher transition readiness levels and benefitted more from the lower energy prices of the last five years. Out of these countries, some of those with lower performance levels (e.g. People's Republic of China or Kenya) established a working ecosystem of enablers, including strong regulations, infrastructures and an innovative business environment, which helped them attract investment for future improvements.

Further issues of ET to reconceptualize the key questions in energy policy in terms of socio-energy systems change have emerged from "ASSET" survey. These dimensions are related to some specific

aspects of energy policy development as problems of socio-energy systems design and develop recommendations for rethinking energy policy and governance in the context of socio-energy systems transitions.

In addition, the results of ASSET social research are close to what the European Union aims to set, particularly to the European Green Deal (EGD) and in the most recent Next Generation EU (NGEU). The EGD indicates policies to reach the target to make Europe climate neutral by 2050. It requires decarbonizing the EU energy system by energy efficiency, developing a power sector based mainly on renewable resources and implementing a fully integrated, interconnected digitalized EU energy market. To achieve these goals, the EU defined a finance plan and included the Just Transition Mechanism (JTM) to ensure that no one will be left behind. The JTM addresses the transition's social and economic effects, focusing on the regions, industries, and workers who will face the most significant challenges. The JTM offers to authorities and beneficiaries support to funds and opportunities to promote the transition but also to avoid that most carbon-intensive industries and their workers, for example, will suffer from the green revolution. Specifically, territorial just transition plans will define the territories in which the JTF will be used through a dialogue with the Commission, opening the doors to finance the more coherent social-territorial initiatives. The plans should facilitate employment opportunities in new sectors and those in transition, offering re-skilling opportunities, investing in fighting energy poverty and promoting access to clean, affordable and secure energy.

The NGEU, to support member states hit by the COVID-19 pandemic, also define a specific climate action that reinforces EU effort in compliance with the Paris climate accord in line with the objectives of the EGD to address the climate emergency.

These initiatives will be more successful if they can activate cooperative processes with local communities and citizens. In this sense, European funds should also strengthen the soft skills needed for a communication process that enables participation and cooperation. In this effort, public authorities (national and territorial) must also adopt a multidisciplinary approach to the problem of transition and foster participatory dynamics within their structures and between political institutions and the market and between institutions and citizens.

3. Research design

As anticipated in deliverable D2.1, the construction and design of the research techniques and the assemblage of the overall methodology have been continuously inspired by a co-production orientation, through the involvement of the ASSET partners. Similarly, the research activities have involved a wider population among stakeholders, techno-scientific (and professional) communities, learning communities, institutional actors and decision-makers, local populations "dwelling" the energy transition.
The research has been carried out through both quantitative and qualitative techniques.
A stakeholders and expert survey at a European level has been held in order to investigate two main focus areas of inquiry: a) the policy frameworks of energy transitions and b) green professions and educational needs.
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 have been designed taking into account the findings of the survey and have addressed the following analytical focuses: energy transition "in action and practice"; values, knowledge, ethics and social legitimation of energy transition.
However, the management of social research has undergone significant changes due to the spread of Covid-19. This has made it impossible for researchers to carry out "field research".
The results achieved and the changes made to the initial idea will be presented in the following paragraphs.

3.1 The survey - *the construction of the sample*

The ASSET survey on social aspects of energy transition has led to the collection of 140 questionnaires during the period January-October 2020. We consider only the questionnaires that have been completed at 100%, with no incomplete or missing answers (for another 63 questionnaires the answers do not reach 30% completion and therefore are not considered valid for processing).
According to the multi-level perspective (MLP), see deliverable D2.1, the following type of stakeholder is considered:

- Market and Users: an association of energy companies (supply and/or produce enterprises), an energy cooperative association, two consumer associations, two citizen associations (i.e., grassroots organizations built up to face specific energy-environmental issues), one association of large energy users (i.e., intensive industrial energy consumers);
- Industrial networks: relevant manufacturers of green energy technology (wind turbine, PV panels, etc.) and associations of those, Trade Unions (manufacturing sector), associations of SMEs and of engineers (on energy related sector);
- Policy and Administration: association of cities and of little communities, national agencies on energy sector;
- Infrastructure managing agencies/authorities: national and local agencies of energy transmission and dispatching, local grid operators.
- Cultural agencies: environmental associations, students associations (from high school to university and PhD), heads of high schools focused on sustainability issues & green energies, environmental journals editors.
- Science and technological actors: private and public research centres in the energy sector, start-ups, heads of university departments focused on sustainability issues.

Furthermore, in accordance with the scientific literature on the varieties of capitalism which underlines a coherent relationship between the paths of the energy transition underway with the same varieties of capitalism, four types of capitalism can be identified:

- Continental (i.e., Belgium, Germany, France, Austria, Holland)
- Mediterranean (i.e., Spain, Italy, Greece, Portugal)

- Nordic (i.e., Denmark, Sweden, Iceland, Finland, Norway)
- West-European Isles (i.e., Ireland, the United Kingdom).

From the combination of the typology borrowed from the multilevel perspective and from the areas relating to the varieties of capitalism, 24 possible crossings emerged.
For each of them it was decided to reach 7 answers (in accordance with Deliverable D2.1). As established through the research design, some ASSET partners were involved in the administration of the questionnaires.
Specifically, these are: ènostra for "Policy and Administration" and "Market and customers"; Logical Soft for "Industrial networks"; Ecopower for "Infrastructures managing agencies"; and, finally, UNINA for "Cultural agencies" and "Science & technology actors".
Due to the outbreak of the pandemic in the first months of 2020, and the consequent upheavals, in order to reach the stakeholders, we asked our partners of the ASSET project to identify their stakeholders for the purpose of completing the questionnaire.
Let's see the distribution of the sample reached with respect to the type of actors and geographical area of reference identified in Deliverable D2.1.

Geographic area	Field of competence of your organization						Total
	Cultural agencies	Industrial network	Infrastructures managing agencies	Market and customers	Policy and administration	Sciences & technology	
Continental	1/7	7/7	7/7	5/7	6/7	10/7	36
Mediterranean	6/7	9/7	11/7	10/7	10/7	19/7	65
Nordic	-	2/7	7/7	1/7	1/7	8/7	19
West-European Isles	-	2/7	7/7	6/7	4/7	1/7	20
Total	7	20	32	22	21	38	140

Table 3.1 - Sample of stakeholder for socio-economic & institutional contexts

As can be seen from the table, not all the quotas foreseen in the deliverable by D2.1 have been reached. But considering the pandemic conditions, all the questionnaires totally completed are used.
For this reason, the sample we have built is of a non-probabilistic type. Due to this, the survey makes no claim to generalize our results to the whole sector. The characteristic of this sample is that it reflects the relational circuits of the project partners.

4. In depth-open interview

On a general scale, from the qualitative side, an ethnographic account of the energy transition "in action" has been used to observe apparatuses and stakeholders from different points of view and a comparative approach.
This research technique has been designed and used to involve experts and, in general, key informants that will be able to reconstruct some pivotal features of the energy transition, both in terms of socio-technical practices and in terms of diachronic processes. This technique of data collection is based on a very unstructured procedure. Indeed, the tool aims in a "general direction" and it consists of a list of narrative items to be investigated by a dialogical approach. This narrative / dialogical strategy of data production has helped to explore both the issues that were detected ex-ante by the researcher, and the arguments and emphases emerging from the interviewed experts. In other words, this technique does not "suppress" respondent initiative because of the asymmetric relationship between the subject (researcher) and the object (interviewed). Key informants have guided the researchers within the cultural and semiotic space of the energy transition.
Our interview campaign involved twenty respondents who we defined as "experts" on the topic of energy transition. Our interviewees have different profiles and are all interested in the

multidisciplinary dimension of energy. In the following table (n. 1) you can read the details of the respondents' affiliations and professions.

Cod.	Qualification
I.01	Professor of Chemical Engineering - University of Naples "Federico II"
I.02	Professor of Sociology of the Environment and Territory - University of Padua
I.03	Secretary General ANEV - National Wind Energy Association
I.04	Professor of Architecture - Department of Architecture - University of Naples "Federico II"
I.05	Researcher - Department of Industrial Engineering - University of Naples "Federico II"
I.06	Professor, School of Science and Technology, Hellenic Open University, Patra, Greece
I.07	Researcher - RSE, Research on the Energy System
I.08	Advisory board, Professor of Economic Sciences - University of Naples "Partenope"
I.09	Sociologist - Scientific responsible for the Energy Development and Innovation Area FDV - Giuseppe di Vittorio Foundation/CGIL
I.10	Economist, Post-doctoral Research Fellow in Environmental/Resource/Marine Economics, University of Greenwich
I.11	Architect, Researcher - National agency for new technologies, energy and sustainable economic development - ENEA, Parma
I.12	Professor, Department of Mechanical, Energetic and Management Engineering – University of Calabria
I.13	President of the European federation of citizen energy cooperatives- RESCOOP
I.14	Managing Director - GEATECNO (BA) and President of the "New Energy District of Puglia Region
I.15	Director of Territorial Planning and Landscape Service, Department of Territorial Government and Environmental Policies, Abruzzo Region
I.16	Environmental historian, Director of the Environmental Humanities Lab at the Royal Institute of Technology, Stockholm
I.17	Topographer, owner of wind farm (Bisaccia, Avellino)
I.18	Nuclear Physicist, Neutral Beam Coordination Officer at ITER Organization, Saint-Paul-lez-Durance
I.19	PhD researcher, School of Geography, Faculty of Earth & Environment, University of Leeds
I.20	Policy adviser for Industry, Research, Energy and Environment (ITRE- ENVI), European Parliament

Table 3.2- List of Interviewees

The interview guideline is designed along the following analytical dimensions:

1. Energy transition and labour market
2. Education, training, career
3. Involvement in the energy transition field
4. Energy transition and ethics.

5. Focus group

Another level of qualitative research involved the use of focus groups. By placing the observer in a different point of the socio-material assemblage enacted by and within the energy transition, we have tried to retrace epistemologies and logics of action behind a policy decision. The output of the analysis consists of an account of how the social legitimation of energy transition is shaped and claimed. Two focus groups using in-depth open interviews with corresponding stakeholders were put in place in order to correctly inform the ASSET project in-action.

We designed an outline – see annex no.3 – to conduct the focus groups to get information from the participants and discussion among them, around their experience in relation to the topic of energy transition, asking about: the relationship between professionalism and energy transition, the motivations behind one's work and the changes experienced in one's work environment, the profiles involved and the interactions with other actors (e.g. institutions, associations, etc.), on skills, gender role differences, and the involvement of territories. Finally, we elaborated together a SWOT analysis – a strategic planning technique used to identify strengths, weaknesses, opportunities, and threats related to project planning – focused on a hypothetical energy transition project.

3.4 Ethnographic research

As is known, the ethnographic investigation is based on the close relationship that the researcher builds with the people who live in the territories that have been selected for the study.
The design of the research is completed by the ethnographic method, with the aim of enter and understand the local world and analyse in depth the elements that favour or slow down and block cultural change, specifically related to the transition process.
In the exploratory phase of our qualitative research, we looked at the experiences and initiatives that responded to the specific objectives of our project:

- to create a community to involve the main actors in the transition process energy;
- to define a conceptual framework to simplify and accelerate the creation of new learning modules and updating of already available programmes;
- developing innovative programmes for the training of students, trainers, workers and citizens;
- promote interdisciplinarity in research, innovation and education services;
- strengthen collaboration between universities and industry;
- support teachers and trainers.

First of all, we turned to our territories and the properties expressed in them and we have started to collect and identify documentary sources on three possible ethnographic focuses that we will try to summarise as follows.

1: Smart Island: the case of ISCHIA

"Smart island" is an Italian project funded by the Ministry of Education, University and Research (MIUR), coordinated by the Atmospheric Pollution Unit of the National Research Council (CNR) in the period between 2014 and 2016. The initiative aimed at finding solutions to increase the energy, economic and environmental efficiency of the entire system of production, management, distribution and use of resources in the smaller Italian islands. The island's energy system is strictly dependent on the continental electricity grid, and its consumption is mainly electrical and for the most part associated with the residential and tertiary tourism sector. The seasonality of tourism leads to anomalies and the inefficient organisation of energy storage and distribution produces very high costs, to which are added the difficulties related to the waste and water cycle. The project therefore intended to focus on the implementation of the energy requalification plan for the islands involved, with particular attention to the involvement of local communities, thanks also to the support of Legambiente.
Ischia was on the list of recipients of the project, and we started to collect some information through the network about its involvement.
In the first exploratory phase of our ethnography, we collected some newspaper articles about the start of the project, a resolution of the municipal council (n. 116, 2014-11-20) approving the project proposal and co-financing according to a budget change, and finally we collected further information through the social media, subsequently making the first contacts on the island.
We carried out three exploratory interviews (a town councillor, a local journalist, a person involved in projects in schools on the island), discovering that in fact, despite an initial involvement of the island of Ischia within the "Smart Island" project, later the attention of the CNR coordination had shifted to another case - probably also due to the lack of concrete involvement by both the municipality and the project partner association.
This information was confirmed to us by the coordinator of the CNR project working group, the project was concentrated only on the island of Lampedusa. A first comparison was made with the island of Ischia for the replicability part of the results, but the activities did not continue.
In any case, through our research activities, we have succeeded in reconstructing the problematic picture of the island, which focuses on two main themes: the seasonality of tourism and the road network.

To date, it would seem that the issue of energy transition tends to be absent from the debate on the local political agenda, if not sporadically linked to the issue of public transport and possible incentives.

2: San Lorenzo Bellizzi and the Covenant of Mayors for Climate & Energy

Since 2014-07-22 – date of formal approval – San Lorenzo Bellizzi, an Italian municipality of 572 inhabitants belonging to the province of Cosenza and located in the Pollino National Park, is a signatory of the "Covenant of Mayors for Climate and Energy". The strategy of the action plan is summarised as follows:

> The municipality of San Lorenzo Bellizzi joined the Covenant of Mayors on 3/07/2013. The objective of the municipality is to prepare its SEAP and reduce 23.70% of the CO2 emissions. In SEAP of San Lorenzo Bellizzi main lines of action to be taken in the time period 2014-2020, are: 1) ENERGY EFFICIENCY IN PUBLIC AND PRIVATE sector, 2) PROMOTION OF RENEWABLE ENERGY. Actions of SEAP are 21. It divided into two categories: a) actions direct and indirect. The actions direct are those that are directly implemented by the municipalities. The "indirect" actions are those whose implementation depends on other market participants such as tertiary sector[1].

The mayor, now in his second mandate, has managed to produce 15 megawatts of electricity from photovoltaic panels installed on greenhouses, so as not to land grabbing from agriculture. He has managed to secure a revenue of 90.000 euros per year, with which he has cut a large part of the municipal taxes.
In this case too, we collected documentary sources through the network and conducted an exploratory interview with the mayor of the village.
Its activity continues and has exceeded 40% of co2 emission reduction in its country. In addition, it has launched a number of projects to restore the country's building heritage, promoted a number of initiatives in support of the local community, and launched a protocol to reimburse public transport tickets for high school students, who are forced to commute. Today it is starting the expansion of photovoltaic systems on the roofs of other municipal buildings (school, hostel, former slaughterhouse).
In fact, he concludes that he was guided by the opportunities offered by the incentives derived from energy transition regulations, which otherwise probably would not have been at the centre of his political agenda.

3: ComESto the Community Energy Storage

In addition to a documentary review, useful for understanding the observed setting, in order to continue our research activities, we would have had to carry out the following steps of ethnographic research: a first level is based on direct interactions between the scholar and different people in their real-life environment; the second level of analysis that concerns the possibility of obtaining information through direct observation. It is clear that the Covid-19 emergency has compromised this part of the research, substantially precluding access to the field, as a result of the travel bans imposed by the government.
At this point we had to rethink what could be cognitive tools to be applied in order to be able to track down a review of experiences in which the planning, the realization and the fruition of the renewable energy plants support the participation of local communities, according to different models of involvement.
So, we decided to look at what we named the "transition agencies", i.e. to intercept the "nodes" within which the transition projects underway at both national and international level converge.
Below is a list of the platforms from which we have started to intercept the projects that come closest to our research objectives and from which to reconstruct the indications for the creation of useful tools for sharing the knowledge and skills needed to face the challenge of the Transition.

[1] https://www.pattodeisindaci.eu/about-it/la-comunit%C3%A0-del-patto/firmatari/piano-d-azione.html?scity_id=17307

For reasons related to the epidemiological crisis generated by the famous Pandemic Covid-19 it was not possible to proceed as planned. This completely unexpected novelty, which characterized 2020, has denied obtaining large information for this section of our project.
Therefore, initial considerations arising from short field surveys must be considered provisional. However, some hypotheses are possible.
For the development of renewable energies, it is important that a strong alliance is created between the economic dimension and the cultural dimension. From a series of surveys carried out when the pandemic had not yet broken out, it emerged that energetic innovation is blocked or favoured both by utilitarian considerations (economic rationality) and by ethical considerations (moral rationality).
In this context of blocked choices, or suspended selection, technical knowledge can be useful. Furthermore, the informative action carried out on several levels would be very important.
In a socio-cultural context in which good deeds are not publicly exalted, behaviours are unlikely to follow virtuous methods. Rather, it is important to form a new conception of citizenship that is even better able to grasp and to understand the signs of climate change and the role of everyone for the future of the next generation.

4. Results

4.1 European survey

4.1.1 Respondent's preliminary information

The sample consists of 78 men, 40 women and 22 opted for the answer "prefer not to say".
The average age is 41,5 years old. The minimum age is 23 while the maximum age is 71; 50% of central observations are between 42 and 58 years old.
The nationality of the respondents to our survey is really very diversified and refers to European and extra-European countries[2]. This data suggests that the energy transition is an interactional sector. The most represented education qualification is a very high one, as a PhD title or a Post-Master degree (85 interviewed), followed by bachelor's degree or equivalent (with 44 answers).

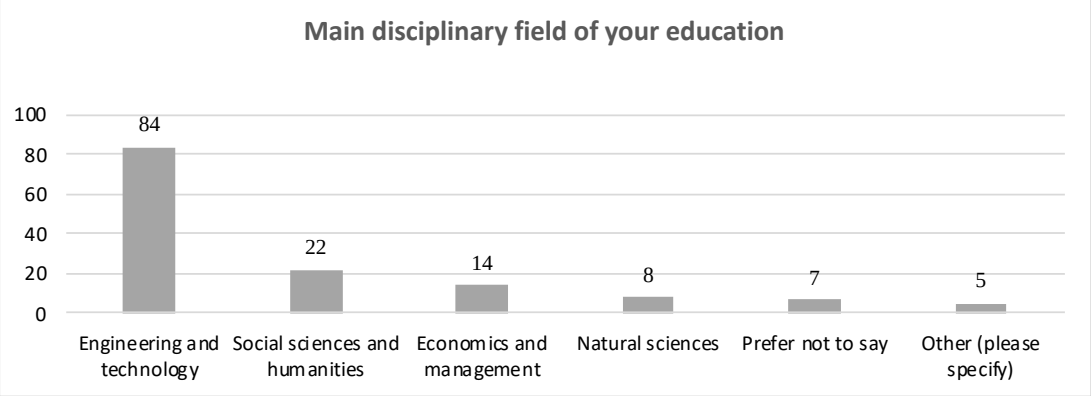


Figure 4.1- Main disciplinary field of education of respondents, frequencies

The main disciplinary field of education of our respondents is "Engineering and Technology" (84 of them). The Social Sciences and Humanities follows with 22, then there is Economics and Management with 14 and 8 for Natural sciences.
These results show, on the one hand, that while the prevalence of hard sciences in the energy management sector is still true; on the other hand, an interdisciplinary approach to the energy transition is needed. Indeed, as we will see throughout these pages, our stakeholders argue that it is important to try to put together a great mix of subject areas that come from both the STEM and SSH sector in order to achieve a full transition.
It seems interesting, at this point, to understand how the level of education is combined with the disciplinary sector. It is certainly relevant that, in our sample which has a very high level of education and a greater predominance of the technical and engineering sector, among this profile 28 respondents declared that they have a bachelor's level of education. Among social scientists, on the other hand, more are those who have indicated a PhD or master's degree.

[2] In detail, all the nationalities indicated are: Algerian (1), Australian (1), Austrian(1), Belgian(15), British (8), Chinese (2), Croatian(1), Danish(1), Filipino(1), Finnish(4), French(5),German(8), Greek(12), Holland(2), Icelandic(1), Indonesian(1), Iran(1), Irish(3), Italian(26), Mexican (3), Pakistani(3), Portuguese(7), Romanian(1), Saudi(1), Spanish(16), Swedish (7), and finally 8 opted for the answer "prefer not to say".

	Lower than high school degree	High school degree or equivalent	Bachelor's degree	PhD, Master, etc.	Prefer not to say	Total
Economics and management	0	2	5	7	0	14
Engineering and technology	0	1	28	55	0	84
Natural sciences	0	1	3	4	0	8
Social sciences and humanities	0	1	7	14	0	22
Prefer not to say	1	0	0	1	5	7
Other (please specify)	0	0	1	4	0	5
Total	1	5	44	85	5	140

Table 4.1- Combination of level of education with the disciplinary sector of respondents

What about the characteristics of the organization from which our respondents belong?
The first level considered regards the type of organization.
Among stakeholders, 46 of them are involved in the private sector, such as companies of private professional activities; 41 are in the public sector, such as public administration or public authorities. Third sector (NGO/Unions) is represented by 34 interviewed and 11 for Public-private partnership.
For what concerns the organization sectors, it is mainly energy production (i.e., energy supplier), followed by Manufacturing industry (i.e., assembling & installing industries, R&D, operation and maintenance) and education agencies (i.e., schools, universities, etc.). Only 9 belong to the civil society category which includes i.e., student associations, grassroots movements and 4 from consumption (i.e., an association of consumers).

Figure 4.2 - Sector of organization of respondents, frequencies

The main level of action of such organizations is the national one (44 answers), followed by regional (28), European (28) local (24) and international/global ones (16). The most represented position inside the organization-chart is Technical and admin staff with responsibilities (34 answers), for example professional, admin assistant, etc., a management position with high responsibilities within the company (department chief, area officer, etc). Then there are 28 employees and activist members of cooperative or association (7).
Thus, from the top management to the bottom of the company, in this sample all the different levels are well represented.

In order to be able to visualize the characteristics of the respondent's organization on a factorial level, the MCA[3] (Multiple Correspondence Analysis) factorial technique was used. As an additional variable, to better discriminate the answers, the variable "your position" was used.

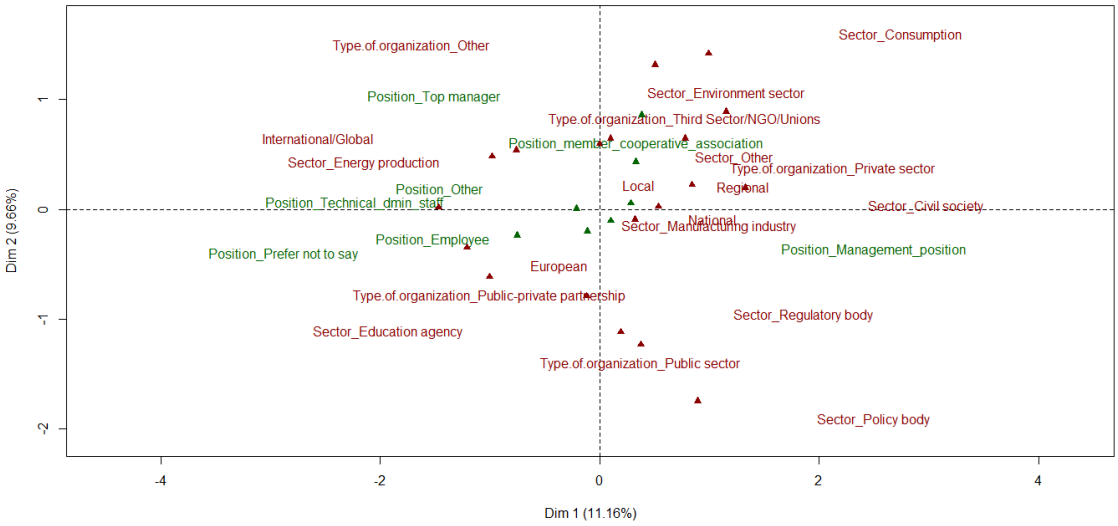


Figure 4.3 - Factorial map with characteristics of the respondent's organization variables

First component splits different sectors (on the left education and energy, on the right all the others). Second component splits both sectors (policy in bottom position, consumption high as y value) and type of organization (other, environment and third sector in the upper part, in the bottom part public sector). Overall, the factorial map shows a pattern with most environment related frameworks that are linked to the cooperative sector, while the public sector (maybe more "traditional") is in the bottom part.

You can find below a table of the prevalent profile of the interviewees:

Socio-structural dimensions	**Gender**	Man
	Average age	41,55 years
	Education	PhD, Master, etc.
	Main disciplinary field of education:	Engineering and technology
Organization featured by	**Type of organization**	Private sector
	Sector of the organization	Energy production
	Multilevel-governance position (main level of action)	National (20)
	Position in the organization	Technical and admin staff with responsibilities

Table 4.2 - Prevalent profile of respondents

[3] The ultimate goals of an MCA are mainly to obtain groups of individuals characterized by a similar profile in the responses and to evaluate the association between the categorical variables.

4.1.2 Overview on energy transition

Several dimensions have been investigated about stakeholders' opinions on energy transition's 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.

Small scale distributed system (roof-integrated solar panel) shared 73 answers and a big scale concentrated system (concentrated solar power) was indicated by 58 stakeholders.

As can be seen from the table below, the responses by Mediterranean area are equally divided between big scale and small scale. While the continental area is instead characterized by Small scale distributed systems (roof-integrated solar panels); the same also applies to the Nordic area. While for the West-European Isles the big scale concentrated systems (concentrated solar power) dimension prevails.

	Big scale concentrated systems	**Small scale distributed systems**	**Other**	**Total**
Continental	11	23	2	36
Mediterranean	30	30	5	65
Nordic	6	12	1	19
West-European Isles	11	8	1	20
Total	58	73	9	140

Table 4.3 - Combination of geographic area and type of scale concentrated systems

The most relevant categories are[4]: Energy production System (solar, wind, hydro) with 103 answers, followed by Energy efficiency/reduction (51) related to net zero buildings, heat pumps, cogeneration. The last two options are: energy management (smart grids, energy districts) and Energy storage, related to electrical and thermal.

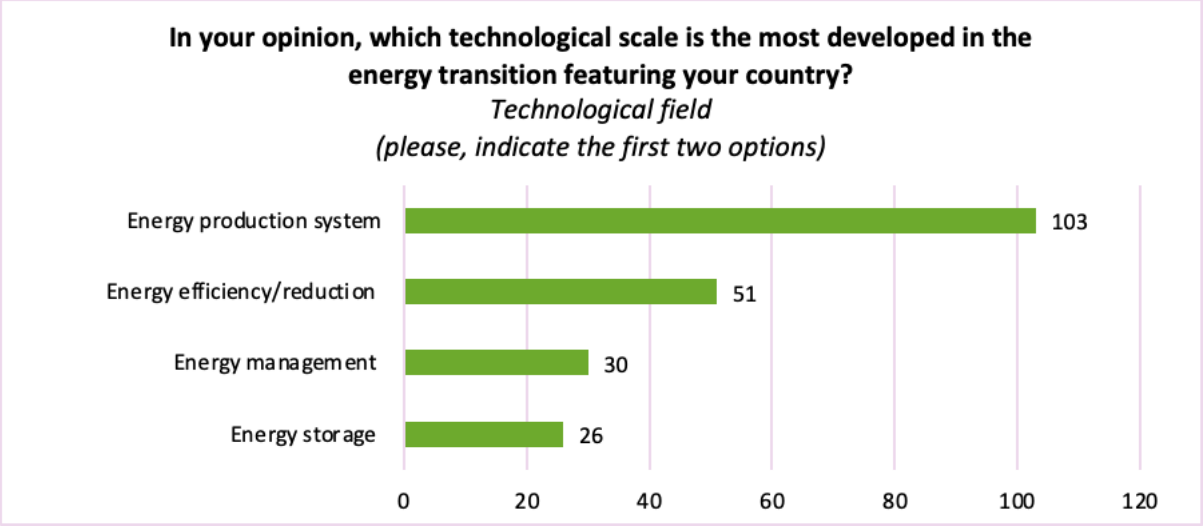


Figure 4.4 - Technological scale developed?

Also, in this case a multidimensional analysis (ACM) was carried out using the variables "In your opinion, which technological scale is the most developed in the energy transition featuring your country?", and as an additional variable relating to the geographical area.

[4] For this question each respondent had the opportunity to indicate the first two options more relevant.

First component splits, first of all, small scale and big scale systems. Second component splits energy systems, with efficiency reduction in the upper part, and storage, management and production system in the part below, closely related to the big scale system. It is clear that the first group (small scales) is more related to Mediterranean and Continental geographical Area, while big scales is related more to Nordic and West-Europe.

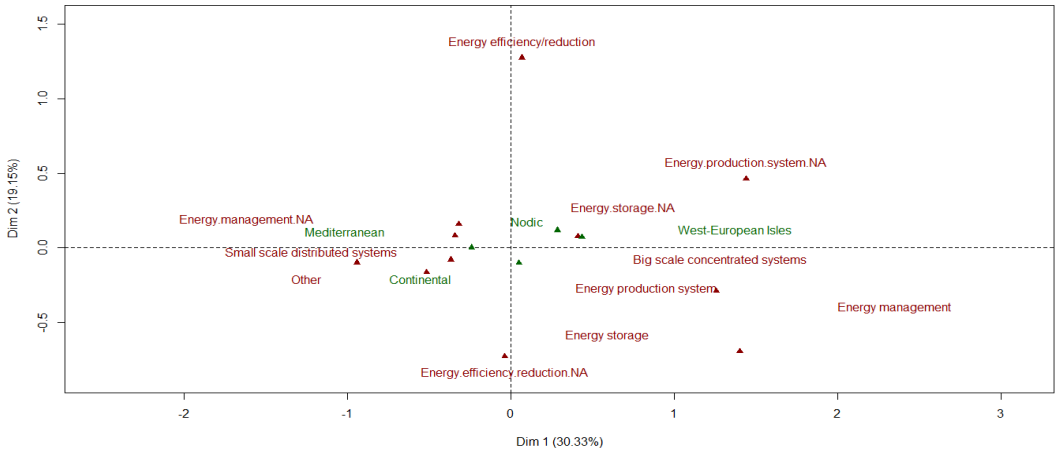


Figure 4.5 – Factorial map technological scale and geographic area

Respondents think that in the next 5 years it will be crucial to develop small scales distributed systems - roof-integrated solar panel - (90 of the stakeholders), while they give same importance to Energy efficiency/reduction (net zero buildings, heat pumps, cogeneration), energy production system, energy management and last energy storage.
In the following case the multi-level analysis places the variable "In your opinion, which technology should be developed mainly in the next 5-10 years in your country?" on the factorial level. Also in this case, to understand the territorial specificities, the additional variable "geographical area" was used.

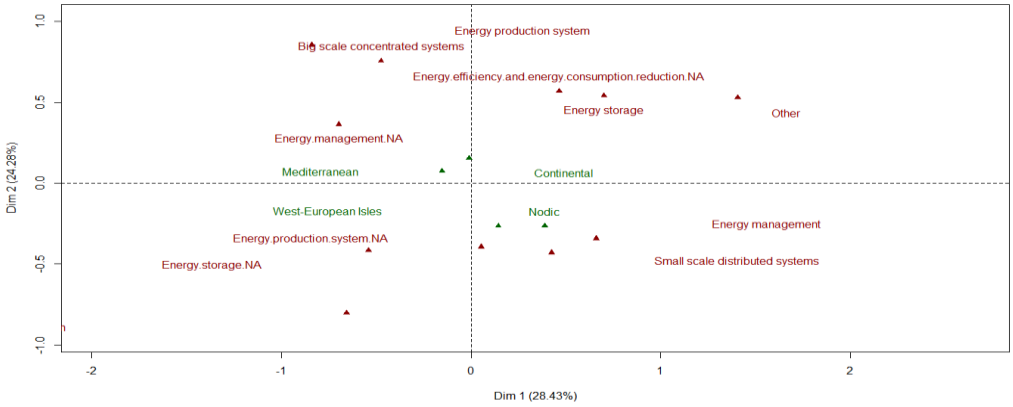


Figure 4.6 – Factorial map which technology and geographic area

Similar pattern is present here, with the difference that it seems that the geographical area has a lower impact overall, with 4 areas all very close to the origin of axes. Main split is between the energy production system (bottom left) vs energy storage (upper part, right).

	Which technological scale is the most developed in the energy transition featuring your country?	Which technology should be developed mainly in the next 5-10 years in your country?
Technological field	Small scale distributed systems	Small scale distributed systems
Dimension	Energy production system	Energy efficiency/reduction

Table 4.4 - Technological field and dimension

Also, in this case it is extremely interesting to understand the prevalence of responses based on the geographic area of belonging. As you can see in the following table, for all geographic areas the idea prevails that the technology that should be developed mainly in the next 5-10 years in their country, is the small-scale distributed system.

	Big scale concentrated systems	Small scale distributed systems	Other	Total
Continental	11	24	1	36
Mediterranean	17	42	6	65
Nordic	4	12	3	19
West-European Isles	8	12	0	20
Total	40	90	10	140

Table 4.5 - Combination of geographic area and technological scale"

In relation to the desirable development of the technological options respondents were asked to indicate above, which are the most urgent priorities in their opinion. They had the possibility to indicate the four most relevant ones. Among the different answers, CO^2 reduction is the most shared priority, followed by more socially shared energy production, a simplified regulatory model and more opportunities to develop local businesses along the energy chain.

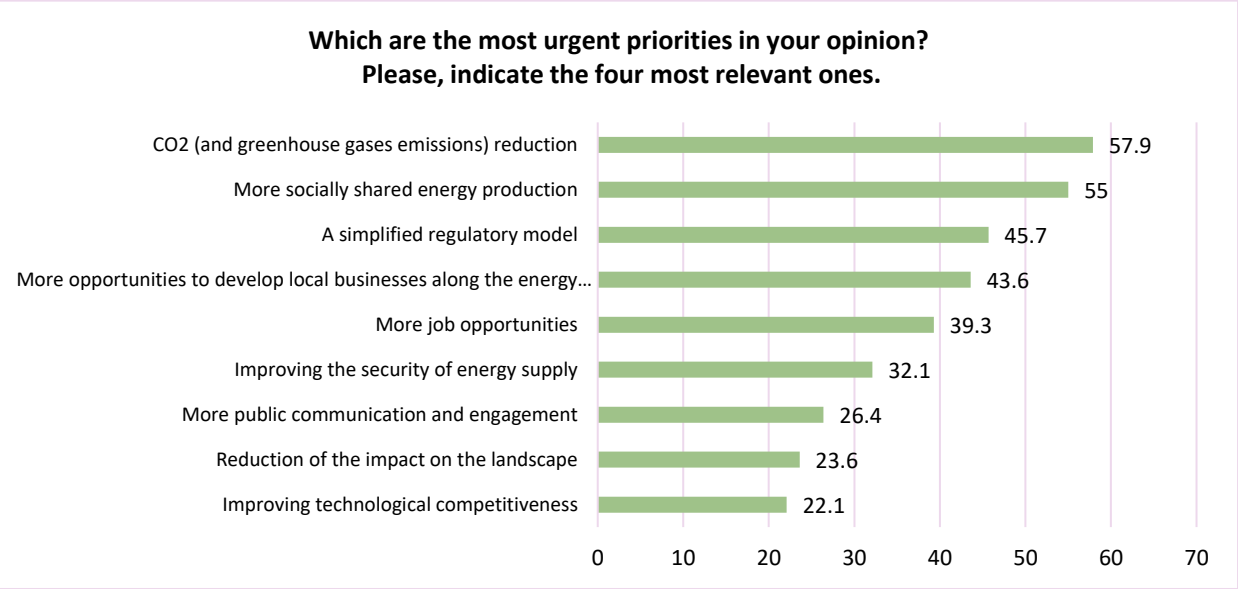


Figure 4.7 - Which are the most urgent priorities in your opinion? - %

To better frame our respondents on the situation of the energy transition in their countries, they were asked to answer to three different Likert scales ranging from 1 to 5. Each of them had a target of

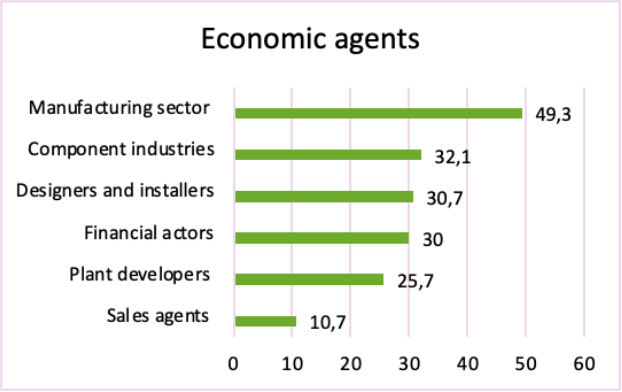
identifying which organizational form to adopt in the next 5-10 years for the energy sector. Two different opinions (to opposites) were presented before them and they had the possibility of placing themselves along a continuum to indicate their opinion towards which extreme it converged. The first two contrasted "Few large players own medium to big facilities" and "Many small to medium facilities owned by cooperatives/citizens". In this case the average of the scores obtained is equal to 7.10 (and the median to 7). This symbolizes that our champion connects more towards the far right that insists on Many small to medium facilities owned by cooperatives/ citizens.
The second group of opinions concerns "a centrally-controlled smart grid to improve efficiency" vs "a decentralized smart grid for symmetrical exchanges". Also, in this case the average of the scores obtained is high (6.71) with a median of 7.
The last scale pitted "users who can choose commercial offers" vs "prosumers involved in the energy supply". In this case, the highest average is recorded (7.25 and a median of 8), which testifies to the prevalence of responses towards Prosumer involved in the energy supply.

4.1.3. 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. First of all, we asked Which of these subjects should be mainly involved in the next 5-10 years of the energy transition process. Four dimensions are investigated:

- Economic agents
- Institutional/regulatory actors
- Research & educational sector
- civil society.

Let's see in detail the answers for each dimension, remembering that each respondent had the possibility to indicate two options among those indicated for each of the sectors indicated above.
Related to economic agents, the subjects that mainly should be involved in the next 5-10 years are: Manufacturing sector i.e., wind turbines, solar panels, etc.) and component industries (i.e., inverters, wind blades, etc.).



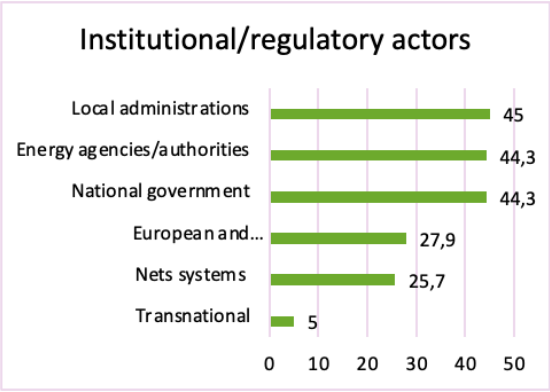
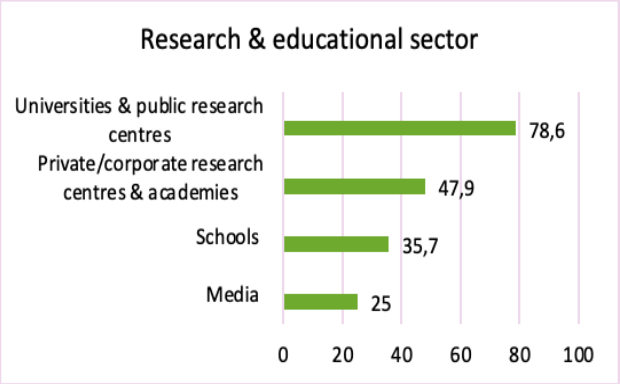


Figure 4.8 – Economic agents -%

Figure 4.9 – Institution/regulatory body -%

As regards institutional and regulatory actors, our respondents instead indicated mainly: national government, local administrations, and energy agencies/authorities.

The Research and educational sector is very interesting: in this case 100 respondents indicated the University as a priority subject to be involved in the energy transition; followed by Private / corporate research centres and academies (67 answers).
For the last dimension, that of the civil society, the greatest responses were recorded by citizens (single energy consumers), environmental associations and end users (corporates, long consumers).



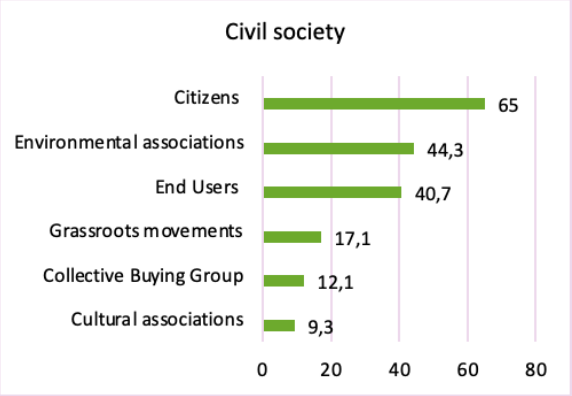


Figure 4.10 – Research and educational sector - %

Figure 4.11- Civil society - %

Thus, a section of the questionnaire has been focused on the skills needed to undertake an energy transition process. According to the Figure 4.12 the first four hard skills necessary to foster energy transition are: software knowledge and big data analysis, digital, network analysis and management.

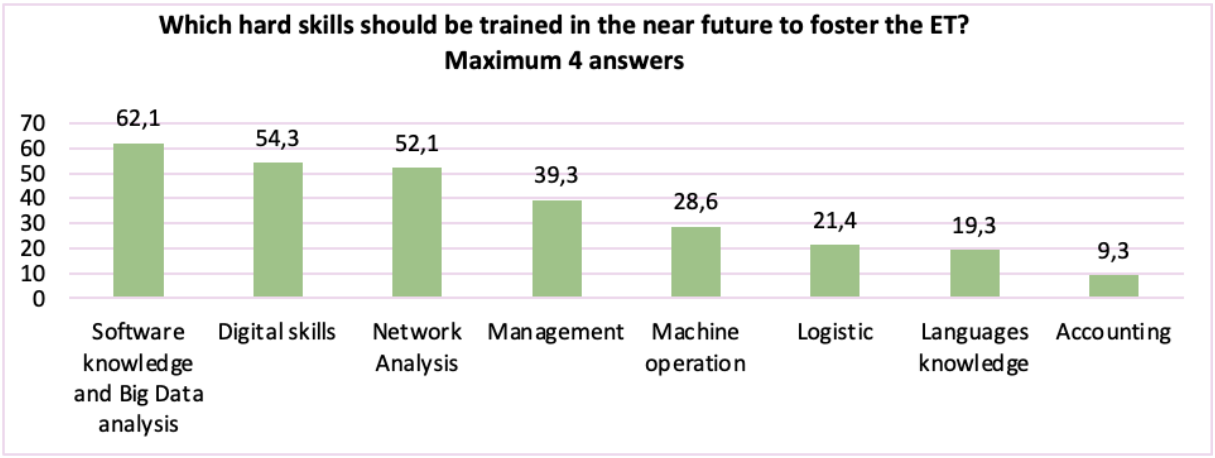


Figure 4.12 - Which hard skills should be trained in the near future to foster the ET?

In accordance with Figure 4.13, however, the four soft skills deemed necessary are: adaptability/creativity; communication skills; decision making and problem solving.

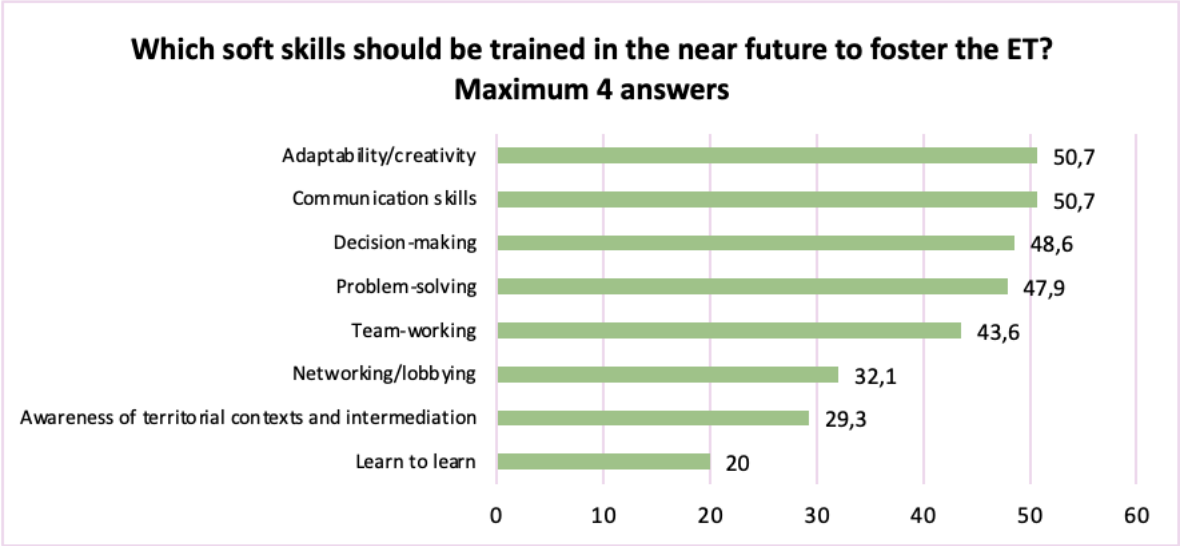


Figure 4.13 - Which soft skills should be trained in the near future to foster the ET? - %

In this factorial map below, the first component is highly described by the distance between accounting hard skills and big data issues (maybe a distance related to a more traditional type of company, right side, and a more innovative one, left side). Cultural agencies are related strongly to management skills, less to languages skills; these skills are pretty isolated in the upper part of the second component.

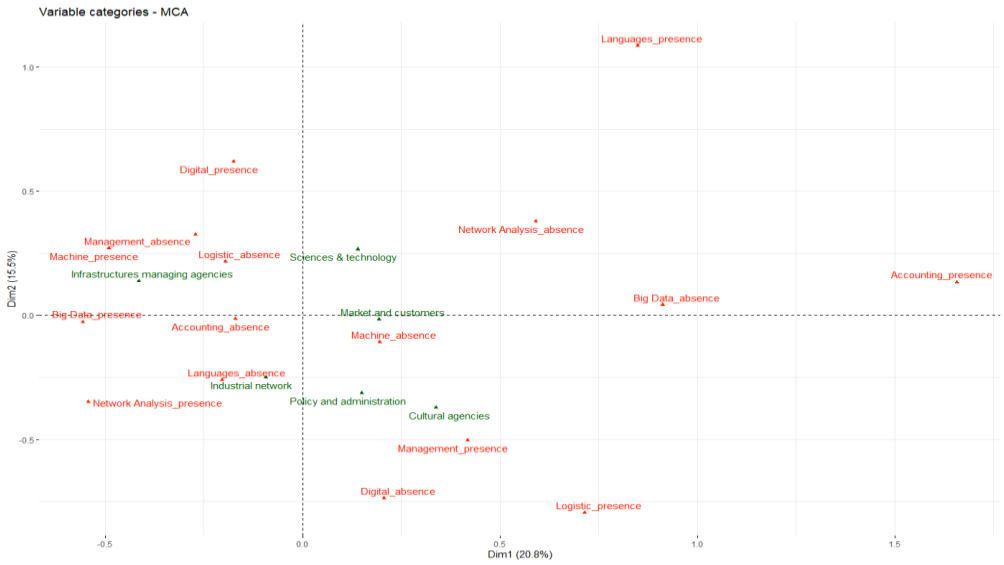


Figure 4.14– Factorial map with hard skills and field of competence

Soft skills, described in this factorial map, are described on the first component by the contrast between problem solving, learn to learn and adaptability (left) and networking/lobbying (right). A more individualistic approach is, so, on the left side (or with small group "team working"), while a collaborative concept on a large scale is present on the right (more related, consistently, with "policy and administration" and "market and customers"). For what concerns the second component, "communication" and "decision-making" are in the lower part, while territorial is, alone, in the upper part. Cultural agencies, lastly, believe more in team working, less in networking.

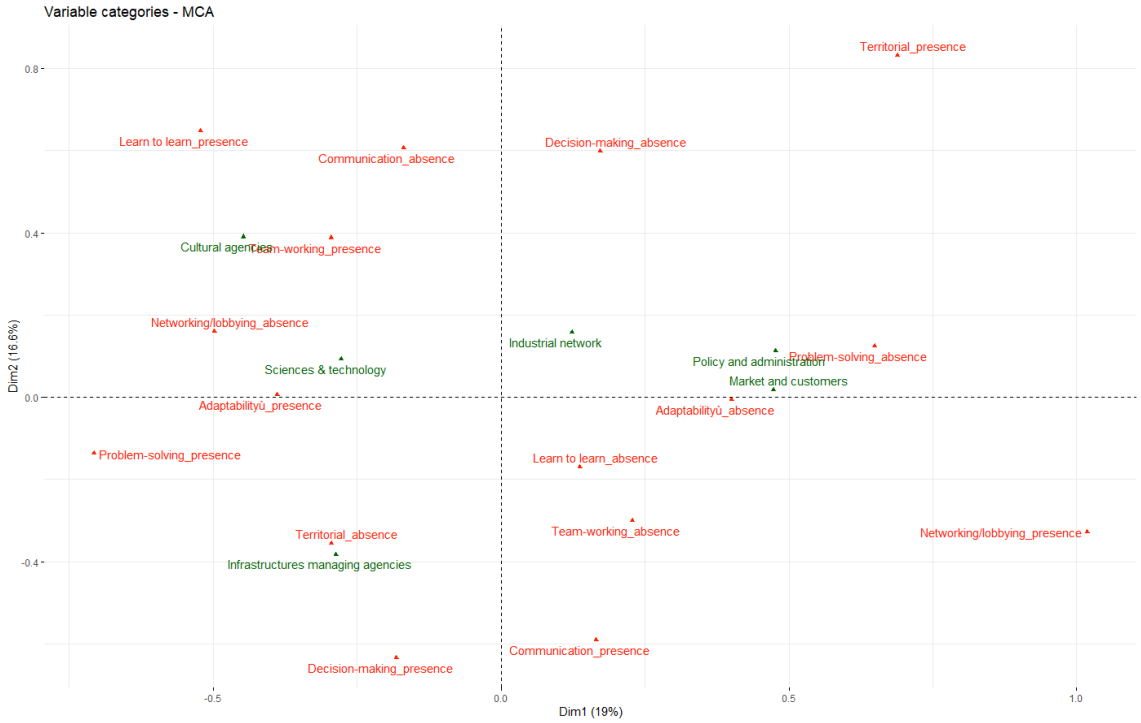


Figure 4.15 - Factorial map with soft skills and field of competence

Our interviewees were also asked to compose the "ideal job profile" for a series of work sectors related to the energy transition including:

- equipment manufacturing and distribution;
- Project development of energy transition projects;
- Construction and installation;
- Operation and maintenance.

Each respondent had the opportunity to choose between disciplinary fields, hard skills and soft skills needed for that particular sector.

	Equipment manufacturing and distribution	**Project development of energy transition projects**	**Construction and installation**	**Operation and maintenance**
Disciplinary field	-Engineering and technology	-Engineering and technology -Social sciences and management	-Engineering and technology	-Engineering and technology
Soft skills	-Adaptability and creativity -Problem-solving Decision-making	-Decision-making -Communication skills -Problem-solving	-Problem-solving -Adaptability and creativity -Decision-making	-Problem-solving -Adaptability and creativity
Hard skills	-Machine operation -Software/Big Data knowledge -Management	-Management -Network analysis	-Machine operation -Management	-Machine operation -Digital skills -Software/Big Data knowledge

Table 4.6 – Ideal job profile

A first interesting issue is certainly that for each sector identified as a disciplinary field, the technological and engineering field predominates. Only in the case of project development of energy transition projects is the importance of social sciences and management recognized as they deserve.
At the end, about half of stakeholders (49, 3%) think that it will be possible to re-employ workers from the traditional energy sector to the new energy transition one, but only after a process of specific skills/competencies acquired. A non-negligible quota (about 30%) 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 of the 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.

CULTURE AND EDUCATION

Another important dimension analysed during the survey relates to culture and education.
First of all, our respondents were asked about which source of education supported most the energy transition in their country.

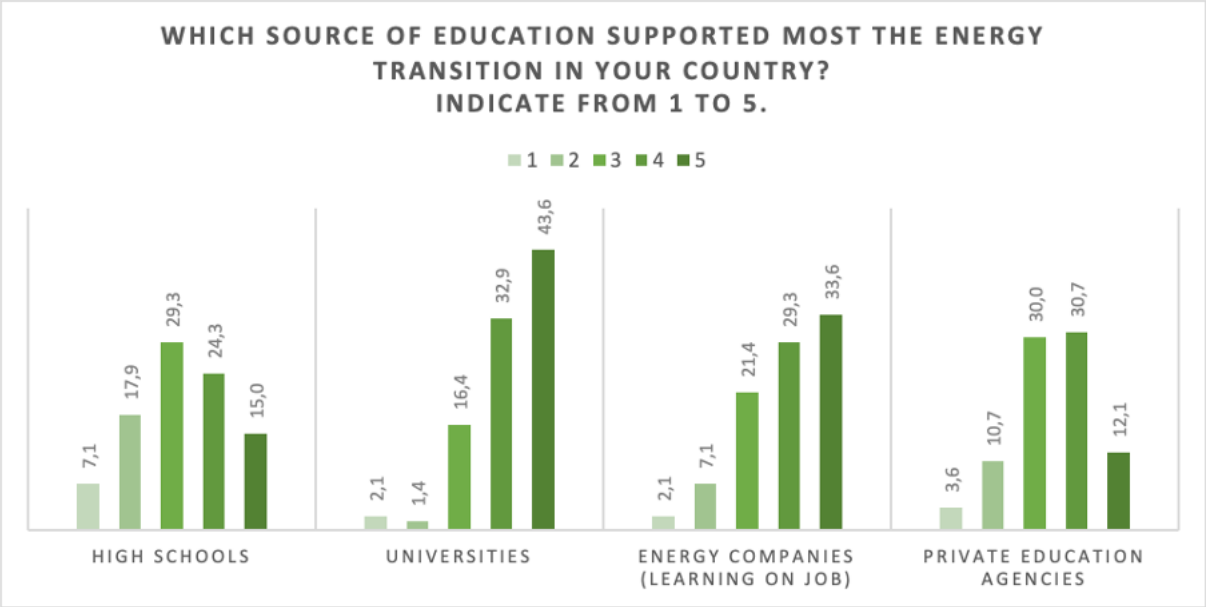


Figure 4.16 - Which source of education supported most the energy transition in your country? - %

As can be seen in the figure below, each respondent could express his importance on the indicated education sources – High schools, universities, energy companies (learning on job) and private education agencies - through a scale ranging from 1 to 5. The highest scores (4 and 5) were certainly collected by the Universities, to follow companies, then high schools and only at the end by private education agencies.
For each of these training actors it was then studied in depth, on which aspects should be focused on the educational system in their country in order to support the next energy transition. Also, in this case, they had the opportunity to indicate a value for each item from 1 (not at all) to 5 (definitely).
Also, in this case a multidimensional analysis, of the ACM type, was used in order to take into account, at the same time, the answers to the question "in your opinion, which educational source has most supported the energy transition in your country?" and the additional variable geographical areas. The first variable is identifiable on the factorial plane by red colour, the second by green colour.

Also, in order to make this analysis better, the scale from 1 to 5 has been modified to a scale with scores of 1 (not at all), 2 (moderately) and 3 (definitely).

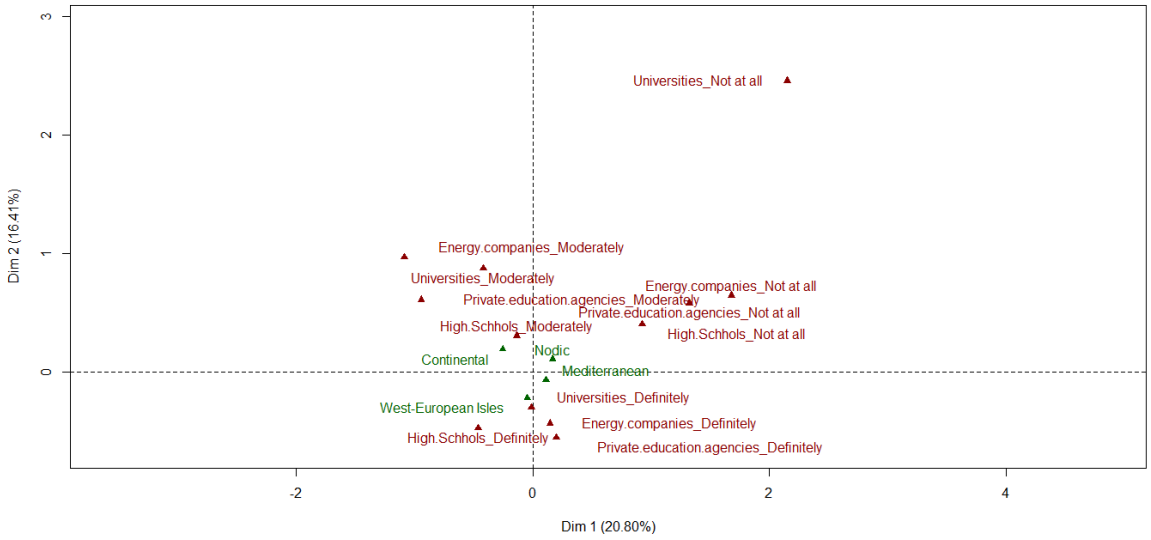


Figure 4.17 - Which educational source has most supported the ET in your country?

Here most of the variable category points are very close to the origin of axes, especially geographical area (in green). Main issue is related to "Universities, category not at all" that shows a peculiar pattern with respect to all other categories. In depth, on the left side we can find all respondents for moderate; not at all, on the other hand, all go in the same direction to the right. Bottom-right instead we find all the "definitely" answers.

So, let's go and see for each source of education on which aspects should be focused on the respondent's country in order to support the next ET.

The first case we consider is that relating to High Schools. As can be seen from Fig. X, the aspects that have received the highest values of the scale (5) are environmental, social, technical, then ethical, and finally gender-related issues.

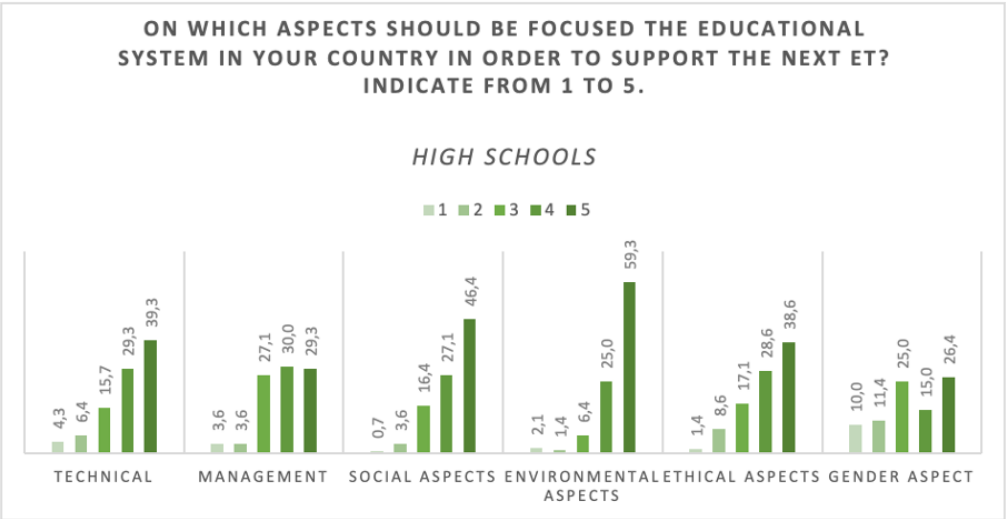


Figure 4.18 - High Schools - %

The second education agency that is considered is that of universities. In this case, the aspects on which we need to invest most are in order: technical, environmental, management, etc. and only at the end, also in this case, related to gender.

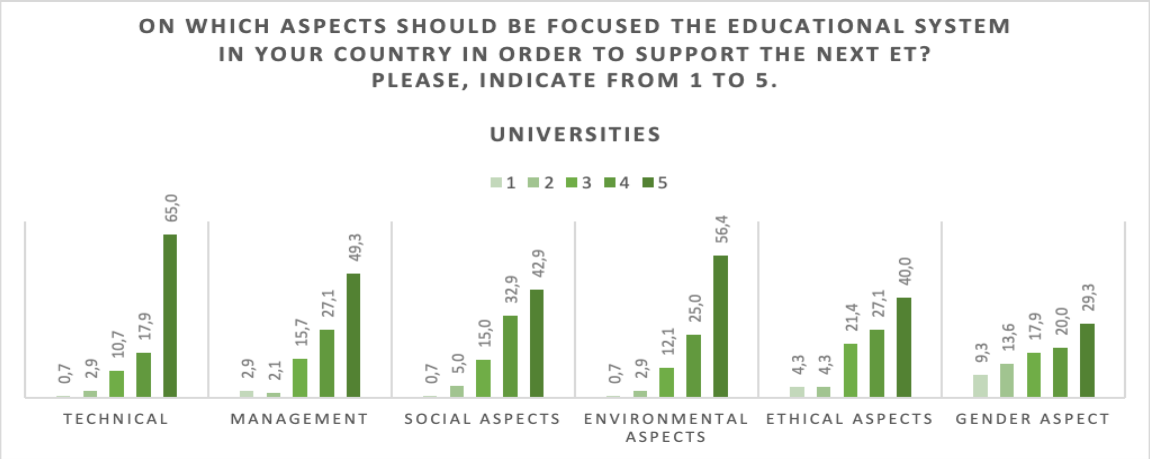


Figure 4.19 - Universities - %

Another educational actor considered is that of private agencies. Also, in this case, like the previous one, greater emphasis is placed on technical issues and to follow environmental ones. The social, then ethical, management aspects fall into one order of evaluation and also in this case the environmental dimension assumes a relevant importance.

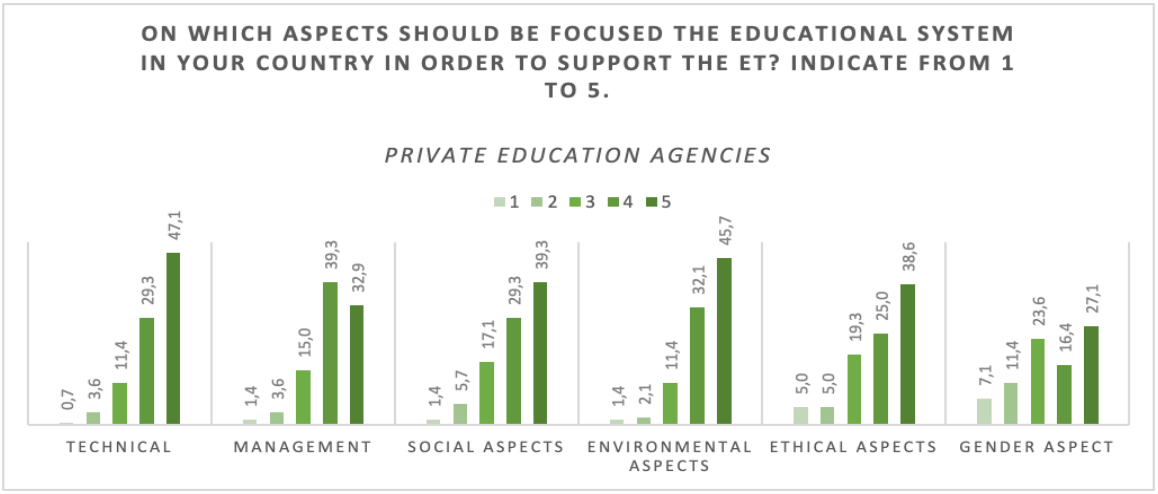


Figure 4.20 - Private education agencies - %

The last actor considered is that of energy companies. In this case, the intervention on the technical and environmental dimensions is predominant, while the dimension linked to gender, although the least indicated, collects higher positive scores (5) compared to the cases seen previously.

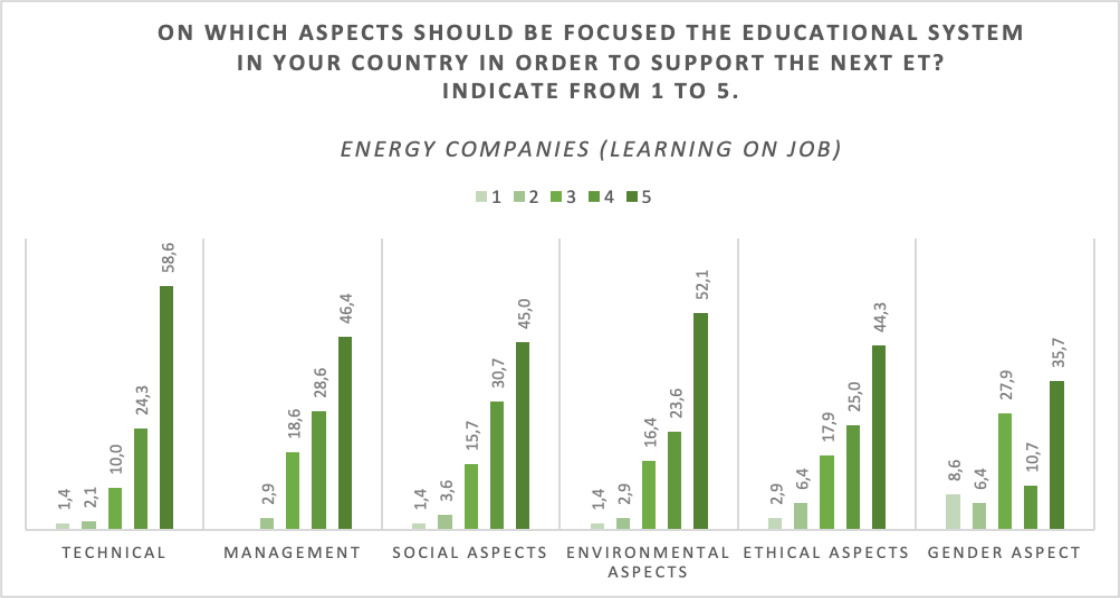


Figure 4.21 - Energy companies - %

Wanting to briefly summarize the results of this important section of our questionnaire, our sample tells us that universities in the first place and the energy companies are the actors who support the energy strangle in their country.

	1	2	3	4	5	Total
Continental	1	1	9	9	15	35
Mediterranean	2	-	5	21	35	63
Nordic	-	1	5	5	7	18
West-European Isles	-	-	4	11	4	20
Total	3	2	23	46	61	136

Table 4.7 – Combination of geographic area and universities - frequencies

The less involved actor seems to be the high schools which, according to our interviewees, should focus on greater training in environmental aspects. In the case of the other training agencies considered, the aspects on which to focus training are mainly technical and environmental. A relevant fact seems to us that gender is not considered an aspect that can favour the energy transition.
We then asked our sample which disciplinary fields should be reorganized to fit the current challenges facing the energy transition. In order to detect the most urgent fields, they were asked to indicate the first two. The answers to this question show that surely the engineering and technology sector is the main one (with 67.9% of the answers). Below, we find instead economic and management (with 60.7% of the answers). All the other sectors indicated achieve results with a strong difference from the first two. An example is the social sciences and humanities sector which collects 33.6% of the answers.

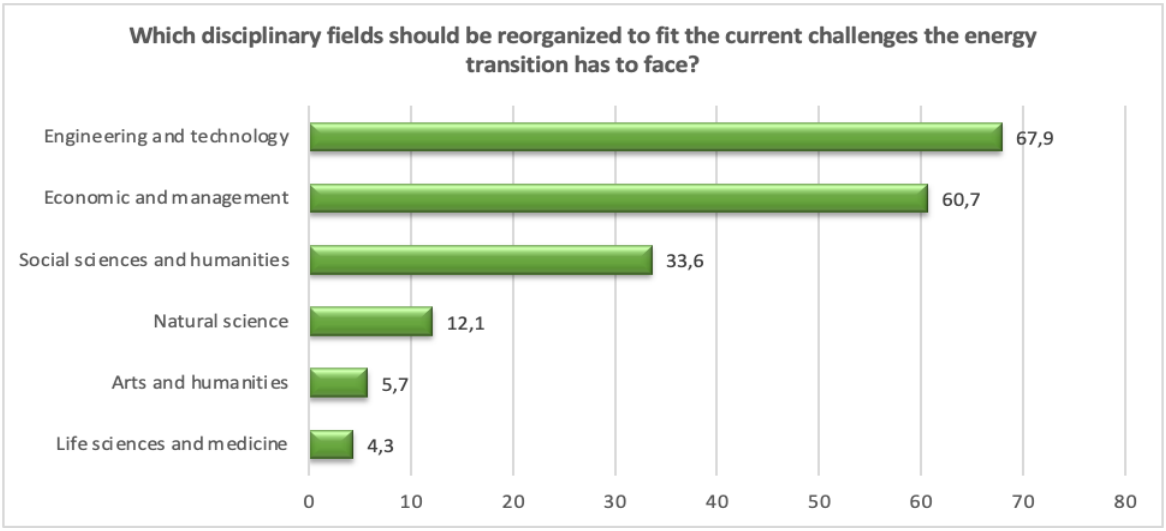


Figure 4.22 - Which disciplinary fields should be reorganized to fit the challenges the ET has to face? - %

Speaking instead of interdisciplinarity, our sample believes that this is fundamental in the field of energy transition. At the same time, however, they argue that it is on average difficult to acquire interdisciplinary skills. Even more important is that around 76.4% say it is quite difficult to practice interdisciplinarity. Last but not least, diversity management and gender education are on average important in their countries.

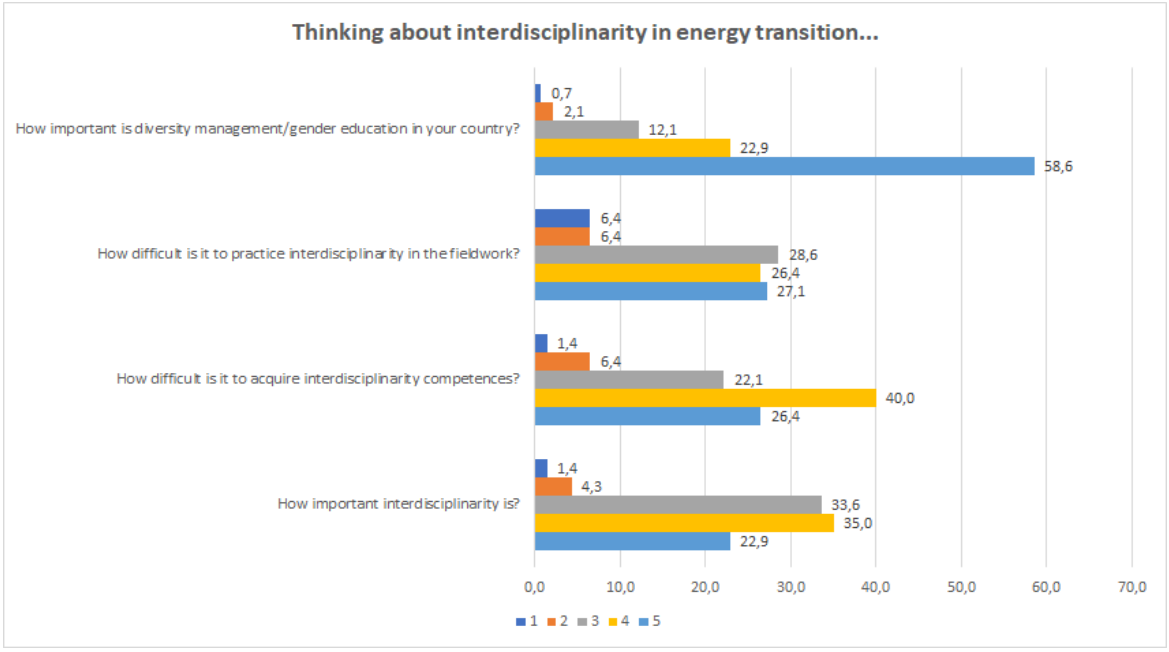


Figure 4.23 - Thinking about energy transition... - %

We then looked into which policy sectors need to be more supported in the energy transition process in their country. In this case, each interviewee had the opportunity to indicate the first three options. Let's see which policy sectors received the most responses. First of all, energy infrastructure and smart grids ranks first with 41.4% of responses, on a par with mobility and transport. Followed by eco-efficient building (37.1%) and energy planning (30.7%).

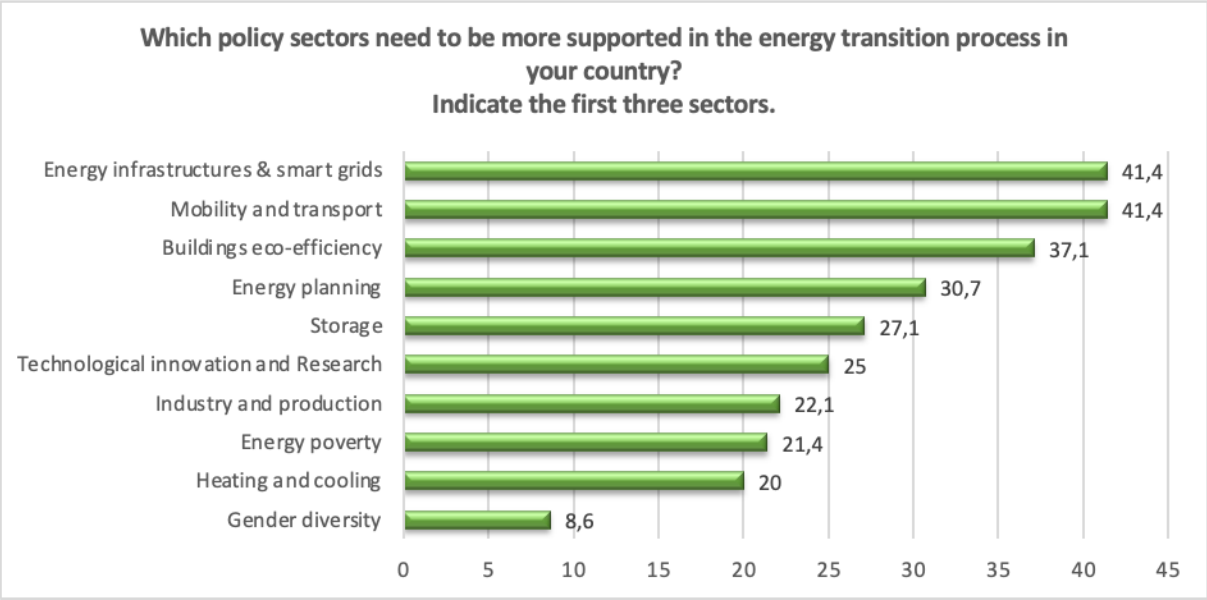


Figure 4.24 - Which policy sector need to be more supported in the ET process in your country- %

Also, in this case we used a factorial map (MCA) in order to see the projection of all the variables on a single space. The variables considered are: "Which policy sectors need to be more supported in the energy transition in your country?" (in the graph below in red) and geographic area like supplementary (green in the graph).

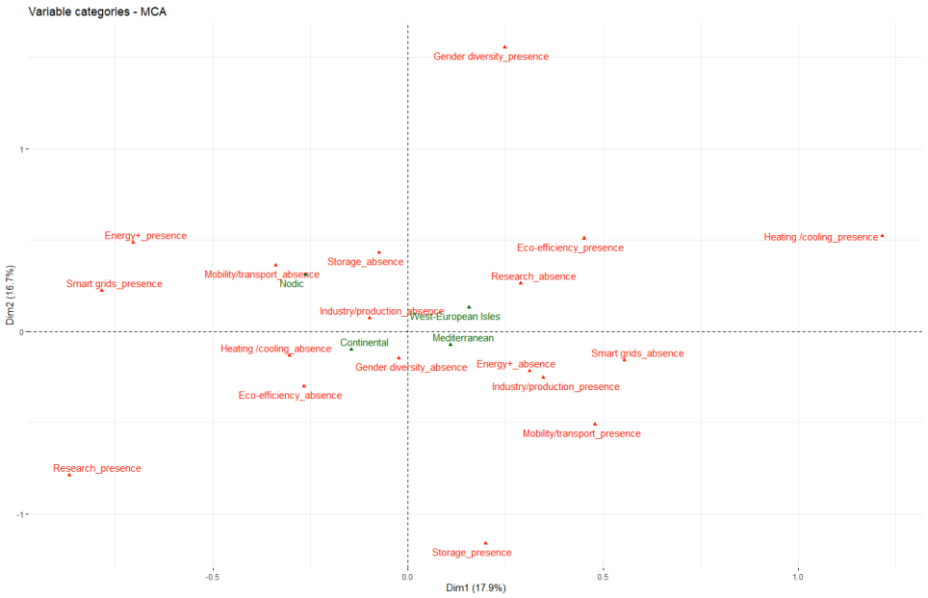


Figure 4.25 – Factorial map with policy sectors and geographic area

First component says great distance among heating/cooling and energy+, smart grids and research. On the second component, in the lower part there is storage and research, and in the higher part is very far from all the other categories of "gender diversity". It is a hint that gender issues are relevant in highlighting peculiar patterns in these data, even with no geographical area relevant variability. As regards the differences with respect to the geographical area. The only one to be noticed is that relating to the Nordic area, as it is more prone to the absence of mobility and transport and the presence of energy infrastructure and smart grids.

POLICIES AND REGULATORY FRAMEWORK

The last dimension investigated in our social research is that of policies and regulatory framework. Let's consider every single statement.
Surely our sample strongly believes that citizens have a relevant role in supporting energy transition. Secondly, they agree that the local level should be much relevant in decision making about energy strategies. Instead, on average, respondents agree that public actors have to mitigate environmental side-effects for the development of green facilities. On average I also agree in arguing that big plants/facilities are needed to pursue economics of scale in the sustainable energy sector.

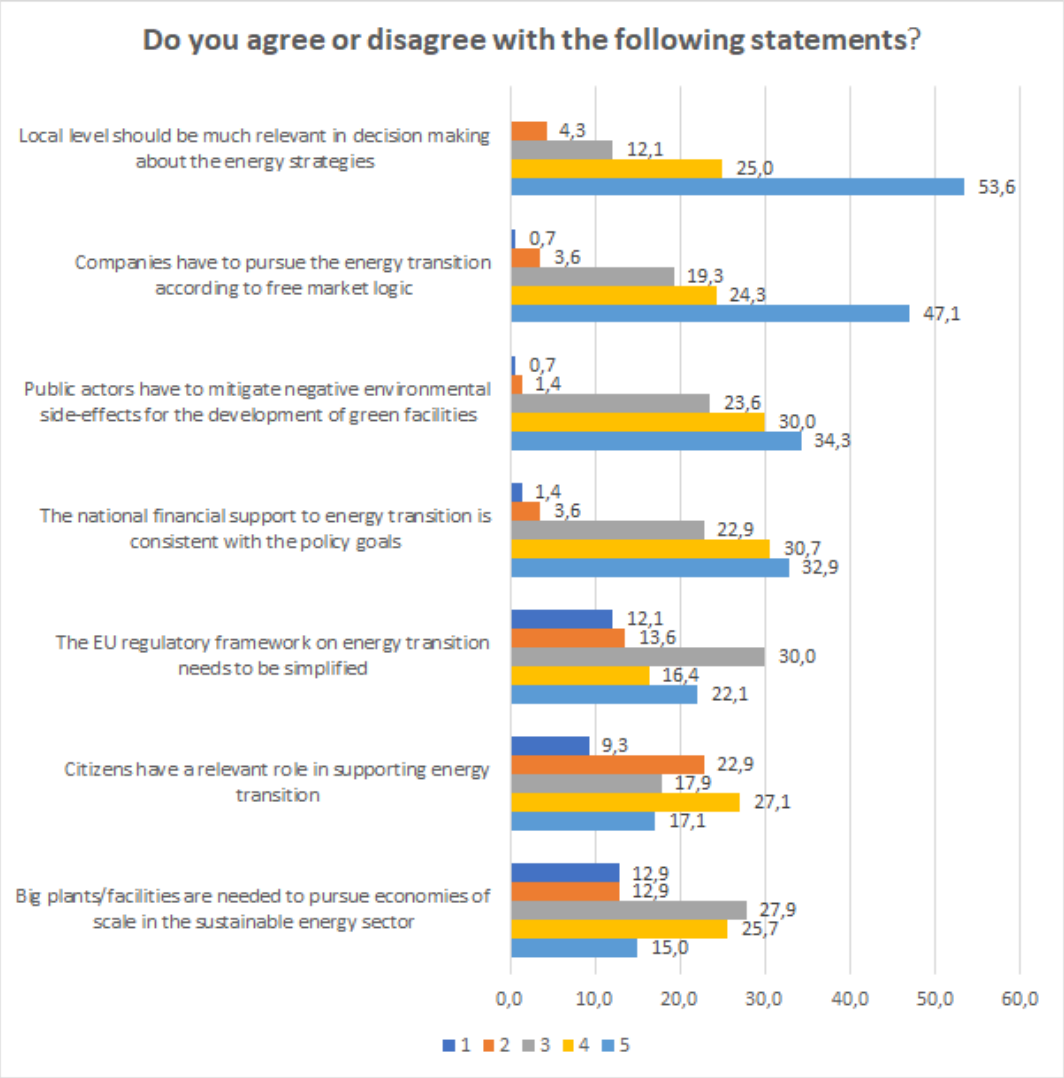


Figure 4.26- Do you agree or disagree with the following statements? - %

In addition, the policies that mainly can contribute to strengthening a democratic energy transition process are supporting energy transition projects; promoting educational and new professional training; developing awareness campaigns about energy efficiency in everyday life. These responses scored the highest (5).

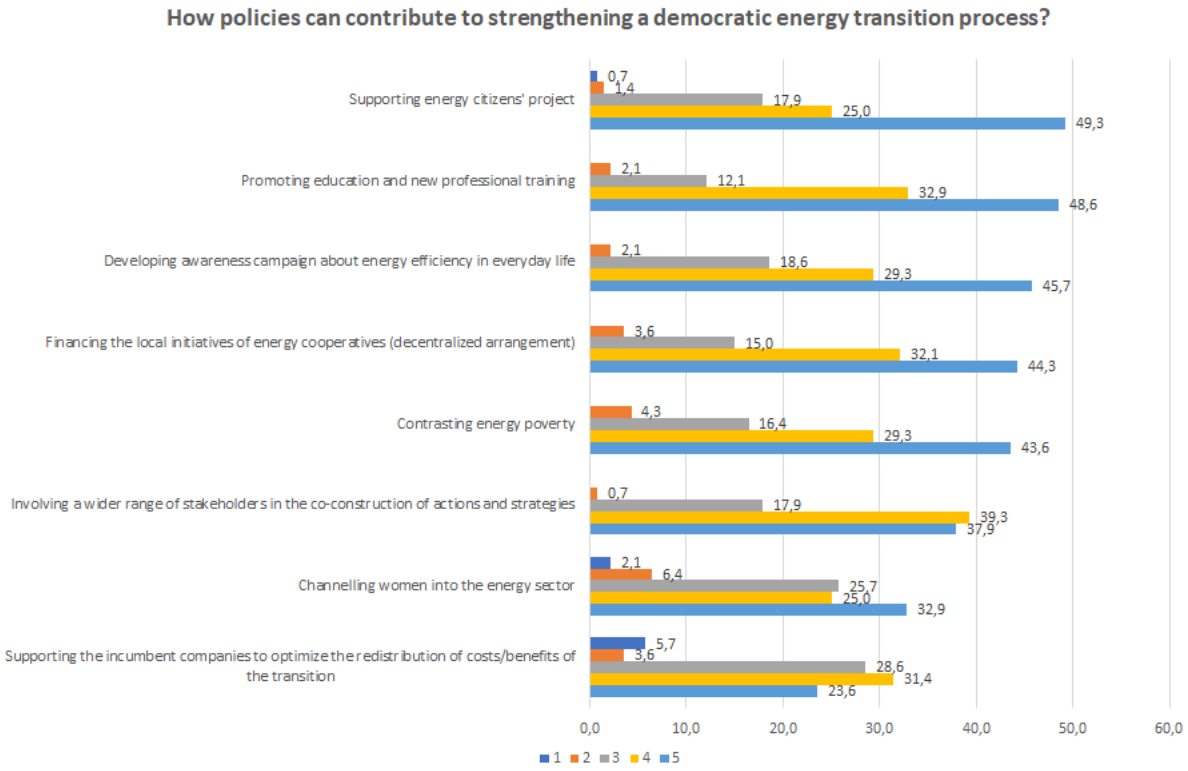


Figure 4.27 - How policies can contribute to strengthening a democratic ET process? - %

It was then asked how policies can contribute to strengthening a democratic energy transition process. Let's see the answers of our sample in order of importance or considering in order those statements that have recorded the highest scores (4 and 5).
Eventually we asked which policies their country is currently mostly focused on. In this case they had the possibility to order the four different statements proposed. Let's see how they were sorted by our sample. In first place: skills shortage and educational programs; in second place is information and communication campaigns, third is agencies and bureaucratic reforms and fourth and last is economic and financial instruments.

	N.	Average	Standard deviation	Minimums	Maximus
Economic and financial instruments	140	1,72	1,025	0	4
Agencies and bureaucratic reforms	140	2,15	1,137	0	4
Information and communication campaigns	140	2,57	1,054	0	4
Skills shortage and educational programs	140	3,14	1,146	0	4

Table 4.8– statistics of the variables

4.2 In-depth open interviews to key informants

The qualitative part 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 be able to integrate the learning offer with specific contents and – according to the objectives of the research – to indicate useful elements for the planning of future policies. At the same time this research 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.

Our interview campaign involved twenty respondents who we defined as 'experts' on the topic of energy transition. Our interviewees have different profiles and are all interested in the multidisciplinary dimension of energy. In the following table (n. 4.2.1) you can read the details of the respondents' affiliations and professions.

Cod.	Qualification
I.01	Professor of Chemical Engineering - University of Naples “Federico II”
I.02	Professor of Sociology of the Environment and Territory - University of Padua
I.03	Secretary General ANEV - National Wind Energy Association
I.04	Professor of Architecture - Department of Architecture - University of Naples “Federico II”
I.05	Researcher - Department of Industrial Engineering - University of Naples “Federico II”
I.06	Professor, School of Science and Technology, Hellenic Open University, Patra, Greece
I.07	Researcher - RSE, Research on the Energy System
I.08	Advisory board, Professor of Economic Sciences - University of Naples “Partenope”
I.09	Sociologist - Scientific responsible for the Energy Development and Innovation Area FDV - Giuseppe di Vittorio Foundation/CGIL
I.10	Economist, Post-doctoral Research Fellow in Environmental/Resource/Marine Economics, University of Greenwich
I.11	Architect, Researcher - National agency for new technologies, energy and sustainable economic development - ENEA, Parma
I.12	Professor, Department of Mechanical, Energetic and Management Engineering – University of Calabria
I.13	President of the European federation of citizen energy cooperatives- RESCOOP
I.14	Managing Director - GEATECNO (BA) and President of the “New Energy District of Puglia Region

I.15	Director of Territorial Planning and Landscape Service, Department of Territorial Government and Environmental Policies, Abruzzo Region
I.16	Environmental historian, Director of the Environmental Humanities Lab at the Royal Institute of Technology, Stockholm
I.17	Topographer, owner of wind farm (Bisaccia, Avellino)
I.18	Nuclear Physicist, Neutral Beam Coordination Officer at ITER Organization, Saint-Paul-lez-Durance
I.19	PhD researcher, School of Geography, Faculty of Earth & Environment, University of Leeds
I.20	Policy adviser for Industry, Research, Energy and Environment (ITRE- ENVI), European Parliament

Table 4.9 - List of Interviewees

To this list we add two more interviews done by e-mail (tab. N. 4.2.2):

I.21	PHD Industrial Student at DTU Management, Kongens Lyngby, Denmark
I.20	Expert in Ecosystems that allow full speed innovation, Granada, Andalusia, Spain

Table 4.10 - List of Interviewees by e-mail

The overall analysis of the interviews has produced the construction of an interpretative model that reports the main constituent dimensions of the survey and new analytical categories that emerged from the reading of the transcripts. The analytical coding will lead us to propose a selection of interview quotes that allowed the exploration and development of the concepts presented.
As will be seen later in detail, starting from the interview outline' dimensions, the themes observed during the study and discussed here include:

1. Energy transition and labour market
2. Education, training, career
3. Involvement in the energy transition field
4. Energy transition and ethics.
5. Skills and competence

The interview outline - which can be consulted in the annex no. 2 - was applied flexibly to the contacted respondents, first through a criterion of relevance (i.e. known experts in the field in question) and then through the *reputational method*, whereby each person directed the choice of the next witness who in their opinion was worthy of being heard, due to their knowledge of the reference object (Warner, 1963; Hunter, 1963; Stone, 1988). Although the results may be open to criticism with regards to the risk of self-selection, in the analysis phase they would appear not to be excessively distorted by the method selected. In fact, it can be seen that the various respondents showed discordant opinions and experiences, with respect to the solicitations received during the interviews.

4.2.1 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 first, 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 market 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.

Within this analytical block, the institutional dimension finds strong relevance in all the experts' testimonies, which highlight some specific features and different levels of action:

> Institutions must regain possession of the role above all educational, of informing, because this illusion of "do-it-yourself" at the educational, informative level is an illusion. It is nice to think that you can have direct access to information, but you also need to have the culture, the training and the skills, the critical sense, the foresight, the awareness also to know how to filter from cyberspace. (I.01, Professor of Chemical Engineering)
>
> If the institutions do not intervene, nothing can be done. The issue of science is fundamental nowadays. And if there is no science together with the government, people cannot do anything. But you need mainly well-informed people. (I.04, Professor of Architecture)
>
> The institutions therefore tend to use a somewhat Lucanian technique of specialisation and differentiation. Assuming that each figure is competent, it is necessary to see how this will affect the other offices. On the political level, there is a philosophy that says: people are incapable of adapting to change, so we just have to impose it. It would probably be right to impose it. Unfortunately, that's how it works. But there is obviously a need for a strong political force that leads to dramatization. (I.02, Professor of Sociology of the Environment and Territory)
>
> Only a far-sighted policy, aimed at ensuring intergenerational equity, would be able to undertake real energy transition paths, in the wake of an effective Green New Deal on both sides of the Atlantic. Local, national, and supranational institutions are crucial to the successful completion of this complex process. (...) It remains to be seen whether the institutions will have the intention to turn this opportunity into a breakthrough that will bring important results in the field of energy and, more generally, of climate change and climate and environmental justice and sustainable development. Or whether, instead, it will just be a tool for political propaganda. of political propaganda. (I.10, Economist)

As can be read in the proposed texts, the institutions are referred to in various areas of action, and among all those that have emerged, the emphasis that is now placed by experts on the role of information agent seems very interesting. The tendency of institutional offices to compartmentalise areas of competence is also highlighted, which is detrimental to the systemic relationship necessary for an action of such complexity as energy transition. Finally, the centrality of the energy issue in the so-called 'Green new deal' is repeatedly recalled, and there is no shortage of doubts about the ability of institutions to meet the major challenges of climate change and climate justice.

Conclusively, 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-responsibilise itself and hand over its competence to citizens.

These 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.

4.2.2 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 theme 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.

Another element on which many experts insist is the interdisciplinary dimension of the energy training plan. More specifically, in addition to the need for different professionals to plan and act on the energy transition, it is noted that each individual would have to take a holistic approach to the issue. In this sense, the training plan for professionals suited to the energy transition process should include forays into different disciplinary environments and exchanges of experience. Let us read, for example, what an economist thinks about this:

> For higher education, I am sure that an interdisciplinary approach, coupled with a holistic and pluralistic approach to the issue, would contribute to an overall view of the problem and the dynamics. In any case, I imagine that training should be oriented towards a dialogue that speaks different languages, aimed at all stakeholders and the widest possible audience. This includes the flexibilization of timetables and tools to ensure the fullest possible use of training for each professional figure and, especially in this period, the provision of digital channels for distance learning. (I.10, Economist)

In the same way a geographer stresses this same demand for interdisciplinarity and introduces the use of a figure such as the community planner:

> Certainly, if we talk about training, the figure of the community planner, a syncretic figure that combines the urban planner, the territorialist, the sociologist, that combines all these skills put together can certainly make a difference, including the legal skills. (I.19, PhD researcher)

The need to create a culture of sustainability - as we have seen above with regard to the information function of institutions - is also often referred to through education, informing and equipping students with cognitive tools to understand the cultural change needed for the energy transition. As, for example, a policy advisor reports, asked about the educational process and insisting on all school levels:

> Civic education, in other words knowing that our actions have consequences for others and for the world. Environmental education, even a little bit about the ecosystem, how the earth works, cycles, climate, what renewable energies are. In other words, a general smattering of the subject and of climate change, just to understand the problem and stimulate individual behavioural reasoning, because if you don't start from that point, bye-bye! In short, a structural,

> programmatic approach to the general problem of climate change in the various educational stages, from primary schools up to high schools and middle schools. (I.20, Policy adviser)

But if in this case the importance of a training course is stressed in order to implement individual action, to intervene on the issue of justice and climate change, in many other testimonies we have seen that a structural intervention is rather desired, acting therefore at a political-institutional level.

In this sense, we can conclude that it is possible to confirm that there are two dimensions at the training level: the individual training pathway must be intertwined with an institutional political design in order to establish a structural type of cultural change.

Looking at profiles and careers, we wanted to look more closely at gender issues: the key question that we have laid forward is how we can encourage women to adopt and pursue jobs in the Energy sector and in general how the existing “skills gap” is treated as a whole.

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 problematic 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.

Let's see how the different experiences of our experts are mixed:

> I met a lot of women in the research, a lot of women... maybe even in the vast majority in the civil society dealing with transition. So, in the cognitariate.... in the country I met few, in the country so I refer to Germany-biogas and also, I met few in Italy. The women I met have, if we go back to the previous speech, a conception, a clear awareness of the fact of being in the energy transition, even those few I met in the investors had a very clear awareness. (I.19, PhD researcher)

> As far as the presence of women is concerned, I'd say definitely a minority, let's say 30%. I have a female boss, but at her level she's one of the few, and I don't think there are any other women above her, so I'd say there's still a strong gender gap. (I.18, Nuclear Physicist)

> There are more men in my sector, but in Bisaccia we have girls who work in the maintenance teams and today they are cadres in these companies. They have climbed... they are happy, they are few but... I don't think they have been discriminated against. I talk to them; they don't feel discriminated against. The discrimination came a little from the country because they were not prepared when they were offered the job they said "but you can climb a tower, but you can do this? But you can't do this". (I. 17, Topographer)

> About the gender gap, when it comes to manual labour, I don’t see many women on the roofs installing solar panels, but when I look at our cooperative we are quite balanced although most engineers are men, not all of them but most. Ecopower is also a supplier of electricity, so I can say that all phone operators are women, and also our communication officers are women. I think still most engineers are men also at the university. I know a vice principal at the university here and he told me that the only thing they can do so that more women come to technical faculties is that there has to be a social aspect to it. (I.13 President of the European federation of citizen energy cooperatives)

> We women always have to show that we are intelligent, but not so much. Not too much, a little at a time. Because otherwise we are a bit scary and then anyway, "this is where she wants to go", this is always there. We have developed powerful chameleon skills, i.e. when to go forward,

> when to stay back. So, it is not enough for us women to know how to do things, we also need other useless skills, forgive me. In social terms they are useless. Because I have to think about going forward, then backwards, I have to think about nonsense, I could think about other things. But it exists above all in the energy field, do you know how many times in the early days, about ten years, maybe even more, that I was travelling around Europe... the energy tables were all male. 80% of the time it was just me. I must say that in that context there was a kind of bonhomie towards me, that is, let's keep it dear...I was also the only sissy, young...so let's keep it dear. So, I didn't have any banners, I was more to be listened to. The problem is there, it still is, of course. You always have to use a lot of strategies to get ahead... I don't know if it's to get ahead, maybe not, but to live all the roles a woman has to live. [...] It's hard to go on, to balance all the roles you have to live, it's hard to keep the family going because if you go abroad, you have meetings, yes you take your daughter with you, but what about your husband? (I.15 Director of Department of Territorial Government)

Ultimately, our testimonies reflect what is known in the literature as a form of horizontal and vertical occupational gender segregation – horizontal: although there are no formal obstacles for women to enter certain areas of work, there remain stereotypes that influence the choice first of training processes and then of work towards sectors linked to the private and family sphere and therefore in the educational and care dimension; vertical: top positions in the various sectors are largely the prerogative of men (Valentini, 1997) – those working in very technical sectors confirm that they have few female colleagues and even fewer are in management roles. At the same time, however, they reveal a gradual increase in the presence of women in the most innovative and renewable energy fields, and despite the persistence of many gaps in terms of employment, management and pay, one economist concludes:

> 'In any case, on a practical level, it is encouraging to know that many innovative projects are oriented towards female users, as we discussed earlier (and vulnerable groups more generally). Many efforts have been made to converge towards this direction, but at the level of gaps, emancipation and gender equality, many countries in the world, including Italy, still suffer from these serious problems. (I.10, Economist)

4.2.3 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.

> Local communities have a crucial role in the energy transition. Every citizen, every neighbourhood, everyone will be involved. It will be a very big change, maybe people don’t realize it yet but in 20 years’ time you won’t recognize Europe and that should be the case. And it’s really necessary if we want to stop climate change or keep it under control, if we don’t want big cities like Amsterdam, Rotterdam, London, Antwerp and so on to get permanently flooded. But the urgency is not there, I'm afraid, so we have to work hard. (I.15, Director of Department of Territorial Government)

> The issue of grassroots involvement is a central theme because the only hope for the development of a democratic model is the involvement of the individuals involved or not involved. So, the part of promotion and communication and above all knowledge transfer is

> central to the choice of development model. (...) What in recent years with the appearance of Greta Thunberg has determined the involvement of teenagers or younger children - who also represent future generations and future consumers eh - was a decisive step, for the construction of a great communicative emphasis. (I.14, Managing Director – GEATECNO)

As well as the education, training and career dimensions, 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:

> The energy transition is a decentralised transition, and as such it involves the local area, and without a push from the local area it cannot be done. On the one hand, there are policy tools, incentives, funding, in short, everything that can make action viable in the field of building renovation and energy efficiency of renewables. And on the other hand, there must clearly be the local sensitivity and willingness to do all this, even the possibility. (I.20, Policy Adviser)

> Certainly, there is also a technological factor: there is a lack of investment in transmission... that is, transmission and redistribution, the network infrastructure needs to be rebuilt, and so these are certainly things that need to be dealt with at European level. There is a technological barrier to community involvement. (I.19, PhD Researcher)

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.

But clearly such an approach can raise conflicting issues, as one of the experts pointed out:

> I believe that one of the reasons why there is a strong aggregation in policy formulation is linked to two aspects. One is that the EU still wants to have an economic dimension so that it can compete with other local powers. The second reason is that the EU adopts the principle of competition, which means that there are a number of constraints on the adoption of measures that specifically affect only particular communities, i.e. the rules are applied uniformly as if all the players in the system had the same weight. This is an ideological distortion if you like. (...) The reason why I say this is that in practice the translation of Community directives into national laws takes place through the national parliaments, and the ability of these parliaments to adequately represent minorities, even local instances, the instances of individual territories, and to represent them adequately and listen to them depends fundamentally on the electoral system and therefore on the political architecture of the democracy of the individual country. (I.8, Advisory board)

4.2.4 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. Some are concerned about how the energy transition discourse will evolve in relation to the 'Green New Deal', i.e. whether the institutions will really be able to influence the processes and envisage scenarios with real impact on climate change and climate justice, or whether they will only invest to strengthen neo-liberal markets:

> It remains to be seen whether the institutions will have the intention to turn this opportunity into a breakthrough that brings important results in the field of energy and more generally of climate and environmental change and justice and sustainable development. Or whether, instead, it will just be a political propaganda tool. A reflection on this can also be made for

> international organisations, which have been exploring and promoting innovative models of energy transition for years. However, the implementation of political action is still lacking. (I.10 Economist)

In addition, there is a need to diversify the perspectives of analysis on the 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.

In this sense, is noted as a new element the concept of intergenerational energy justice is placed alongside the issue of energy justice tout court:

> We need to address the issue of climate change, not only globally, but also over time. Thinking about the benefits that will go to future generations and in part that are absorbed by present generations. So, we introduce the concept of intergenerational justice, to examine all the facets in which energy justice can be examined and analysed, of which intergenerational justice is an intersection rather than a component.

It is therefore a question of making the concept of justice more complex, looking at future generations but also at the specific needs of individual social groups, therefore asks for 'energy 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.

A further element that concerns the difference between the different territories is highlighted: the ET process cannot be univocal; it must look at and be able to redefine itself according to the specificities of the different places where it is to be implemented. Although this statement is obvious, it does not seem to have received much attention:

> The ethical dimension with regard to territories... is an issue little explored, because in most cases where territorial disparities or discrimination are discussed, even with regard to certain categories of citizens from certain regions, very often no reference is made to the issue of the environment, even though it is clear that there are strong criticalities, as we know they are linked for example to waste management as well as to some industrial plants with a very strong environmental impact that are in some areas. To tell the truth, this is an issue that has not yet been addressed from an academic point of view. Probably because the interests of territories and regions are primarily seen from a strictly economic point of view. economic point of view. There is probably the function that through economic growth and bridging territorial income gaps can also solve a whole series of environmental problems. a whole series of environmental problems. (I.8, Advisory Board)

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.

4.2.4 Skill and Competences

The analysis of the interview transcripts - in relation to the dimension of competences and skills needed for the energy transition - led us to reveal at least three fundamental characteristics that seem to represent the cultural need of the interviewees: 1) to include the theme of energy within each training trail; 2) recognising its holistic and multidisciplinary component and finally 3) defining the horizon of transition culture necessary for the process, in a framework that manages to connect the different and successive levels of action and policies. Nevertheless, the second requirement that emerges in the words of the interviewees is focused on the communication level. Many people

highlight the centrality of the forms of knowledge transmission and in the ability of transition actors to raise awareness of the results of their work and future needs.

Recognising the cross-sectional nature of the energy issue, respondents emphasise that different actors will need to cooperate to bring about change. They also reflect on how all disciplines contribute with different competences to the transition process, so they do not recognise a hierarchy, but rather a necessary plurality of skills.

Let us now read some examples in the words of the interviewees, through the selection of particularly emblematic passages:

> From the point of view of university education, the model should provide for the inclusion of this subject [the energy] at all levels, all degrees should address their role in relation to change, this great change, and then on the other hand their role in all processes in which energy is involved. (I.11, Architect)
>
> However, there is still a need for shared governance, for not being alone, for keeping in touch, for keeping in touch all levels of governance from implementation to design, from research to application in the last of the houses, the smallest. (I.15, Director of Territorial Planning and Landscape Service)
>
> Therefore, if we talk about training, the figure of the community planner, a syncretic figure that combines the urban planner, the territorialist, the sociologist, that combines all these skills put together, can certainly make a difference, including legal skills. (I.19, PhD researcher)
>
> You have to do what your grandfather used to do and what I used to do... that is, turn off the light if you don't need it. Today I see that this generation has not been used to doing this, so I would say start from the beginning... if that wind turbine turns and produces energy, but if we can consume less, we will need less. It's a whole thing. It starts from the beginning: from education. (I.14, Managing Director)

As you read, there is a lot of emphasis on the need to include energy in different levels of education, vocational training and administration. Our experts highlight the opportunity to lay the foundations for a cognitive change, to initiate a conscious process that can ultimately recognise the holistic nature of energy.

> I also think it is essential, before thinking about anything else, to reflect on what has not been done so far, namely good communication together with new forms of communication. If there had been a better way of working in the past, perhaps the community would now be better informed about the need for this change. (I.18, Nuclear Physicist)
>
> I think it is useful to give more emphasis to those with humanistic, educational and motivational skills. [...] Not everyone can be an expert, not everyone has time to think about energy transition, etc., and so in a context like this I think it is necessary to think about who is more able to engage people according to their characteristics and skills. So who is a good communicator. (I.20, Policy Adviser)
>
> I think that universities have a fundamental role to play in providing more adequate preparation in specific degree courses. But also, private or public associations could provide more ad hoc courses, because I think they are very important for work. So, the more the better! (I.03, Secretary General ANEV)

In this context, in order to strengthen and support this so-called cultural change, the challenge of a good communication strategy arises: the actors of change turn out to be the local communities, who must have the possibility to access the forms of knowledge to consciously respond to the efforts required by the actions essential for the energy transition.

> Engineering, sociological and economic skills are needed because the issue is very broad and has an impact on various social, technological and economic spheres. At this moment even more, the energy transaction has been with us for more than 20 years, since liberalization began, at this moment it crosses a lot with new technologies. Skills are needed: economic, technological and social. There has to be a well-developed knowledge of the regulation of this sector. (I.05, Researcher)
>
> Energy brings together different worlds: engineering, architectural sciences (to reduce co2 impact in the building sector), management and accounting related to companies operating in the environmental and energy field, environmental and climate finance skills (environmental certificates, green certificates, bonds issued by companies in sectors with low environmental and climate impact); technology development (engineering and architecture), management and finance (corporate management field, and professionals disseminating sustainability-related knowledge in the public sector. (I.02, Professor of Sociology)
>
> There is a lack of transversal experience, where people from different fields can communicate with each other. Getting social scientists and engineers to communicate is not easy! It would be important to create people who facilitate these meetings, who can effectively organise a meeting between different groups of stakeholders, so that a constructive atmosphere can emerge. A major limitation is precisely that of creating opposition. A useful figure would therefore be these facilitators, who are not people who have to promote a project, but are people who have to promote dialogue between different interests, therefore without espousing an a priori thesis. (I.07, Researcher)
>
> I remain strongly attached to a vision in which we must not lose the depth of our own disciplinary knowledge, of the method, and must instead work more on the connection between figures with different backgrounds, who must build up a capacity for scientific and project-related relations, etc. (I.01, Professor of Chemical Engineering)

Finally, the main feature of the energy dimension is confirmed: multidisciplinary. As in the conceptual premises of our research, each expert systematically recalls the relational dynamics with other disciplinary fields.

There are also those who are anchored in a more traditionalist view in which technical disciplines seemed to play a more central role in the energy discourse:

> Certainly, the technological skills and the economic-managerial skills are, I believe, on a fairly similar level, and I think that without an ability... without adequate technological skills, therefore provided by the departments of engineering and architecture, I believe that the economist and the manager have little to develop. So, from this point of view there is probably this slight difference; I am always talking about specialist skills and I am not referring to what may be the widespread sensitivities, the information disseminated through the media and through the primary and secondary levels of education. (I.08, Advisory board, Professor of Economic Sciences)

In conclusion, on the level of educational needs in order to create professional profiles capable of responding to the new challenges of the energy transition, our experts direct us in the research of new figures capable of developing forms of cooperative work. Therefore, paths that implement relational skills, ways of carrying out teamwork and also, and above all, ways of transmitting information will be useful. The world of work, on the other hand, should be able to build up transversal experiences, enabling people from different fields to communicate with each other.

4.3 Focus Group

The focus group method allows to explore people's knowledge and experiences and to examine not only what people think, but how they think and why they think that way (Kitzinger, 1995). We set up two focus groups online, involving people who are differently professionally and socially active in the energy field.

We designed an outline – see annex no.3 – to conduct the focus groups to get information from the participants and discussion among them, around their experience in relation to the topic of energy transition, asking about: the relationship between professionalism and energy transition, the motivations behind one's work and the changes experienced in one's work environment, the profiles involved and the interactions with other actors (e.g. institutions, associations, etc.), on skills, gender role differences, and the involvement of territories. Finally, we elaborated together a SWOT analysis – a strategic planning technique used to identify strengths, weaknesses, opportunities, and threats related to project planning – focused on a hypothetical energy transition project.

No.	Personal Code	Number of participants	Setting and participants	Characteristics of the participants
1	FG_1	4	Digital platform with audio and video connections	Director (Department of Environment and Climate) – Lombardy Region, Project manager of Legambiente – Campania, Founder of Green Jobs - Milan, Co-founder of Energy of Smart things – Brescia.
2	FG_2	3	Digital platform with audio and video connections	Member of Communication and Sustainability Division of Falck Renewables, member of the Lucana Energy Society, investment and business developments analyst of the Genera Society.

Table 4.11- Overview: Research Sample Focus Group Interviews

The table no. 4.11 shows the people involved in the two different focus groups and their specific membership, in addition, three researchers were present, one as conductor and the other two as observers. During all focus group meetings, people determined a fluid and participated reasoning, offering the opportunity to highlight attitudes, priorities, languages, and framework of understanding; it was important to distinguish individual opinions from the group consensus. Instead, interaction among participants permitted to catch the expression of criticism and dynamics of conflict in relation to different dimensions of energy transition issues and related into participants' role or membership. For every focus group, the different elements discussed are synthetized and analysed thereinafter.

4.3.1. Focus group 1 outlines

As anticipated, the conditions due to the health emergency forced us to plan our focus group online, we used a platform that allowed us to record both the video and audio of our meeting together with the collective drafting of the SWOT analysis. Four participants were present: a manager of the Environment and Climate department of the Lomabardia region, a project manager of Legambiente in Campania, the founder of the Green Jobs project and finally the co-founder of Energy of Smart things

in Brescia. In addition to one researcher who conducted the focus and a second who participated in the design of the SWOT analysis, two other researchers were present as observers. From the transcription and analysis of the text, some particularly relevant issues emerged which we will try to summarise.

After a traditional round of presentations, the debate opened on the relationship between professionalism and energy transition. All participants agree that this is an indispensable binomial, in their experiences they perceived a progressive awareness in this sense and recall the need to broaden the tools to accompany the transition process in professional environments by a greater sharing of values and cultural patterns. They also note the need to bring about changes in the administrative apparatus, so as to ensure greater transversality as opposed to the traditional vertical management of institutions. The rigid sectoral schemes in which the offices operate would seem to generate implementation problems for the realisation of concrete objectives:

> The term that comes to mind when linking the word professionalism to transition is the issue of transversality. In other words, our professionalism... and I am speaking especially in institutions that have been strongly... how can I say they have a strongly vertical tradition, that is, sectoral. […] The theme of sectoralism, therefore of the vertical approach, also with which we ourselves are organised as a structure... creates very strong difficulties in making a series of actions concrete and implemented and therefore guaranteeing the achievement of certain objectives. (Director into the Department of Environment and Climate – Lombardy Region)

Those working in the private sector who are observing the change from the perspective of companies are also witnessing a change in management; more and more companies are equipping their offices with an 'environmental management system' for the organisation of energy installations:

> What 15 years ago was seen by the entrepreneur as a mere cost, having a figure in an environment office is a real cost, it was almost seen as a sometimes-unnecessary cost. Now it becomes... it's really seen as a fundamental cost, it becomes an investment, it's not really a cost anymore. So, in 10-15 years the mentality has really changed, and consequently so have the professional skills within companies. (Co-founder of Energy of Smart things)

Subsequently, the conversation focused more specifically on the professional profiles involved in the participants' work and the interactions with companies, associations and institutions. In this context too, it is clear that technical profiles still dominate the energy world. However, everyone agrees on the importance of a more interdisciplinary vision, capable of determining a systemic vision from both an institutional and a business point of view. To facilitate this process, someone also underlines the importance of introducing new tools to consolidate some of the dynamics necessary for the transition: digital innovation and social innovation - understood in terms of greater participation and sharing, both in the work environment and in the dimension of active citizenship.

They all confirm the centrality of another fundamental element in the transition, namely: the territory. It is a protagonist that over the years has managed to assert its role in the transformation processes. The institutions themselves, slower than others to adapt to change, have activated mechanisms to improve participation and facilitate citizen involvement. However, some people note that some difficulties persist:

> I don't think that today the institutions lack the tools to do this. In other words, we have a framework, including legislation, that allows us to do this. I am thinking of instruments such as programme agreements or negotiated agreements. I mean, at least in the Lombardy Region, we have the tools to create actions that have a cross-cutting connotation with respect to responsibilities and tasks. Perhaps they need to be put into practice, i.e. used. From this point of view, I do not see any particular criticalities, but I do see an absence of courage, and even a somewhat political lack of courage. In other words, the future belongs to those who make it, as they say. In the sense that having a crystal ball and guessing is very risky because we have seen,

> that is, we know that there are many uncertainties, but perhaps we should turn the point of view upside down. That is, what is the future that we want to build? (Director of the Department of Environment and Climate – Lombardy Region)

Imagination is therefore needed for the future. In other words, in order to understand what to do, one must first understand and think about objectives and scenarios. In this sense, some people refer to the need for professional figures who deal only with this: with the future. In other words, those who are able to observe the present, grasp its demands and transform them into scenarios for the future.

We will now look at what emerged from the participants' experiences with gender issues. We will now look at what emerged from the participants' experiences with gender issues. Here again, trends noted in the literature and in our previous observations are confirmed: technical profiles more represented by the male gender or in any case few women in management and top positions. With the exception of those who are part of the associative universe where the dominant trends in the labour market are reversed:

> in my associative life, let's say, I don't see this... absolutely there is a gender parity... so discussed... but undoubtedly in the interlocution with external subjects, from institutions to enterprises, more and more on institutions there is a very strong gender disparity, for the top roles compared to the basic ones. (Project manager of Legambiente)

However, there seems to be a slow but steady reversal of this trend in the younger generation, as one of the participants observed:

> I see a prevalence of men, but with a gender disparity that is also linked to age. If I think of a group of people under 35/40, it's probably a draw. Men are more or less the same number as women. Perhaps because they are also new professional figures in which women can enter more easily. However, if you go up in age, they are mostly men.

It is therefore interesting to observe how some of the new professional profiles that are becoming part of the energy transition processes are gradually managing to escape the forms of 'gender segregation' that have so far characterised the training and employment dimension. They are described as hybrid figures, as in the example of facilitators and community animators.

Finally, we report the summary scheme of the SWOT analysis elaborated by the focus group participants (tab. 4.3.2)

STRENGTHS	**W**EAKNESSES
- proactive energy of people - ability to find resources to cope with transition - resilience of the cognitive apparatus - ability to find and invent solutions for the future	- inefficient bureaucracy - hostile corporatism - fear of responsibility - inability to intervene in problems that create mistrust in young people - lack of attention to the enterprise dimension in training programmes
OPPORTUNITIES	**T**HREATS
- proactive energy of people - energy transition and strategic choices made by Europe and driving force in the global context - innovativeness as a revolution for something that does not yet exist	- cultural system depressing the propensity to take risks, distrust - accentuation of social inequalities - inability to grasp the opportunity for change - difficulty in leaving the comfort zone

Table 4.12– SWOT analysis FOCUS GROUP N. 1

4.3.2 Focus group 2 outlines

Even for this second focus group we were forced to use an online platform for the meeting, although we had planned to have a larger presence, due to problems that arose we received some defections just before the meeting. Therefore, three participants were present: a member of communication and sustainability division of Falck Renewables, a member of the Lucana Energy Society and an investment and business developments analyst of the Genera Society. Also, in this case, in addition to one researcher who conducted the focus and a second who participated in the design of the SWOT analysis, two other researchers were present as observers.

We now review the elements that emerged from the discussion, after the usual round of introductions, we asked the following question: «our project focuses on skills and knowledge, considering the issue of professionalism and energy transition: in your opinion, what is the relationship between the two?».

Participants highlighted the rapid evolution in the labour market in relation to the energy transition, referring to the emergence of new professional figures in their workplaces, in this sense they also underlined its strongly interdisciplinary composition:

> In fact, within Falk we are constantly recruiting human resources and following the evolution of the sector, which is always evolving both technologically and in terms of services and the new countries in which we operate. […] Therefore, we also create employment opportunities and new professionalism. These are people who have technical expertise in plant maintenance on

> the one hand, and managerial, economic and more managerial skills within the company on the other. (Member of Falck Renewables)

It was interesting to observe afterwards the motivational path of the participants regarding the choice of their field of competence, who associated the theme of transition with the concept of freedom and autonomy. Transition is thus introduced as a possibility to emancipate oneself from interdependent relationships, that can have a strong impact both at a systemic and territorial level.

Returning more closely to the issue of skills, the need for greater transversality between technical-scientific and socio-organisational skills is also strongly emphasised here. Where specific skills are required, it would seem appropriate to set up basic courses on topics that cut across their work, so as to ensure greater fluidity between sectors:

> The people I deal with on a daily basis are managers who generally do not have technical profiles, but they have been in the energy sector for a long time so they have gradually acquired more technical skills. And that's also the beauty of the sector, that even though it is a sector that requires technical skills it does not exclude a priori that these skills can be created. What is missing in my opinion are the opportunities to deepen the themes of the energy transition, perhaps there is still a lack of knowledge that allows you to take a step into this sector, I don't necessarily have to do engineering studies to enter the sector, but to do a training course to enter this sector. Training, so transversal. (Member of Falck Renewables)

The issue of institutional responsibility also returns in relation to competencies:

> In my opinion, in order to talk about energy competence, we have to start from the top, i.e. from all regulations and planning. Having followed all the energy plans in Basilicata, I have seen that there is a lack of good planning. In my opinion, profiles with good planning skills and both legal and technical competences should be included in the energy field. (member of the Lucana Energy Society)

On the subject of the presence of men and women and on the roles they play in the energy sector, the same images come back as before: higher male presence, male-dominated management roles, although symptoms of change are perceived:

> Energy is a very masculine field because it is always linked to technical education, and culturally technical education is something that men have access to, all STEM subjects. That's still kind of the situation today but I think it's slowly evolving. (Member of Falck Renewables)

Finally, we report the elements that compose the SWOT analysis, compiled during the collective discussion of our focus group.

STRENGTHS	**W**EAKNESSES
- targets achieved for renewable energy production; - presence of resources to support the transition; - growth in public awareness and consensus and political recognition; - presence of congenial areas due to their conformation (e.g. Alps and Apennines).	- NIMBY syndrome; - absence of perception in terms of opportunities (e.g. possibility of new jobs).
OPPORTUNITIES	**T**HREATS
- European funding; - European programming; - global trends.	- inability and inefficiency on the part of institutional actors; - changes in the democratic process do not guarantee continuity of programming.

Table 4.13– SWOT analysis FOCUS GROUP N. 2

5. Conclusions

5.1 Triangulation and research results

Different research techniques have been designed, assembled, and used in this two-year-long research project. In the previous paragraphs, the main results achieved using the single technique has been reported and discussed. Here the empirical results from a mixed-method approach are summarized.

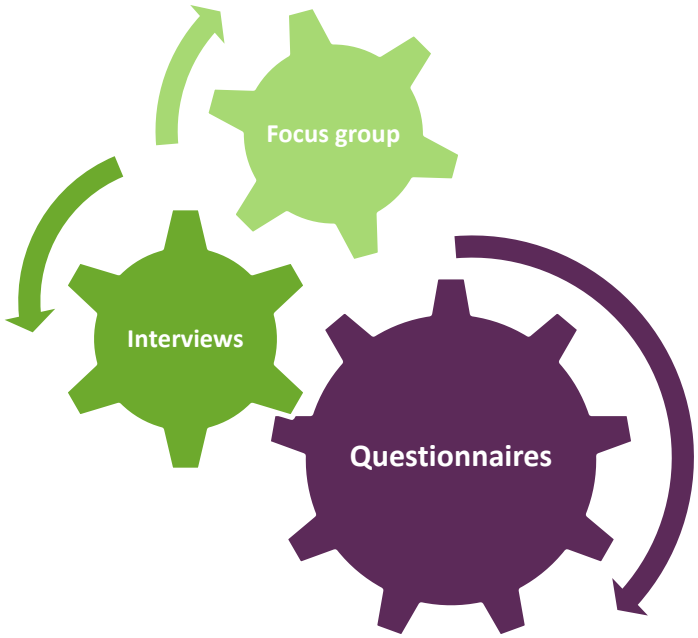


Figure 5.1 - Triangulation

The questionnaire was designed to explore four different analytical dimensions (economy and labour market; policies and regulatory framework; culture and symbols; socio-technical innovations). The focus group sessions were devoted to unfolding the social legitimation of energy transition, looking at how experts and stakeholders claim for a certain vision and version of this process. Finally, in-depth open interviews were needed to record those cultural, historical and socio-technical features that are considered crucial for the energy transition.
In doing so, the SSH (of Social Sciences and Humanities) framing of the research design was intended to investigate the social construction of the energy transition in broader terms. Triangulation is a way to put in evidence those results that emerge as more consistent and confirmed about a specific phenomenon, thus it is a strategy to enhance validity through the comparison of results. In our case, the dynamics of alignment and/or disagreement among heterogeneous actors (companies and customers, industrial networks, policy and administration representatives, infrastructure agencies/authorities, cultural agencies, science and technological actors) were collected and compared. The research was also aimed to understand the role of the experts, professionals, and institutional actors that promote and implement the education systems' transformation. With the integration of the perspectives and the arguments collected during the research, it is possible to retrace the relationship between the actors' expectations and participation in the energy transition and their perceptions about state of the art.

In what follows, the results of the systematic comparison among the different findings will be presented. The final findings are reported along three lines of discussion: a) knowledge, skills, and competencies; b) Local communities and institutional trust; c) gender balance and energy transition.

5.1.1. Knowledge, skills, and competencies

The data collected shows trends in the energy sector and the skills considered necessary to facilitate the complex process of a just and sustainable energy transition.
A first aspect that emerges – both in quantitative research and qualitative data – is the relevance of small-scale production energy systems in the next future combined with digital technologies. If smart solutions play a pivotal role in production management and energy provision, final consumers and local communities' participation will be essential to spread and adopt these technological novelties. In short, what seems prefigured is the increasing diffusion of "smart energy communities". For this, the forthcoming energy system would require new skills to govern the technological complexity and the variety of actors that will be active or need to be involved in the energy field (new companies, consumers, local communities, etc.). In this sense, one of the priority goals identified (after the CO2 reduction) is improving the social sharing of energy production and its benefits, thanks to an easier regulation to foster new economic and job opportunities at the local level. Coherently, respondents report that innovations (such as green energy infrastructures, smart grids, green mobility or buildings' energy retrofit) require significant investments and the participation and collaboration of end-users for their implementation. In the qualitative research, step participants emphasized the need for policies that promote a cultural change for the energy transition planning. First, the training and professional paths of those working in the energy sector (or involved in it, like civil servants in the urban planning office) should consider cooperation as the primary tool to identify appropriate solutions for any specific socio-territorial context. Secondly, cultural change needs to occur in the users/citizens' vision and practice about the energy provision that will combine elements of independence (self-production) and interdependence (relations between smart grid actors or between energy companies and local communities).
The knowledge and skills considered necessary to facilitate a just and sustainable transition are transversal and differ according to the energy issue sector (production, consumption, transport, bureaucracy). In general, if technical and engineering competencies are considered pivotal to the energy transition, they need to be complemented by hard skills related to digitalisation and data analysis, fundamental for an interconnected, smart and green system. Respondents also listed adaptability/creativity and communication as the primary soft skills for them. These last competencies appear helpful for interfacing with local communities, consumers and citizens to establish a relation, a bond with them to promote a cooperative transition process. Participation can help define the energy system transformations and adopt the most suitable solutions for a local context.
More specifically, on the one hand, if the quantitative data indicate that engineering and technical profiles are essential for the energy transition, on the other, in the "development of project" segment (renewable power plants, new transport systems), social science disciplines are alongside to the engineering ones. This highlights the need to consider the social dimension and the involvement of end-users and local communities for more profitable use of resources and adequate implementation of sustainable technologies. On this point, the experts compare new job profiles to the "information agents" or "community planners" that use communication competencies to encourage a change in consumer behaviour or participation in the transition planning. In short, energy transition requires a multidisciplinary approach for the professionals who must implement the transition. In line with this consideration, qualitative and quantitative data suggest that the energy issue should be included in several educational and training courses because of the energy transition's multidisciplinary feature as a socio-technical innovation process.
The energy transition crosses industry sectors (energy, manufacturing), public administrations (Ministries, local authorities), consumers and territorial communities. For this, professionals (both new

and traditional job profiles) must update technical skills. They also have to acquire communication and relational skills to decline according to those with whom they interface. Experts also reported that training should focus even on managerial and social-ethical competencies. The ethical dimension seems relevant for companies since they interface with territories, customers, and public bodies. It is also not unexpected that quantitative and qualitative data reveal the need for a reorganization of disciplinary fields, especially for technical-engineering and economic-managerial ones, which need an update in technical and legal aspects related to innovations (like the off-shore wind turbines and their maintenance) and planning activities, but also socio-environmental aspects and ethics.
The university is pivotal for the "transition workers" to acquire the necessary basic multidisciplinary skills for their jobs. At the same time, professional skills need on-job learning that is also a lifelong learning activity because of the constant innovation in the energy sector (technological innovation, new regulations). In this sense, the universities can provide adequate training if they integrate into the educational courses studies on communication activities (for the business sector, for example), mediation processes (between and with institutions) and participation (for citizens and local communities). As reported by experts, professional profiles able to respond to the new challenges of the energy transition are different and with some specificity for any sector. In the case of project developers, they need to connect the players and stakeholders in the field. In this case, mediation and communication skills are essential. Multidisciplinary is also critical even in the public administration that should define plans for the energy transition. This means developing a capacity building for the energy transition process's governance that often clashes with an inadequate public administration and the difficulty of acquiring the considerable skills deemed necessary to promote the energy transition.
In short, data collected suggest that the energy transition cannot disregard technical-scientific and engineering disciplinary fields, but these competencies alone are not sufficient. The energy transition is a transformation of social practices (using energy and technological devices) and territorial contexts (e.g., renewable power plants, new grids). To be realized in a just and sustainable way, it needs to develop positive narratives and best practices to involve citizens and final users. The greater involvement of citizens seems relevant for the transition (both for large facilities and small systems); the change cannot be imagined, promoted and managed in a univocal way everywhere. Still, it must be adapted to socio-territorial peculiarities, also considering the possible social asymmetries (energy poverty, difficulty in accessing energy services) as aspects to be faced.
It emerges that the transition needs a high level of technical professionals linked to values and passions. It recalls the idea of an innovation respectful of places and local communities because the energy transition can change the landscape and territorial identities impacting negatively on communities, especially in marginal areas. In other words, the transition must be closer to the communities so that they perceive its ecological and economic collective benefits. In this sense, qualitative research suggested a lack of competencies for professional profiles that have to manage participation, build relationships with local governments and establish connections with local communities to negotiate a fair distribution of benefits. To do this, “transition workers” should acquire interpersonal skills to recognize local social needs, and communication skills to enact a collaborative environment. This argument is quite similar to that about the role of political institutions in framing educational trajectories aimed to face the energy transition-related societal challenges.

5.1.2. Local community and institutional trust

The focus on local knowledge and social capital in relation to energy transition is one of the pivotal features of this SSH oriented project. Indeed, the research design was intended to investigate the main general question (what are the knowledge, skills, competencies needed to foster the transition?), but at the same time to look at the territories demand and community’s needs. The argument about the professional and technical learning needs emerged quite straightforwardly, whereas the relationship

between knowledge, local contexts and innovations appears more complex, and often contradictory as well.

The first issue that deals with the very structural technological dimension of the transition. Large facilities, concentrated infrastructures, and high-cost technologies prefigurate consistent advantages in terms of economy of scale, as well as "bounded" management of the process. This configuration seems to imply a functional connection of the "centres" of transition/innovation with territories. Indeed, standardized knowledge, advanced and constantly updated competencies are at the core of this model that needs to be nourished by economic/financial awareness and technological reliability. Local territories and communities seem to play a residual role in this scenario, and often the educational needing is basically limited to information about correct behaviours as energy consumers.

The idea of a decentred model of the energy transition, made of affordable technological solutions, direct involvement of citizens in energy production according to the "prosumerism" logic, cooperative arrangements of management and decision making, open to different societal challenges. Firstly, ordinary people need to be educated enough to legal, technical, and financial aspects that shape a low carbon and embedded/local energy system. This point leads clearly to the democracy one, in terms of citizen capabilities to establish their effective and direct role in framing the socio-technical option consistent with the local context. The research shows that the claim for information, communication and education campaigns dedicated to households and local communities is still recurrently debated among experts, decision-makers and stakeholder. But we have to underline that this argument is redundant as much as it sounds rhetoric and generic. The bottom-up empowerment is mentioned but rarely deepened by the actors involved during the empirical activities, and when they focus on this issue it is not very clear who they consider in charge of promoting such a "commonification" of the energy transition. Institutions and public agencies are, generally speaking, considered responsible for the local development programmers. But what the research shows, collecting results both from quantitative and qualitative tools, is a kind of interruption between the levels of the energy governance. How institutions, at different levels, must cooperate to enhance territories and their fair and effective transition? This emerges to be a very critical issue because the narratives about multilevel governance and those to the democratic arrangements seem to overlap but not connected enough. Is this a matter of lack of institutional competencies and/or intellectual resources? The answer to this question is not so immediate, thus this point must be considered a relevant criticality that needs more efforts to be understood.

Another critical point emerging from the research deals with the so-called local knowledge and its relevance in implementing new low-carbon arrangements and energy solutions. Communities are quite often recalled by experts and stakeholders as a pivotal collective actor, but the main argument emerging from interviews, focus groups, and somehow from the survey too, prefigurates a passive role since these social groups of households, citizens, consumers need to be supported. In other words, it seems that the local knowledge discourse opens another question that is the general recognition of local specificities and competencies. Again, we retrace a trade-off between standardized models of transition and local features. How to connect the most legitimized and formalized skills profiles (academics, professionals) with those emerging on the field (local technician, local representatives)? In this case, the specific point regarding the energy transition refers to the "general picture" that is about the relationship between theoretical/abstract knowledge and practical/embedded skills. It can be said that an effort to establish common dialogue and mutual recognition is needed to develop a sustainable and consistent transition.

The economic sphere, the technological one as well as associations and cooperatives are represented as actors quite established and routed in the general dynamics of the energy transition. They contribute whit their specifics, perspectives, and epistemologies to build the paths of new low-carbon arrangements. Ordinary people, households, and citizens practice experiments, they contribute to enacting very embedded experiences of innovation, but this is generally considered not enough for the accomplishment of a systemic and structural socio-technical change. Institutions seem to be perceived in the middle, they are supposed to connect different levels of action, interests as well as

vocabularies and knowledge. Institutions are asked to fill several voids of a complex, multilevel (and contradictory) process. How to synchronize differences? What institutions need to improve? It attains to public accountability and responsiveness; it is a matter of new educational and training needs for? Problematizing these questions lead us to suggest that social trust is a crucial point that needs to be considered in the general framework. Frequently institutions are addressed as actors in charge to promote the culture of environmental sustainability, as well to the public understanding of complex phenomena, as in the case of the energy transition. To accomplish these tasks, institutions have to play their primary role/function to ensure social trust and collective coordination for the common good. Trusting institutions, that is supposed to legitimate the action of institutions themselves, cannot be considered a taken for granted dynamic. Therefore, energy transition needs to be supported by knowledge about how social trust works, which is more than an issue of public communication and/or public engagement. We can say that it regards institutional education since those that have to play a complex role of connecting levels of governance and composing interests at stake have to manage societal (and sociological) dynamic through a holistic approach.

5.1.3. Gender balance and energy transition

The research insights about the gender issue depict this as an ambiguous dilemma. The need to "engender" energy transition is a very common claim and nowadays it is commonly stated in policies and institutional strategies, both at the supernational and national level. Even if gender issues are sometimes quite underestimated within the global energy policy frameworks, the results of the research show an increasing degree of awareness about this issue. International agencies and official document report statistics showing that women are still residual (in number and hierarchical positions) in technical professions, as well as they are underrepresented among those students enrolled in STEM education courses.

Nevertheless, the main scenario is featured by an emphasis on the "hardware" side of energy infrastructures consistently with technical options and technological effectiveness. Generally speaking, energy is part of a wider (and taken for granted) assemblage of "pipe and cables" providing services and goods for a decent everyday life (that means citizenship inclusion). Policymakers are more and more aware that this complex socio-material network is not "natural" and managed mostly by men. Indeed, gender neutrality opens to a tricky option. It could enhance policies aiming to benefit both women and men equally in meeting practical needs. Conversely, it could blind and neglect differences in terms of socio-cultural capital, stereotypes, and actual discrimination.

Research findings of this awareness show that this is performed addressing women more as stakeholders or beneficiaries (passive role) than as agents of innovation and societal change (active role). Indeed, we collected arguments mainly focused on weaknesses (time poverty, lack of electrification in rural areas, women's health and well-being, underrepresentation in employment and decision making). At the same time, the research confirms that renewables industries are more gender-inclusive and featured by a multidisciplinary/holistic approach when participating to co-construct decentred/democratic arrangements. In these cases (off-grid, local prosumerism, rural green-settings) women are reported as actively engaged, from the organization to finance and management, to technical details as well.

The comparison of policies assumptions and research results leads to an interesting contradiction. The official discourse and the public debate seem to converge on the request for a «gender-balanced» energy transition, as well as for a fair, equity/equality-based, and sustainable model. At the same time, our respondents (in particularly the survey ones) are very timid on this issue and actually, gender is not reported as an issue in itself. Moreover, gender seems not to be a priority in educational programs, neither for learning agencies/providers. When we look at the distinction between hard and soft skills the results show a sings of gender polarization with men more associated with the first and women with the second. But what emerges is that channelling women into the energy sector is considered not a relevant priority, often also for women themselves. In other words, it could be said that the energy

field is featured by the “neutralization” of the gender issue we mentioned above. The absence of an emphasis on a general gender issue and the confirmation of a sort of stereotyped polarization between man and women in terms of competencies, lead to confirm the need for educational and learning activities for all the actors of the energy “ecosystem” addressing the acknowledgement the socially constructed nature of gender relations.

To conclude, this work aimed to understand which knowledge and skills can help to promote a just and sustainable energy transition by questioning with different techniques a series of experts in relevant topics to the process of socio-technical transformation of the energy sector. A series of relevant considerations emerged in the study. On the one hand, data have highlighted the need for multidisciplinary training for “transition workers”. On the other, it was also stressed the need for participatory processes and the importance of involving citizens and local communities in energy sector transformation. There are noticeable differences among the various "jobs for the transition". Professionals who have to define new, more efficient and less impactful green energy technologies should have technical and engineering skills. Still, they must also be aware that many of those innovations have to be used by different actors, with values, attitudes, and knowledge that may not fit initially with the "culture of sustainability". Other technological innovations, on the contrary, will affect local communities, and technicians need to assess the type of socio-environmental impacts and how to mitigate them. At the same time, the professionals whose role is to promote the dissemination and use of green technologies need skills to mediate and cooperate with the actors they interface, without losing sight of the economic sustainability of investments (especially in companies that invest in the energy transition). In this scenario, political institutions are pivotal to plan and govern the transition process, avoiding unintended or unforeseen negative social impacts.

6. References

Hunter F., (1963), *Community Power Structure: A Study of Decision Makers*, University of North Caroline Press, Chapel Hill.

Kitzinger, Jenny. "Qualitative research: introducing focus groups." Bmj 311.7000 (1995): 299-302.

Stone C.S., (1988), “Preemptive Power: Floyd Hunter's ‘Community Power Structure’ Reconsidered.” American Journal of Political Science, Vol. 32, pp. 82-104.

ValentinI, C., (1997), *Le donne fanno paura*, Il Saggiatore, Milano 1997.

Warner L.W., (1963), *Yankee City*, Yale University Press, Yale.

Annex I: The stakeholder questionnaire

Available at the following address: https://it.surveymonkey.com/r/3T7VZQ3

Annex II: The Expert Interview guideline

Energy transition and labour market
- Features and relationship with another occupational field
- Statistics and sources of data about the field
- The role of the professional/technical associations
- The role of the companies
- The role of the institutions

Education, training, career
-Education: practices and agencies
-Trajectories, theoretical and practical knowledge
- The training on the job and the experience
- Tricks of trade: work experience and ethics
- Competences and skills endowment (trajectory)
- The labour "culture" of the energy transition
- Job profiles and "institutionalization" processes
- Prestige and hierarchies among different job profiles
- The gender gap. Discrimination and the "green" glass ceiling

Involvement in the energy transition filed
- Cooperation and competition. The areas of exclusive "jurisdiction"
- Accountability and evaluation of the professional quality
- Citizen energy, new business model, policy leverage

Energy transition and ethics
- The relationship with the logic of the energetic market
- The issue of the local territory's interests
- Technologies, contexts, communities
- Energy transition, gender and values

Anagraphic data
- Age
- Gender
- Country in which he lives
- Educational qualification
- Professional field
- Professional position
- Institution/Organization/Company
- Current project involvement (local/global; urban/rural)

Annex II: The focus-group guideline

Opening question: general opinion	1. Introduce yourself and tell us about your involvement in energy transition
Introduction question	2. Professionalism/energy transition: comment on this combination
Transition questions	3. Thinking back to when you started your experience in the energy field, what were your motivations? 4. What has remained? What has changed?
Key questions	5. What are the profiles of the people involved in your work? 6. Which interactions are necessary in your work (associations, companies and institutions)? 7. What skills are missing in the energy transition process? 8. How many men and women do you work with? 9. How is the local territory involved in your work?
	10. SWOT
Final discussion	11. Of the topics discussed, which do you think is the most important? 12. How can it be improved? 13. Is there anything we have missed or that you would like to add?